



**The History of CIGRE
National Committees**
(International Council on
Large Electric Systems)

**A major contribution
to the International history of CIGRE:
Creation and Development of National
Committees since the 1920s**



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FOREWORD

In 2011 CIGRE celebrated its 90th Anniversary and the Association's progress is no doubt to a large extent a result of the invaluable and multifaceted contribution of the National Committees. The object of this work is precisely to highlight the harmonious development of CIGRE and its National Committees. I would first of all like to express my gratitude to the 31 National Committees who responded to our call for contributions. Each of them proceeded to a meticulous search into the beginnings, making and action of the National Committee. The outcome of their work, for the benefit of the CIGRE community, was 31 monographs which all render a synthetic and lively picture of the specific actions in the context of a vision which is both retrospective and prospective. This was no easy task as National Committees were required to follow the guidelines set by the International Editing Committee, whose objectives were:

- To present the situation of the Electric System Industry at the time of creation of the National Committee, giving the main technical, organisational and economic characteristics;
- To present the direction and main development of each National Committee, with mention of the main players;
- To point out the major contributions of each National Committee to CIGRE: participation in Sessions, Study Committees, Working Groups, technical papers produced;
- Finally, to sketch out the prospective vision of the National Committee.

The 31 remarkable contributions reflect first and foremost the constant efforts to single out and harmonize the best practices and procedures within the framework of the Statutes and technical expertise missions set. At the same time we note the wealth of knowledge and experience stemming from the widely differing geographical contexts. Unity and diversity: therein lies the long-standing success of CIGRE. The 31 contributions stand as evidence that, as expressed through its logo, the Association has managed to acknowledge the experience of its National Committees over the five Continents in the interest of the whole community.

It must be stressed that many National Committees have played a vital role in their respective countries, especially through organising and heading “Mirror” Committees reproducing locally the international set-up of CIGRE Study Committees. Generally, they have promoted and continue to promote the activities and technical expertise which are at the core of CIGRE’s mission. They have contributed to the advance of technical knowledge and its diffusion within the country as well as beyond the borders to the whole region. The symbiosis and cross fertilisation between the National Committees and CIGRE are ensuring the lasting visibility of our International Organization.

I wish to express my thanks to a number of people whose strong support has allowed achieving this work: André Merlin, former President of CIGRE, the members of the International Editing Committee, the Secretary General of CIGRE in the person of Jean Kowal followed by François Meslier, and Liliane Ney for her assistance in the publication process. Of course my thanks also go to Christophe Bouneau, the historian, for his introduction to this book.

In conclusion, my wish is that the present work be regarded as a useful complement to the first book issued in 2011 under the title: The History of CIGRE – A key player in the development of electric systems since 1921. It is hoped that the buoyant networking between successive generations of Cigreans, as evidenced in the book, will contribute to highlighting the specific features of each National Committee. And as anticipation and construction of a prospective vision have always characterised the CIGRE spirit, may this book also serve as a milestone on the road to the 100-Year Anniversary of CIGRE in 2021.

Jerzy Lepecki

Past President of CIGRE

INTRODUCTION

A Major Contribution to the General History of CIGRE: creation and development of National Committees since the 1920s

The history of the National Committees of CIGRE (International Conference on Large Electric Systems) which in 2000 changed its name, the word “Conference” being replaced by “Council”, is intricately related to the creation of the International Association. CIGRE’s creation was acknowledged worldwide through its founding congress held in Paris in October 1921¹. Why Paris for venue of the congress then as the permanent headquarters of the International Organization? The reason was that it was known as the City of Light exerting great attraction worldwide. Also, Paris as the venue of the largest number of conferences was as important as the role played by the French community of electrical engineers in the development of CIGRE in the Interwar Period.

In the long term, from the 1920s to the year 2010 – close to one hundred years – the diverse contributions of the National Committees toward the international dynamics of CIGRE resulted in a deep-rooted and lasting symbiosis. This harmonious interaction was a great asset toward recognition of CIGRE expertise and the shaping of the “CIGRE spirit”, as members shared a feeling of belonging to an enlightened community. Beyond the Organization aspect, a human/technical/social network developed with NCs² acting as interconnecting links. Basically, the National Committees – through their growing number and geographical expansion over the five Continents – have been the levers of CIGRE’s internationalization, gradually leading to its worldwide impact and actions.

1. Creation and growth of the National Committees in the Interwar Period: a very gradual organizational process

1931 is the official year of the creation of NCs as this is also the year when the Association’s Statutes were issued; these included provision for recognition of the NCs.

1- See “The History of CIGRE (International Council on Large Electric Systems) – A key player in the development of electric power systems since 1921”, Paris, Conformes 2011, 204p.

2- National Committees will be abbreviated as “NCs” in the text.

A thorough search into the CIGRE archives did not allow spotting the time when the question of creating NCs was explicitly raised. A detailed historical analysis, based on all possible clues, names, titles and activities led to the conclusion that the creation and development of NCs were determined in time by 4 major landmarks: 1931, 1946, 1966 and 2000. Hence, from the legal, institutional and organizational points of view the official creation of NCs was definitely a progressive move.

1.1. From the 1921 founding congress to the 1931 stabilization: the IEC model and search for international relays

As part of CIGRE's structure and driving forces, the NCs – as opposed to Study Committees – were set up very slowly. The name and basic principles on which they were founded were clearly derived from the IEC model. The IEC was founded in 1906 in London, at a time when Western cooperation was starting in the area of electro-technology, and efforts were being made to reach a balance across the Atlantic. This was fifteen years before CIGRE was founded. London became the permanent seat of the IEC, the major Standardization Organization for the Electric Industry. An important difference between the IEC and CIGRE must be noted: whereas the IEC is a federation of countries represented by National Committees who speak and take position in their name in international meetings, CIGRE has always been an association of members (both individual and collective) who represent themselves, not a country³.

IEC National Committees made up the membership of the Association. In CIGRE NCs act as liaising structures and links between members and the General Secretariat in Paris. This role is of the utmost importance for CIGRE; looking back in history a very clear reference to NCs is found in one of the resolutions of the second CIGRE Conference in 1923 when a wish was expressed: *“that in every country be created a National Committee made up of a few members with the aim of making the conference better known, of encouraging the production of papers, selecting only those of the highest interest, and sending these papers as early as possible to the General Secretariat so that they may be translated and circulated before the opening of the conference”*.

Further to this resolution the first three NCs were created: United Kingdom, Netherlands and Italy. It was some time before others were officially founded. The recommendation was renewed at the time of the 1925 Conference (Resolution N°2). In 1927 the same idea was expressed in these words: *“in every country – as has already been done in some – a National Committee should be formed whose objectives would be the following...”* Anyway, from these pioneering

3- Any sovereign country wishing to be part of the International Electrotechnical Commission (IEC) could form a National Committee made up of technical Companies or if there was none a Committee could be appointed by the Government. Each Committee was required to send delegates to the Commission and each country was entitled to one vote, regardless of the number of delegates.

days (mid- to end of the 1920s), the rules required that papers for presentation at CIGRE Conferences be sent in via the country's "participating National Committee", term used at the time.

1.2. Official recognition of the first NCs as related to the founding of the Association in 1931

The permanent Association was thus founded in 1931 with Statutes providing for the creation of NCs;

Article 11 read:

"Article 11: Groups and National Committees

If they so wish the members of the Association belonging to the same country may come together to form a group. Each Group elects a Committee referred to as National Committee whose role is defined hereafter.

The membership fees of the Group members may be collected by the National Committee, who will then forward these to the Association Secretariat.

The operation of the Group is left up to the people concerned. But their by-laws will have to be approved by the Administrative Council of the Association.

National Committees are in charge of:

- a) Participating, on behalf of their country to the preparation of Sessions and organizing the country's collaboration with the Conference;*
- b) Encouraging the drawing up of papers for presentation at Sessions and forwarding these papers according to schedule;*
- c) Recruiting members for the Association and for the Sessions, organizing the representation of the country at Sessions, appointing a head of delegation;*
- d) Making the Conference better known in the country, protecting its interests, attracting members etc."*

The above Article, in its formulation, was practically word for word the initial recommendation put forward at the 1923 Conference.

The French National Committee was founded in 1931 when already around 10 NCs were in operation. The French NC soon became the largest in terms of membership. In 1923 French members made up 62.9% of the total membership. This proportion decreased gradually with the growingly international character of CIGRE and the increase in number of National Committees. In 2010 French members made up around 5% of the total membership.

The reasons accounting for the large number of French members and their high participation in Sessions were: 1) the state of advance of electrical engineering in the area of power systems, 2) the fact that the CIGRE Sessions were

held in Paris, thus making it easier for French nationals to attend these events, and 3) the fact that Paris was confirmed in the Statutes as the permanent seat of the Association. Also, CIGRE benefited from the strong support of the French State Electricity Company, EDF.

Paris as the venue for CIGRE Sessions was generally supported as President Ernest Mercier confirmed at the Administrative Council meeting of 14th April 1934 when he said “...if CIGRE Sessions are always held in Paris, it is because such is the wish of the international CIGRE membership who feel this to be more advantageous and convenient than a change of venue every two years for our congresses”.

1.3. Formation and expansion of the international network of CIGRE National Committees

From 1931 up till today the international network of NCs was formed and expanded as shown in Table 1. Three development periods can be identified:

- Early 1930s when the 18 existing NCs which had formed spontaneously in the period 1923 to 1931 were officially recognized.
- From 1946 to the early 1950s, when the pre-war network formed again with new countries outside Europe and North America. In 1950 CIGRE counted 50 NCs.
- End 1990s-early 2000s when the internationalization intensified, CIGRE opening out to all Continents. There are 57 NCs today.

Table 1
Evolution of CIGRE NCs: a sustained development since the 1930s

Year	Number of National Committees
1934	18
1939	22
1946	17
1950	30
1960	36
1970	34
1980	40
1990	43
2000	53
2012	57

On the eve of the Second World War the NC network had reached the first stage of maturity with no less than 22 NCs in operation. The Administrative Council at its meeting in June 1939 praised their action in a context of international crisis which prevailed at the time of preparation of the 10th and last Session to be held in the Interwar Period. This Session was held from 29th June to 8th July 1939. The Minutes of the meeting read: *"We wish to express our warmest thanks to all our National Committees for the efficient and devoted collaboration of the Chairmen and Secretaries. The role of these National Committees in preparing and selecting papers for the Sessions is becoming more and more important"*.

2. From an International to a World impact: the continued expansion dynamics of National Committees since 1945

A new international expansion dynamics was experienced with new NCs founded and growing membership after the Second World War. The rapid growth soon made up for a five-year period of imposed standstill when German occupation affected the activities of the Association in France as well as in a large part of Europe.

2.1. Impetus with peace restored after World War II - The 1946 Session

During the war some very limited activity was maintained by the CIGRE office thanks to the action of President Ernest Mercier and the French members. The first meeting of the Administrative Council since Summer 1939 was held on 14th November 1945, and the Secretary General, Jean Tribot-Laspière said in his financial report:

"The financial situation from 1940 to October 1945 is characterized by significant receipts in the form of subsidies paid, at the request of the President, Ernest Mercier, by the members of the French National Committee so that, awaiting contributions from other countries, sufficient financial resources can allow CIGRE to resume its activity without delay and to start preparing for the 1946 Session."

The success of the first after war Session held in June 1946 resulted in a new impetus for CIGRE, in a context of international technological enthusiasm where electricity and in particular high voltage power systems carried a connotation of progress, civilization and peace. This new spirit followed a period of war trauma and frustration and in CIGRE a significant slowdown in the exchange of technical knowledge. In 1945-1946 there was a strong need to resume the fruitful interchange developed in the Interwar Period and to this end to rely on the invaluable participation of the National Committees.

At the Administrative Council meeting of 4th July 1946 Ernest Mercier recalled the specific role of CIGRE National Committees in comparison with the IEC's organization:

"CIGRE is basically and statutorily an association of persons and not a federation of National Committees. CIGRE has drawn precious benefits from this particular situation which has always allowed it to exclude from its functioning any political concerns. The National Committees will remain in the future – as they have been in the past – extremely useful as working bodies and for collecting funds, but they will not constitute parts of a federation of National Committees".

The 1946 Session had a decisive influence on the NCs as it introduced a permanent representation system which today is part of the Association's governance and ensures a national and regional balance. In order to determine the relative weight of the different NCs, in 1946 CIGRE adopted an "equivalence" system according to which one "collective" member 1 (Company) was counted as equivalent to five "Individual" members (persons). This calculation reflected the financial contribution of each member category.

In 1949 CIGRE issued a Note aiming to promote the Association through a wider circulation of its work. Here again the basis and purpose of the National Committees who should continue to act as "Participation Committees" of CIGRE was set forth:

"CIGRE is an Association of individuals. Neither countries nor States are members, but rather electrical engineers who join either for themselves or as representatives of a Company or an Organization. The only requirement to join CIGRE is technical competence.

However, to facilitate liaison with members all over the World CIGRE is asking its members living in the same country to entrust a few of them with the task of liaising with the General Secretariat in Paris. Hence, were formed thanks to the dedication of a few Cigreans, Participation Committees who, as already said, are not members of CIGRE but fill the function of relays for the General Secretariat, namely for the preparation of Sessions. These "Participation Committees" are therefore useful administrative liaison bodies for contacts with Paris."

In June 1948, for the first time, a non-French person, R.A. Schmidt (from Switzerland) was elected as President of CIGRE, succeeding to Ernest Mercier; the latter pointed out at the Administrative Council meeting of 26th June 1948 that *"the decrease in the number of French participants from 50% to 30% of the total Session attendees stands as evidence of the success of the international Organization toward which the French National Committee has worked with perseverance and outside any selfish interest"*.

By the 1950s CIGRE was acknowledged as one of the most significant international Organizations handling technical issues in the field of electrical networks and power systems, an area which is both specific and wide. By 1951 the Association counted over 2000 equivalent members.

2.2. A many-sided organizational and administrative contribution

As national structuring bodies within the international CIGRE community, NCs from the start in the 1920s had a mainly administrative role, as opposed to the Study Committees whose role was of a purely technical character. The NCs have always acted as an invaluable cogwheel between the CIGRE Secretary General in Paris and the permanent members of all NCs. Their role made his task much easier by ensuring liaison with hundreds of members. In connection with Sessions, NCs encouraged contributions from their members, examined and selected the best papers for presentation, ensured observance of the CIGRE instructions by authors. More generally, in connection with the running of the Association, they collected membership fees and registrations to Sessions, carried out promotional actions to recruit new members. The NCs also supplied useful advice to the Central Office. Hence the many-sided activity of the NCs involved a growing workload and called for a strong sense of dedication.

The well-balanced development of the CIGRE Organization and regulation of its international activities certainly owes much to the strategic role played by the NCs. Their main task is to promote and pursue CIGRE's mission in the countries they represent. At the same time they draw attention to specific national issues which CIGRE should examine. This is achieved through the participation of Study Committee members and through the presentation of papers at Sessions and Symposia. A stringent selection of papers by NCs became all the more important in 1948 when the organization of the Sessions required that simultaneous meetings be held instead of plenary meetings. A prior consultation of NCs had been launched and although most agreed to the change, all wished simultaneous meetings to be as few as possible.

So, thanks to the involvement and sustained work of NCs CIGRE managed to contribute efficiently to technical innovation in areas of topical interest, for the benefit of research, system operators and decision-makers worldwide.

2.3. Continued dynamics of the National Committees and revision of the 1966 Statutes

For the first time since 1931 the CIGRE Statutes were revised/modernized, thus reflecting the maturity of a major International Organization as regarded both structure and operation. The person who was instrumental in bringing about the changes and drawing up the new Statutes was François Cahen, General Delegate of CIGRE from 1964 to 1970. In an editorial in *ELECTRA* (Special Issue 1972) on the occasion of the 50th Anniversary of CIGRE, the President of CIGRE, Andrew R. Cooper, wrote: *"CIGRE is a collection of individuals rather than a collection of countries. It is true that the membership is drawn from some sixty countries and that more than half of these have their own National Committees, but this merely indicates that the activities of CIGRE are worldwide. It does not imply that*

nationalism, as we have come to know it, plays any controlling part in CIGRE affairs. Cigreans are seekers after fundamental truths, who are happy to exchange information with their fellow members in those areas of specialized technology which are of common interest. Each man, in effect, represents himself. His country of origin, for all practical purposes is interesting but not significant”.

In the same period the main change in the organization of the Sessions was the adoption of the Preferential Subjects system which strengthened the role of NCs in maintaining the high level of CIGRE expertise. The rules for the preparation of Session papers provided for each NC to be entitled to an allotment of papers. Each NC would solicit proposals in the form of a 500-word synopsis focusing on one or the other Preferential Subjects. This system still applies today.

3. Evolution of the CIGRE network of National Committees since the end of the 20th Century: reform and expansion

At the turn of the Century which was a period of fast industrial and institutional changes (liberalization/deregulation/re-regulation, on the one hand, and innovation on the other), the NCs who were still growing in number, brought an essential contribution to the modernization and adaptation process undertaken by CIGRE at the end of the 1990s and which continued into the 2000s.

3.1. From the MasterPlan to the reforms of the early 2000s: the invaluable contribution of the National Committees.

Taking as starting point the “Missions” of CIGRE as formulated in the Statutes to which no significant change had been brought since 1966, an in-depth analysis of the strengths and weaknesses was carried out at the end of the 1990s. The areas calling for changes and innovation were thus identified and resulted in a MasterPlan being thought out. The document stressed the need for a clear policy as regarded CIGRE’s internal and external communication. Once again, the role of the NCs was enhanced as further participation was advocated from developing and newly industrialized countries.

The steady rise in the number of National Committees was clear evidence of the buoyancy of the International Organization and guaranteed its recognition worldwide. In 1996 three new NCs were officially confirmed by the Administrative Council; in 1997 and 1998 respectively one NC was confirmed. So, in 1998 CIGRE counted 52 NCs. Also, the number of members in countries where there was no established NC continued to rise; in 1998 CIGRE counted members in 88 countries. This expansion made the role of NCs all the more vital in maintaining existing members and attracting new members. Among the actions to this end were – and still are – the hosting of Study Committee meetings with associated events (Colloquia, Tutorials...), of Symposia with the assistance of the Central office, the organization of Regional Meetings. All such

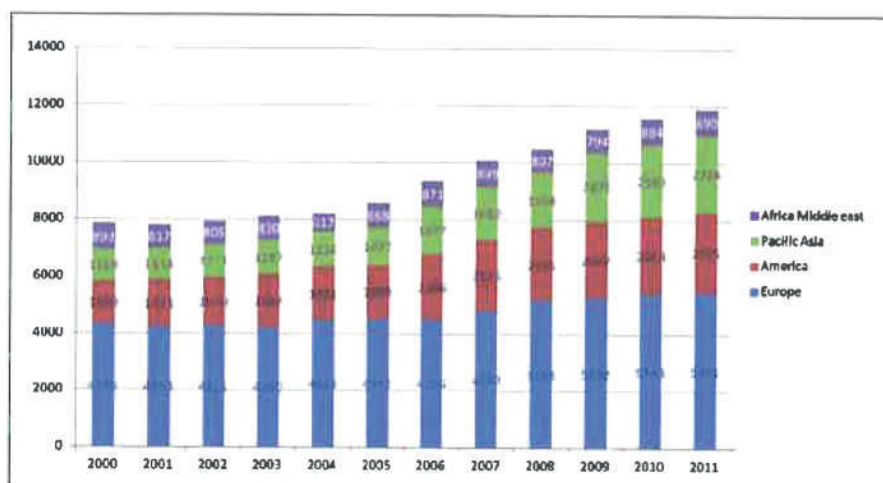
actions greatly contribute to the promotion of CIGRE and to the development of what is referred to as the “CIGRE spirit”.

The NCs were closely involved in the implementation of the MasterPlan with regard to attracting new members, among whom were Transmission System Operators and Regulation bodies. Moreover, from 1999 to 2002 the Technical Committee proceeded to a complete rethinking and reorganization of Study Committees with significant changes in technical scopes to meet new challenges. The NCs were particularly attentive to the overhaul as they were in charge of seeking experts for membership to the Study Committees and were involved in the choice of new Chairmen for these Committees.

Generally, it can be said that the overall modernization of the early 2000s and the change from “Conference” to “Council” in the name of CIGRE evidenced the further development of the Organization whose governing principles were: neutral position, expertise and transparency. CIGRE’s governance thus relied on the geography factor through the diverse action of the 57 NCs and the technology factor through the dynamic action of the Study Committees.

Gradually over the last fifteen years a new configuration emerged as a result of the impact of internationalization and globalization. The overall total membership figures expressed as Equivalent members showed a steady rise, from 7667 Equivalent members in 1998 to 11910 in 2011. However, over the same period variations were noted in membership in the four geographical zones identified in the CIGRE statistics:

- drop in Europe: from 56.5% to 46.1% of total membership, and in Africa/Middle East: from 10.7% to 7.5%;
- rise in the Americas and Asia-Pacific respectively from 19.6% to 23.4% and 13.4% to 22.7%, as illustrated in the following graph.



CIGRE Membership evolution (expressed in terms of equivalent members), from 2000 to 2011 showing geographical distribution under the four Continents

Today, the 10 top-ranking NCs as regards membership are : Brazil, China, Japan, United States, United Kingdom, France, Germany, Russia, Australia and Canada. However, within each Continent the NCs differ widely in their composition, history and development; this will be highlighted in the next chapters which are dedicated to CIGRE NCs and whose history is the purpose of this book. NC structure varies depending on membership, whether mainly “Individual” or “Collective”, on the Electric power industry set-up, on its status and the role of national scientific and engineering Societies.

3.2. The manifold role of National Committees confirmed by the 2006 Statutes and Rules of Procedure

Article 16 of the 2006 CIGRE Statutes (full text available on the website) states that in order to exist and benefit from international recognition, a National Committee must first be officially recognized by the Administrative Council. It can only be so if it counts at least 40 Individual members or any equivalent combination of Individual and Collective members, as specified in the “Rules of Procedure”. The benefits and tasks of NCs as listed hereafter are effective as from this recognition.

Generally, the mission of NCs is to promote CIGRE and serve its interests in the countries they represent. Their priority tasks and benefits have been and still are the following:

- To collect membership fees which are then forwarded to the Central Office;
- To put forward papers for presentation at Sessions (according to the rules given in the document “General Rules for Sessions”;
- To recruit CIGRE members, organize their country’s delegation for Sessions and Symposia;
- To put forward candidates for membership on the Study Committees and to encourage the participation of experts in workshops related to the work of the Study Committees;
- To encourage the organization of meetings;
- NCs have the possibility of putting forward a candidate for membership on the Steering Committee;
- A National Committee has full responsibility for its bylaws but these must not be in contradiction with the CIGRE Statutes.

In the CIGRE Rules of Procedure which were updated in 2006 in conjunction with the revision of the Statutes, it is stated that the term “National Committee” is used to refer to all CIGRE members from the one country, or from a grouping of countries which are collectively represented by one National Committee. The term also refers to the national office/bureau which operates in keeping with the local legislation. The missions carried out by each NC, as summarized under Article 16 of the Statutes, are handled by the bureau. The Central Office must be informed of the composition of the bureau which should include at least:

- A Chairman, with possibly one or more Deputy Chairmen
- A Secretary who may act as Treasurer or share tasks with a Treasurer.

The bureau of a National Committee may comprise other members who will handle different, mainly technical tasks, such as assisting Study Committee members or circulating the results of CIGRE work in their country. All NCs are represented on the CIGRE Administrative Council by a person of their choice, most often the Chairman of the NC. As member of this Governing Body, the NC representative is expected to promote CIGRE among circles (Industry, Universities, economic institutes...) who may be interested in the activities of the Association.

The relationship between the Central Office and the NCs is based on mutual trust. The NCs have full responsibility for their financing.

If the membership of a National Committee drops below the statutory minimum requirement of 40 equivalent members, the measures taken differ depending on whether the drop is temporary or long-lasting. In the first case – drop over two consecutive years – recognition of the NC is maintained with right to put forward members for Study Committee seats and papers for presentation at the Session. However the NC's representative on the Administrative Council is considered as an observer member until the membership situation is restored. In the case of a drop lasting four years, the Administrative Council, upon recommendation of the Steering Committee, stops recognition of the NC as well as all related benefits.

A major development in the organization of NCs was the introduction of a "Region" status, as provided for under Article 17 of the Statutes. NCs may decide to form a regional grouping. The Region's object will be to strengthen cooperation between countries and to promote and develop CIGRE. The first Regions were formed on an informal basis since the 1980s, in Latin America, the Far-East and the Middle-East.

Geographical proximity is the first criterion for creation of a Region; however, other factors are considered when in line with the general interest and basic objectives of CIGRE, namely:

- To contribute to Study Committee activity, identifying and handling regional issues
- To organize Regional Meetings or other local events (Colloquia)
- To coordinate relations with the Electric Industry
- To coordinate contributions to major CIGRE events (Sessions, Symposia)
- To recruit new members for CIGRE, encourage creation of new NCs by incorporating in their work structure countries where there is no NC.

The existence of Regions did not alter in any way the governance of CIGRE; they do not constitute an additional hierarchical level but act as a link between the various entities of the CIGRE community.

As provided for under Rule 14 of the Rules of Procedure, Regions set their action plan during their first meeting, then meet at least once a year. A Chairman for the Region is selected among the NCs concerned. Technical issues specific to the Region must first be raised with the Chairman of the relevant Study Committee, if possible through the Study Committee member from the Region. The Study Committee Chairman suggests the appropriate action to be taken and informs the Technical Committee Chairman. Each Region presents an annual report to the Administrative Council, highlighting its activities over the last year and its projects for the year to come.

3.3. CIGRE in the years 2010: results and prospects for NCs

The main orientations and the strengthened role of the NCs for the second decade of the 21st Century were clearly set forth in the 2006 MasterPlan (See CIGRE website for full text). The document stresses the need for a strong action on the part of the NCs to maintain present membership and recruit new members, in close cooperation with the Central Office. To this end, a strong communication plan through an active website, in direct correlation with the central website and its functionalities will be an invaluable tool. In this connection, circulation of Electra and especially its electronic access are not to be overlooked.

The MasterPlan stresses the need for NCs to target all stakeholders in the Electric Power Industry with sustained efforts and determination. Their action should first focus on the breeding ground of CIGRE experts, directing efforts towards young engineers and students who were to benefit from special privileges. Strengthening ties with Universities and electrotechnical institutes in each country is part of the overall strategic objective. Also, recruiting actions should be directed towards experts in new industry sectors, new market areas, and regulation organizations. Finally, with respect to CIGRE's geographical impact the buoyancy of NCs in emerging regions should contribute to the worldwide development of the Organization. As new balances are emerging between CIGRE Regions, the aim is that the common interest be shared in the best possible way between all players concerned.

In brief, the MasterPlan's priority strategy for consolidation and expansion of the Organization is a many-sided communication plan which will lead to strengthening the identity and international recognition of CIGRE. To meet the task NCs will be required to diversify their actions in order to enhance their visibility.

The 57 NCs stand - as they always have and hopefully will in the future - as a cornerstone of CIGRE participating in the international functioning through their representatives on the Governing Bodies. The composition of the Steering Committee reflects the contribution of NCs to CIGRE and ensures the

representation of the 4 geographical zones: Europe, Americas, Africa/Middle-East, Asia-Pacific.⁴

In the 1990s, Yves Porcheron, then Secretary General, put forward the suggestion that exceptional contributions to CIGRE be acknowledged through an award being granted to the members concerned. This idea was supported by the Administrative Council and CIGRE awards were introduced. One of these, the “Distinguished Member” award is under the responsibility of NCs. Every two years, NC officers are asked to single out members from their NC for this award. The criteria for selection are: long-standing membership (over 10 years) and an exceptional contribution to the NC. The number of nominees is not to exceed 1% of the total NC membership. Over 80 nominees are granted this award every other year.

A determining factor in the successful running of activities and circulation of results is the efficient networking of NCs with Study Committees. As mentioned earlier, the setting up of Study Committees in the Interwar Period was particularly rapid. The rule providing for the 24 seats on each Study Committee to be filled by representatives from different NCs – and only one for the same NC per Study Committee – means that NCs have access to a worldwide network of experts with whom they can have exchanges on the most complex topics. The selection of Study Committee members is based on qualifications and these members are instrumental in the operation of CIGRE, while at the same time working in their country’s interest. Their mission is to propose the study of topics of particular interest for the national electric power industry; they also encourage members of the NC to put forward papers for presentation at CIGRE Sessions and Symposia.

CONCLUSION

The history of National Committees, as we have seen, is certainly an inherent part of CIGRE’s history. Internationalization of power system technology and the development of CIGRE NCs owe their success to a combination of three factors: technical expertise, transparent communication of information, and a community spirit, in a context where all stakeholders are represented and have the opportunity to express their views.

From the beginning in the 1920s to this day, NCs have brought an invaluable contribution – often too discreet hence insufficiently acknowledged – to a strengthening of CIGRE’s international character. The NCs’ action has been an invaluable asset for the international development of the Association. Moreover,

4- In accordance with Article 11 of the CIGRE Statutes, Rule 8.1 of the Rules of Procedure specifies the process for the appointment of Steering Committee members by the Administrative Council every two years. The list of candidates is forwarded to the Admin. Council together with the NC membership figures averaged out over two years. Three members are appointed through direct election outside the membership criterion.

through their differences they have contributed a wealth of technical knowledge and experience and allowed contacts between experts and engineers to develop on a world scale through collaboration in CIGRE's work and hosting of CIGRE events (meetings of Governing Bodies, Symposia, Study Committee meetings, Colloquia...).

National Committees together with Study Committees have constantly devoted time and effort to the international development of large electric power system technology, addressing stakeholders in all areas. NCs and Study Committee evidence a cross-fertilization process between the international mission of CIGRE and the technical advance on the national scale.

The National Committees embody both individually and collectively the success of a human interconnection of experts serving what may be termed an international electricity culture, or even a civilization.

Christophe BOUNEAU

APPENDIX

List of the 57 National Committees and their membership figures as recorded end of March 2012

NATIONAL COMMITTEE	EQUIVALENT MEMBERS	INDIVIDUAL MEMBERS I	INDIVIDUAL MEMBERS II (YOUNG MEMBERS)	COLLECTIVE MEMBERS I	COLLECTIVE MEMBERS II
Algeria	40	40			
Andean Nat.Com.	151	55	16	16	
Arab States of the Gulf	204	79		25	
Argentina	241	84	2	29	5
Australia	402	93	8	57	8
Austria	150	42	3	21	
Belgium	100	62	3	7	
Bosnia Herzegovina	40	30		2	
Brazil	1087	540	137	80	5
Canada	382	192	7	33	9
Chile	62	17	5	8	
China	692	380	64	44	14
Croatia	91	64		5	1
Cyprus	56	24	8	4	2
Czech & Slovak Reps.	103	63	7	5	4
Denmark	93	52	4	7	1
Egypt	275	106	1	28	14
Estonia	37			7	1
Finland	121	49	1	13	3
France	527	384	21	24	1
Germany	484	269	29	36	3
Greece	158	77	1	16	
Hungary	11	9			1
Iceland	56	6		10	
India	276	126	24	22	8
Indonesia	91	27		12	2

Iran	79	71	1	1	1
Ireland	181	93	58	6	
Israel	59	47	2	2	
Italy	228	109	20	17	7
Japan	648	287	105	48	8
Jordan	52			10	1
Korea	289	179	10	20	
Libya	Membership figures not recorded at 31/03/12 as transfer of funds has been delayed				
Macedonia	65	60		1	
Malaysia	75	40		7	
Mexico	250	250			
Montenegro	40	13	12	3	
Netherlands	163	104	5	10	2
New Zealand	168	19		29	2
Norway	189	60	7	24	1
Paraguay	55	40		3	
Poland	154	100	9	9	
Portugal	84	33	1	10	
Romania	182	89	16	15	1
Russia	422	174	4	46	7
Serbia	62	36	1	5	
Slovenia	94	48	1	9	
South Africa	100	69	4	5	1
Spain	341	111	5	39	15
Sweden	267	165		20	1
Switzerland	358	143	9	40	3
Thailand	49	11	1	7	1
Ukraine	73	17	6	10	
United Kingdom	531	179	71	51	13
United States	558	381	17	32	
Venezuela	7				



International Council on Large Electric Systems

The History of CIGRE National Committees

**A major contribution to the International history of
CIGRE: Creation and Development of National
Committees since the 1920s**



History of the Argentine National Committee of CIGRÉ

It can be stated that the actual origins of the Argentine National Committee (ANC) of CIGRÉ come from the idyllic development period of the Argentine electric power services. ANC not only accompanied this growth but also its members contributed with ideas which constituted the basis for both the construction of important power generation plants and the expansion of transmission grids.

The panorama was quite peculiar in the 1950s; on the one hand, there were no large grids and generation was performed by poorly efficient power stations; and, on the other hand, main companies were run by engineers trained in Europe. These engineers' knowledge and enthusiasm were not restricted to their own companies, on the contrary, they wanted to share and discuss their own ideas. The gestation of this cultural movement was developed in the Asociación Electrotécnica Argentina (Argentine Electro technical Organization), prestigious private-nonprofit organization founded in Argentina in the early 19th Century. Many of their members, mainly executives of electric, construction, and electric power related-companies started to attend the Biennial Sessions of CIGRÉ where they could get new ideas. From this stage up to the formal constitution of ANC there was only a very short time distance.

In the meantime, both the great enthusiasm and the new ideas were translated into the development of 132 kV and 220 kV lines. In the 1960s there were large high-power towers distributed in different regions of the country. Likewise, new and more efficient power stations were built. Universities could not be indifferent to this electrical development; therefore, many of them, mainly, the National Universities of Buenos Aires, La Plata, Córdoba and the South created Electrical Engineering Departments. And, many electric companies' prestigious executives worked as professors in these engineering departments.

In the early 70's, the construction of the large hydroelectric power stations of the COMAHUE -1500 km from Buenos Aires - provoked the development of large 500 kV transmission lines. Later, the first nuclear power station was commissioned: ATUCHA – near Buenos Aires-. In the early 1980s the SALTO GRANDE hydroelectrical power station was commissioned, and later, a new

thermal power station: PIEDRA BUENA. Undoubtedly, more 500 kV lines and Substations were necessary; and, some of them began to be seen in a vast area of the country.

In the early 1990s a deep and sudden transformation of the Argentine Electrical Sector started. A complex regulatory frame was developed and the largest power generation, transmission and distribution companies were privatized. Concessions were granted to foreign capitals, mainly to similar companies of UK, USA, France and Spain.

All the above mentioned had a decisive influence on the foundation and development of the ANC of CIGRÉ. Now, we are ready to know and understand its chronology and explain deep ups and downs.

The informal foundation of ANC, promoted by the AEA members, goes back to the early 1950s. But, the formal foundation of the first DC (Directive Committee) took place in 1955, with as first President Eng. Augusto Bacqué, prestigious professional of the Argentine electrical sector. Eng. Augusto Bacqué was supported by different members of AEA like Eng. O. Delfino and Eng. J. di Salvo. Even though no SC (Study Committee) was created, the DC encouraged the electrical companies to analyze the papers for the Paris Biennial Sessions. In this way many important ideas were contributed to the development of transmission grids in Argentina.

In 1960 Eng. A. Bacqué resigned from his position as President, and Eng. O. Delfino took over this position temporarily. In 1964, under Eng. O. Delfino's presidency and during a meeting held in Paris, the General Assembly of CIGRÉ formally recognized the ANC. Though this event meant a great advance to CIGRÉ, only few Argentine members could attend the Biennial Sessions. Since 1978 there has been a greater attendance to these Sessions; and, in 1982 the first two members of the SC were accepted: SC38 – Eng. J. di Salvo and SC21 – Eng. V. Rol. Because of the enthusiasm aroused by this event, the SC wrote a Regulation for ANC and subjected the same to the consideration of the Partners' Assembly; finally this Regulation was approved on December 15th, 1983. At that time the NC structure was as follows: Eng. O. Delfino – President; Eng. J. di Salvo – Vice President; Eng.V.Rol – Secretary; and Eng. F. Ortiz – Treasurer. Soon afterwards, Eng. Ortiz resigned and Eng. Rol took over the Treasurer position, and Eng. N. Mattanó the Secretary position.

An actual transcendental process was initiated in 1984. From a general point of view, this process was significant to CIGRÉ in Latin America; and it was particularly important to ANC. Conversations held between Eng. Delfino and Eng. J. Lepecki – President of Brazil National Committee - constituted the basis for regional meetings. This topic was discussed in a meeting by representatives from Argentina, Brazil, Chile, Mexico and Uruguay during the Biennial Session held in Paris in 1984. This meeting was also attended by the Secretary General, Mr. Leroy.

It was stated that the CIGRÉ regional meetings would contribute to the exchange of experiences, identifying issues of common concern and making public the activities of the institution. Late in 1984, Mr. Leroy sent a letter to Eng. Lepecki and Eng. Delfino, which read as follows: *“Your initiative may help to make CIGRÉ activities better known locally in turn, before the CIGRÉ audience the experience presented by your specialists should carry more weight. This action will have proved a success if your local membership increases without any consequent drop in participation to Sessions and Symposia”*. However, Mr. Leroy stated that formal approval from the CIGRÉ governing body would have to be asked for. After this request, the Regional Meeting was provisionally approved on June 20th, 1985 and definitively approved on April 26th, 1986.

Furthermore, on April 10th, 1985 ANC formally created 15 Technical Committees following the pattern of the international SCs. But, the main objective was to identify local and regional problems to be discussed during the First Latin-American Regional Meeting of CIGRÉ (ERLAC – acronym used both in Spanish and Portuguese languages). The first ERLAC took place in the Brazilian city of Foz do Iguaçu from April 30th through May 3rd 1986, and was attended by 154 representatives from Argentina, Brazil, Paraguay and Uruguay. The main objective of this first meeting was to exchange experiences, identify problems common to two or more countries and, if possible, constitute JWG (Joint Working Groups). This goal was achieved in a very satisfactory way as many JWG with members from Brazil and Argentina were created. One of these JWG developed a work based on the application of digital techniques to the control and protection of power stations and substations. A summary of this work, which had an international impact, was presented at the CIGRÉ Symposium held in Bournemouth (UK) in 1989.

The second ERLAC, sponsored by the Argentine Energy Secretariat, was held in Puerto Iguazú, Argentina from June 13th through June 19th 1987. This event was attended by many members of the CIGRÉ Administrative Council, Mr. Leroy and over 200 delegates. Its organization characteristics were similar to those of the Biennial Paris Sessions, with 15 group meetings, and the presentation of papers that reflected the results achieved by the Brazilian and Argentine JWG.

It is worth mentioning two milestones that were important to ANC and that took place in 1987 and 1988. In 1987 Eng. M.V. González Sábato was appointed as member of SC 34; and at the General Assembly - 1988 Session held in Paris, Eng. O. Delfino was appointed as representative of the Administrative Council, this was the first time an Argentine national had been elected to occupy the said position. Unfortunately, this golden period was affected by the serious economic crisis in Argentina in 1989 which impacted the number of Argentine attendees to LWG (Local Working Groups) and made it very difficult for delegates to attend the third ERLAC held in Foz do Iguaçu, April 30th through May 4th 1989. Though Argentina

was facing hard times, this event was a real success not only on account of the great number of delegates – around 300 -, but because of the large quantity of papers that had been discussed.

In the early 1990s and within a very difficult context where many electrical companies - that had gone through the pre-privatization process - did not support their professionals to continue within the LWGs, the Directive Committee decided to appoint younger members to run the ANC. Consequently, Eng. M.V. González Sábato was elected as President, Eng. J. Carbajales as Treasurer, Eng. Luis Bossi as Secretary, while Eng. J. di Salvo kept his position as Vice President. Since ANC had already been committed to organize the fourth ERLAC, the new Directive Committee had to face an extremely difficult situation provoked by the economic chaos and the lack of individuals to fit within such a complex organization. Therefore, members of the Directive Committee personally contacted executives of the still associated companies and obtained an advance of their membership dues. Likewise, support was given by both the Brazil NC who advanced registration payments and the goodwill of the CIGRÉ Secretary General who allowed delaying consignments to Paris. In this way, the fourth ERLAC could be organized and proceeded with in Puerto Iguazú from August 4th through August 7th, 1991. Despite the mentioned difficulties, the meeting was a success since there were 275 attendees from Argentina, Brazil, Chile, Mexico, Paraguay, Uruguay and Venezuela; and, over 150 papers were discussed. Different personalities of the Argentine electrical market disserted in two special meetings about different topics such as the characteristics of the regulatory frame adopted by the country and the details of the privatization plan. Due to the fact that Argentina had been the first country of the region to go through a privatization process, the audience closely followed these lectures.

Moreover, in 1990 the General Assembly elected Eng. M. V. González Sábato as Argentine representative on the Administrative Council. Since the number of Collective Members had been drastically reduced from 24 in 1987 to 19 in 1990, and only 8 in 1992, it can be inferred that it was extremely difficult for ANC to survive during the period 1990 – 1999. This situation represented an immediate consequence of the privatization of power generation, transmission and distribution-related companies; most of the new General Managers were foreigners and, though they knew the international activities of CIGRÉ, they had no idea about its local activities. These executives believed that it was only necessary that parent companies, mostly European companies, be associated to the CIGRÉ. But, they did not know the high-efficiency level of the Argentine engineers whose efforts and knowledge had been obtained during different activities developed by CIGRÉ. These special attitudes had contributed to maintain the service during the Argentine economic crisis in general and in particular during the economic crisis suffered by electrical companies. Hence, the ANC of CIGRÉ was committed to reversing this situation. Different Seminars and Courses on the

new regulatory frame were organized and executives were informed about the benefits of participating in all the local and international activities of CIGRÉ. Besides, it was necessary to amend the ANC Regulation twice, in 06/22/92 and 09/27/96. Eng. Angel Fedrizzi became President in 1996; but, due to changes at the managerial level of his company, he had to renounce in mid-1997. Consequently, Eng. M. V. González Sábato, in his capacity as 1st Vice President, provisionally took over the position of President. A new attempt to capture the participation of large companies was the election of Eng. Ramón Sanz in late 1997, but a few months later he also had to resign as he left the company for which he was working. Once more Eng. M.V. González Sábato took over this position until 09/30/99. During this period different events were developed: Fifth ERLAC was organized by the Brazil NC and held in Foz do Iguaçu (1993); Sixth ERLAC organized by Paraguay NC and held in Ciudad del Este (1995); and, seventh ERLAC organized by ANC and held in Puerto Iguazú (1997). All of these events proved successful since there were over 400 delegates and 150 papers were discussed. Likewise, new activities were developed such as the incorporation of an Exhibition and a plenary forum discussion denominated Nations' Forum where various personalities of the electrical market from different countries had the opportunity to give lectures on the on-going regulatory changes. It is worth mentioning that during the above-mentioned period the Administrative Committee was constituted as follows: Eng. González Sábato as President; Eng. D. Mesz as 1st Vice-President; Eng. J. di Salvo as 2nd Vice-President; Eng. L. Bossi as Secretary (later, when Eng. L. Bossi passed away, Eng. M. Fernández took over the Secretary position); Eng. L. Bértola as Prosecretary; Eng. J. Carbajales as Treasurer; Eng. C. Burgo as Protreasurer.

On 09/30/99 Eng. Julio di Salvo was elected as President, and there were other appointments, as follows: Eng. Julio Bragulat as 1st Vice President, Eng. Jorge Nizovoy as 2nd Vice President and President of the Technical Committee, Eng. Máximo Fernández as Secretary, and José Carbajales as Treasurer.

The Secretary General of CIGRÉ, Eng. Marc Herouard, encouraged a higher participation of Argentina in the SCs. Hence, since the 2000 Biennial Session, ANC was represented in nine SCs: 14, 22, 23, 33, 34 (Regular M.), 36, 37, 38 and 39. And because of this new situation, Eng. Jorge Nizovoy had the opportunity to be a lecturer at the Tutorial on "Electricity Markets – International Practice and Experience", organized by the SC 37 on 09/02/00 in Paris during the 2000 Session.

During this Session Eng. M. V. González Sábato was elected as member of CIGRÉ Technical Committee for the period 2000-2002, representing the Administrative Council. It is worth mentioning that it was the first time Argentina had been honoured with this appointment. Likewise, during this same Session, the Spanish National Committee promoted a meeting that was later held together with the National Committees of Argentina, Mexico and Venezuela on 08/31/00.

This last meeting was aimed at determining a forum constituted by Spanish and Portuguese speaking representatives to encourage the activities of CIGRÉ in each country based on the interaction of related countries.

Ninth ERLAC that was held in Foz do Iguaçu from May 27th through May 31st 2001 constituted not only the basis for the development of new technical activities of ANC, but a new milestone for CIGRÉ regional development. The National Committees of Argentina, Brazil, Mexico, Paraguay and Venezuela entered into a protocol for the creation of Latin-American Region of CIGRÉ. (LARC: acronym used both in Spanish and Portuguese languages).

The organization of the tenth ERLAC, held in Puerto Iguazú from May 18th through May 22nd 2003, represented an actual challenge for ANC. Late in 2001, a severe economic crisis broke out in Argentina and made the organization of this event extremely difficult. Thanks to the financial support given by the Brazil NC and an agreement entered into with the "Revista Mercado Eléctrico" (an Argentine electrical sector related-magazine) stating that its granted services would be paid with money obtained from courses to be jointly organized. These courses were developed under the general heading "CIGRÉ and the Technical Management of Electrical Companies during Crisis Times" turned out to be most successful.

Since 2002 ANC has increased the number of its representatives in SCs from 9 to 12, as follows: SCs A1 (R), A3, B2, B3, B4, B5 (R), C1, C2, C3 (R), C4, C5 (R) and D2.

Despite the Argentine economic crisis, the participation of Argentina in the activities of CIGRÉ could be appreciated at the 2002 Session with the attendance of 8 representatives. During the development of this Session great progress was made with the revision of draft papers for the creation of the LARC Region. But in October 2002, Eng. João Batista Guimarães Ferreira da Silva, at that time President of Brazil CIGRÉ, contacted ANC to inform the Committee that both Spain and Portugal were interested in extending the coverage of CIGRÉ Region from Latin America to Iberoamerica. ANC formally accepted this proposal on 11/18/2002.

Notwithstanding the hard circumstances under which tenth ERLAC had been organized, the results were gratifying since there were over 300 attendees and 93% of the 207 approved works were presented. Eng. Jean Kowal, CIGRÉ Secretary General, attended the event and was supplied with documents related to the foundation of the Iberoamerican Region of CIGRÉ (RIAC: acronym used in Spanish and Portuguese languages). The meeting where this project was launched, was held on 05/19/03 with the participation of the 7 Iberoamerican National Committees of CIGRÉ in existence at the time (Argentina, Brazil, Spain, Mexico, Paraguay, Portugal and Venezuela).

The 4 courses on the organization of tenth ERLAC were successfully developed during the second semester of 2003 and in 2004. All these courses considered present technical issues related with electrical companies.

On 08/17/2004 the Ordinary General Assembly of ANC considered the renewal of the President position; and, Eng. Jorge Nizovoy was elected as new President of Argentina CIGRÉ to replace Eng. Di Salvo who on this occasion was appointed as Honour Member of ANC. Besides, the ANC Statutes were amended and this measure strengthened the Technical Committee.



X ERLAC, RIAC foundation meeting, Puerto Iguazú, Argentina, 05/19/2003

From left to right, top to bottom: J.Nizovoy, J.do Nascimento Baptista, J. di Salvo, J. Kowal, J.B.G.Ferreira da Silva, R.Valdivia, F.Salamanca, L.M.Sánchez de Lozada, L.Bértola, M.Fernández, O.Ribeiro, C.Saldaña, G.Calzolari, H.Pereira, C.Espasande, A.Adam Nill, A.Villa, P.C.Vaz Esmeraldo, J.H.Machado Fernandes, G.Enriquez Harper, Rubén Marca, F.Soto, J.Carbajales, M.V.González Sábato, N.Alves de Rezende.

Argentina could maintain its 12 representatives in the SCs for the period 2004-2006.

The Regulations had to be adapted prior to the approval for the foundation of RIAC, and the CIGRÉ General Assembly could finally give its consent on 08/28/2006.

After having been a member of the Administrative Council for over 12 years, Eng. M.V. Sábato presented his resignation. Later, Eng. Sábato was recognized as "Honorary Member of CIGRÉ" in Paris on August 31st, 2004; Eng. Jorge Nizovoy was appointed as member of the Administrative Council during the General Assembly of CIGRÉ held on August 30th, 2004.

In order to encourage the activities of CIGRÉ, a “Meeting on CIGRÉ diffusion and Technological Updating” was held in Buenos Aires on 12/02/04 under the name of “CIGRÉ in Argentina and Paris 2004 Conference”. The topics considered during this meeting included the description of the Paris Session, its most outstanding results and the CIGRÉ local and international organization. Argentine Coordinators of each of the 16 local SCs depicted both the international SCs and the subjects they were working on. It is worth commenting that this event, which was free and financed by its sponsors, reached an attendance of 190 people and around 70 institutions were involved. Taking advantage of this ideal opportunity, Eng. Julio di Salvo and Eng. M. Víctor González Sabato, both former ANC Presidents, were honoured.

“The first Seminar on Mineral Insulating Oil and Transformers expectancy life” was held in Buenos Aires, May 19th – May 20th 1985 and counted with the presence of international prestigious lecturers from Europe and Argentina and, on this occasion the number of delegates reached 170.

Eleventh ERLAC was the first regional event of CIGRÉ convened as Iberoamerican; it was held in Hernandarias, Paraguay, May 22nd - May 26th 2005. This was the first time that Argentina had been the leader of countries with more technical works approved; undoubtedly, this situation reflected the strengthening of the activities of CIGRÉ in Argentina.

An International Seminar on “Integration of Protections, Control and Communications” was held in Buenos Aires, September 14th – September 16th 2005. During this seminar with 180 delegates, international prestigious CIGRE experts had the opportunity to deliver lectures on the above-mentioned topic, which at that time, was being internationally adopted subject to the Standard IEC 61850.

In addition to the above-detailed situation, the increase in the activities developed by CIGRÉ in Argentina made it imperious to constitute a non-profit and civil society for both administrative and legal support. Hence, “Investigation Center of Large Electric Grids – Civil Association” (CIGREAC: acronym used in Spanish language) was founded on 09/15/05 and its elected authorities were as follows: Jorge Nizovoy – President; Julio Bragulat – 1st Vice President, Rubén Fernández Rienzi – 2nd Vice President, Máximo Fernández – Secretary; José Carbajales – Treasurer and Pedro Issouribehere – President of the Technical Committee. Its Legal Capacity was granted on 12/07/05 and its Statutes and Authorities Register were presented to CIGRÉ on 12/21/05 together with the pertinent CIGREAC Recognition Request as National Committee of CIGRÉ in Argentina. This request was accepted by means of letter dated 01/15/2006 and written by CIGRÉ Secretary General, Eng. Jean Kowal. Since the 2006 Session it was possible to get the long awaited representation of Argentina in the 16 SCs of CIGRÉ for the period 2006-2008. This could be achieved thanks to the incorporation of Observer Members in vacancies available in SCs: A2, B1, C6 and D1. As regards the SCs A1,

B5, C3, C5 and D2, the representatives were appointed under the category of Regular Members.

During the meeting of the CIGRÉ Administrative Council held on 08/09/2006, Eng. Jorge Nizovoy was appointed as Member of CIGRÉ Technical Committee for the period 2006-2008.

Accepting the proposal made by CIGREAC, Eng. José D. Carbajales was appointed 2006 “Distinguished Member” of CIGRÉ in recognition of his personal contributions to the activities of CIGRÉ. Similarly, Eng. Carbajales followed Eng. Julio di Salvo and Eng. M.Víctor González Sábato had been honoured with this award in 1996.

Thanks to the contacts made during the 2006 CIGRÉ Session, an International Seminar on “Management of Transmission and Distribution System Assets” was held in Buenos Aires, on October 23rd – October 24th 2006. This Seminar, which had been organized by SC C1 and sponsored by Argentine transmission companies, counted 111 delegates and European prestigious lectures.

Once more, on 11/20/2006, a Meeting was held on CIGRÉ diffusion and Technological Updating. This meeting was free and was based on topics about “CIGRÉ in Argentina and the Paris 2004 Conference”. This meeting was a success; it was attended by 160 delegates.

Twelfth ERIAC held in Foz do Iguaçu, May 20th through May 24th 2007 called for the significant participation of the Technical Committee during the period 2006-2007. However, this effort was widely compensated by its success; 700 participants attended this event. During the annual RIAC meeting, Eng. Jorge Nizovoy was appointed as Co-President of RIAC for the period 2007-2009.

In 2007 Eng. Rodolfo Pellizzoni, CIGREAC representative in the SC D2 was granted the CIGRÉ Technical Committee Award; it was the first time an Argentine national was honoured with this distinction.

The second Ordinary General Assembly of CIGREAC was held on 09/14/07 and, during this event Eng. Jorge Nizovoy and José Carbajales were reelected as President and Treasurer, respectively. And, Eng. Patricia Arnera and Eng. Rodolfo Pellizzoni were elected as Secretary and President of the Technical Committee, respectively.

The “First Seminar of CIGRÉ in Uruguay” on “Electric Power Generation and Distribution - Present Challenges and Solutions” was held in Montevideo, Uruguay, November 4th through November 6th 2007. It is worth commenting that this Seminar had been organized by the Uruguayan State-owned Company, UTE, CIGREAC, and BRAZIL CIGRÉ on the basis of the RIAC President’s proposal. This event was most successful on account of the great variety and high level of its lectures, and the high number of delegates which reached 160.

As proposed by CIGREAC, Eng. Luis Bértola and Máximo Fernández were

appointed 2008 “Distinguished Member” of CIGRÉ as a reward for their personal contributions to the activities of CIGRÉ.

On the invitation of CIGREAC, the international CIGRÉ JWG B2.17/B4/C1 (Impacts of HVDC Lines on the Economics of HVDC Projects) met in Buenos Aires, on June 4th 2008. This was the opportunity for an “International Tutorial and Seminar of CIGRÉ on High-Voltage Direct Current (HVDC) – Design and Economy” to be held in Buenos Aires, June 5th through June 6th 2008. This event was attended by 180 delegates, participants from 9 countries, and the topics discussed were of interest to the development of the Argentine system.

Undoubtedly, the meeting of the Administrative Council held on 08/26/08 during the Paris Session was extremely important to Argentina. On the one hand Buenos Aires was elected as venue for the 2009 Ordinary Meeting of this Council; and, on the other hand, Eng. Jorge Nizovoy was appointed as Member of the CIGRÉ Steering Committee for the period 2008-2010. This was the first time an Argentine national had been elected to occupy the said position.

Besides, thanks to the activities developed by Eng. Rodolfo Pellizzoni in CIGRÉ SC D2 and in the IEC Technical Committee 57 (“Power Systems Management and Associated Information Exchange”), CIGRÉ together with Asociación Electrotécnica Argentina could carry out an international IEC/CIGRÉ Joint Seminar in Buenos Aires, November 12th through November 14th 2008. Despite the 2008 international economic crisis, this “XXI Century Communications, Control and Protection Architecture - Evolution of the IEC 61850 Standard” was a success. This event attracted 181 delegates from 16 countries.

The organization of thirteenth ERIAC in Puerto Iguazú under a global deep economic crisis meant another challenge to CIGRÉ. However, this event was attended by 510 delegates from 15 countries and 318 papers were discussed. The parallel Technical and Commercial Exhibition counted 13 scheduled stands. Once this event was over, Argentine authors were encouraged to take part in the 2010 Session; and this effort was rewarded with 9 papers approved, which meant a historical record for Argentina.

Between October 13 and 16, 2009 CIGREAC was able to show to the world of CIGRE its working capability, since it had the honour of organizing in Buenos Aires the CIGRÉ Administrative Council Meeting. There were 39 attendees from 33 different countries, and 24 accompanying persons. The programme included the Argentina Day: an interesting Seminar on “Electricity Networks of the Future”, with 160 attendees.

The fourth Ordinary General Assembly of CIGREAC was held on 12/14/09 and during this event Eng. Jorge Nizovoy, Julio Bragulat, Rubén Fernández Rienzi, Patricia Arnera and José Carbajales were reelected as President, 1st Vice

President, 2nd Vice President, Secretary and Treasurer, respectively. And, Eng. Roberto Molina was elected as President of the Technical Committee.

As regards membership, it can be stated that ARGENTINA CIGRÉ reached a relevant development during the first decade of the 21st Century since the number of its members has doubled to reach over 200. Likewise, it is worth mentioning not only the increased number of events but also the variety of issues dealt with. A higher technical participation of its members is still a great challenge to be achieved. Notwithstanding the important institutional progress made, it is essential to consolidate the functioning of the organization so that it is less dependent on its leaders' personal work and has the necessary administrative capacity to maintain the present high level of its activities.



CIGRÉ Administrative Council Meeting, Buenos Aires, October 14th 2009



History of the Belgian National Committee of CIGRÉ

**Prepared by Victor Berlemont
Distinguished Member of CIGRÉ**

Foreword

This report covering the history of the Belgian National Committee (BNC) of CIGRE is based on the information I have been able to obtain from available sources and, in some ways, my personal recollections. My CIGRE knowledge came mainly through my personal link with electric power industry colleagues in Belgium: Pierre Depauw, André Calvaer, Michel Couvreur, Alain Robert, Marc Stubbe, Edwin Van Geert, Bruno Jacquet, Jean Hoeffelman, Pol Pirotte, Emmanuel De Jaeger, Frank Wellens.

I have also contacted some of the individuals that I got to know as a Belgian National Committee member and obtained additional information.

I thought it was interesting to remember some Belgian members through pictures respectively made in 1988 and 1990.

Victor Berlemont



Picture 1988:

From left to right: Xavier Voodecker, André Gohman, Victor Berlemont, John Wijngaard, M. Satchevsky, Anne-Marie Deblezer



Picture 1990:

From left to right: Cécile Calvaer, Victor Berlemont, Michel Couvreur, Jacqueline Berlemont, André Calvaer, Joseph Thity

The Electric Power Sector until and somewhat after the Creation of BNC

From the beginning of electrification onwards, electric power experiences an intensive development in Belgium. In 1911, the synchronous operation of several power stations is experimented in order to optimise the electrical energy cost. After the 1914-1918 war, the principle of synchronous operation of several generators is largely applied in diverse regions of the country. In the whole country, a significant number of small power stations are built, as well direct current as alternating current, in the framework of independent private power companies. Inside these companies, the synchronous operation of alternators becomes the rule. Low Voltage direct and alternating current networks extend followed in the last case by Medium Voltage essentially for rural electrification. Bit by bit, alternating current replaced direct current, except for electrical drives (tramways, industrial drives and other appliances).

Around 1937, there were more or less 110 power stations equipped with generating units up to 60 MW. Installed power generation totally rose to 2000 MW for a peak load of some 800 MW which means a reserve margin of 150%, huge compared with the present reserve margin. The reason was the weak interconnection between the power stations.

In 1937, 8 years after the creation of the BNC, the main private companies created CPTÉ (Coordination of Production and Transmission of Electric Power) with the objective to coordinate the generation on an optimal economical basis.

Three personalities left their marks on the development of electric power in Belgium.

First of all, Zénobe Gramme who succeeded in designing the first direct current generator in 1870. A second one was Fernand Courtoy who successfully interconnected industrial power stations with pulsating loads, and also developed the rules and implementation of economic dispatching. The third one was Louis De Heem who started CPTÉ.

It is worthwhile to mention the creation in 1883 of the SBE association (Société Belge des Electriciens). This creation was supported by «la Société Internationale des Electriciens», based in Paris. It should be recalled that the electrotechnical industry had been classified at that time as the third one in importance throughout the world. In 1959, SBE became SRBE (Société Royale Belge des Electriciens). Presently SRBE maintains excellent relations with CIGRE.

The Belgian National Committee (BNC)

The Role

The BNC was born in 1929, the objective of which was to prepare and to organise the Belgian participation to the activities of the International Conference on Large Electric Power System, the Sessions of which are held since 1921 in Paris.

The Mission

The committee was created in order to:

- Collaborate with the International Office in Paris;
- Be the organism between the Belgian members and the International Conference;
- Prompt experts to write reports to be presented during the sessions, to check that they have a technical or scientific content (rather than a commercial one) and to transfer them to the Conference Office in due time;
- Make up the Belgian delegation which will attend the sessions and to nominate the delegation leaders ;
- Support international Cigré meetings in Belgium;
- Make the International Conference known, to support its interests and to draw new members.

The Structure

The committee comprises:

- Collective members who may be national or private authorities, associations, groups, educational bodies, large companies, etc., i.e. all organizations carrying out totally or partially their activity in Belgium.
- Individual members who must be of Belgian nationality or appointed by Belgian organisms.

The management is ensured by an executive committee comprising the Chairman acting also as a member of the Administrative Council of CIGRE, four Vice-Chairmen, a Secretary General and the Chairman of the Belgian technical committee who represents the chairmen of the national study committees. Members of the executive committee are elected by the General Assembly.

Presidents of the Belgian Committee

Year	President	Business sector
1929	Gevaert	Administration
1929-1931	E. Duquesne	power utilities
1931-1933	Forgeur	Industrial power systems
1933-1935	Migot	Power equipment manufacturing industry
1935-1937	Uytborck	Power utilities
1937-1939	Baron Forgeur	Industrial power systems
1939-1946	Dupont	Power equipment manufacturing industry
1946-1948	Baron André Rolin	Power utilities
1948-1950	Houbart	Industrial power systems
1950-1952	Demierbe	Power equipment manufacturing industry
1952-1954	Baron André Rolin	Power utilities
1954-1958	Margoulies	Industrial power systems
1958-1962	Demierbe	Power equipment manufacturing industry
1962-1966	Mario Poma	Power utilities
1966-1970	Huskin	Industrial power systems
1970-1974	Demierbe	Power equipment manufacturing industry
1974-1978	Ernest Méan	Power utilities
1978-1990	Michel Couvreur	Industrial power systems / power utilities
1990-1992	J. Dacier	Power equipment manufacturing industry
1992-	Pierre De Pauw	Engineering

Past Study Committee Chairmen

Period	Chairman	Study Committee
1929-1938	Van Cauwenberghe	5
1948-1957	Mario Poma	Former 14, 35
1957-1966	Richard	Former 14, 35
1968-1974	Paul Borremans	Former 14, 35
1974-1980	Gérard Dienne	Former 34
1984-1990	J. Dacier	17, 11 and A1
1963-1968	Henri Balériaux	Former 19
1994-2000	Jean-Pierre Waha	39 and C2
1998-2002	Alain Robert	36

Past International Meetings in Belgium

Date	Type	Study Committee	Place
May 1979	Annual Meeting of the Technical Committee	All TCs	Bruges
June 1993	Colloquium (.....)	SC34	Antwerp
October 2007	Joint Colloquium (Power Transformers)	SC A2 & D1	Bruges

And many Study Committees held annual meetings in Belgium.

Contributions of Belgian National Committee to CIGRE Progress

The following historical information highlights the specific areas in which the BNC and some Belgian CIGRE members made important contributions or played important roles. Hopefully, this information will transfer past knowledge and experience to the current generation of electric power engineers, along with experience concerning the cooperative procedures that fostered important advances.

Unfortunately the BNC archives are not complete anymore, which means that some contributions and personalities may have been forgotten. That is the reason why we essentially began the Belgian contributions in 1982 which is a remarkable date for Belgian power system (see further), still in the memory of responsible managers. A second reason was the limitation length of the text. We apologise for this lack of information, especially for those we did not quote.

Key contributions

1 - On 4 August, 1982, the Belgian electric system widely collapsed. This occurred while a new just started nuclear unit of 900 MW tripped out and in absence of maintenance of an interconnection link with France. The analysis of the incident showed that the cause was a lack of reactive power that led to a voltage collapse. This collapse was mentioned during the CIGRE 1982 Session. During the 1984 Session Belgian experts officially communicated the results of their activities and research to the Session participants.

But what was, at that time, the state of the art as far as reactive power was concerned? Circa 1970, the VHV and HV Western European systems were characterized by a large extension and the different countries often became strongly interconnected. In fact, although not explicitly written, the frame of mind of the majority of managing people accepted the simple relations:

[Active power ↔ Money] = strong interaction → strong interest (1)

[Reactive power ↔ Money] = weak interaction → weak interest (2)

Nevertheless, around 1975, some breakdowns (i.e. voltage collapses) occurred in the systems and the poor treatment of reactive power was suspected as the predominant basis of those drawbacks. Simultaneously, the weight of the above equation (2) declined. A group of Belgian experts, all CIGRE members and among them André Calvaer, professor at the University of Liège and adviser at CPTe, took the problem at hands with the scope of describing the reactive power behaviour of synchronous generators in cases of large system disturbance. They developed an equivalent model, as simple as possible, in terms of impedances and added it in load flows programs so as to allow exchanges of information concerning the reactive power between responsible planning and operations managers as well as control centres of the different subsystems of the national system. There exists, in the behaviour of the networks, an essential difference between frequency (active power) and voltages (reactive power). While the first one is the same in the whole system, the second one is by far more localized. This difference was perhaps the reason of the delay between the studies and the slow transition from equation (2) to the following equation (3) (from 1975 to 1984 and even to 1995 for some people):

[Reactive power ↔ operating security] = strong interest → impossible carelessness (3)

Anyway, the developed method and model were greatly helpful in the reconstruction of the successive steps of the important voltage collapse of the Belgian system on 4 August, 1982, described above. The collected information was communicated to CIGRE members and has contributed to a better understanding of voltage collapses.

2 - Beside the analysis of the partial system blackout and the determination of its causes, a lot of work has been done to prevent repetition of a voltage collapse.

The above-mentioned model for the reactive response of a generator has been implemented in nearly all programs used for system study and monitoring at least in Belgium.

With the generator manufacturers steps were taken to prevent an excessive response of protective devices of the generators, so that they could plainly contribute to the system robustness.

A prototype of a device to monitor the working point of a synchronous generator with regard to its limitations (capability curves) was developed, the author of which was Edwin Van Geert, at that time engineer at Traction-Electricité and CIGRE member. The demonstration occurred on one of the units of the nuclear power plant of Doel. However, the idea was abandoned, while in other countries (e.g. in South Africa at the Drakenberg power station) similar devices are part of daily operation. (Photo hereunder).

Finally, a group of experts worked on the possibility of estimating the risk of

voltage collapse by simple indicators. Several possibilities have been presented in a paper for the 1984 session of CIGRE.

Edwin Van Geert has also been Head of WG 37- 10 (Flexibility in System Planning) and WG-28 (Quality of Supply: Customers Requirements, with a CIGRE-publication of the final report).



Drakenberg generator working point monitoring, photographed during a CIGRE Symposium in 1993 in South Africa

But these tools addressed the so-called “quasi-steady state” behaviour of the power system, disregarding true dynamic behaviour. At that time, the simulation of complex dynamic scenarios, mixing different electro-mechanical phenomena, possibly unstable (like rotor oscillations, voltage or frequency instability, cascade tripping, inter area oscillations) was just impossible. This simulation was the key to succeed in designing system protection schemes and defence plans able to limit the extension and the probability of black-outs. Marc Stubbe (Tractionel) set up a team of experts, obtained the support of all the Belgian utilities and conducted a research programme on a new generation of simulation tools. This has led to the well-known STAG software (now Eurostag) based on an algorithmic breakthrough consisting in an automatically variable integration step-size. It has been presented at CIGRE 1990. Today, a real time version of the software, called FAST, is available as simulation engine for advanced Dispatcher Training Simulators. FAST has been presented at CIGRE 2006. Eurostag, presently developed with RTE, is now in use in more than 60 countries for advanced simulations of complex and large scale networks, as well as for research purposes.

3 - Belgium also made significant contributions to the domain of Electromagnetic Compatibility in the broad sense, i.e.

- Power Quality (“PQ”, i.e. voltage continuity and voltage quality – LF disturbances, ≤ 9 kHz, reaching equipment through the electricity supply),

EMC in the narrow sense (EMI, EMF – HF disturbances on the electricity supply and all disturbances, HF or LF, reaching equipment otherwise than through the electricity supply), and also some safety and resistibility concerns,

- Environment: fields, noise, and interferences.

Bruno Jacquet has been a real pioneer in the field of EMC (mainly in its narrow sense, i.e. HF emission and immunity of HV equipment and installations and influence of power links on other installations). As member of WG 36-04 he made important contributions in the field of immunity tests, shielding performance of cabling systems and people electrical safety (step and touch voltages...). As convener of WG 36-02 he is, among others, at the origin of the guide 95 (published in 1995) dealing with the Influence of High Voltage AC Power Systems on Metallic Pipelines.

Jean Hoeffelman continued his work as main author of the guide 124 on EMC in Power Plants and Substations issued by WG 36-04 (1997). He also made important contributions in the field of EMF as convener of TF C4.205 which produced the guide 320 on Characterization of ELF Magnetic Fields (2007) and also as convener of AG C4.2 responsible of all the EMC/EMF activities within SC C4, by setting up WG C4.204 which wrote the guide 373 (2009) dealing with Mitigation Techniques of Power-Frequency Magnetic Fields originating from Electric Power Systems.

Both have been several times Special Reporter of the Paris CIGRE SC 36 sessions.

Since 1972, Pol Pirotte was a member of the WG 36-01 «Corona and Fields» of which he became convener from 1992 up to 1998. During this period of time, the WG issued two main guides: in 1974 on interferences produced by corona and in 1980 on electric and magnetic fields. Moreover, in 1993 the WG published the best seller CIGRE document entitled Electric Power Transmission and the Environment.

Alain Robert was convener of WG 36-05 on Power Quality from 1988 to 1994. He had been a member of this group since its creation (1977) and had actively participated in a report which was at the basis of important standards (IEC 63000-1-1/2, EN 50160) stating permissible levels of harmonics (and other disturbances) in power systems. Under his leadership, WG 36-05 became a joint CIGRE/CIRED working group (CC02) and issued several important publications.

He was asked by IEC to set up an international joint task force to issue emission limits for distorting and fluctuating loads. So, JTF ICU was created (1993-1996), grouping representatives of the several international organizations which had worked on the subject (ICU was a contraction of IICCUU, for IEC, IEEE, CIGRE, CIRED, UIE, UNIPEDE). The result was IEC publications 63000-3-6/7.

Afterwards, he became chairman of Study Committee 36 on Electromagnetic Compatibility (1998-2002) and, finally, he was chairman of the Technical Organising Committee of the very first common CIGRE/IEEE symposium, the subject of which was "Quality and Security of Electric Power Delivery Systems".

4 - Belgium has also played an important role in the network protection study committee due to its pioneering work in protection testing and digital techniques. The strong interest for protection was related to the challenge of protecting the heavily meshed Belgian network. The Belgian electricity utilities cooperated via their laboratory Laborelec with the University of Brussels (ULB) to reach the optimum protection compromise on the new 380_kV network. Therefore, an experimental and didactic mini-network (the "R.E.D.") had been inaugurated in 1967 and most of the 380kV protections were tested on that network.

In parallel with the development of the R.E.D., Professor Robert Poncelet was one of the pioneers in the introduction of digital computer possibilities for protection relays. His doctorate thesis "Contribution to the control and the protection of electrical networks by digital computers" was presented in 1972 and describes one of the first complete algorithms for digital distance relays.

Belgium's leading role led to the nomination of Gerard Dienne (Laborelec) as Study Committee 34 chairman in the period 1974-1980.

In the early eighties the first digital fault recorder ("BEN") was introduced on the Belgian network developed by a Belgian manufacturer in cooperation with Laborelec (Pierre Liénart) who had a long tradition in fault analysis on the whole Belgian network.

Also the first digital open-loop transient simulator ("synthesizer") for testing was introduced in Laborelec in cooperation with the university of Brussels (ULB).

And finally the Belgian utilities initiated by Jos Goossens sponsored the design of a micro-processor based digital distance relay in cooperation with Laborelec (G. Dienne), University of Brussels (R. Poncelet), Cornell University (J. Thorpe) and Virginia Polytechnic (A. Phadke). All of these persons made significant contributions to SC 34 and Jos Goossens took over the Belgian leading role in SC34 from G. Dienne.

In the late eighties and early nineties Belgium's strong contributions to SC 34 were based on 3 pillars: sound knowledge of the network protection functional requirements based on fault analysis, adequate testing programs combined with adequate testing equipment and an early interest in digital protection.

The first commercial digital protection was already tested by Laborelec in 1986. This early start gave Belgium a leading position in application experience. In this period different remarkable papers were submitted to CIGRE: the first application of a digital differential protection on a two-circuit three terminal line using digital

microwave links as communication carrier (1990), the analysis of the performance of protective devices (1992), the problem of upgrading digital protection (1995).

The prominent Belgian role was honored with the organization of the 1993 SC34 colloquium in Antwerp. In the meantime a new generation was ready to take over the leading role. Amongst them Leo Simoens, Willy Hermans (Electrabel), Jean-Claude Maun (ULB) and Frank Wellens (Laborelec) as SC34 representatives.

In the late nineties Belgium was already working on the next century's challenges as illustrated with a CIGRE paper on "Protection related connection conditions for independent power producers in Belgium", which already identified problems related to massive introduction of renewables.

In the early 2000s, the utilities had to face the effects of unbundling and the Belgian role in SC34 was taken over by Jan De Cock (2000), Didier Wiot (2003) and Luc Uyttersprot (2007).

The technical challenge was mainly the integrated protection and control systems.

5 - The technical, economic, financial, environmental, political and social aspects of the power system evolution and planning have also been addressed and presented to CIGRE Sessions, symposia and working groups.

In the sixties, under the leadership of Henri Balériaux who was chairman of former SC 19 from 1963 to 1968, Belgian utilities developed models so as to plan their generation system. The method used probability convolutions taking account of the load and of the power units availability probabilistic aspects. The method provided for the planning of a generation system on the long run, aiming at meeting a LOLE (Loss Of Load Expectation) criterion. Contemporaneously with the development of the French model MEXICO, this approach was totally new. Many CIGRE delegates have been highly interested in it and in the relevant information presented during the Sessions. In the recent past the US delegate Jack Casazza still spoke of the Balériaux method.

Of course, other models have been developed and used in order to strengthen the international cooperation between companies. Victor Berlemont pursued the work of Henri Balériaux in Belgium and CIGRE.

For many decades, the people in charge of the electrical industry have on a voluntary basis, and knowing they could rely on cooperation, created particularly high performance generation/transmission systems. But the idea of putting power companies into competition emerged in the beginning of the nineties, pushed by the British. This gave rise to many discussions between pro and con arguments on this evolution. Victor Berlemont who was special reporter at that time led the discussions during the 1992 and the 1994 CIGRE Sessions in Paris. He was special

reporter from 1988 to 1996, i.e. during 5 Sessions. The problematics of the NUGs (Non Utilities Generators) was addressed too. Anyway, it was made clear that an interconnection cannot exist without cooperation and that competition is impossible without interconnection. The advantages of interconnection are now beyond discussion, which was not obvious at the beginning of power systems deregulation.

As a conclusion of this report, it is up to young people now to continue, in the deregulated system, the work accomplished by their elders.

And there are a lot of subjects which need to be addressed in order to ensure the reliability of the power system, especially its security aspects, like:

the cascade overloading, the frequency instability, the voltage instability, the loss of synchronism, the untimely loss of a wind power system, acts of terrorism actions.

Anyway taking account of the deregulation and of the introduction of renewable energy sources, a significant investment has to be put into R & D which deserves the attention of CIGRE and of course of the BNC.

The key contributions which are developed herewith are not exhaustive. Of course, there are many others but, as already mentioned, the length limitation of the report did not give the possibility to mention them. We apologize for that.



History of the Brazilian National Committee of CIGRÉ

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With thanks to
P. C. Vaz Esmeraldo,
M. de Fatima C. Gama,
Arthur Cohen

Background

The Brazilian National Committee was founded on May 5, 1971. The road to this point was a long one and it took the efforts of many people to reach it. In 1946, at the first biennial Session after World War II, there was one Brazilian delegate in Paris and one could say that this was the beginning of the long way, not only for CIGRÉ-Brazil, but for the Brazilian electric power sector. Up to that time, the electricity industry in Brazil consisted mostly of private companies operating at a city or state level, dominated by two big foreign owned groups: American Foreign Power – Amforp, operating mainly in state capitals, and Electric Light and Power (usually known as Light) a Canadian group operating in the São Paulo and Rio de Janeiro region, the most industrialized in Brazil. This model worked successfully for decades but, for several reasons, began to lose its efficacy by 1945 and a new model, based on strong government presence (as was also the case of Europe), started to emerge.

In 1945 a so-called mixed economy company (state owned, but admitting private shareholders and ruled by the same laws as private enterprises), named CHESF – *Companhia Hidroelétrica de São Francisco* - was formed by the federal government to build and operate the Paulo Afonso power plant (first stage 192MW), on São Francisco river in the northeastern region of the country. This project was a sort of prototype – both technical and institutional – for the evolution of the Brazilian electric power sector for the next decades. Technically, it was a hydro plant, located on a large river and hundreds of kilometers away from the main load centers, implying long high voltage transmission lines and as in most other early cases radial. On the other hand, CHESF was the first of many

other federally or state (province) owned utilities that were formed in the following years. The next company to be created was CEMIG – *Centrais Elétricas de Minas Gerais*, formed by the state of Minas Gerais and after that another federal company – Furnas – came into being and a federal holding company – Eletrobrás. The model that finally emerged and was in place for about 30 years, until the end of 1980s, consisted of a Ministry of Mines and Energy for general guidance, policy formulation and regulation and Eletrobrás with four regional subsidiaries: Eletronorte (Northern region), CHESF (Northeastern region), Furnas (Southeastern region) and Eletrosul (Southern region) and state (province) companies such as CEMIG in Minas Gerais, COPEL in Parana, CESP in São Paulo and others each in every state. Municipal and private companies also existed. The latter were being gradually bought by the government companies. The Amforp group sold its assets in Brazil and its existing utilities were transformed in state companies and continued operating. By the end of the period the Light group was bought by Eletrobrás, becoming another subsidiary. By the end of the century, following the privatization trend that was adopted in a large number of countries, Light group and many other utilities were sold back to private investors, mostly foreign. Currently, besides Ministry of Mines and Energy and Eletrobrás there is a regulatory agency – ANEEL, an independent system operator covering the whole country – ONS and EPE a planning agency attached to the MME. Its planning activities are the basis for a bidding procedure for granting concessions for building and operating new facilities – power plants and transmission lines. The power companies, previously vertically integrated, were unbundled and generation, transmission and distribution functions are now separate. A chamber where energy trading operations are performed was also created.

During this period, the installed electric power capacity in Brazil grew from about 1300 MW in 1945 to 12670 MW in 1971, when the Brazilian National Committee was established. This almost tenfold growth required a large number of qualified engineers and technicians and Eletrobrás instituted measures to meet this need, by financing and otherwise supporting the upgrade or implementation of specialized courses at Brazilian and some foreign universities. This kind of environment was also a strong incentive for self studies with an important role for publications of technical societies such as IEEE and CIGRÉ.

Thus, it was natural that Brazilian engineers of the power sector be attracted to CIGRÉ, its publications and Sessions.

Creation of the Brazilian National Committee

During this period contacts were maintained between the Brazilian engineering community and CIGRÉ in Paris. CIGRÉ officers were also interested in these contacts and trying to stimulate the formation of a National Committee in Brazil. Letters were exchanged between Paris – signed respectively by J. Tribot Laspiere,

F. Cahen and R. Pélissier on one hand and prominent Brazilian engineers like Octavio Marcondes Ferraz, Technical Director of CHESF who had ties with France, having studied and graduated in Grenoble. Also CIGRÉ obtained a number of individual and collective members, as well as presence of a fair number of Brazilian delegates at the biennial Sessions. In spite of these interchanges, during several years the conditions in Brazil were not ripe for the creation of the National Committee. Technically, this period was very interesting, with a growing number of new plants and lines, forming an ever more interconnected system. Just to illustrate this, from 1948 to 1973, among others, the following hydro plants were built: Paulo Afonso I (192 MW), Itutinga (24,3 MW), Três Marias (396 MW), Furnas (1024 MW), Jupiá (1551 MW) and Ilha Solteira (2816 MW). Each plant with its own transmission system but progressively interconnected, with voltages ranging from 138 kV to 750 kV AC and +/-600 kV DC. Brazilian power engineers were also growing in numbers and experience, being able not only to absorb knowledge from other CIGRÉ members but also share their own experiences with them.

In 1969, Albert W. Huseby, deputy director of Light Company maintained correspondence with CIGRÉ, for the purpose of establishing conditions for the creation of a National Committee in Brazil. For this he obtained the support of his company, with the participation and involvement of Director of Operations José Sampaio Freitas and later of Alexandre Henriques Leal, Director of Light Rio, who became a corresponding member of the Administrative Council.

In May of 1971, Study Committee 31 (Transmission Lines), under the chairmanship of Howard Barnes, held its meeting in the city of São Paulo, upon invitation from Albert Huseby. As, at that time, Brazil had surpassed the necessary minimum number of members for the establishment of a National Committee (40 equivalent members), the decision was taken to take advantage of this opportunity and create the NC. Thus, with the presence of 23 individual members, and representation of eight collective members, the Brazilian National Committee was created on May 5, 1971.

Its board was as follows:

Octavio Marcondes Ferraz – Honorary Chairman

Alexandre Henriques Leal (Light – Rio) – Chairman

Flavio Henrique Lyra da Silva (Furnas) – Vice-Chairman

Alexandre Alissoff (Themag Consulting) – Vice Chairman

Albert William Huseby (Light) – Executive Secretary

On May 21 1971, the Administrative Council, at its meeting in Moscow formally approved the creation of the Brazilian National Committee.

Organization and Evolution, Finances

The newly formed Committee was legalized in Rio de Janeiro and had its first headquarters at the offices of Light-Rio. It was registered as the “Brazilian National

Committee of *Conférence Internationale des Grands Réseaux Electriques (Cigré-Brasil)*” and among its objectives was the representation in Brazil of CIGRÉ. This denomination was valid until 1995, when it was officially changed to “Brazilian National Committee of Production and Transmission of Electric Energy – Cigré-Brasil”, due to the incorporation of the events of the Seminar of Production and Transmission of Electric Energy (SNPTEE).

The headquarters at Light-Rio remained the official address of BNC but the actual premises, as well as logistical support, were usually offered by utilities to which the current chairman belonged. Eventually, the then newly established Electric Power Research Center – Cepel in Rio de Janeiro which belonged to Eletrobrás, its subsidiaries and several other Brazilian utilities, offered a space to be utilized by the BNC as well as secretarial and accounting services. All this was paid for by the Committee. Finally, in 2003 the BNC was able to purchase its own premises where it established its offices.

As seen above, BNC initially consisted of a Chairman, two Vice-Chairmen and an Executive-Secretary. Eventually, an Advisory Council of past Chairmen was created which evolved into an Administrative Council, representing all interested stakeholders who grew in number as the Committee activities increased and grew in scope. In all cases, the supreme body was the General Assembly of all members.

The BNC also instituted Study Committees, which eventually reproduced all the SCs of the international organization and its chairmen were members of the corresponding international SC. The present structure of the BNC, according to its bylaws is as follows:

General Assembly

Administrative Council - elected by the GA for a four-year period, consisting of 22 members, representing the stakeholders, such as Eletrobrás, major utilities, universities, research centers, manufacturers and individual members, etc. and including also the current and past chairmen as permanent members. (A total of 20 members).

Executive Board - elected by the GA for a four-year period, consisting of: Chairman, two Vice-Chairmen, Financial Director, Administrative Director.

Financial Council - (6 members).

Editorial Council - (12 members, for the magazine *EletroEvolução*).

Audit Committee - elected by the GA for a four-year period. (3 members).

Technical Committee - chaired by one of the vice-chairmen and consisting of Study Committee and Permanent Module chairmen (appointed by the Board, confirmed by the Council). (17 members).

Permanent Modules - the most important organs and events through which BNC performs its activities:

Study Committees, Working Groups and Task Forces, National Seminar of Production and Transmission of Electric Energy (SNPTEE), Symposium of Experts in Planning of Electric Operation and Expansion (SEPOPE), Symposium of Electric Power System Automation (SIMPASE), the magazine "EletroEvolução – Sistemas de Potência" (ElectricalEvolution – Power Systems) and permanent cooperation agreements with other entities. The seminar and symposia were originally independent activities, incorporated by BNC. There are also programmed temporary modules such as courses and tutorials, congresses, technical and scientific workdays, workshops, research and development programs and eventual cooperation agreements.

The modules are created or ended by the Administrative Council upon a proposal by the Executive Board. Each has its own rules approved by the Board and the Council and as far as possible should be financially independent.

Staff - (5 employees)

As was to be expected, financial problems were the main difficulty faced by the newly established Committee. The membership fees barely covered the amounts sent to CIGRÉ in Paris especially as the problem was compounded by more or less continuous devaluation of the Brazilian currency in those times. In order to cover current expenses, the BNC slightly increased the corporate fees. Eventually the Committee created or incorporated events that could produce revenue. A particularly successful example is the incorporation of the Production and Transmission seminar, the SNPTEE. This seminar was created almost simultaneously with the National Committee and mostly by the same organizers, while its original objective was to discuss the preferential subjects to be considered at the next Biennial Session; so it was to be held every two years in an odd-number year. The Seminar was an immediate success, the subjects discussed were increased in scope and the attendance grew all the time, reaching at present about 2500 participants. Soon, the revenues from the registration fees and later from a parallel technical exhibition produced a surplus that strengthened BNC's finances. This was because the Committee at an early stage was charged with the coordination and organization of the Seminar. Other activities, such as seminars, tutorials, conferences, etc. incorporated into the Permanent Modules are whenever possible, organized so as to be financially independent. This applies also to all external activities created by the Study Committees. Of course, this is not always possible and the technical quality of events is always a priority. Nevertheless it was possible, in this way, to maintain a comfortable financial situation for the BNC. Among other advantages, it was possible to solve a recurrent problem which was the difficulty of financing travels related to the international activities, mainly the participation in Biennial Sessions, Administrative Council and

Steering Committee meetings and international Study Committees activities.

For this a Travel Fund was created, to reduce the necessity of obtaining subsidies from the companies to which the delegates are affiliated, or even the need to cover their own expenses by individual delegates. The Fund has its own strict rules and is overseen by a committee especially created for this purpose.

The membership situation evolved satisfactorily and, since 2001 the CNB is in the first position in the ranking of CIGRÉ National Committees as regards equivalent membership and revenue produced. In 2008 the total number of equivalent members was 892, distributed as follows: 285 Collective members I, 12 Collective II (universities), 410 Individual I, 185 Individual II (young members). In 2009 the number of equivalent members exceeded 1000: 345 Collective I, 10 Collective II, 457 Individual I, 224 Individual II with a total of 1036.

The BNC now owns an ample office space, with all up to date computing and audiovisual equipment, with a meeting room large enough for study committee meetings, comfortable space for chairman and staff as well as for any visiting members and a library open to members. It also has a web site (www.cigre.org.br) with all necessary information about its activities and facilities for on line discussions of Session Technical Reports by interested professionals (chats).

Technical Activities

Since the beginning, BNC was involved in all kinds of technical activities, both at national and international levels. Delegations participated in Biennial Sessions, contributed papers, worked within Study Committees and Working Groups. As mentioned, all international SCs included a Brazilian member. In 2008, the Brazilian delegation to the Session counted 93 delegates and 46 accompanying persons and had 26 technical papers published. BNC also provided four Special Reporters for SCs B5, C2, C3 and C5.

In Brazil, activities include events incorporated in the Permanent Modules and other more specific events. As an example, in 2007, were held: 19th SNPTTE with over 2500 participants, 7th SIMPASE with over 500 participants and ERIAC the Ibero-American Regional Meeting of CIGRÉ with about 700 participants. In 2007 were held the 5th Workspot – International Workshop on Power Transformers, organized by the Brazilian SC-A2, with over 500 participants and SIGMAT – International Seminar on Assets Management, Transmission Maintenance and Electrical System Performance organized by Brazilian SC-C4. This was the first issue of this Seminar and attracted about 450 participants.

In both years Brazilian SCs organized specific events, 10 in 2007 and 15 in 2008, with an average of almost 200 participants each.

Technical Communications – The first orderly attempt of the BNC to communicate with its members was the publication of a newsletter called

“Informe Cigré”, published from 1984 to 1993, which informed about various activities, administrative, social and technical organized by the Committee. In 1984, in a joint venture sponsored and financed by the Brazilian National Research Council (CNPq), with participation of the Brazilian Association of Electrical Engineers (ABEE), BNC was charged with the publishing of a new magazine, entirely technical in scope, called “Notebook of Electrical Engineering”. The research center CEPEL selected and edited the papers, which were sent to CNPq for printing and publication. By 1989, CNPq, due to financial difficulties, stopped the funding, which was then entirely taken by BNC for the last four issues of the magazine. The board and Council then decided that the Committee should independently publish its own magazine. Thus was created “EletroEvolução – Sistemas de Potência”, which publishes selected papers presented at SNTPEE as well as at the Paris Sessions by Brazilian participants. This magazine was first published in 1984 and has been published regularly since then, under the guidance of an Editorial Council, nominated by the BNC Board.

Many of BNC activities are sponsored or organized jointly with IEEE, which is also quite active in Brazil.

International Activities

Since 1974 there has always been at least one Brazilian member on the Administrative Council and since 1978, one on the Steering (formerly Executive) Committee. In 1990 Jerzy Z. L. Lepecki, from Brazil was elected CIGRÉ President and twice reelected finishing his term in 1996. Brazil also had two SC chairmen: Xisto Vieira Filho SC 38 (1996-2002) and Marcio Szechtman SC B4 (2002-2008) who was distinguished, for the second time, with CIGRÉ Technical Award at the 2008 Session. Erly Figueiredo is currently the third Brazilian SC chairman (SC A1 from 2008 to 2012). Also in 2008, Paulo Cesar Vaz Esmeraldo was elected Treasurer of CIGRÉ and José Henrique Machado Fernandes, current BNC chairman, sits on the Administrative Council. Brazil also hosted the following meetings of CIGRÉ governing bodies:

- 1987 Administrative Council - Rio de Janeiro
- 1991 Executive Committee - Angra dos Reis
- 2002 Executive Committee - Manaus
- 2003 Technical Committee - Rio de Janeiro

BNC is also very active in regional activities. In 1986 was held the first Regional Latin American Meeting of CIGRÉ– ERLAC. It was organized by the Brazilian and Argentine national committees, with the collaboration of the newly formed Paraguayan committee ; the latter three were the initial nucleus of the Latin American Region of CIGRÉ. It was held in Foz do Iguaçu , Brazil in the region of the Triple Frontier – Argentina, Brazil, Paraguay. The meeting was a success and from then on was held regularly until 2003, when the 10th meeting was held in Puerto

Iguazu, Argentina. From that year the Latin American Region was expanded to include, besides Latin American countries, Portugal and Spain, thus forming the Ibero American Region. This region was formally recognized by the governing bodies of CIGRÉ, not without some discussion, as there was no geographical proximity of the European and Latin American countries. Finally, the argument of close cultural and language ties prevailed. In 2005 was held the first ERIAC meeting, named the 11th ERIAC in order to keep the continuity of former terminology. These developments were due mainly to the efforts of João Batista Guimarães Ferreira da Silva, president of BNC in 1999-2003, very active in CIGRÉ affairs, member of Administrative Council and Steering Committee, recipient of the first "CIGRÉ Medal" in 2008.

The Future

Brazil is a large country – about 8.5 million sq. km - with an important hydro potential, estimated at 260 000 MW. It has an installed capacity of about 100 000 MW, of which 70 % is hydro. Under these conditions, the transmission network was always an important element of its electric power system. Its importance tends to grow as most of the untapped hydro potential is located far from the industrial centers, in the Amazon region. The plants now being built on the Madeira river (two plants, Santo Antonio and Jirau, with a joint capacity of 6 500 MW), will require a DC transmission system of 2 500 km with a large part of it running through the rain forest. In the next 15 years at least three major hydro generating centers are expected to be developed in the region: Belo Monte (11281 MW), the Tapajós complex (about 8000 MW) and the Teles Pires complex (about 4000 MW). All of them are at least 1500 km distant from the main load centers. The technology needed to transfer these amounts of energy over the very long transmission systems will pose new challenges for the Brazilian engineers, with voltage levels of 1000 kV AC and +/- 800 kV DC being envisaged. Besides, taking account of the ever increasing importance of the Brazilian interconnected system in taking advantage of the hydraulic diversity and complementarities among regions, its controllability should be enhanced with the application of FACTS devices.

Considering all this, it seems natural that BNC will have much material for study and discussion, with many new problems dealing mainly with environmental aspects, as well as with techniques necessary for efficient transmission over very long distances. On the other hand, the interconnected system in addition to increasing in size and complexity, shall operate with ever larger proportion of small plants (distributed generation) such as small hydro, biomass, wind and solar generating plants which will present it with other challenges. On the administrative side, the BNC will constantly watch and improve its organization and its events as well as give serious consideration to the use of its financial resources, increase the number and quality of its technical meetings and guarantee the Brazilian participation in international discussions.



BNC TECHNICAL COMMITTEE MEETING 2006

Boards of the Brazilian National Committee of CIGRÉ

Period 1971 – 1974

Honorary Chairman Otavio Marcondes Ferraz

Chairman Alexandre Henriques Leal – Light

Vice-Chairman Flavio Henrique Lyra da Silva – Furnas

Vice-Chairman Alexandre Alisoff – THEMAG

Secretary/treasurer Albert William Huseby

Period 1974 – 1977

Chairman Flavio Henrique Lyra da Silva – Furnas

Vice-Chairman José Marcondes Brito de Carvalho – Eletrobrás

Vice-Chairman Nédio Lopes Marques – PTEL

Secretary/treasurer Carlos Augusto de Oliveira Peixoto – Furnas Note -. José Marcondes Brito de Carvalho became chairman in middle term after resignation of FH Lyra da Silva.

Period 1977 - 1980

Chairman Carlos Augusto de Oliveira Peixoto – Furnas

Vice-Chairman Júlio Jalonetsky – Eletropaulo

Vice-Chairman Newton Pereira Nogueira – CEMIG

Secretary/treasurer Xisto Vieira Filho – Eletrobrás

Period 1980 – 1983

Chairman Júlio Jalonetsky – Eletropaulo

Vice-Chairman Jerzy Zbigniew Leopold Lepecki – CEPEL

Vice-Chairman Leonardo Lins de Albuquerque – CHESF

Secretary João Felix Nolasco – CEMIG

Treasurer Mauro Guilherme Jardim Arce – CESP

Period 1983 – 1987

Chairman Jerzy Zbigniew Leopold Lepecki – CEPEL

Vice-Chairman Arthur Cohen – Light

Vice-Chairman Angelo Vian - THEMAG

Secretary Eduardo Marcio Teixeira Nery – CEMIG

Treasurer Reolando Silveira - CESP

Period 1987 – 1991

Chairman Arthur Cohen – Light / Itaipu

Vice-Chairman Eduardo Marcio Teixeira Nery – CEMIG

Vice-Chairman Marcos José Lopes – THEMAG

Secretary Sergio de Oliveira Frontin – Furnas

Treasurer José Carlos de Medeiros – CEPEL

Period 1991 – 1995

Chairman Eduardo Marcio Teixeira Nery

Vice-Chairman José Carlos de Medeiros – CEPEL

Vice-Chairman João Canellas Pires de Mello – ALCOA

Secretary João Batista Guimarães Ferreira da Silva (Mendes Junior Industrial)

Treasurer Antonio João Direne - (Furnas)

Period 1995 – 1999

Chairman Xisto Vieira Filho – CEPEL

Vice-Chairman João Batista Guimarães Ferreira da Silva – ABB

Vice-Chairman Paulo Afonso Pegado – Furnas

Director Secretary Roberto Del Giudice da Rocha Pinto – CEMIG

Financial Director Niromar Alves de Rezende – COPEL

Period 1999 – 2003

Chairman João Batista Guimarães Ferreira da Silva – ABB

Vice-Chairman Paulo César Vaz Esmeraldo – Furnas

Vice-Chairman Paulo Roberto G. Monteiro de Barros – LIGHT

Director Secretary José Henrique Machado Fernandes – Eletronorte

Financial Director João Carlos de Oliveira Mello (CEPEL)

Period 2003 – 2007

Chairman Paulo Cesar Vaz Esmeraldo – Furnas/ EPE

Vice-Chairman José Henrique Machado Fernandes – Eletronorte

Vice-Chairman Mônica Neves Cordeiro – CEMIG

Director Secretary Antonio Varejão de Godoy – CHESF

Financial Director Albert Cordeiro Geber de Melo - CEPEL

Financial Director Josias Matos de Araújo – Eletronorte (from 2005)

Period 2007 – 2011

Chairman José Henrique Machado Fernandes – Eletronorte

Vice-Chairman Antonio Varejão de Godoy – CHESF

Vice-Chairman Luiz Carlos Leal Cherchiglia - CEMIG

Administrative Director Maria de Fatima de Carvalho Gama – EPE

Financial Director Josias Matos de Araújo - Eletronorte

CIGRÉ AWARDS FOR BRAZILIAN NATIONAL COMMITTEE

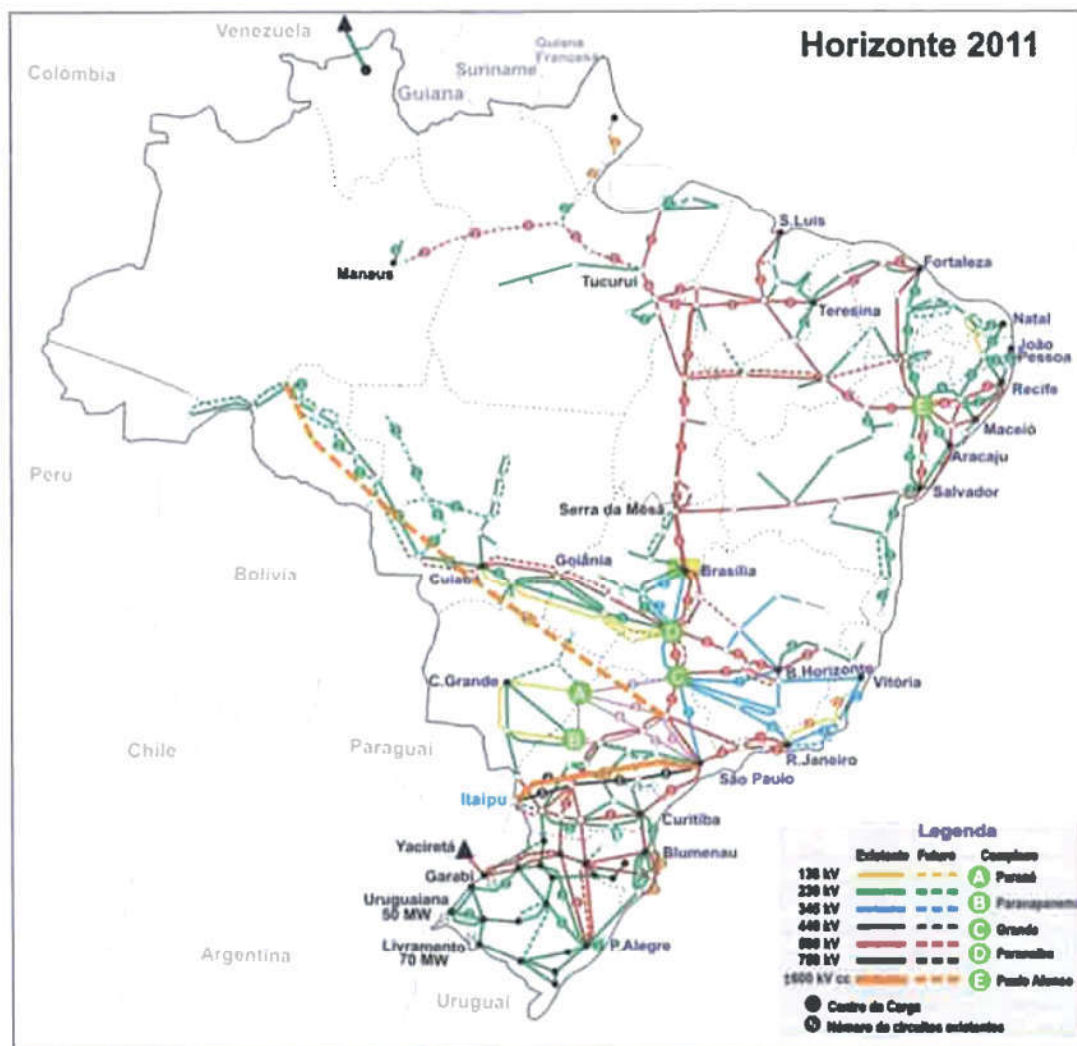
CIGRÉ GOLD MEDAL	
2008	JOÃO BATISTA GUIMARÃES FERREIRA DA SILVA

BRAZILIAN HONORARY MEMBERS CIGRÉ	
APPOINTMENT	NAME
1996	JERZY Z. L. LEPECKI
2002	XISTO VIEIRA FILHO
2006	JOÃO G. GUIMARÃES FERREIRA DA SILVA
2008	MARCIO SZECHTMAN

BRAZILIAN TECHNICAL AWARD RECIPIENTS		
YEAR	NAME	SC
1993	Tobias Hurter	12
1993	Carlos Augusto de Oliveira Peixoto	14
1994	Marcio Szechtmann	14
1997	Joao Guedes de Campos Barros	14
2000	Paulo Cesar Vaz Esmeraldo	33
2002	Antonio Carlos de Carvalho	13
2003	Guilherme Moutinho Ribeiro	B5
2005	Joao B. Guimaraes Ferreira da Silva	B2
2006	Luiz Américo Venturini Cheim	A2
2006	Jorge Amon filho	A3
2006	Joao Felix Nolasco	B2
2006	Jorge Miguel Ordacgi Filho	B5
2006	Saulo José Nascimento Cisneiros	C2
2007	Nelson Martins	C4
2008	Marcio Szechtmann	B4

BRAZILIAN DISTINGUISHED MEMBERS	
APPOINTMENT	NAME
1996	JOÃO GUEDES DE CAMPOS BARROS
1996	JOÃO B. GUIMARÃES FERREIRA DA SILVA
1996	PAULO CESAR VAZ ESMERALDO
1996	EDUARDO MARCIO TEIXEIRA NERY
1996	JOÃO FELIX NOLASCO
1996	CARLOS AUGUSTO DE OLIVEIRA PEIXOTO
1996	JULIO CESAR GUIMARAES PRAÇA
1996	MARCIO SZECHTMAN
1996	XISTO VIEIRA FILHO
1998	SERGIO DE AZEVEDO MORAIS
1998	PAULO AFONSO DA SILVA PEGADO
2000	ERLI FERREIRA FIGUEIREDO
2000	TAMYRES LUIZ MACHADO JR.
2000	ROBERTO DEL GIUDICE DA ROCHA PINTO
2000	NIROMAR ALVES DE REZENDE
2002	LUIZ CARLOS LEAL CHERCHIGLIA
2002	JOSÉ HENRIQUE MACHADO FERNANDES
2002	ALOISIO JOSÉ DE OLIVEIRA LIMA
2002	NELSON MARTINS
2002	GUILHERME MOUTINHO RIBEIRO
2004	JOÃO CARLOS DE OLIVEIRA MELLO
2006	LUIZ AMÉRICO VENTURINI CHEIM
2006	CARLOS APARECIDO GAMA
2006	ANTÔNIO VAREJÃO DE GODOY
2008	JORGE AMON FILHO
2008	HERVELTO DE SOUZA BRONZEADO
2008	SAULO JOSÉ NASCIMENTO CISNEIROS
2008	RICARDO CAVALCANTI FURTADO

HONORARY MEMBERS OF BRAZILIAN NATIONAL COMMITTEE
ANGELO VIAN
ARTHUR COHEN
CARLOS AUGUSTO OLIVEIRA PEIXOTO
EDUARDO MÁRCIO TEIXEIRA NERY
JERZY ZIBGNIEW LEOPOLD LEPECKI
JOÃO BATISTA GUIMARÃES FERREIRA DA SILVA
JOÃO FELIX NOLASCO
MARIO FERNANDO DE MELO SANTOS
MARCIO SZECHTMAN
NIROMAR ALVES DE REZENDE
PAULO CÉSAR VAZ ESMERALDO
REOLANDO SILVEIRA
SAULO JOSÉ NASCIMENTO CISNEIROS
XISTO VIEIRA FILHO



BRAZILIAN INTERCONNECTED POWER SYSTEM



***500 kV high surge
impedance loading (hsil)
line experimental
prototype monitored
in Rio de Janeiro***

Photo by Marcelo Willian Henriques Szrajbman



Ibiuna +/- 600 kV Converter station (Itaipu system)



History of the Canada National Committee of CIGRÉ

From Sea to Sea

Bordering the continental United States and extending north to the Arctic Circle, Canada is second only to Russia as the world's largest country. Canada's total area is 9,984,670 km², nearly 10 percent of which is covered by freshwater. From east to west, Canada encompasses six time zones.

With shores on the Atlantic, the Pacific, and the Arctic Ocean, it boasts the longest coastline of any country. Internally, Canada is divided into ten provinces and three territories. Canada's southern boundary is an 8,892 km border with the United States, its prime trading partner. Much of this trade involves energy. Within Canada, there are three electricity grids (see map below).

Despite the size of its territory, Canada has a very small population, with just over 33 million in 2008, located in a few urban centres. The great majority of Canadians live in a narrow band in the south of the country. Over 60 percent of the population lives in the two provinces of Québec and Ontario.

Another remarkable fact about Canada is the abundance of natural resources – water, oil, diamonds, timber – most of which are available in areas far from population centres. This distance between cities and resources makes transportation, be it by railway tracks or transmission lines, vital.

Canada's unique geography, geology and demographics have contributed to making it a leader in electricity generation and transmission.

Today, Canada is a major electricity producer and has an electricity generation base that is one of the most diversified in the world, consisting of hydropower, natural gas, oil, coal, nuclear power, wind and biomass. Hydropower is the leading source of electricity, making up 60 percent of the country's electricity supply.

Interestingly, Canada has exported its clean hydropower to the United States since 1901, when the first transmission line between the two countries was built at Niagara Falls. Today exports of electricity to the United States average 40 TWh/year.



*[Map of Canada with three grids.
The four asynchronous North American electricity grids]*

The Electric Era

The electric era dawned in 1882 when 52 light bulbs at the offices of the New York Times newspaper were lit by Thomas Edison's Pearl Street Station in New York. Central to this lighting system, but hidden from plain sight, was an elaborate interconnected network of underground wires and tubes that branched from Pearl Station, bringing the power to end users. This moment marked the beginning of electricity grids in North America.

Within a decade, electric generating stations were lighting streets and businesses in communities across Canada.

Most electricity produced in the late 19th century was used for street lighting, business lighting and public transportation; very little was for residential use. In fact, Canada's first electrical companies were created to build and run tramways.

As electricity use grew, it contributed to building the country, opening regions, stimulating the economy, and improving the quality of life of Canadians.

In the early years, electric utilities were privately owned. Competition was fierce, profits slim and the life of many of these companies was short. With the arrival of the twentieth century and the growth of the electricity sector came the creation of public utilities.

For the People

The first Canadian government-owned utility was the Hydro-Electric Power Commission of Ontario, formed in 1905 to help structure the development of the major Niagara Falls hydropower project. The Commission, renamed Ontario Hydro Commission in 1906, took responsibility for hydropower generation, at Niagara Falls and elsewhere, and for electricity transmission throughout the province.

When Ontario Hydro inaugurated its first transmission line in 1910, from Niagara Falls to Berlin (now Kitchener), the illuminated banner at the switching on ceremony tellingly read “For the People.”

Government ownership of electric utilities was taken up by provinces across Canada: Nova Scotia and Manitoba in 1916, New Brunswick in 1920, Saskatchewan in 1929, Québec in 1944.

More recently, the electricity sector has undergone a transformation from vertically-integrated government-owned utilities to various degrees of market liberalization and unbundling of generation, transmission and distribution services into separate organizations. As well, some provinces have moved towards a more competitive generation system with the private sector playing an increasing role, giving rise to independent power producers.

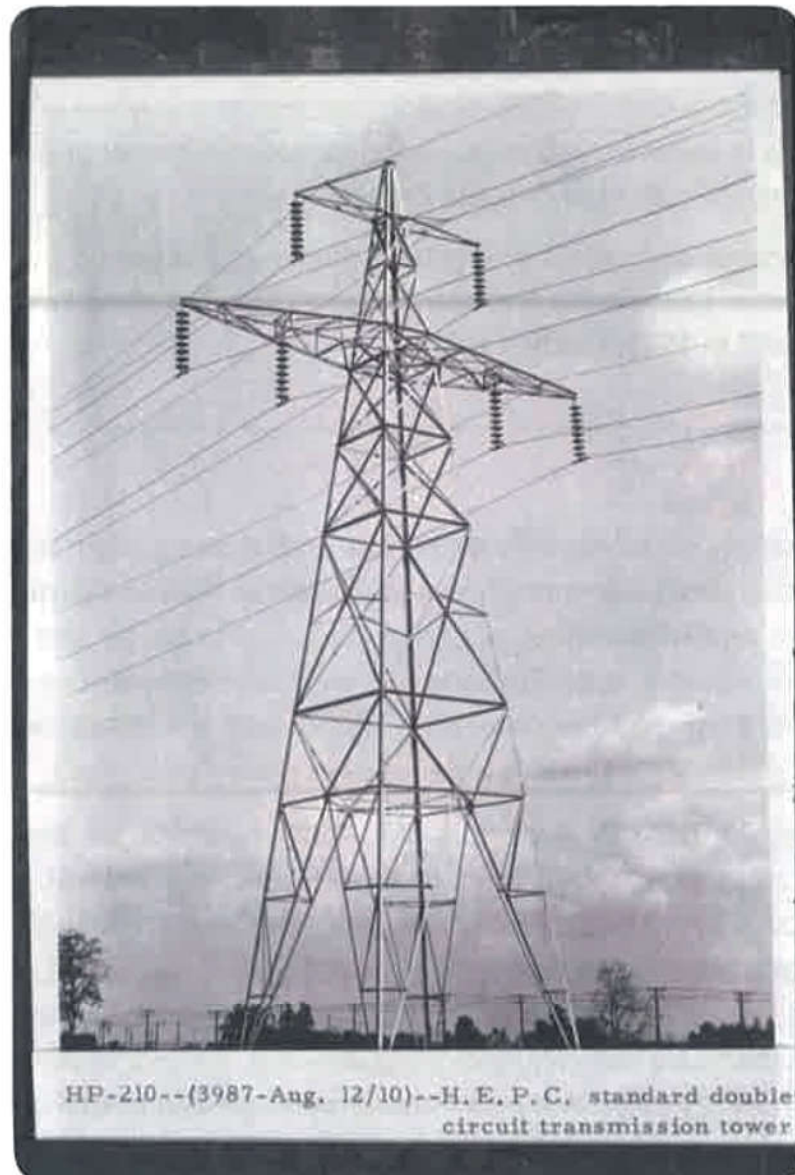
Electricity in Canada generally falls under provincial and territorial jurisdiction. However, when lines cross borders, the federal government becomes involved. All electricity exports, and export facilities, such as international transmission lines, are licensed by the National Energy Board. In addition, Canada participates in the North American Electric Reliability Corporation (NERC), a self-regulatory organization, subject to oversight by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada that ensures the reliability of the bulk power system in North America.

Hydropower and High-voltage

When Shawinigan Falls in Québec and Niagara Falls in Ontario were developed, at the turn of the 20th century, it was technically impossible to transport hydroelectric power across large distances; consequently, industries set up their factories close to the source.

The discovery of the AC motor and the polyphase power distribution system and later the development of HVDC transmission in the fifties opened up the

possibility of transmitting electricity across distances. This groundbreaking invention ignited the development of large hydropower installations in Canada, such as the Manic-Outardes and James Bay facilities in Québec and the Kettle, Long Spruce and Limestone generating stations on the Nelson River in Manitoba.



Canada's first 110-kV line links Niagara Falls and Dundas, Ontario, 1910.



*[735-kV angle towers
at James Bay,
Québec]*



*[Manitoba Hydro's HVDC
Towers located near Gross
Isle,
Manitoba. Image courtesy
of Manitoba Hydro /
Mario Palumbo CPA.]*

World First

In 1965, after three years of work, the first ever 735-kV power line began operation, linking the Manicouagan and Outardes generating stations to the metropolitan areas of Québec City and Montréal. This electricity breakthrough, developed by engineer Jean-Jacques Archambault, was key to developing hydropower projects in northern Québec. Today, Hydro-Québec's system has about 11,400 km of high-voltage lines: 11 at 735-kV and one at 765-kV.

At the opening ceremony of the 1966 Biennial Session of CIGRE, a film was shown on the construction of the 735-kV line, unveiling each and every step over the seasons and years. When the lights came on, over 2000 engineers and experts who were gathered at the international meeting gave a standing ovation.

In 2009, Hydro-Québec's system remains the world's largest 735-kV network.

Bipole 1 and 2

In the 1970s, Manitoba Hydro built two HVDC transmission lines that were instrumental to the development of the province's hydropower potential, specifically on the majestic Nelson River.

Bipole 1, built in 1971, operates at DC voltage of 900 kV; Bipole 2, built in 1978, operates at voltages of 1000 kV. These voltages were among the highest in the world and the lines were among the world's longest at the time of their construction.

River Crossing

Most of Canada's transmission system is transmitted along overhead power lines. More expensive underground lines are used in urban areas or for crossing bodies of water. In 1990, Hydro-Québec built the world's first underwater river crossing for a 450,000-volt direct-current power line. The tunnel leaves the north shore near Grondines and surfaces on the south shore close to Lotbinière substation.

Canada joins CIGRE

CIGRE, the international organization devoted to high-voltage transmission, was established in 1921. Canadians were involved in it four years after its creation.

In 1925, A. E. Davidson, an engineer with the Hydro-Electric Power Commission of Ontario, was delegated by the federal Department of the Interior to participate in the third CIGRE conference in Paris.

Not surprisingly, Canadian participation grew slowly over the next decade, as travelling to Paris for CIGRE meant a slow trip over the Atlantic on a steamship. Except for a brief hiatus during World War II, the Canadian delegation continued to grow over the years.

In 1935, five Canadians, including Pierre Dupuy, Second Secretary to the Canadian delegation in Paris, attended CIGRE's eighth international meeting, along with representatives from approximately 40 other countries.

Two years later, the Canadian delegation to Paris included John Morse, Vice-President of the Shawinigan Water and Power Company. In 1938, the National Research Council of Canada, the leading governmental organization for research and development, supported the creation of a Canadian National Committee of

CIGRE, and John Morse was named Chair. However, it was not before the end of the war that members met for the first time, on June 27, 1945 in Ottawa.

Head of the organization from 1938 to 1951 Morse was the longest serving Chair of the Canadian National Committee. Under his leadership, the committee's membership grew to 237 equivalent-members.

From 1948 to 1960, the Canadian delegation at CIGRE's biennial session in Paris averaged 15 representatives, a remarkable number considering the challenges and cost of transatlantic travel at the time.

With the growth of Canada's electricity sector and the advent of daily international flights, participation doubled in the sixties, seventies and eighties. Today about 140 Canadians participate in this international biennial event.

CIGRE Canada Firsts

1921	Creation of CIGRE
1925	1 st time Canada takes part
1931	1 st Canadian report to CIGRE study committee
1935	Five Canadians travel to Paris for CIGRE's 8th meeting
1938	Creation of Canadian National Committee
1945	1 st meeting for CNC/CIGRE
1947	1 st CIGRE Executive meeting in North America, in Montreal
1961	1 st meeting of the Administrative Council in Canada
1965	1 st statutes for CNC/CIGRE
1976	1 st Canadian study committee chair
1991	1 st CIGRE symposium in Canada
2001	New statutes, new name
2004	A Canadian at the helm of CIGRE
2006	1 st technical conference in Canada

Table 1 - CIGRE Canada's Executive

Dates	Chair	Vice-chair	Secretary-treasurer
1938-1942	John Morse, Shawinigan Water & Power		
1946-1951	John Morse, Shawinigan Water & Power		E.V. Leipoldt Shawinigan Engineering & CNRC / NRC
1951-1954	G.A. Gaherty Calgary Power		E.V. Leipoldt Shawinigan Engineering & CNRC / NRC
1955-1958	E.V. Leipoldt Shawinigan Engineering	F.L. Lawton Aluminium Laboratories	H.L. Hurdle Montreal Engineering
1959-1965	F.L. Lawton Aluminium Laboratories	H.A. Smith HEPCO	R.E. Grout Shawinigan Engineering
1966-1968	H.A. Smith HEPCO	R.E. Grout Shawinigan Engineering	S. Kozak Canada Wire & Cable
1968-1970	R.E. Grout Shawinigan Engineering	W.L. Hetherington Ferranti Packard	N.J. McMurtrie Ontario Hydro
1971-1975	W.L. Hetherington Ferranti Packard	Lionel Cahill Hydro-Québec	J.R. Leslie Ontario Hydro
1976-1979	Lionel Cahill Hydro-Québec	J.R. Leslie Ontario Hydro	Gilles G. Sauvé Rousseau Sauvé Warren
1980-1983	Leonard A. Bateman Manitoba Hydro	Lorne McConnell Ontario Hydro	Ellis Hughes Federal Pioneer
1984-1987	Lorne McConnell Ontario Hydro	Gilles G. Sauvé Rousseau Sauvé Warren	Don Lamont Canadian General Electric
1988-1991	Gilles G. Sauvé Rousseau Sauvé Warren	Ellis Hughes Federal Pioneer	Hugues St-Onge Hydro-Québec
1992-1995	Ellis Hughes Federal Pioneer	Roger W. Whitehead Ontario Hydro	Mohamed M. Rashwan Manitoba Hydro
1996-1997	Tom Rusnov Ontario Hydro	Yves Filion Hydro-Québec	Richard P. DeLhorbe Schneider Canada
1998-1999	Yves Filion Hydro-Québec	Ron Threlkeld BC Hydro	Richard P. DeLhorbe Schneider Canada
2000-2003	Yves Filion Hydro-Québec	Dave Barrie Hydro One	Paul Dufresne SNC-Lavalin
2004-2005	Dave Barrie Hydro One	Prabha S. Kundur Powertech Labs	Paul Dufresne SNC-Lavalin
2006-2008	Prabha S. Kundur Powertech Labs	Mohamed M. Rashwan TransGrid Solutions	Paul Dufresne SNC-Lavalin
2008-	Prabha S. Kundur Kundur Power Systems Solutions	Mohamed M. Rashwan TransGrid Solutions	Jean Guay ABB inc.

In 1959, F. L. Lawton, Chief Engineer of Aluminium Laboratories, became the first representative of the electrical equipment industry to chair the Canadian National Committee. Under his direction, the committee adopted its first statutes in 1965.

Known at the time as CNC/CIGRE, the committee clarified its role as intermediary between CIGRE Central Office and Canadian electric transmission specialists, and acquired the right to promote Canada's participation and involvement in CIGRE projects. This new relationship paved the way for greater regional diversity and better representation for Canadians at CIGRE.

Over the latter half of the 20th century, a number of dedicated individuals served as chairs, vice-chairs and secretaries (see Table 1 for a complete list). The Canadian National Committee of CIGRE continued to grow and Canadian experts actively participated in CIGRE's work.

After serving as Vice-chairman for a couple of years, Yves Filion, then Hydro-Québec's Deputy CEO, took the mantle of Chair in 2000. Under his leadership, the Canadian committee underwent several changes, including revised statutes, and a new name and signature, CIGRE Canada. The organization also launched a website, one of the first national committees to do so. After two terms at the helm of CIGRE Canada, Filion went on to serve the organization at the international level, as President of CIGRE, during which time the membership rose above the 10,000 equivalent-members bar. Under his leadership, CIGRE launched e-cigre, a web-based tool designed to facilitate access to cutting-edge research and technical information.

Today, CIGRE Canada remains a very dynamic committee, with members sitting on every CIGRE study committee, contributing papers, and chairing committees (see Table 2) and working groups. In terms of membership, CIGRE Canada ranks among the top committees with close to 300 equivalent-members out of a total world membership of 10,304.

Canadian electricity experts are renowned for the quality of their contribution to the field, and have received numerous distinctions and awards for their work. Over the last decade, 24 Canadians have been awarded the prestigious CIGRE Technical Committee Award (see Table 3). For outstanding service to CIGRE, four Canadians have received the title of Honorary Member of CIGRE: P. Sarma Maruvada in 1998, Paul G. Meyère and Ellis Hughes in 2000, and Prabha S. Kundur in 2006.

Table 2 - Canadians Chair CIGRE Study Committees

Leonard A. Bateman Manitoba Hydro	HVDC Links and AC Power Electronic Equipment	1976 - 1982
Harry M. Ellis BC Hydro	Power System Analysis and Techniques	1982 - 1986
P. Sarma Maruvada Hydro-Québec research institute (IREQ)	Power System Electromagnetic Compatibility	1990 - 1998
Paul G. Meyère Hydro-Québec	Overhead Lines	1994 - 2000
Prabha S. Kundur Powertech Labs	System Technical Performance	2002 - 2006
Michel Armstrong Hydro-Québec TransÉnergie	System Operation and Control	2006 —

Table 3 - Canadian Technical Committee Award Recipients

V. Allen Moore, Canadian General Electric	SC 11	1993
Donald T. McGillis, Hydro-Québec	SC 38	
Jacques Aubin, Institut de recherche d'Hydro-Québec	SC 12	1994
Chandra Krishnayya, Institut de recherche d'Hydro-Québec	SC 14	
Elias Ghanoum, Hydro-Québec	SC 22	1996
Farouk A. M. Rizk, Institut de recherche d'Hydro-Québec	SC 33	1997
W. Janischewskyj, University of Toronto	SC 36	
Dennis A. Woodford, Manitoba HVDC Research Center	SC 14	1998
Dave Havard, Ontario Hydro	SC 22	
Michel Plante, Hydro-Québec	SC 36	
P. Sarma Maruvada, Institut de recherche d'Hydro-Québec	SC 36	1999
Prabha S. Kundur, Powertech Labs	SC 38	
David F. Peelo, BC Hydro	SC 13	2000
John R. Densley, Ontario Hydro	SC 15	2001
Mohamed M. Rashwan, Manitoba Hydro	SC 14	2002
Germain Beaulieu, Hydro-Québec TransÉnergie	SC 36	
Greg S. Polovick, BC Hydro	SC A2	2003
Yvon Fillion, Hydro-Québec TransÉnergie	SC A3	
Michel Duval, Institut de recherche d'Hydro-Québec	SC D1	2004
Anne-Marie Sahazizian, Hydro One	SC B3	2005
Mohindar S. Sachdev, University of Saskatchewan	SC B5	
Jean-Marie Gagnon, Hydro-Québec TransÉnergie	SC C2	
Ray Awad, Hydro-Québec TransÉnergie	SC B1	2006
Joe Paul Toneguzzo, Hydro One	SC C1	

The Future is Electric

In Canada, the histories of hydropower development and high-voltage transmission are inextricably linked. In fact, it is impossible to tell the story of one without the other, and like the egg and the chicken dilemma, it is not clear which came first.

What is clear, however, is that transmission has been the keystone to hydropower development in Canada. Without high-voltage technology, Limestone, Churchill Falls, Manic-Outardes and James Bay hydropower facilities would never have been built.

Canada continues developing its electricity capacity to meet domestic demand and export opportunities. Because of this growing demand, investment in the transmission system has become increasingly urgent – and more challenging for several reasons.

While challenges over the past two centuries were mostly technological, today's challenges include integrating socio-economic and environmental considerations in project planning. Planners also work with a wide range of stakeholders, including municipalities, government agencies and departments, landowners, local residents, and special interest groups. In addition, the NIMBY (not in my back yard) syndrome creates difficulties for transmission development projects. The electric systems industry must focus on building support for projects from the outset. Two-way communication is critical.

On the other hand, the industry does have a sympathetic groundswell from which to work. Growing concern about climate change and air pollution is making electricity – especially electricity from clean, renewable sources such as hydropower – a preferred energy choice for a wide range of needs, from heating and cooling, to public transportation and electric cars.

Canada has a huge potential for undeveloped low emitting sources of electricity. If developed, untapped hydropower potential could double the current capacity of over 72,000 megawatts. Untapped wind resources could one day provide for about 20% of our electricity needs. Moreover, home to world's largest known high-grade natural uranium deposits, Canada can significantly add to its nuclear power capacity of over 18,000 MW.

Not only will advances in electric power systems facilitate the integration of new sources of renewable yet intermittent power such as wind, they will also make electric power systems more intelligent and efficient with the advent of digital technologies and nano-technologies.

With our northern climate, our vast land mass and abundant natural resources, as well as with the increasing concern about energy security, air pollution and climate change, clean low-emitting electricity – the modern fuel – is the best solution.

CIGRE Canada, since its inception in 1938, has played a major role in meeting the technical challenges related to the design and operation of large electric power systems by providing a forum for networking, information sharing and addressing technical problems. It will continue to play a major role in addressing the electricity needs of Canadians through the 21st Century.



500-kV line, Alberta



History of the Chinese National Committee of CIGRÉ

The Creation of Chinese National Committee & the Situation of Electric Power in China

Chinese National Committee CNC of CIGRE was established in July, 1980 upon the approval of the State Council of the People's Republic of China, with acceptance of the CIGRE Administrative Council after a referendum. Mao Henian, then the Vice Minister of the Ministry of Power Industry, took up the position of first President of CNC, and also of third Council Chairman of the Chinese Society for Electrical Engineering (CSEE) in December.

During the 29 years since the establishment of the CNC of CIGRE, thanks to the reform and opening-up policy, China's power industry has been developing rapidly. With up-to-date techniques, the capacity of installed generators and electricity grids has been continuously expanding. In the year 1980, the total installed generating capacity of mainland China was merely 65.87GW, with an annual electricity output of 300.6TWh. At that time, the six inter-provincial grids were still in the making, namely, the Northeast, North China, East China, Central China, Northwest and Southwest power grids. Among them, the largest installed capacity was no more than 10GW. In contrast, by the end of 2008, the national installed capacity reached 792.53GW and the annual electricity output 3433.4TWh. The six inter-provincial regional grids have been put in place. The North China, Northeast, East China, Central China and South China regional grids are now interconnected. The installed capacity of the East China, North China, Central China and South China grids has for all exceeded 100GW. The East China grid claims the largest installed capacity—178GW. In terms of power technology, in 1980 the largest capacity of China's generator unit was 300MW and the maximum transmission voltage of the regional grids was mostly 220KV, with the only exception of 800km EHV transmission line with a voltage of 330KV in the Northwest grid. By comparison, ten 1000MW-class ultra supercritical thermal generator units were put into operation by the end of 2008, more than 230 power plants each with installed capacity 1000MW and above. The main transmission networks of the regional grids (with the Northwest grid as an exception) are mostly composed of 500KV EHV lines with total length of 10,9642km. The HVDC

transmission technology with a voltage of $\pm 500\text{kV}$ has been widely used in the interconnected regional grids and the project of West-East Power Transmission. The new technologies, such as the Compact Transmission Technology, FACTS technology, Security and Stability Control Technology, as well as Power Dispatching Automation and Information Communication Technology have been developed and applied to the operation of grids. At the same time, research and development of UHV transmission technology have been progressing steadily. In January 2009, The UHV Demonstration Project with a voltage of 1000kV from Southeast Shanxi Province to Jingmen of Hubei Province was put into operation, following which the Northwest grid commercialized the first 750kV transmission line in 2005. Right now, two $\pm 800\text{kV}$ DC projects, from Yunnan province to Guangzhou city, and from Xiluodu of Sichuan province to Shanghai, are under construction.

The management and structure of the power industry have also gone through tremendous changes since 1980. In 1980, China's power industry was administered by the Ministry of Power Industry. Regional power administrations and provincial power administrations were created to manage power generation and dispatching. Power-related institutions, including planning, designing, construction and research institutions, were directly subordinated to the Ministry of Power Industry. Since 1988, however, power enterprises have been founded and electrical power has been made a commodity available on the market. There are now nearly 20 independent power producers of different sizes and source of capitals after the reform. They are financed either by the Central Government, or local governments, or local entrepreneurs, or foreign investments or by joint funds. Besides, the State Grid Corporation of China and the China Southern Power Grid Co., Ltd. have been founded. The State Grid Corporation of China claims five regional grid companies, namely, the North China, Northeast China, East China, Central China and Northwest China grid companies. In addition, two research institutions are directly affiliated to the State Grid Corporation of China: the China Electric Power Research Institute (CEPRI) and the State Grid Electric Power Research Institute. The China Southern Power Grid Co., Ltd also has five power companies, including Guangdong, Guangxi, Yunnan, Guizhou and Hainan power companies. The China Southern Power Grid also owns the CSG Technology Research Center.

In the past 29 years, the Chinese National Committee of CIGRE has been growing with China's power industry. CNC has been dedicated to the development of China's power technology by enhancing communication between Chinese engineers and their foreign counterparts concerning power techniques, engineering experiences and relevant information.

The Main Evolution of the CNC and the Present Organization

2.1 The Main Evolution of the CNC and the Chief Executives

Since the establishment of the Chinese National Committee, especially after

the year 2005, the CNC of CIGRE has made remarkable achievements in both organization development and academic activities. Upon the foundation of CNC, there were only collective members, but no individual members. The 8 collective members included one social organization—the Chinese Society for Electrical Engineering (CSEE), two power plants—the Northeast Electric Power Administration and the North China Electric Power Administration, two research institutes—the Research Institute of the Ministry of Power Industry, and Harbin Institute of Large Electrical Machinery, one equipment manufacturer—the Xi'an Electric Manufacturing Company, and two universities—Tsinghua University and Xi'an Jiaotong University. By 2005, CNC counted 15 collective members and 3 individual members, and 72 equivalent members. These numbers rose to 49, 97 and 309 respectively by 2008, and further to 51, 143 and 363 by March 2009.

Since its establishment the Presidency of CNC has always been held by the CSEE President (see Table 1.). The incumbent CNC President, Lu Yanchang also serves as the Vice President of China Association for Science and Technology. He has been the Vice Minister of the Ministry of Power Industry and Deputy General Manager of the State Grid Corporation of China. The Vice President of CNC, Li Ruomei, was elected as a member of the Steering Committee of CIGRE in 2006. This was also the first time for a Chinese Director to hold a seat on the Steering Committee. In 2008, Li Ruomei was reappointed to the Steering Committee.

Table 1. The Chief Executives of CNC

Year	President	Member of Administrative Council	Secretary
1980 - 1984	Mao Henian	Xu Shigao	Yu Minji
1985 - 1988	Mao Henian	Xu Shiheng	Guo Hao
1989 - 1993	Zhang Fengxiang	Du Xingyou	Guo Hao
1994 - 1999	Zhang Fengxiang	Guo Hao	Zeng Pangyu
1999 - 2004	Lu Yanchang	Guo Hao	Chen Jing
2005 - 2008	Lu Yanchang	Li Ruomei	Li Ruomei (2005-07) Zhao Jianjun (2007-08)
2009 until now	Lu Yanchang	Li Ruomei	Zhao Jianjun

Table 2 . Membership

	Collective Member	Individual Member	Equivalent Member
1980	8	0	
2005	27	3	72
2006	37	32	190
2007	42	85	265
2008	49	97	309
2009	51	143	363

Table 3. CNC Membership Development and Composition

		Power Enterprises	Research Institute	Manufacturer	University	Social Organization	Total
1980	Collective	2	2	1	2	1	8
2006	Collective	12	6	7	11	1	37
	Individual	4	11	8	7	2	32
2008	Collective	12	10	12	11	2	47
	Individual	21	29	29	16	2	97
2009	Collective	12	11	14	12	2	51
	Individual	34	47	42	16	2	143

2.2 The Present CNC Organizational Structure

Incumbent President of the Chinese National Committee: Lu Yanchang, the President of the Chinese Society for Electrical Engineering; Vice Presidents: Wu Yusheng, the Chief Information Officer of the State Grid Corporation of China, Zhao Jie, Director of Technology Research Center of the China Southern Power Grid and Li Ruomei, the Secretary-general of the Chinese Society for Electrical Engineering; Secretary-general of CNC: Zhao Jianjun. CNC of CIGRE has 84 directors in total.



2005 CNC General meeting

The main body of CNC consists of the Steering Committee, Technical Committee and Secretariat. The Steering Committee is the supreme decision-making body, making and checking the working plans of the CNC, and at the same time supervising the operation of the Technical Committee and the Secretariat. The Steering Committee comprises its Chairman, Vice Chairman, Secretary-general, the Chairman of the Technical Committee and all the collective member representatives.

The Technical Committee plans and organizes the academic and technical activities of the CNC of CIGRE. The sitting President of the Technical Committee is Xue Yusheng academician, the Chief Engineer of the State Grid Electric Power Research Institute. The Chinese staff working in the CIGRE study committees are naturally taken as members of the Technical Committee of CNC. The Technical Committee staff is divided into different sections in accordance with the fields of study as stipulated by CIGRE and these sections are headed by CIGRE study committee members. (See Table 4.)

The Secretariat is the standing body of the Chinese National Committee of CIGRE. Headed by the Secretary-general, it is in charge of contacting the CIGRE headquarters and dealing with the daily operation of the Chinese National Committee of CIGRE.

CNC Contributions to CIGRE

3.1 Organize the CNC Members to Participate in the CIGRE Session in Paris.

In 1980 CNC organized its first delegation, with 13 members headed by the CNC President Mao Henian, to attend the 28th CIGRE Session lasting from August 27th until September 4th in Paris. During the Session, 10 Chinese representatives of the delegation spoke at 9 of the seminars, introducing the technical development of China's power industry and electrical manufacturing. Also at the Session, Xu Shigao, then the Deputy Dean of the Electrical Power Research Institute, Chief Engineer of the Study Committee was elected as CIGRE Director.



CNC organized its first delegation headed by the President Mao Henian (first from the left) to attend the 28th CIGRE Session

Since then, CNC has been organizing its members to attend the CIGRE Session held every other year. More and more members have been getting involved and the quality of dedicated theses has been improving.

In 1990, the Chairman of CNC Zhang Fengxiang headed the 15 members of Chinese Delegation to attend the 33rd CIGRE Session. President Zhang Fengxiang gave a project report about China's Power System on the seminar.



*Chairman of CNC Zhang Fengxiang, head
(fourth from the left) to attend the 33rd CIGRE Session*

In 2000, President Lu Yanchang led the 28 members Delegation to attend the 38th CIGRE Session. The theme of this Session was Electrical Power System at the Turn of the Century. The Chinese delegation published many theses on this theme, covering many fields, such as HVDC transmission, FACTS, communication and remote control and system planning etc.

In 2006, 43 CNC members participated in the 41st CIGRE Session, the largest delegation in CNC history. The Deputy General Manager of the State Grid Corporation of China, Shu Yinbiao gave a report on the Development of China's UHVDC Grids, which drew enthusiastic response. And 40 CNC members participated in the 42nd CIGRE Session in 2008. The Deputy General Manager of the State Grid Corporation of China, Zheng Baosen gave a report titled "Building a Disaster-proof Reliable State Grid", which analyzed the technical challenges posed by snow storms and earthquakes for China's grids in 2008 and presented the counter-measures adopted. This report drew great attention from the participants.

3.2 Host CIGRE Working Conferences in China

- In June 1983, CIGRE Technical Committee convened a working conference in Beijing at the invitation of CNC. The Secretary-general and Chairmen of the CIGRE Study Committees participated in the conference.
- In September 1995 the Chinese National Committee hosted the CIGRE Administrative Council meeting in Beijing. This was attended by 37 members and around 20 companions. A full programme of technical and tourist visits

was organized over 3 days as well as a number of post-meeting tours. The event was a success.

- In September 1997, CIGRE SC35 convened the Information Systems and Telecommunications conference in Beijing. This conference was organized by the CNC of CIGRE, and hosted by the National Power Communication Center. The President of CNC Zhang Fengxiang extended welcome to the participants at the greeting ceremony. The members of CIGRE Study Committee 35 and 150 representatives from 25 different countries took part in the event and 41 theses were presented at the conference. The participants discussed the power communication development of the world and other common concerns on this occasion.
- In August 2001, CIGRE Technical Committee conference was held in Chongqing, China. The conference discussed and arranged the research fields and the cooperation of the Study Committees of CIGRE in the 21st century. The structure of the Study Committees was also revised to adapt to the development of new techniques. The Chinese experts introduced China's national interconnected power system project at the conference. During the session, the participants also visited the Three-gorge hydroelectric project.
- In August 2001, the Chinese Society for Electrical Engineering and CNC of CIGRE co-hosted the CIGRE SC14 –HVDC Study Committee conference in Yichang city, Hubei province. The members of the SC14 committee and about 80 representatives from 21 countries took part in the conference. Chinese experts presented their experiences about China's grid planning and HVDC transmission.
- September 2007, CIGRE Administrative Council convened its working conference in Nanjing, China. 44 representatives and 22 accompanying persons participated in the meeting.



*In 2006, President Lu Yanchang led the members
Delegation to attend the 38th CIGRE Session*

During the 2005 CIGRE Council conference, the President of CIGRE proposed that the 2007 Council meeting be held in China. Upon the President's proposal, CNC responded positively and actively. As a result, the proposal was ratified during the 2006 CIGRE Council meeting. CNC was entrusted with the task of handling all arrangements for the 2007 CIGRE Administrative Council conference, which would mainly focus on CIGRE organizational structure and the preparation for 2008 CIGRE General Session. According to the usual practice, one day would be reserved for special technical seminar and visit in the hosting country during the Council meeting.

In the afternoon of September 25th, 2007, CIGRE Steering Committee conference was held in Nanjing, China. 12 Steering Committee members and CIGRE Secretary General and secretary attended the meeting. The Dubai Conference Proceedings of April 2007 were ratified and the activity schedule of CIGRE from 2007 to 2010 was discussed at the meeting. Also decided were the time and place of next CIGRE Steering Committee conference and how CIGRE should strengthen the support to the Chinese National Committee. In the evening, a cocktail party was held by CNC. At the party President Lu Yanchang and Vice President Li Ruomei of CNC extended their warm welcome to the experts and friends present. CIGRE President, Mr. Yves Filion expressed his gratitude towards the CNC for the preparation of the conference and also welcomed the directors participating in the conference.

On September 26th, the CIGRE Administrative Council convened a meeting, ratifying the Paris Conference Proceedings of 2006. Many other issues were also tackled at the meeting, including a discussion on the Technical Committee report, a report on the financial budgets and their implementation since the year 2006, notification for the preparation of the 2008 CIGRE General Session, discussions on the CIGRE regulations and activity schedules, the construction of CIGRE website, arrangements for Technical conferences, cooperation with other international organizations and the time and place of next Council meeting.

China Day activities were also hosted by CNC on the 27th, including special seminars and technical visits. More than 40 CIGRE Council members and more than 40 representatives from institutions and manufacturers related to China's power research participated in the activities. 6 reports were scheduled for the special seminar in the morning. The speakers included CNC President Lu Yanchang, RTE President Andre Merlin, Academician with the North China Electric Power University Xue Yusheng and the Chief Engineer of TBEA Shenyang Transformer Group Zhong Juntao. The Chinese speakers introduced the general information of the development of China's power industry, the grid control and protection technique, the grid dynamic security prevention system and the development and manufacturing techniques of China's transformers. The foreign speakers talked about the European Blackout in 2006 and introduced the standards of reliability

of North American grids. After the seminar, participants visited the Guowang Nanjing Automation Research Institute, the Nari-Relays Electric CO., Ltd., Guodian Nanjing Automation Co. Ltd., and Jiangsu Provincial Electric Power Dispatching Center. The China Day activities was the opportunity of in-depth presentations of China's power industry for the benefit and better understanding by the representatives. Furthermore, it provided an international platform for China's electrical technical research and manufacturing institutions and enterprises.



CNC President Lu Yanchang delivering an address at China Day Meeting during CIGRE Administrative Council Meeting-2007

3.3 Host International Academic Activities in China

In May 1994, the international academic seminar— New Technique of Power System Relay Protection and On-site Control— was held in Beijing, organized by the Chinese Society for Electrical Engineering and co-hosted by CNC and IEEE/BEIJING. More than 100 experts and scholars from 15 countries and Hong Kong of China dedicated 83 theses on the seminar. The latest breakthroughs and development in relay protection and on-site control were introduced. The future development of power system relay protection and transformer substation automation was also discussed. Minister of the Ministry of Power Industry, Shi Dazhen attended the opening and closing ceremonies and delivered speeches. President of CIGRE 34 Committee, Mr. Cheetham, and Mr. Pettigrew, representative of the IEEE Relay Protection Committee attended the conference and delivered their academic reports. At the same time, the 1994 Exhibition of Relay Protection Products with New Techniques was also held, where 14 domestic and overseas manufacturers and companies participated.

In August 1997, an international conference on grid and power plant control sponsored by IFAC/CIGRE was held in Beijing. More than 240 representatives from 24 countries and areas participated. 131 theses were published on the conference,

84 of which were written by overseas participants. A collection of the theses had also been published. New techniques such as power system control, power plant control, FACTS, application of intelligent system and electricity market were also discussed. Vice president of China Association for Science and Technology, Hu Qiheng and Vice Minister of the Ministry of Power Industry, Lu Yanchang delivered speeches at the opening ceremony.

In August 2001, the Chinese Society for Electrical Engineering and the Chinese National Committee of CIGRE hosted the ICPS2001 in Wuhan city, Hubei province. 307 representatives took part in the seminar and 195 theses were published. The Council Chairman of the Chinese Society for Electrical Engineering, President of CNC, Lu Yanchang delivered the keynote speech: China Power Industry in 21st Century. President of EURELECTRIC Bill Hoff delivered a speech on The Liberal Reform of Europe Power Industry; President of CIGRE SC14 talked about The Requirements on the Quality of Power Supply; and the representative of EPRI reported on Challenges for Power Transmission System and the Technical Solutions. In addition, CIGRE SC14 issued two working reports—Economic Analysis of DC Power Transmission and Safety Standards of Converter Station Equipment, which have gained international influence.

In July 2007, CNC of CIGRE, CNC of IEC, the State Grid Corporation of China and CEC co-hosted the UHV International Standard Symposium, which was co-organized by IEC and CIGRE. More than 120 UHV experts from 18 countries discussed with their 200 Chinese counterparts the development and application of UHV transmission techniques and the standardization of UHV power transmission. This conference had accelerated the stipulation of the international standards of UHV transmission. At the conference, 10 technical seminars were organized and 59 theses were published.



The International Symposium on International Standard for UHV, co-organized by IEC and CIGRE, held in 2007 in Beijing

In May 2008, CNC of CIGRE hosted the Seminar on the Impact of Natural Disaster on Electrical Power Facilities and Its Solutions. More than 120 experts and scholars from grid companies, power generating plants, research institutes, universities and electric power equipment manufacturers participated in the meeting. 26 domestic and overseas experts delivered their academic reports, introducing the impacts of natural disaster like snow storms, earthquakes and storms upon their own power system. They also discussed the cause of ice damage, designing standards, defrost measures, pre-warning and prevention. Also discussed were the impact on power equipments exerted by earthquakes, typhoons and the feasible solutions.

3.4 Active Participation in the Working of CIGRE Study Committees

CNC of CIGRE pays special attention to the study activities of CIGRE and also to recommending Chinese experts to work in the CIGRE Study Committees.

Since its establishment, CNC has been actively getting involved in the work of CIGRE Study Committees. In 1982, three Chinese experts were commissioned as committee members to the SC12—Transformer Committee, SC31—System Operation and Control Committee and SC32—System Development Committee. In 1996, Chinese experts were involved in 11 of the 16 Study Committees of CIGRE, and were appointed as committee members. By 2006, Chinese experts were involved in all of the 16 Study Committees, including 12 full members and 4 observers. Table 4 lists the Chinese members working in the 16 Study Committees in 2008. Study Committee members are indispensable for the CNC involvement in CIGRE activities and are main forces in international academic communications. CNC also actively recommends Chinese experts to the Study Committee working groups. In 2006, 8 experts from China were recommended to take part in the working of A2, A3, B1, B3 and C5 groups. The next year, 13 Chinese experts were recommended and in the year 2008, 14 experts were referred to work in 11 different working groups of 5 Study Committees.

Besides, CNC of CIGRE built a website for CNC in June, 2005. The English website of CNC was created the following year. Information on CIGRE and CNC activities is promptly published through the websites, including all the theses abstracts from the General Assemblies, speeches on the technical forum, special reports, conclusions of the technical conferences held by Study Committees and also the evolution of CIGRE. The websites are not only important platforms for members of CNC, but also an efficient way to keep close contact between CNC and CIGRE and other national committees of CIGRE.

Table 4. The 16 Study Committees of CIGRE and Chinese Members' Involvement

Group	Fields of Activity	Chinese Representative	Employer	Membership	Year of Participation
A1	Rotating Electrical Machines	Chi Su	Harbin Institute of Large Electrical Machinery	Full Member	2004
A2	Transformers	Wu Zhirong	State Grid Electric Power Research Institute	Full Member	2008
A3	High Voltage Equipment	Wang Jiansheng	Xi'an High Voltage Apparatus Research Institute	Full Member	2008
B1	Insulated Cables	Cao Xiaolong	Xi'an Jiaotong University	Full Member	2004
B2	Overhead Lines	Liang Xidong	Tsinghua University	Observer	2006
B3	Substations	Guo Jiayang	North China Electric Power Research Institute	Full Member	2006
B4	HVDC and Power Electronics	Hong Chao	China Southern Power Grid Co., Ltd	Full Member	2006
B5	Protection and Automation	Zhao Xicai	NARI Group	Full Member	2002
C1	System Development and Economics	Shao Lan	China Power Engineering Consulting Group corporation	Observer	2006
C2	System Operation and Control	Xin Yaozhong	National Electric Power Dispatching and Communication Center	Full Member	2006
C3	System Environmental Performance	Zhu Fahua	State Power Environmental Protection Research Institute	Full Member	2006
C4	System Technical Performance	Xue Yusheng	Nanjing Automation Research Institute	Full Member	2006
C5	Electricity Markets and Regulation	Shi Lianjun	State Grid of China	Full Member	2008
C6	Distribution Systems and Dispersed Generation	Fan Mingtian	China Electric Power Research Institute	Observer	2008
D1	Materials and emerging Test Techniques	Li Xuemin	Guilin Electrical Equipment Research Institute	Observer	2008

CNC of CIGRE will further optimize its organization, attract more members and improve the functioning of the websites in the future. Besides, CNC will continue to recommend Chinese experts to work as members of CIGRE Study Committees. CNC also regards organizing delegations and collecting theses for the CIGRE General Assembly as one of its principal tasks. With unwavering efforts, CNC will surely be more important and contribute more to the CIGRE activities. At the same time, CNC will try to connect China's power system engineers to the outside world through the help of CIGRE. These efforts hopefully will accelerate the development of China's power industry, the progress made by the Chinese power engineers and the modernization of China.



History of Croatian National Committee of CIGRÉ

The founding assembly of the HRO CIGRÉ was held in Zagreb in February 1992 and HRO CIGRÉ was admitted to the CIGRÉ family in the same year at the CIGRÉ conference in Paris. But to have the true insight into CIGRÉ activities in Croatia we should go back to the year 1951 when the Yugoslav committee of CIGRÉ was founded with the head office in Zagreb. That committee in which experts of all the republics of former federative Yugoslavia performed its activities very successfully in the period of 40 years until 1991 when the dissolution of Yugoslavia occurred.

In the year 1951 the condition of electric power industry of Yugoslavia and consequently Croatia was far from ideal. After the ravages of World War II, small power generating systems were slowly created out of local networks but there was no unique system. For instance the regional system was thus established on the territory of western Croatia and Slovenia, but similar regional systems were established in other regions of Yugoslavia. All former electric power industry was nationalized as it was among others in major part of Europe, too. The rated power of the power plants in Croatia amounted to 188 MW, while consumption was 666 GWh. Electrification of the settlements was covered by only 13%. The consumption grew but it was explosive with annual rates above 12% or on average somewhere above 7% for the period between 1951-1991. Consequently in the year 1991 the rated power of the power plants in Croatia amounted to 4247 MW, consumption to 14749 GWh and the electrification of settlements amounted to 98%.

From the moment of its foundation JUKO CIGRÉ had a very positive impact on Yugoslav electric power industry and electrical engineering industry. It may be interesting to note some topics, which dominated the first conference of JUKO CIGRÉ held in 1953:

- Experience in construction of standard transformer stations;
- Problems in construction of hydroelectric power plants;
- Relay protection;
- Creation of 110 kV systems in the northwest side of the country;
- Numeric marking of phase conductors;
- The problems of regulations for plants and transmission lines;
- Rational size of construction of hydroelectric power plants;
- The operation with decreased technical minimum of thermal power plants.

As the system developed so did the report themes change and our own experiences emerged in the planning, construction and operation of electric power projects and auxiliary equipment.

Further on we shall list in time sequence some typical themes, which had been emerging in 40 years' operation of JUKO CIGRÉ from which one can see the main technical problems, which followed the development of electric power industry.

- Decrease of construction costs of power plants;
- Selection of insulators for overhead transmission lines;
- Manner of earthing of the 110 kV network;
- Co-ordination of insulation;
- Transmission line conductor sections;
- Automatic reclosing in 110 kV network;
- Experience in operating hydroelectric power plants.
- Centralized control system in switchyards;
- Location of faults on transmission lines;
- Dispatch centers;
- Connection of synchronous zones into a unified system;
- Problems of transition to the 220 kV voltage level
- Live working;
- Role of synchronous compensators;
- Development trends for short circuit powers;
- Power system stability;
- Evaluation of electric energy;
- Balance of reactive powers in a system;
- Impact of transmission lines on telecom conductors;
- Automatic voltage control in a system;
- Regulation of exchange power and frequency;
- Turbine generators cooled by hydrogen;
- Application of network analyzers;
- Electrification of railways;
- Economic position of electric power industry;
- Economic price of electric energy;
- Nuclear power plant as a variant for consumption provision;
- Use of computers in solving electric power problems;
- Automatic and remote control in transmission network;
- Consumers safety of supply;
- Transition problems to 400 kV voltage level;
- Effects of electric field on living beings.

The last conference of JUKO CIGRÉ was held in 1991 in Bosnia and Herzegovina. Although the successful operation of CIGRÉ and its study committees was pointed out, the climate of economic crisis was clearly felt as well as the forthcoming

events connected with dissolution of Yugoslavia. That dissolution happened at the end of the same year and an initiative board for establishing of Croatian national committee of CIGRÉ was founded in October that year. As already said in introduction, that founding occurred in Zagreb in the next year 1992.

2. HRO CIGRÉ

2.1 First steps

The beginning of activity of Croatian national committee in 1992 was performed in very hard wartime conditions. Electric power consumption of 14749 GWh in 1990 decreased to 10882 GWh in 1992.

Many electric power plants were destroyed or badly damaged. Northern Croatia was cut from southern Croatia (Dalmatia), which also refers to transmission network. Such situation reflected deeply on activities of the HRO CIGRÉ.

On the one hand HRO CIGRÉ tried to regularly perform its activities in compliance with its Statutes and accordingly in 1992 it already organized professional consultations and a round table conference. In the next year 1993 it organized its first national conference and in 1994 two symposia were organized. It also participated in the operation of CIGRÉ and its study committees as well as in the conference in Paris in 1992.

On the other hand beside regular themes connected with the activities of individual study committees, a specific theme emerges connected to wartime conditions such as reconstruction of damaged plants, construction of improvised transmission plants in wartime conditions, problems with power supply to Dalmatia and similar. As an example we shall state also the report Cross Island Connection presented at the CIGRÉ conference in Paris in 1996. This report showed construction of 110 kV connections performed partly by overhead lines and partly by undersea cables. This connection enabled a link between northern and southern Croatia through Adriatic islands in the period when all connections on land were cut-off and destroyed for the major part. Further on we shall state some of the themes which dominated professional meetings of HRO CIGRÉ in the first years of its activities. Some of these themes are specific to the situation of Croatian electric power system in those years, but some are a consequence of the general course of development in the European electric power industry:

- Undersea cables and electrification of islands;
- Fibre-optic telecommunication cables;
- Provisional 110 kV transmission lines in wartime conditions;
- Construction of temporary transformer substation (220 kV) due to destructions in war;
- Selection of insulation in zones of heavy salty precipitations;

Emergency diesel generating sets as a mode of recovery of weakened network;
 Data processing system for equipment maintenance;
 Meteorological phenomena and their impact of Croatian transmission network;
 Emerging of electrical energy market;
 Restructuring and privatization of electric power industry;
 Renovation of 400 kV network as precondition for connection of southeastern European network;
 System management model in market conditions;
 Do we need thermal electric plants on imported coal;
 Californian crisis and reform of Croatian power generating sector;
 Application of global relay protection.

2.2 Organization

The present organization of Croatian national committee and its activity are very similar to parent CIGRÉ. 16 study committees are active out of which some have one or several work groups. Every odd year the national conference is organized, and every even year the symposium is organized. Several hundreds of experts are present at the conference and they present more than 200 reports. The themes are the same as for CIGRÉ conferences but extended by specific domestic themes. Round tables or extended meetings of two or more study committees are organized for some current themes. Many CIGRÉ members from European countries participate also in all these meetings beside domestic experts.

Apart from experts from Croatia, many European countries also participate in all the meetings.

HRO CIGRÉ manages financing its activity partly from the membership fees of individual and collective members but mostly by payments of sponsoring companies interested in exhibitions and lectures during conferences and symposia.

2.3 Main members

It is perhaps more correct to state those members of HRO CIGRÉ who have been accepted as Distinguished Members of CIGRÉ. These are:

Ante MILIŠA, the deptd.
 Zorko CVETKOVIĆ
 Zdenko TONKOVIĆ
 Zlatko MALJKOVIĆ
 Ante SEKSO
 Krešimir MEŠTROVIĆ
 Gordan MIROŠEVIĆ
 Josip MOSER

2.4 Contribution to CIGRÉ work

The contribution to CIGRÉ operation is multiple. HRO CIGRÉ has one of its representatives on Administrative board of CIGRÉ. Members of HRO CIGRÉ participate in CIGRÉ conference in Paris as well as in individual symposia and other meetings. In Paris we are represented by one or two reports. Most members of HRO CIGRÉ are active members of study committees of CIGRÉ and their working groups.

Finally HRO CIGRÉ hosted various bodies of CIGRÉ and different professional gatherings were held in Croatia, such as:

The meeting of the study committee SC 33 (C4)	1998
International conference SC 33	
<i>Insulation coordination for electricity development in central European countries</i>	1998
The meeting of the study committee SC 35 (D2)	2001
Colloquium SC 35	
<i>Providing quality Telecommunication Services to the Power Supply Industry</i>	2001
Meeting of WG B2 Insulators	2003
Round table B2 WG 03	
<i>Composite insulators, experiences and perspectives</i>	2003
International CIGRÉ symposium	
<i>Transitional phenomena in large electric systems</i>	2007
International colloquium	
<i>Application of lightning arresters in distributive and transmission network</i>	2008
International colloquium	
<i>Transformer Research and Asset Management</i>	2009

2.5 Future challenges and objectives

At the moment we envisage a few challenges, which stand before us:

How to maintain the present mode of operation of HRO CIGRÉ in the conditions of world economic crisis;

How to attract young persons to work in HRO CIGRÉ when transition to market electric power industry quickly and increasingly draws them away from the technical issues although we hope and believe it is a transitional phenomenon;

How to inspire the government and its bodies in the country where electric power industry is government owned property to closer cooperation with HRO CIGRÉ as regards the electric power industry;

How to establish a free discussion of individuals on meetings of HRO CIGRÉ if their attitudes differ from the attitudes of their employers.



History of Czech & Slovak Republics National Committee of CIGRÉ

CIGRE from the viewpoint of the Czech Republic and the Slovak Republic national committee



The organization CIGRE was established under the original name «Conférence Internationale des Grands Réseaux Électriques à haute tension» very soon after World War I. In 1918 the new state Czechoslovakia was established in the area with most of the industrial production of former Austria-Hungary monarchy. It is no wonder that the industry was developed dynamically after the independent state formation. This development wouldn't have been so great if it hadn't been supported by huge electrification development in Czechoslovakia. At the time of Czechoslovakia origin about 11% of towns and villages were electrified and the electrical energy was available for 34% of the inhabitants. According to CIGRE historical sources, R. Legouez was elected as President of CIGRE in 1921 and remained in office

until 1928. Professor Vladimír List from Czechoslovakia was elected as vice-president of CIGRE. Professor List was a scientist and pedagogue at the Brno University of technology. He significantly participated in the Czech electrical industry development and he was a main organizer of technical normalization process and development in Czechoslovakia. Furthermore, his activities were important from the viewpoint of creating contacts with foreign professionals in view of exchanging valuable information and experiences. His work and activities were appreciated and he was awarded the CIGRE commemorative medal in 1946. In 1949 he was elected as the CIGRE honorary vice-president.

One of the important electrical industry and electricity utilization pioneers is also František Křížík who is considered to be the Czechoslovakian Thomas Alva Edison.

Professor List participated in the Act no. 438/1919 Col. (About the state support for the system electrification beginning) formation which was edited already in 1919. This act normalized the low voltage level at $3 \times 380/220$ V and the frequency at 50 Hz. There were gradually constructed primary distribution systems with voltage level 22, 35 and 100 kV in Czechoslovakia. The State allocated huge financial amounts in the period 1919 to 1928 for supporting General-useful power utilities development. These utilities formation and operation rules were defined by the Labour minister declaration in September 1920. Each company formed as general-useful was required to supply electricity in a specified region to everyone who asked for it if the connection was not uneconomic. The first double 100 kV powerline in Czechoslovakia was constructed in 1924 to 1926. It covered the distance from the Northern Bohemia to Prague North with the length of 84,5 km, equipped with $2 \times 3 \times 95$ mm Cu conductors. Next 110 kV were constructed in Moravia over the distance Třebovice – Dluhonice – Zábřeh and further to Třinec and Žilina.

Since the Czech power industry was involved also in the war industry, the number of power plants increased also during World War II. Therefore a new 220 kV line construction from Southern Poland over Ostrava region to Austria was started but it was finished after the war. The power companies after the war in Czechoslovakia were undergoing a restoration and development of power plants with low powers and efficiencies. It was evident that new sources with higher unit powers were called for. Therefore the 110 kV transmission system had to be developed but it would prove insufficient in perspective. The transmission system with a higher voltage level was required. This requirement was supported by the construction of new power plants in North-west Bohemia near to brown coal mines, together with a need for interconnection with neighbouring countries. Until 1950 the main Czechoslovak transmission system consisted of 110 kV lines. The transmission

system development had to be implemented in different conditions than before the war. It was a reason for collaboration of Czechoslovak experts with CIGRE Study committees (SC) organizing some SCs' meeting also in Czechoslovakia. It was necessary to choose new transmission system voltage levels in a context of discussion between two opposite groups: 220 kV supporters led by Prof. Matěna from CTU in Prague and 400 kV experts mainly from Brno Power Institute. Finally the 400 kV concept was chosen due to the relations with France where the same transmission voltage level was being experienced. The first 400 kV line was put into operation in 1958. It went from the Výškov substation over Čechy Střed, Krasíkov, Prosenice, Sučany, Lemešany, Mukačevo and further to Sub-Carpathian Ukraine and Romania. At the beginning, the first part of the line was constructed for 400 kV but operated at 220 kV for a limited time period.

The transmission system constructions were carried out by two home companies ELEKTROVOD Bratislava and ENERGEOVOD Prague. A power dispatch centre was formed in parallel with the construction of new transmission lines. Its aims were an operational control and electricity transmission coordination. The Power research institute was also formed which tried to collaborate with CIGRE together with other Czechoslovak experts. 400 kV towers and components were needed to be able to operate the new transmission system. The collaboration and experiences from CIGRE were again beneficial in this field, mainly for the technicians from ČKD and ŠKODA companies.

In 1958 the Mír (Peace) international transmission system was formed. It interconnected transmission systems of Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria and West Ukraine, including former USSR electrification system. This international interconnection had several main advantages: different electricity sources utilization, electrical energy exchange given by power peaks moving, reducing necessary power reserves in individual system or more easy failure control, balancing overloading etc.

The collaboration with CIGRE was developed in the next years mainly in the framework of Study committees. SCs handled different tasks in the area of electrical power engineering. Some of them can be singled out for their success or for their contribution toward solving important problems.

The HV overhead lines field was very important for Czechoslovakia because it tackled the problem of insulators endurance against sediments (mainly 400 kV, but also 220 kV and 110 kV). The Czech Republic but also some parts of the Slovak Republic are areas prone to adverse weather conditions. CIGRE solved the overhead lines (OHL) endurance at the seaside where water includes higher mineral substances (salt) concentration in comparison with river water. A group from EGÚ Prague Běchovice led by Ing. Dana Kohoutová handled a

similar task in Czechoslovakia. It was the insulation endurance against dust and chemical substances deposits on the insulation during inversion states. The research resulted in using long rod insulators instead of disc-type insulators. The next perspective way was to reduce sulphur oxide exhalations gradually mainly from classical coal-fired power plants or from chemical factories.

The next field was the OHL endurance against icing. The knowledge of icing formation conditions and its effects on endurance of power line endurance allowed solving the problem by experimental testing in EGÚ Brno including a transfer of long-term experiences and classifying the regions into groups according to danger intensity. A workshop took place in Brno in 2002 which handled the icing formation issue and its removal under the aegis of EGÚ Brno.

The results of these researches were presented in CIGRE Sessions based on the long-term collaboration of EGÚ Brno with experts in other companies, e.g. with Ing. Hrabánek from ČEZ company in the field of icing and with Ing. Lago from Slovakia in the field of conductors loading capacity. The next task in the HV OHL field was solving the 400 kV OHL damages which were the reasons for large HV lines failures in the affected area. The analyses showed that the failures were caused by the terrain changes in the Czechoslovak conditions. There were specific places with wide valleys getting narrower at their ends. The wind was getting higher at these ends and stressed the lines. So some OHL section can suffer damages even if neighbouring section conditions are normal. This knowledge resulted in additional rules in the choice of HV OHL tracing over the countryside. The collaboration with SC 22 was also beneficial for Czechoslovakia when our transmission system was formed and in solving operational problems. For example, these mainly concerned tower constructions types, basement solving or conductor hanging types.

The other issue solved was HV transformers ageing and reliability. Knowledge in SC 12 over the long-term could be divided into two sections: transformer state diagnostics and partial discharges diagnostics.

HV transformers state diagnostics resulted in preventing failures by means of oil chromatography. This diagnostic method allowed a well-timed prevention against failure at its beginning. Nowadays this method is used for the diagnostics of selected transformers connected to the transmission system when data is transferred online to the TSO dispatch centre. The partial discharges diagnostics should find partial discharges occurrence during HV transformers testing. SC 12 information was very useful for operational failures analysis and failure identification at system transformers 250 MVA.

The problem of cables insulation systems was also solved in the framework of CIGRE. A good collaboration between VUKI Bratislava research and CIGRE

knowledge in the field of dendritic discharges was beneficial here. Another field was HV cables lifetime research with a new insulation system going from the paper insulation to polyethylene technology. There are many equipment stresses resulting from natural overvoltage in Czechoslovakia. This context resulted in systematic works on storms statistics methodology, flashes intensity knowledge and overvoltage phenomenon in the systems. The main emphasis was put mainly on defining rules for global system protection against overvoltage in HV and MV substations main devices. After 1990 our research followed the modern trends and new surge arrestors implementing based on metal oxides (ZnO), similarly as in CIGRE. The collaboration of research in EGÚ Brno or in Prague Běchovice mainly in the field of insulation coordination in HV systems and overvoltage protection was also beneficial. Dr. Richard Gert from EGÚ Prague and Brno took part in these works in CIGRE SC 33 as secretary of the SC. In the field of protection against flashes were in particular involved Ing. F. Popolanský, Ing. J. Jirků, Ing. V. Vyskočil and Ing. D. Kohoutová. The study committee SC 33 and working group WG 33.04.11 meeting took place in 2000 when overvoltage limiters and powerlines endurance against overvoltage fields were discussed.

The results of SC 23 HV substations activities were useful for Czechoslovakia mainly in connection with implementation of enclosed substations and quenching gases SF₆ applications for improving short-circuit currents switching-off. Air pressure circuit-breakers were in operation at that time which required high pressure compressor stations operation. They needed high amount of energy for circuit-breaker functions. Also the old circuit-breaker reliability was worse as was shown through a questionnaire action carried out in the context of SC 23. Another important area in which the information from CIGRE SC 23 was appreciated concerned HV substations transition to the unattended state. Czechoslovakia was represented by Ing. D. Kopejtková from ČEPS in SC 23 or its working groups and by Prof. Z. Vostracký from Pilsen University in SC 13. The study committee SC 23 meeting was held in 1992 and 1998 with the topic "Enclosed Substations" and in 2003 with the topic "Conventional Substations".

Czechoslovak experts participated in activities of the SC 14 "HVDC Links" since 1972 and later on also in the SC B 4 "HVDC and Power Electronics". It should be mentioned that Prof. Milan Kubát, the regular member of SC 14, was minister of Electrical engineering industry of Czechoslovakia. Subsequently he was replaced by Mr. Pavlinec who was the chairman of the NC at the same time. The activities were utilized in the interconnection of electric power transmission grids of West and East Europe via Back-to-back HVDC transmission links in Dürenrohr (connecting Austrian and Czechoslovak 400 kV networks in 1982) and further on in Etzenricht (connecting German and Czechoslovak 400 kV transmission systems).

The work of Study Committees 36 to 39 focussed on topics connected with transmission systems operation and control and voltage and reactive power control. There were wide collaborations in this field. These contacts enabled a better orientation of prepared changes in specified conditions after 1989. This field can include a parallel synchronous interconnection preparation of several power systems in Middle Europe to UCPTE. They were namely sufficient power back-up ensuring for failures covering and a quick response of frequency and powers primary control to rapid load changes. The preparation was positive as it has been shown by the strong collaboration which continued over 15 years. The next transmission systems operation quality changes is implementing voltage and reactive power secondary control according to chosen regions and on the base of system programme instructions. This field includes also preventions and actions to the transmission system against system disintegration along with long time periods without electricity supply. This problem is also connected with transmission system transient events computational method improving. SC 36 organized several CIGRE colloquia during its meeting in Prague, in 1983 and 2001.

A power system transition to a market environment in the power production field and ensuring renewable sources development are ranged to the same field as mentioned above. The European Union emitted a range of documents on the mentioned concept intentions. The real changes were a fundamental transition from the electricity production control based on costs marginal increments to the market system based on the electricity price. Such decisions depended on a supplier choice by the consumer with an assumption that electricity transmission is not an obstacle to the contract making. CIGRE organized discussions on these topics in two year periods in the time of transition to the competitive environment. A CIGRE symposium was organized in Tours in 1997 where five basic task fields were defined:

- 1 - Future operators role definition
- 2 - Power systems planning in a competitive environment
- 3 - Power systems analysis for organizational changes preparation
- 4 - Market organization method in competitive conditions
- 5 - Production services in a competitive environment

The Czech Republic and the Slovak Republic national committee took part in the mentioned symposium through a paper under section 4.

The Czech Republic and the Slovak Republic national committee has always been particularly attentive to national committee representation either directly in professional Study committees or in Working groups of particular SCs. This was not easy because the number of SC members was

always limited. The situation in WGs was similar. Therefore the national committee supported WG membership.

Over the years there have been many changes in national committee chairmanship. It would be good to mention Prof. Reis from Bratislava and Ing. Vyskočil from Brno. One of the very active CIGRE promoters was also prof. Veverka from Prague who participated actively in CIGRE Paris Sessions for many years.

Nowadays in 2010 CIGRE counts in the Czech Republic and the Slovak Republic 63 individual members, 10 collective members and 7 individual young members.





History of Estonian National Committee of CIGRÉ

The Estonian power system is relatively small with consumption of ca 8 TWh and a peak load of ca 1550 MW. The Estonian power system has strong links to neighbouring power systems in Russia and Latvia. Together, the Baltic states – Estonia, Latvia, Lithuania – form the Baltic power system. Estonia also has a 350 MW HVDC connection with Finland called Estlink and by 2014 there will be another HVDC connection of 650 MW between Estonia and Finland – Estlink 2. Estonian power is generated mainly from oil shale, which is also mined in Estonia. This unique fuel has been the main source of electrical power for more than 50 years. Oil shale is also used for shale oil production. This unique technology and shale oil production know-how has great potential globally, as oil shale resources are vast. Estonia also has good wind conditions and many wind farms are being developed. Estonia is also investigating the possibility of developing nuclear power.

The Estonian National Committee of CIGRE was established in September 2005 and recognized by CIGRE's Administrative Council on 19 September 2005 making it the 54th national committee to be officially recognized. The Estonian CIGRE is also part of the Nordic Regional Council of CIGRE (NRCC). The creation of the Estonian CIGRE committee was aided greatly by Tallinn University of Technology associate professor Tiit Metusala, who, starting in 2000, worked in cooperation with the NRCC as a so-called observer member.

The Estonian branch of CIGRE has 5-9 members and the committee has been headed since its creation by Raine Pajo, member of the management board of Eesti Energia (Estonia's largest energy company). Pajo was previously employed by Estonia's TSO Põhivõrk.

To this point, the biggest event in the history of the Estonian National Committee was the CIGRE Regional meeting, held in Tallinn in 2007 in cooperation with NRCC. This major three-day conference took place at the Tallinn University of Technology and was opened by Estonian Minister of Economic Affairs and Communications Juhan Parts.

Besides guests from the Baltic Sea region, the 150 participants in the conference – which was devoted to topics related to security of supply and operational reliability of electrical systems – included delegates from 30 countries around the world, such as Brazil, Australia, Korea, South Africa and the US.

The conference proceedings were divided into three groups of topics – Market and System Security Aspects on Large or Dispersed Generation, Interconnections for Increasing the Security of the Power System and Methods and Tools for Managing System Security and Black-outs. There were 25 presenters and three fruitful rounds of discussion.

Besides the working part of the conference, participants toured Tallinn's Old Town and experienced Estonian culture. A technical tour of the Harku HVDC substation was especially well-received; guides from ABB introduced the VSC converter station for the first submarine cable between Estonia and Finland, Estlink.



History of French National Committee of CIGRÉ

Introduction

The French National Committee of CIGRE (CNF) was set up in 1931, when the national committees were officially recognized and their roles were defined in the Statutes of the International Association, CIGRE.

From 1931 till 1947, this National Committee remained closely related to CIGRE's central institutions as both shared the same Paris headquarters, the same President and the same Secretary General. It was not until 1947 that this National Committee became independent, by appointing its President and later its Secretary General, and furthermore by moving into new premises other than the CIGRE Head Office. This gradual evolution was completed in 1990, with the issuing of the Association's official Statutes in accordance with the requirements of the French Law governing Associations. Through this process, the Association, called French National Committee of CIGRE, made its legal move from a *de facto* to a *de jure* status.

However this move did not modify the duties of the French National Committee since the beginning of its existence. These duties were those assigned to the national committees within CIGRE since 1931: contribution to CIGRE's promotion and operation, in particular ensuring that the experts put forward to contribute to the work were the best qualified. Since then no major changes have been brought to these duties, except that they have grown in extent and complexity, requiring the establishment of a strict and structured organization of activities related to CIGRE.

Although its functions are those of the other National Committees, the CNF also has a role in contributing to hosting the biennial CIGRE Conferences which are traditionally always held in Paris.

The French industrial and institutional context from the post-World War I to post-World War II period

During the interwar period, electricity generation and distribution in France gradually structured itself around a couple of large set-ups, which depended on roughly ten industrial and financial groups. Among these, one of the most

important was the Union of Electricity, which was directed by Ernest MERCIER, an important figure in CIGRE. The transmission network was built and run by joint-venture companies belonging to these ten groups and to two railway companies, Midi (South) and Paris-Orléans, both who had a strong vested interest in electrification of the lines. There were, moreover, close links between these groups and some electrical equipment manufacturers or contractors.



Figure 1 : Ernest MERCIER in 1897 and 1924

It should be noted that the French political as well as industrial leaders placed great importance on the country's autonomy in the area of energy. This autonomy was based on two primary energy sources available in France: hydraulic, especially present in Southern France and coal, quite abundant at that time in Northern France. Through electricity it was possible to exploit hydraulic power at best - thanks to a South-North transmission network. Nevertheless, it was necessary to balance this hydraulic resource with a thermal one. The latter was to be installed in the industrialized regions and near big city centres of the North, including Paris. This of course made it obvious that a national interconnection would be very useful. This was clearly summed up in a statement issued in 1930 and well known of all electrical engineers: « France is, 'par excellence', the country of interconnection ».

Thus, the French power grid developed from 900 km of 110kV lines in 1923 to 12400 km of 110kV lines and more in 1946. This huge grid was particularly dense: 22.5 km for 1000 km², while Germany counted 18 km, Great Britain 15 km and the United States 5 km due to obviously different geographical conditions. Such was

the context at the time of creation of Electricité de France (EDF) in 1946. This Public Utility combined the activities of generation, transmission and distribution, till then operated by approximately 1400 different companies, although they were often federated into big groups, as mentioned above. In this way, EDF became a dominant power producer for France, with a monopoly over transmission and playing a major role in the distribution of electricity.

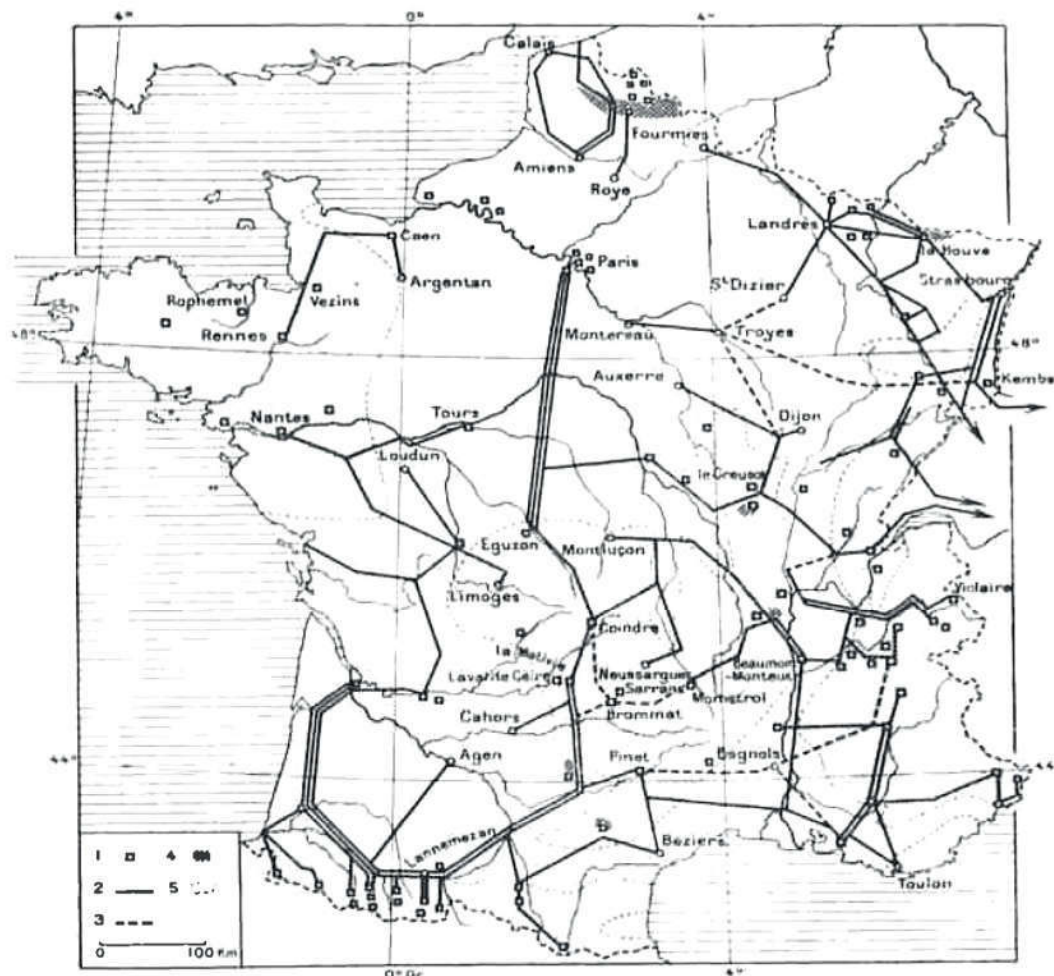


Figure 2 : The French power grid in 1934 (*Le réseau électrique français, de R. Clozier: Annales de Géographie. 1934, t. 43, n°242. pp. 119*)

For a full picture, it is necessary to note that besides these technical aspects, EDF was conceived as an organization channeling funding for the reconstruction of the French power system, affected by the economic crisis of the 30s followed by the war. It initially assumed this role with public funds, but very soon managed to finance its own development. Rural electrification, however, continued to be supported by a dedicated fund.

The creation of EDF was a major event and it had a strong impact on the relationship between all players in the electricity sector in France. A single entity

had to coordinate its technical and commercial relationship with diverse and competing partners. This entity had the means to develop strong competence in contracting projects and in their management. It had to deal with suppliers with a world-wide dimension, keen to preserve and develop their own skills, while at the same time taking advantage of their client's expertise. Thus the French members found in CIGRE a place where the spirit was well in keeping with the technical nature of mutual exchanges.

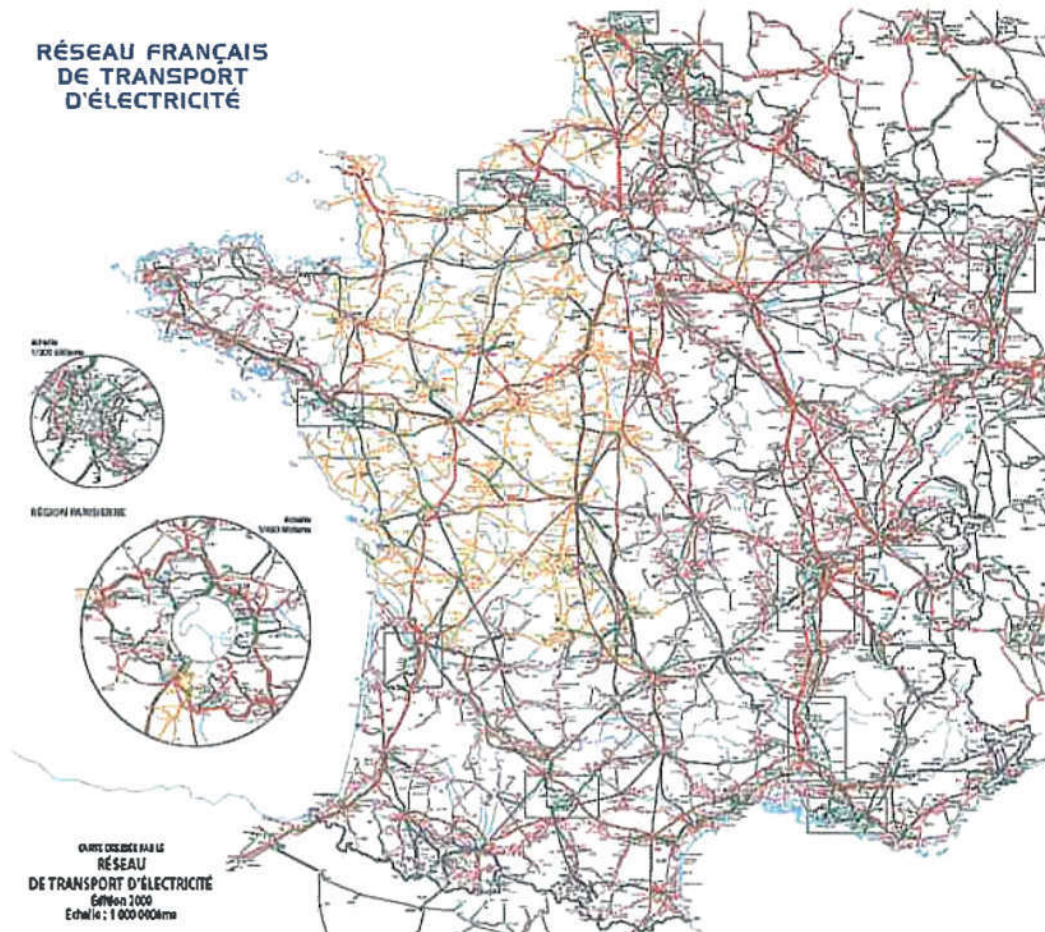


Figure 3 : The French power transmission network in 2009 (source RTE)

The creation of the French Group and the French National Committee in 1931

The Statutes of the CIGRE Association which were issued in 1931 expressed a strong wish to promote the Conference on Large High Voltage Electric Systems as the support of a permanent international cooperation. They planned the formation of national groups, represented each by a National Committee with a common central office.

At that time, the French National Committee was known as the «Conference Participation National Committee». Its first President was Ernest MERCIER, one of the major figures in the energy sector of France. In 1924, he founded the

Compagnie Française des Pétroles (French Oil Company), which later was named Total. He then went on to set up the “Union de l’Electricité”, which he chaired in 1931. In 1933, he also became President of Alstom. The first Secretary General of the CNF was Jean TRIBOT-LASPIERE, who was at the same time Secretary General of the international CIGRE Association.

In 1934, E. MERCIER was elected President of CIGRE. This evidently strengthened the ties between the CNF and the CIGRE Central Office, even though their tasks were clearly distinct. This election had an unexpected and happy consequence for CIGRE: E. MERCIER convinced the French Group to ensure the financial existence of the CIGRE Association from 1940 till 1945. Consequently at the end of 1945, J. TRIBOT-LASPIERE, as Secretary General of CIGRE, wrote the following message:

« The financial balance sheet from 1940 till 1945 is characterized by a very significant income resulting almost completely in subsidies, paid -at the request of President Ernest MERCIER- by the members of the French Group in order to provide, while awaiting the contributions of the other countries, sufficient resources allowing CIGRE to immediately resume its activity and to begin the preparation for the 1946 Session ».



***Figure 4 : Jean TRIBOT-LASPIERE (1882 – 1963),
Secretary General of the CNF from 1931 to 1963***

The International Conference on Large High Voltage Electric Systems could thus be held shortly after the Second World War. Yet, the whole political and industrial environment was profoundly changed, in particular in France when EDF, sole entity in charge of the large network, was founded. As a result, the CNF had to adapt to a new distribution of roles.

The evolution of the French National Committee from 1946 to this day

This adaptation was initiated in April 1947 by E. MERCIER, who proposed to the CIGRE Council his replacement by Pierre AILLERET, as:

« ... he [E. MERCIER] will be participating in the next meetings of the Administrative Council as President of CIGRE. This international function will imply that, in some cases he may have to make decisions, and would thus not assume the role of French representative on the Council».

Therefore, in 1947, P. AILLERET, first Director and founder of EDF Studies and Research Division, became the Chairman of the CNF.



**Figure 5 : Pierre AILLERET (1900 -1996),
Chairman of CNF from 1947 to 1970**

The following year, E. MERCIER withdrew from his position as President of the Administrative Council of CIGRE. He was replaced by Robert A. SCHMIDT, a Swiss member. On this occasion, E. MERCIER stressed that:

«If the French participation is showing a relative drop in numbers, this is clear proof of the Association's international success, for which the French National Committee has worked persistently, in absence of any selfish interest».

Based on these factors, the «new» French National Committee, gradually built itself in a very pragmatic way.

Rather than present this evolution step by step, we will briefly outline what has been achieved. The organizational bases of the Committee in fact rest on the Statutes of CIGRE's French National Committee, officially issued in 1990 and updated in 2003.

Statutorily at present, the CNF consists of 17 members representing respectively public authorities (2), French trade association for electrical equipment, automation and related services (5), Union of electric engineering

companies (1), Electricité de France (6), Union Technique de l'Electricité (UTE), the French correspondent of the International Electrotechnical Commission (1), the Society of Electrical and Electronic engineers (1) and SUPELEC¹ (1). These various entities are represented by their presidents or directors, which gives the CNF a very strong legitimacy within the French sector of electric power.

The CNF elects its Chairman and its Vice-Chairman, who are alternatively representatives of the Union of electric equipment industries (usually the Chairman) and representatives from EDF (usually the Head of Research and Development Division, or as is the case today, the CEO of RTE, the French Transmission System Operator). This statutory rule thus confirmed a practice started in the 1970s.



Figure 6:

On the left, Maurice MAGNIEN (†2001), Chairman of CNF from 1982 to 1988.

On the right, Robert MAHLER, Chairman of CNF from 1996 to 2003

The CNF chooses the French representative to be put forward as representative on the CIGRE Administrative Council. It puts forward a French candidate for regular membership on each one of the 16 CIGRE Study Committees. The chosen Study Committee members enjoy full latitude in setting up Study Committee «mirror committees» made up of colleagues, who represent the various French stakeholders concerned with the work of the particular CIGRE Committee.

The CNF acts as administrative intermediary between the French members and the CIGRE Central Office. In addition to this role it includes, under the leadership of the vice-Chairman, a Technical Committee composed of the French Study Committee Chairmen, Special Reporters, Secretaries and members of the various CIGRE Study Committees. This Technical Committee prepares France's participation in the plenary Sessions. This preparation consists in selecting Session paper proposals on criteria of quality of contents and relevance to the Session Preferential Subjects. The selection process often gives rise to lively discussions, as the number of proposals put forward exceeds by far the paper allotment of the French National Committee. From these discussions sometimes emerge

recommendations to the French members of the Study Committees in view of setting the preferential subjects to be chosen for the next Session.

It has also always been part of the CNF's policy to encourage collective members to recruit young and carefully selected electrical engineers to CIGRE. For these young people CIGRE provides an excellent opportunity to broaden and enrich their technical knowledge and to be initiated to international discussions. In return, as young people gain experience they can contribute to CIGRE activities through their enhanced competence and stamina. The participation of a recognised French expert on most of the CIGRE Working Groups is, no doubt, part of the CNF's policy.

Another important role assumed by the CNF is the organization of events for Session participants and their companions, as France is the venue of the CIGRE Session. Up until 2008, this hosting role materialized through a major evening reception to which all the delegates and their companions were invited. This was organized under the aegis of the CNF. Handling the related practical organization and diplomatic aspects (2500 guests in 2008) proved to be a very challenging task; however, it also involved significant expenditure, and unfortunately the CNF was not able to pursue this task after 2008. As part of the hosting tradition, for many years a "Ladies Committee" consisting of a group of French ladies – wives of French delegates – escorted the delegates' companions on their tours in Paris and the surroundings at the time of the Session. This practice was dropped in 2004 when the number of delegates and companions became very large with visits organized in a highly professional way. The CNF, therefore, feels that over the years it has significantly contributed to the congenial and friendly atmosphere of the Sessions, as often reported by the Session delegates.

Finally it should be noted that unlike a number of National Committees, the CNF has not taken on the role of a "Learned Society». This is due to the fact that such a Society already existed in France, prior to the creation of CIGRE. This Society called "Société des Electriciens et Electroniciens" devoted its action in particular to electrical power. The Chairman of this Society is a member of the CNF.

As the biennial Sessions are traditionally held in France in even-number years, in uneven number years CIGRE events are expected to be organized outside France. So, the CNF is not expected to organize Study Committee meetings, regional meetings or Symposia.

The presence of the French members within CIGRE

A National Committee essentially represents all CIGRE members in the country. These are men and women who, in addition to their professional activity, are prepared to contribute to CIGRE work on the volunteer basis, thus allowing the Association to benefit from their expertise.



Figure 7 : Opening ceremony of the 30th Session in Paris, Assas University, in 1984. From left to right in the foreground : M. Maurice MAGNIEN (Chairman of the CNF, Mme Edith CRESSON (French Minister of Foreign Trade and Tourism), Rudolph GUCK (President of CIGRE), Gérard LEROY (Secretary General of CIGRE), and Luigi PARIS (Chairman of the Technical Committee).

The CNF has always been very much aware of this contribution. The Committee has a coordination function but considers that the real players in CIGRE work are its members, all working as a team.

This historical report on the CNF would thus not be complete without mentioning the French people, who were fully dedicated to CIGRE. Some of them were rewarded for their contribution through an official function or an award. Others – who are the majority - have only been recognized among their colleagues and CIGRE friends. In the appendix, lists of these experts are given, starting in 1970. First is a list of the CNF Chairmen. Some members' names may not appear, simply because our lists had to be limited. Nevertheless, the contribution of all has been appreciated and the latter are kindly asked to consider that they are being honoured through their colleagues.

If CIGRE friends wish to express their appreciation to specific French colleagues, a note should be written to the French National Committee, recalling a memory concerning them. This will be taken into account by the CNF to complement its history.

Conclusion

CIGRE is now 90 years old and its French National Committee is 80 years. The technical and institutional environment has constantly changed throughout this period. In any case, it can surely be asserted that the CNF has always been able to adapt its practices to the role it was assigned by CIGRE, thus making France a constant, reliable and effective partner.

Thanks

The present report¹ was drawn up on the basis of documents, interviews and analyses carried out by Christophe BOUNEAU, a historian specialized in modern industrial history. The CNF would like to express its thanks to Mr. BOUNEAU for his work and his analyses. Without this research work, it would not have been possible to draft this text, which is more specially aimed at all its foreign friends and young French engineers. The CNF hopes that they will be interested to acquire some knowledge on the past of CIGRE and its French National Committee.

Appendix: Some French members whose exceptional contribution has enhanced the impact of CIGRE

The lists in this appendix are not intended to “glorify” some members or to draw up a complete inventory. They only aim to give a more precise idea as to the large number of contributions made under the aegis of the CNF. These lists are a better illustration than a lengthy statement to show the real work put in to develop technical knowledge within CIGRE. It is recalled that over the last 35 years, between 500 and 600 French members have been participating in the plenary Sessions and approximately 150 people contribute to the Working Groups.

Chairmen and Secretary-Generals of CNF

Period of time	Chairmen	Secretary-Generals
1931-1933	Marcel ULRICH	Jean TRIBOT-LASPIERE
1934-1947	Ernest MERCIER	Jean TRIBOT-LASPIERE
1947-1970	Pierre AILLERET	Jean TRIBOT-LASPIERE (until 1963)
1970- 1976	Charles CHEVRIER	Pierre FEINTUCH
1976-1982	Roland KOCH	Pierre FEINTUCH
1982-1988	Maurice MAGNIEN	Pierre FEINTUCH
1989 - 1992	Roger CHALVON-DEMERSAY	Alain LACOSTE
1992 - 1996	Paul CASEAU	Thierry ROYER
1996 - 2003	Robert MAHLER	Jean-Pierre RIU
2003 - 2008	André MERLIN	Christian DUQUESNE
2008 - 2009	Philippe GUILLEMOT	Philippe ADAM
2009 - 2011	Michel AUGONNET	Philippe ADAM

1- This report has been prepared on behalf of the CNF by Jacques CLADÉ, Lucien-Emmanuel BLANC, André COUSTÈRE, Christian DUBANTON, and Philippe ADAM, with the assistance of Liliane NEY for the final translation into English.

Chairmen and secretaries proposed by the CNF

• *Chairman and secretary of the Technical Committee*

Before being elected as the President of CIGRE in 2008 and reelected for a second term in 2010, André MERLIN was the first French person to be appointed as Chairman of the Technical Committee in 1996 until 2002. While holding this position, he initiated the studies that led to the reorganization of CIGRE's technical activities. These were implemented from then on.

Philippe ADAM assumed the role of secretary for the Technical Committee since 1998, under the successive chairmanships of André MERLIN, Aldo BOLZA and Klaus FRÖHLICH.

• *French Study Committee Chairmen from 1927 to 2010.*

SC	Study Committee domains	Dates	SC Chairmen
1	Insulating oils and insulating materials	1946 - 1966	H. WEISS
17	Alternators	1949 - 1958	Georges BELFILS
2	High voltage cables	1955 - 1957	Maurice LABORDE
17	Alternators	1958 - 1968	Pierre Gabriel LAURENT
4	Protection and relays	1960 - 1966	C. DIETSCH
36	Power system electromagnetic compatibility	1967 - 1976	M. PAIMBOEUF
32	Power system stability	1970 - 1974	Maurice MAGNIEN
15	Materials for electrotechnology	1974 - 1980	Bernard FALLOU
11	Rotating machines	1976 - 1984	Gilbert RUELLE
22	Overhead lines	1982 - 1988	Yves PORCHERON
37	Power system planning and development	1984 - 1990	Jacques CLADÉ
39	Power system operation and control	1988 - 1994	André MERLIN
23	Substations	1990 - 1996	Christian DUBANTON
11	Rotating machines	1994 - 1998	Marc HEROUARD
37	Power system planning and development	1996 - 2002	François MESLIER
12	Transformers	2000 - 2002	Philippe GUUINIC
B2	Overhead lines	2002 - 2010	Bernard DALLE
D2	Information systems and telecommunication	2006 - 2010	Georges de MONTRAVEL
B1	Insulated cables	2010 - ...	Pierre ARGAUT

Many of the aforementioned members, and others who received a CIGRE Award, had previously assumed many other functions among which Study Committees Secretaries or Special Reporters for Discussion Groups at CIGRE Sessions.

The CNF had the honour of counting among its members many CIGRE Award Recipients

• *The CIGRE Medal*

The CIGRE Medal is a biennial award which was introduced for the first time in 2008.

This award is granted to a CIGRE Individual Member in recognition of work which has significantly influenced CIGRE. In 2010, Jean KOWAL was one of the two recipients of the CIGRE Medal for his recognisable and outstanding contribution as Secretary General of the Association from 2000 to 2010.

• *French Honorary Members of CIGRE*

The CIGRE Honorary Member Award which had systematically been granted only to past CIGRE Chairmen was re-activated in 1992, to reward a very small number of members, every other year, for their exceptional contribution to the Association. Since 1992 the French recipients were: Jacques CLADÉ (1992), André MERLIN (1994), Christian DUBANTON (1996), Paul CASEAU (1998), Marc HEROUARD (2000), François MESLIER (2002), Robert MAHLER (2004), Philippe GUUINIC (2004), Jean KOWAL (2010), Bernard DALLE (2010) and Georges de MONTRAVEL (2010).

• *The Technical Committee Award French recipients*

The Technical Committee Award was introduced in 1993 to reward an outstanding technical contribution to Study Committee work. Study Committee Chairmen single out one or two people every year for this award. Proposals are approved by the Technical Committee Chairman. The French members who have received this award since 1993 are listed hereafter. The relevant Study Committee reference is given in brackets.

1993 : G. LE ROY (12), C. GARY (36)

1994 : J.-M. GUILLARD (11), P. JAY (15), G. de MONTRAVEL (35), P. MEYNAUD (36)

1995 : P. ADAM (14), J.-L. LAPEYRE (22)

1996 : J. SAMAT (15), E. A. FAVRIE (21)

1997 : M. PAYS (21), P. BORNARD (38)

1998 : P. ASSAILLY (23)

1999 : J.-L. SABRIE (11), J.-L. JAVERZAC (36), B. MEYER (38), G. SIMONNET (39)

2000 : P. ARGAUT (21), B. DALLE (22)

2001 : J. POITTEVIN (12), D. DUFOURNET (13), M. GAUDRY (22), J.-P. DESBROSSES (37)

2002 : Y. MAUGAIN (21)

2003 : A. SABOT (B3), N. BERGER (D1)

2004 : G. HEROIN (B3), P. ADAM (Comité Technique)

2005 : E. DORISON (B1), O. LAVOINE (C5), M. MONTI (D2)

2006 : C. DE TOURREIL (B2)

2008 : V. LEITLOFF (B5)

• **French “Distinguished Member” recipients**

The “Distinguished Member” award was introduced in 1996. Its object is to acknowledge long-standing membership to CIGRE (10-year seniority required) and the active participation of members to the work of their National Committee. Listed hereafter are the French “Distinguished Member” recipients; the relevant Study Committee reference is indicated in brackets.

P. AURIOL (33, 36, 39), M. COJAN (22), C. COUNAN (B3), F.-X. CUVELIER (22), P.-M. DEJEAN (B1), J.-M. DELCOUSTAL (B3), F. DESCHAMPS (C4), Y. DOIN (A3), J.-P. DUPRAZ (A3, B3, B5), A. GIBOULET (A3, B3), A. GIRODET (D1), C. GUILLOUX (13), A. HAUTOT (37 et 39), L. HOSSENLOP (B3, B5), J.-L. JAVERZAC (36), J. JOUAIRE (33), A. LE DU (14 et 38), T. LEFEBVRE (D2), C. LUMB (C4, D1), P. MALLET (C1), J. MARTIN (A3), J. MIDOZ (21), J.-P. MURATET (35), L. PARGAMIN (22), J. PASTEAU (13), C. MOREAU (B1), R. PARRAUD (22), P. PRAMAYON (B2, C1), G. RIQUEL (B2), A. ROUSSEAU (33), P. SANDRIN (38 et 39), G. SIMONNET (39), J.-P. TAISNE (A2), A. TANGUY (A2), J.-M. TESSERON (34), E. THURIES (13), J.-G. VALENTIN (C5), S. VITET (C4), A. XEMARD (C4).

The CNF, a driving force of technical skills

Of course, long before the introduction of the CIGRE Awards, French electrical engineers were taking part in CIGRE’s technical work. They played a significant part in CIGRE, either as active members of Study Committees or Working Group conveners or members. Their contributions can be found in a large number of CIGRE papers and articles of ELECTRA or other conferences.

We shall give a few names, but this list is certainly not exhaustive: C. GARY, B. HUTZLER, G. LEROY, J.-P. RIU in the field of very high voltage and insulation coordination. In another field – lines and cables – we should mention Y. PORCHERON and L. DESCHAMPS. Other major contributors were, among others: M. AUGONNET, A. LACOSTE, E. STERN.

The list of members who contributed in the area of electrical equipment would be very long, considering the wide range of equipment. The readers will remember a number of the following: A. COUSTÈRE, M. POUARD, L. PIERRAT, I. HENNEBIQUE, J.-C. HENRY, P. HEROIN, L.E. WHITE. We should not forget the people who worked on physical phenomena which have a direct influence on performance of equipment: M. CARBALLEIRA, R. FOURNIER, T.

FRITSCH, J.-F. HEUILLARD, G. KOUSKOFF, L. LATIL, P. LE VERRE, J.-C. SABONNADIÈRE, J. AMALRIC, among others.

We would also like to mention some of the people who contributed to system planning, design and operation, as for instance: R. ABELLA, C. BARBER, J. BERGOUGNOUX, J.-C. GOUGEUIL, F. MAURY, A. MERLIN, A. PARDIGON, H. PERSOZ, M. PETARD, R. ROBERT, P. SAPET, etc.

Other than the people we have just quoted, numerous French members contribute anonymously to the general progress of CIGRE. The long lists of French delegates to the Paris General Sessions every other year evidence at best the impact of the French contribution, enhanced by the CNF.



History of German National Committee of CIGRÉ

by Reinhart Baehr, Dusan Povh and Jürgen Schwarz

Present structure

The German CIGRE activities are embedded in the organization of the German Association for Electrical, Electronic and Information Technologies (*Verband der Elektrotechnik Elektronik Informationstechnik - VDE*) with its head office and secretariat in Frankfurt/Main. The leading body is the German National Committee of CIGRE, chaired by the president and the vice-president who are elected by the NC members for a period of 3 years. The members are outstanding personalities representing the electrical industry, utilities, universities, and scientific institutes working within the scope of CIGRE. Each group is represented by 5 persons. German chairmen of Study Committees are associated members during their terms of office.

To disseminate the information on the work carried out in the Study Committees and to feed in contributions and initiate new tasks, national working groups related to each SC are formed and chaired by the respective German SC member.

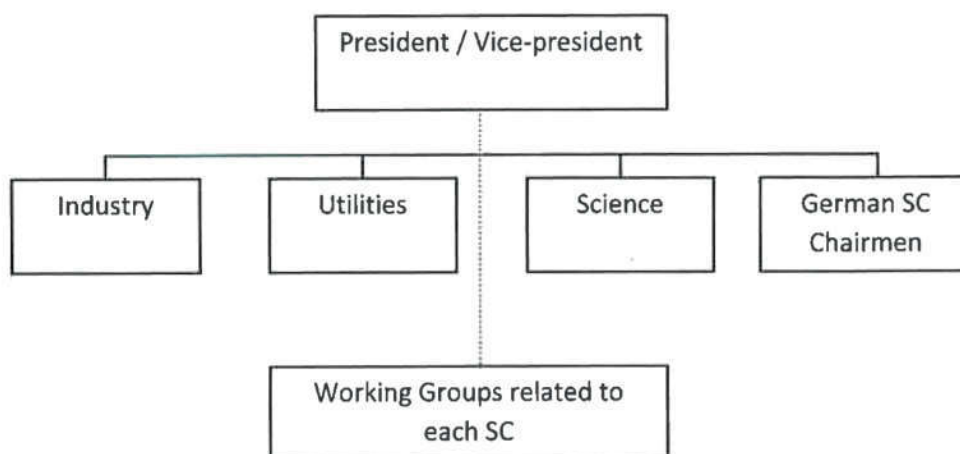


Fig. 1 Structure of the German National Committee of CIGRE

At present, the German NC represents 216 individual and 36 corporate members. In addition, around 200 experts in the national working groups are involved in the international CIGRE activities of Study Committees, Working Groups and Task Forces.

At the biennial Sessions in Paris, German authors regularly present an average of 20 to 30 papers dealing with the preferential subjects of all 16 SCs. The German delegation to the Session normally comprises 160 to 180 participants.

Germany has three votes in the Administrative Council and a permanent seat in the Steering Committee.

Germany is represented in all Study Committees by regular members and by a large number of experts in the related Working Groups. The SC members are obliged to organise meetings with their national working groups and to report on their activities to the NC.

The NC meets twice a year to discuss the on-going affairs and the decisions negotiated by the Administrative Council and the Steering Committee, and to receive reports by the German SC members on the work progress of all SCs. Once a year an information meeting is organised open to all interested persons to provide information on a specific technical matter under discussion within CIGRE.

Historical development

When CIGRE was founded in Paris in 1921, Germany was not invited to take part (as a consequence of World War I and the Versailles Treaty) though the German electric power industry was one of the leading industries in the world. Nevertheless, in the following decade the German electrical engineering society observed the CIGRE activities with great interest. Finally, Germany was admitted as a member in 1933. In order to organise the communication with the Central Office in Paris and to coordinate all activities, the German NC was formed under the umbrella of VDE and chaired by

President A. Rachel (member of the Board of AEG Berlin)

Vice-president H. Passavant (VDEW President)

Secretary General P. Schirp (Secretary General of VDE).

It is worth mentioning that after extended negotiations the German language was accepted as one of the official Session languages. Due to the late decision to accept Germany as a member only in spring 1933, German authors could provide just a few papers to the Session of that year.

In 1935, Germany was fully integrated and contributed 22 papers to the 8th Session. It is interesting to know that in these early days two papers were related to the subject of HVDC power transmission and reported on the development and design of the first HVDC scheme in Germany /1, 2/.

World War II interrupted all German CIGRE activities and only in 1952 Germany (represented by the Federal Republic of Germany) joined the CIGRE community again. Until the end of World War II, Berlin was the centre of the German electro-technical industry represented by AEG and Siemens, and others. So it was logical

that the German NC as a non-political technical and scientific organization represented members from both parts of Germany. Two seats in the NC including the vice-president were reserved for persons from Eastern Germany. Papers from there were promoted as part of the German allotment and participants to the Paris Sessions were sponsored by the (West) German NC as far as possible under the political conditions of the Iron Curtain. But the political philosophy of the (East) German Democratic Republic did not allow all-German organizations and tied up the contacts and aimed to be recognized as a separate NC. A problem arose from the question of the official country codes of both NCs and their ranking on the names listing. Finally in 1980, the GDR, too, was associated with CIGRE. Due to the political and travel restrictions, the participation and the number of activities of East German engineers and scientists were considerably lower than the cooperation of West German CIGRE members with all SCs.

So until 1991 two German National Committees were accredited to CIGRE.

In acknowledgement of his merits, A. Rachel was elected Vice-president of the CIGRE Session in 1953.

During the past 5 decades, Germany as a whole has been and still is one of the main actors with permanent members in all Study Committees, with a large number of papers submitted to the Sessions and numerous participants in Working Groups and last but not least with active participation in the governing bodies of the international organization.

During the period from 1972 to 1984, R. Guck was President of CIGRE, and from 1984 to 1990, K.-H. Schneider acted as Chairman of the Technical Committee. During the past 40 years, Germany has hosted 6 Colloquia, 1 Symposium and provided 12 chairmen to Study Committees.

German representatives in the international CIGRE organization since 1990:

Chairmen of the German NC:

1990 - 1993	Horst Lennertz
1993 - 1996	Bruno Müller
1996 - 1999	Rolf Renke
1999 - 2002	Jürgen Schwarz
2002 - 2004	Klaus-Peter Müller
2004 - 2008	Rolf Windmüller
2008	Udo Niehage

Chairmen of Study Committees:

1990 - 1996	Heinz-Helmut Schramm, SC 13/A3 High Voltage Equipment
1994 - 2000	Reinhart Baehr, SC 12/A2 Transformers
1996 - 2002	Gerhard Ziegler, SC 34/B5 Protections and Automations

1996 - 2002	Dusan Povh, SC 14/B4 HVDC and Power Electronics
2002 - 2006	Reinhart Schroth, SC 21/B1 Insulated Cables
2004	Ernst Gockenbach, SC15/D1 Materials and Emerging Technologies

Technical environment at the time of foundation and after

In Germany, electrification started at the end of the 19th century in urban areas, such as Berlin in 1884. For technical reasons, in the beginning there were only limited supply areas close to the production centres. They used the national resources available (hard coal, lignite and hydro). The number of supply companies increased rapidly, and already in 1914 there existed more than 4,000 utilities for public supply with a total installed production capacity of around 2,100 MW. At that time, industrial production reached an additional 8,000 MW. /3/.

In the 1920s, several regional *Überlandwerke* (long-distance public power supply systems) already existed or were founded, mainly for the interconnection of hydro and thermal production plants. At the regional level, interconnections existed between those networks but not yet on a national basis. In the South of Germany, the first cross-border interconnections to Swiss and Austrian companies came into operation. The benefits of interconnection – exchange of power, sharing production reserve, and balance of consumption – were the driving forces. The important lines were operated at 110 kV. Already in 1926, the lignite power plants of the Cologne area were connected to the hydro resources in the southwest of Germany. In the same year, a 110 kV line between the centre of Germany (lignite) and Breslau went into operation.

As a consequence of the increasing demand, the production capacities were enlarged and the 110 kV networks extended. In 1923, the first 220 kV line went into operation in the Ruhr area. In 1929, the 220 kV line between Brauweiler (near Cologne) and Hoheneck (near Stuttgart) was put into operation and soon extended to Bludenz (Austria). According to the expected future development this line was designed for 380 kV from the beginning.

The growth and development of the power supply system was based on the powerful and innovative electro-technical industry represented by AEG, BBC, Sachsenwerk, Siemens and other firms which developed very fast and successfully at the beginning of the 20th century. Several imported inventions promoted the high standard of the German electrical industry.

In 1911, Ludwig Roebel, engineer in the Mannheim factory of Brown Boveri, invented a stator-bar for turbo-generators, the so-called *Roebel-Stab*. The ingenious invention of the transposed conductor was and still is the precondition to construct large turbo units up to the highest ratings by limiting the eddy current losses of the stator winding. In 1914, the first 20 MW rated unit of the world went into operation in the Elverlingen power station.

In 1929, Bernhard Jansen received a first patent on on-load tap changers (OLTC) for power transformers. This revolutionary invention marked a major progress in regulation and control of voltage and load flow in the transmission system.

An early example of large-scale storage of electric power is the *Koepchen-Werk*, the first large pumped-storage power plant in Germany erected by RWE close to the city of Essen. The plant went into operation with 132 MW in 1930 and is still in operation.

In the following years, the number of 220 kV lines increased significantly. Though synchronous parallel operation existed only between individual networks and changed according to operational requirements, the exchange between the production plants based on different sources increased considerably. It was only due to this fact that power supply to the public and the industry could be managed to a certain extent during the period of heavy destruction of power plants and lines at the end of World War II. Though there existed an installed capacity of 13,300 MW in January 1945, a demand of only 6,400 MW could be met. It happened fairly often that the operational frequency was intentionally reduced to 44 Hz for the reduction of load. / 4/.

After the war, Germany was divided into a Western and Eastern part. In electric terms, there existed even three different systems (FRG, GDR, and West-Berlin) from 1954 – after opening of the last existing interconnections.

In the Western part, the eight interconnected power companies started cooperation to develop a powerful interconnected system under common rules; for this purpose, the *Deutsche Verbundgesellschaft (DVG)* was founded in 1948. The first 380 kV double-circuit line between Brauweiler and Hoheneck went into operation in 1957. Due to the common planning philosophy (production to be erected close to consumption centres) this voltage level was supposed to be sufficient for future consumptions, and assuming that transmission losses remained low. Due to separate control areas, a national control centre was not required. In the field of production, the size of units increased from 50 MW at the end of the war to 700 MW of conventional thermal capacity and 1300 MW of nuclear generating capacity at the end of the 1980s. West Germany was part of the UCPTE (founded in 1951) and the German grid became more and more an integral part of the West European interconnected system.

The Eastern part of Germany was a centralised state system mainly based on lignite production. In 1959, the first 380 kV line was erected. In 1962, the interconnection to Poland and Czechoslovakia was taken into operation. In the same year, the CDO Prague – the Eastern Central Dispatch Organization – started its activities.

In West-Berlin, a special island operation had to be implemented for supply to 3 million people. The nine units represented 2,500 MW of installed power. Mainly

the provision of reserve power and frequency control were great challenges. Small quick-start gas turbines, a powerful steam storage and a battery system (17 MW for 16 min) were essential for a secure power supply. A 380 kV intra-urban cable connection went into operation in 1978.

	West	East	West Berlin	
Consumption	431	120	10	TWh
Peak load	69	18	1.8	GW
Installed capacity	102	24	2.6	GW
Interconnection capacity	31	5	0	GVA

Fig. 2: Germany – Typical values (1989, before reunification)

After the fall of the Berlin Wall in 1989, the re-interconnection of the three German systems became possible. At the same time, the separation of the East German system from the Eastern CDO system made certain preparations necessary there; and the remaining systems of the countries Poland, Czech Republic, Slovakia, and Hungary prepared for an integration into UCPTÉ. /5/

Three 380 kV double-circuit lines were erected between East and West Germany, as well as 110 kV lines between West and East Berlin. An adjustment of the production units to UCPTÉ standards was necessary in order to meet the frequency control requirements. Additional measures had to be taken to meet the requirements of the Catalogue of Measures for the preparation of parallel operation with the UCPTÉ system.

Finally, after different steps of testing, the operational integration of the German system took successfully place in September 1995. Since then, it has been an integral part of the UCPTÉ system. Only one month later, the systems of CENTREL (PL, CZ, SK, HU) started trial parallel operation with the UCPTÉ system, and finally became full members of the Western European system in 1997.

Since then, the European networks have undergone many changes. Political influence, liberalisation, appearance of new market players, unbundling of integrated companies, large feed-in of renewable energies, environmental restrictions, regulation, etc. pose great challenges to network operators (TSO and DSO). Existing network structures have to be operated completely different from what they were planned and erected for.

Studies prove that Germany needs more than 800 km of additional 380 kV lines (in addition to the existing 38,000 km of 380 and 220 kV lines) to meet the new requirements and maintain security of supply. But licensing is a great problem. The introduction of HVDC and/or FACTS is under discussion. Smart grids

and smart metering may also help to solve present and future problems. These developments are also a great challenge to CIGRE.

Present Activities

Giving national transparency to CIGRE activities (both in terms of input and output) has a long tradition in the German engineering community.

All German representatives in CIGRE Study Committees collaborate with a national group of experts who support their international contributions and benefit at the same time from the work carried out in the SCs. The group normally comprises experts from manufacturers, utilities, research centres and/or universities.

Great importance is attached to the CIGRE Session in Paris. The German NC not only takes great care in the selection of the papers to be proposed. The NC also organises a regular reception of the German participants to the Session, which takes place on the premises of the German Embassy in Paris. Special guests from CIGRE bodies and other national committees are also invited.

In order to inform the engineers who were not able to attend the biennial CIGRE Session, the German representatives in the SC give an account of important papers and discussion results immediately after the Session in the VDE magazines. In the same way, the national representatives to the Administrative Council and the Steering Committee report regularly on important discussions held and decisions taken in the NC meetings as well as – in a more comprehensive way – in the magazine of the VDE Power Engineering Society.

Once a year – in connection with an NC meeting – selected subjects of recent CIGRE activities are presented in a conference to the community of German power engineers. A platform is given simultaneously on the same occasion to CIRED with some selected topics. Close cooperation and coordination between national CIGRE and CIRED activities has taken place for some years. The national CIRED representative is regularly invited to the CIGRE NC meetings, and vice versa.

Most of the activities mentioned above are also addressing young engineers and students to make CIGRE better known to them. Additionally, a limited number of young engineers receive financial support for the attendance of the Paris Session. A new form of addressing young engineers is just being developed. They shall be given access to international activities – additionally to the internet – in a more personal way. Thus they may better benefit from CIGRE results and equally contribute to CIGRE work – and later hopefully will become members.

Examples of important German contributions to CIGRE activities

The international collaboration within CIGRE has proved to be an excellent platform to present national developments, on the one hand, and to discuss future

developments of power systems worldwide, on the other hand. Since German experts have participated to a great extent in the work of all Study Committees and in many Working Groups, only some major contributions shall be mentioned here.

Based on the development of mercury-arc converters and the experience with experimental HVDC installations, the first commercial HVDC transmission in Germany was ready for service at the beginning of 1945. The Elbe – Berlin project was designed for ± 200 kV dc and 60 MW. The plant should transmit power from the Elbe power plant to Berlin via a cable connection of 115 km in length. After the end of World War II, the whole system was transferred to the Soviet Union and reconstructed as the Kashira – Moscow transmission with a rated power of 30 MW/ 200 kV dc /6/.



Abb. 178. Stromrichterhaus der Anlage Moabit der RAV.
1 Isolierumpanzer, 2 Kühltank, 3 Öffnungsrohr für Anodenöl, 4 Öffnungsrohr für Kathodenöl, 5 Kopplungskondensatoren, 6 Kathodenstrom, 7 Anode, 8 Kondensatorbatterie, 9 Anodenstrom, 10 Zwickelstrom, 11 Pumpenraum, 12 Verteilung.

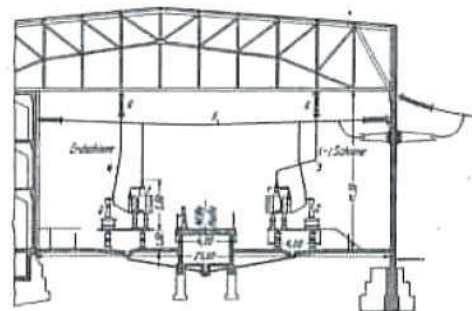


Abb. 189. Querschnitt durch das 440 kV-Stromrichterwerk Elbe der AEG.
1 Gleichrichtergruppe auf Zwischenkreis, 2 Isolierwand, 3 Gleichstrombusse, 4 Drehstrombusse, 5 Drehstromumrichter, 6 Drehstromumrichter, 7 Drehstromumrichter, 8 Drehstromumrichter, 9 Drehstromumrichter, 10 Drehstromumrichter, 11 Drehstromumrichter, 12 Drehstromumrichter.

**Fig. 3 HVDC Test installation Berlin-Moabit (left)
and design of Elbe station (right)**

Since the 1950s, German experts have taken an active part in Study Committees dealing with HVDC (SC 10, SC 14 and B 4). HVDC became an important transmission technology worldwide. The German contributions were mainly related to the development of thyristor technology of valves, light firing for HVDC transmission, pollution under dc stress and multi-terminal HVDC grids.

Around 1960, extensive studies on the further development of the German EHV transmission system were performed with the result not to introduce a higher ac voltage level beyond 380 kV. Nevertheless, the electric power industry participated in the worldwide development of UHV equipment including breakers for short circuit currents of up to 100 kA, as well as in international discussions on HV test procedures and standards.

After the political changes in the late 1980s, German experts contributed strongly to the upcoming discussion on the challenges resulting from the interconnection of large electric systems and the technical, operational and organisational problems involved.

Another main topic was the development of SF6 insulated equipment and systems for electricity supply in densely populated areas up to the highest voltage levels. This included not only SF6 substations and their components but also technologies for GIL application for underground long-distance transmission. In this context, the introduction of the 400 kV cable with extruded dielectric using water cooling for high ratings must be mentioned as well.

Future activities are related to the development and integration of renewable energy in the existing supply system. At present, Germany is one of the leading countries in terms of the generation of electrical power based on wind energy, around 24,000 MW already being installed. To meet the goals of increased use of "green" energy, more sophisticated methods for dispatching and controlling the power flow in the network must be developed on the basis of advanced information technology. It is a great challenge to engineers to fulfil at the same time all political, legal, commercial and last but not least technical requirements. Due to the increasing cross-border power exchange between countries, this task is also a typical topic for international cooperation within CIGRE.

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- /5/ J. Schwarz, H.-B. Tillmann: Zehn Jahre deutsch-deutscher Stromverbund – Rückblick und Ausblick, et (2006) H. 1 / 2.
- /6/ K. Baudisch: Energieübertragung mit Gleichstrom hoher Spannung, Berlin/Göttingen/Heidelberg (1950).



History of Hungary National Committee of CIGRÉ

Short history of the electricity industry in Hungary

In 1884, two years after the first public utility electric works in New York was put into operation, the public utility electric works was established in the Hungarian Monarchy, more specifically in Temesvár. Electrification in the present territory of Hungary started in Mátészalka in 1888, in the same year as in Paris. This is the year when the beginning of the Hungarian electricity industry is dated.

At the end of the century electrification went on by leaps and bounds in Hungary. The majority of larger power plants and distribution companies were in private ownership and remained as such later as well.

After WWII following the nationalisation in 1948, about 300 public utility electric works were under the control of the national Electricity Co. Connecting in synchronous operation the several independent power plants and the supplied network was a significant event. As a result, the National Electricity Dispatch Centre was set up in 1949.

In 1951 six regional distribution companies were established, and they are still in existence.

In 1954 the Power Plant Trust was founded.

The Hungarian Electricity Board (MVMT) was founded in 1963. It incorporated the Power Plants Trust and the six distribution companies.

In 1992 the companies were converted into a two-level holding system. MVM Rt. constituted the first level with the responsibility of owner and controlling, the power plant, distribution companies and the grid company constituted the second level.

In 1995, the distribution companies and majority of power plants were privatised.

In 1995, the Hungarian power system became part of the West-European interconnected system.

In order to meet EU Directive 96/92/EC, in 2001 the power system operation was reorganised to a separate company called MAVIR, operating as ISO. Since

2006, as the owner of transmission assets, MAVIR has been operating as TSO.

Step-wise market opening began in 2003 and was completed by 2008, when the Hungarian electricity market was fully liberalised.

Hungarian participation in CIGRÉ activities

Even at the establishment of CIGRÉ, the Hungarian engineers were there and took an active role. They all were members of the Hungarian Electrotechnical Association (MEE), an organization of the Hungarian electric power industry with a high reputation already at that time and covering all fields of domestic electricity industry. MEE was founded in 1900; since then it has been the forum and main field of formal technical and scientific cooperation and social life and networking venue of Hungarian power engineers. Stemming from this the work is shared in such a way that MEE is the information and coordination forum in domestic issues and the international organization CIGRÉ is the platform for the individual experts in international issues. This may be the reason why the establishment of the CIGRÉ Hungarian National Committee cannot be considered as the most significant event in the history of development of the Hungarian power industry; however it has considerably contributed thereto. Still today the cooperation of experts in electricity industry companies within MEE has been a decisive factor, in which also the universities and research institutions participate. This cooperation is highly supported by the opportunity, or should we say the inevitable condition, that these experts can exchange experiences and information within the framework of CIGRÉ which covers the whole world.

These experts, as individual members of CIGRÉ, take part in the activities of several CIGRÉ working groups. Presently, we have delegates in Transformers, Substations, Electricity Markets and Regulations Study Committees.

CIGRÉ Hungarian National Committee is mainly an administrative organizer of and for the Hungarian individual CIGRÉ members: it convenes the members every other year, where the experts can get a comprehensive picture about the latest achievements, the future tasks and have a platform to express their opinions. HNC is also an information channel for members, and a consulting body for professional organizations and authorities.

It is a good example for the very strong cooperation between CIGRÉ Hungarian National Committee and MEE, that in September 2009, Study Committee D1 "Materials and Emerging Test Techniques" and its associated working groups held their annual SC and WG's meeting together with a Colloquium in Hungary, organised by the CIGRÉ Hungarian National Committee together with MEE. This meeting and technical colloquium provided an excellent opportunity for the specialists to share the technical information,

research achievements and experiences in the recent technical issues.

The Hungarian National Committee wishes to participate in and to add a high value to the unique work of CIGRÉ in the future too.

Main personalities of present CIGRÉ cooperation



***Dr. NAGY István,
President of the Hungarian CIGRÉ Committee***

He graduated from the Technical University of Budapest (TUB) and earned the degree of Diploma Electrical Engineer with distinction in Faculty of Electrical Engineering, TUB. He continued his study at TUB as PhD student in English terminology and earned the degree of Candidate of Technical Sciences from the National Scientific Qualification Board (NSQB). He received the degree of Doctor Tech. from TUB in 1960. After submitting his dissertation and thesis he was bestowed the degree of Doctor of Technical Sciences again by the NSQB.

Probably the most important contribution among many other ones was the devise of some of the theoretical basis, the design and the implementation of five generations of the whole automatic excitation system for large turbine synchronous generators operating in power plants. He developed the dynamic representation of synchronous machine as controlled object taking into account the saliency, the amortisseurs, variable speed operation, positive and negative sequence components of the infinite bus voltage and an approximate treatment of the saturation. He worked out the general theory of the minimum excitation limit and introduced a new limit circuit.

For the high scientific and engineering contributions described above later he was elected as corresponding member of the Hungarian Academy of Science (HAS) in 1993 and as full member of HAS in 1998.

He is member in societies, boards and committees such as IEEE or EPE and has hundreds of technical and scientific publications at home and abroad. He plays active role in Hungarian and international scientific associations.



***OROSZKI Lajos,
Secretary of Hungarian National Committee***

He has M.Sc. degree in electrical engineering. He graduated in 1974 from Budapest Technical University, at Faculty of Electrical Engineering. Subsequently, he joined the National Relay Protection, Automatics and Measurement Service (OVRAM) of the Hungarian Electricity Board (MVMT) where he was network protection expert. Between 1982-1988, he worked as TESCO expert in Iraq in grid development projects. In 1989, he became the Leader of OVRAM's Expert Team for National Grid and Power Plants, afterwards he joined the National Dispatch Service of the National Dispatch Centre (OVT) in 1992 where he passed a dispatcher examination. Between 1995-1998, he was the Director, later Deputy Director of the National Dispatch Centre of the Hungarian Power Companies Ltd. (MVM). Since the establishment of MAVIR Rt., he has been the Director for System Operation and has been Deputy CEO since 2003.



***Dr. KRÓMER István,
Honorary Member of CIGRÉ, former Secretary of HNC***

He counts more than 40 years research experience gained at the Electrical Power Research Institute (VEIKI) in Budapest and at several foreign laboratories as Electricité de France R and D Directorate, Sankt Petersburg Polytechnical University and Oak Ridge National Laboratory. He has held various research engineer, lecturer

and management positions, for the last 16 years as Director General of the Institute.

Recently his activities focus on development and management of research technology development activities provided for the national and foreign electric power industry.

In 1979 he received the Ph.D. degree from Sankt Petersburg Polytechnical University and the Dr. Eng. degree from Budapest Polytechnical University and in 2000 the D.Sc degree from the Hungarian Academy of Sciences. He is a university professor. He has lectured extensively at international conferences on a large number of topics and has more than 150 publications in national and foreign journals and transactions. He plays an active role in Hungarian and international scientific associations. He was a member of SC22 and the Technical Committee. Now he represents Hungary on the Administrative Council. He received the title of Distinguished (2000) and Honorary member (2004).



History of Iran National Committee of CIGRÉ

Foreword:

National Committee (NC) of Iran was established in 1989 in Iran by sponsorship of the Ministry of Energy and technical universities by registration of about 40 individual members in Cigre. In 1990 the Committee was officially registered in Central Office.

At that time, the situation of Electric Power Industry of the country was as follows:

Installed capacity of power plants around 13681 MW, annual peak load 7762 MW, the length of transmission and sub-transmission lines 33920 km/circuit, and the number of customers 8826.

Repair of damages of Iran Electric Power System together with the rapid development of this infrastructural system called for extraordinary efforts and dedication and now in the year 2008, the situation has been remarkably changed. From then on, electric power generation has increased by about 3.8 times, the length of transmission and sub-transmission lines by 3.5 times, annual peak load 36000 MW, whereas the population of the country has increased by about 1.4 times.

As it can be observed, all indices listed above indicate the public awareness and better services of this industry to public, and these are the results of technical and economic activities and also holding some specialized panel and conferences.

Today Iran is determined to manufacture electrical equipment needed by the electric power industry of the country and at the same time exporting abroad these equipments as well as engineering services.

At present, the Deputy of Ministry of Energy for power affairs as well as Tavanir Co. and sixteen electric regions are involved in the generation, transmission and distribution of electricity in Iran; all of them belong to Ministry of Energy and are governmental.

Why a National Committee:

Before establishing the NC, we organized the first international Power System Conference (PSC) in 1985, which acted as an appropriate tribune for introducing

the scientific and technical potentials of the Iranian experts as well as receiving feedback from electric utilities about their problem. In the conference a wide range of theoretical and practical problems have been posed and discussed, and the solutions have been submitted to the authorized department.

After establishment of NC, the committee has been very active in holding the conference and also many technical reports were produced by Cigre-Iran.

National Committee Management:

Cigre-Iran Managed by Chairman, Co-chairman, Executive Director, Technical Coordinator, and Secretary who are selected from high ranking managers of the Ministry of Energy.

Technical Committee:

In 1990, the following four technical committees were established.

- Study committee for power plants.
- Study committee for system planning
- Study committee for substations
- Study committee for transmission lines

Nowadays, NC of Cigre Iran counted seven technical committees at end of 2008, as follows:

- Study committee for insulation coordination
- Study committee for transmission lines
- Study committee for transformers
- Study committee for planning
- Study committee for substations
- Study committee for electric losses
- Study committee for control & protection

Working Groups:

In each study committee some working groups have been considered who act as the members of Cigre working group.

Technical Events:

During about last two decades Cigre-Iran organized many technical meetings, workshops and sponsored many conferences and symposia. An important one is the International Power System Conference (PSC) which is organized annually by participation of more than 2000 experts from Iran and other countries.

Technical Documents:

Cigre-Iran provides many technical reports and papers which are submitted to

the conferences as well as Cigre Sessions. Five papers from Cigre-Iran were accepted for the 2008 Session.

Membership:

Overview of Cigre- Iran members during the period 2006- 2008 is as shown hereafter:

Membership		2006	2007	2008
Individual Mem.		60	71	73
Collective Mem.	I	2	2	2
	II	-	-	1

Distinguished Members:

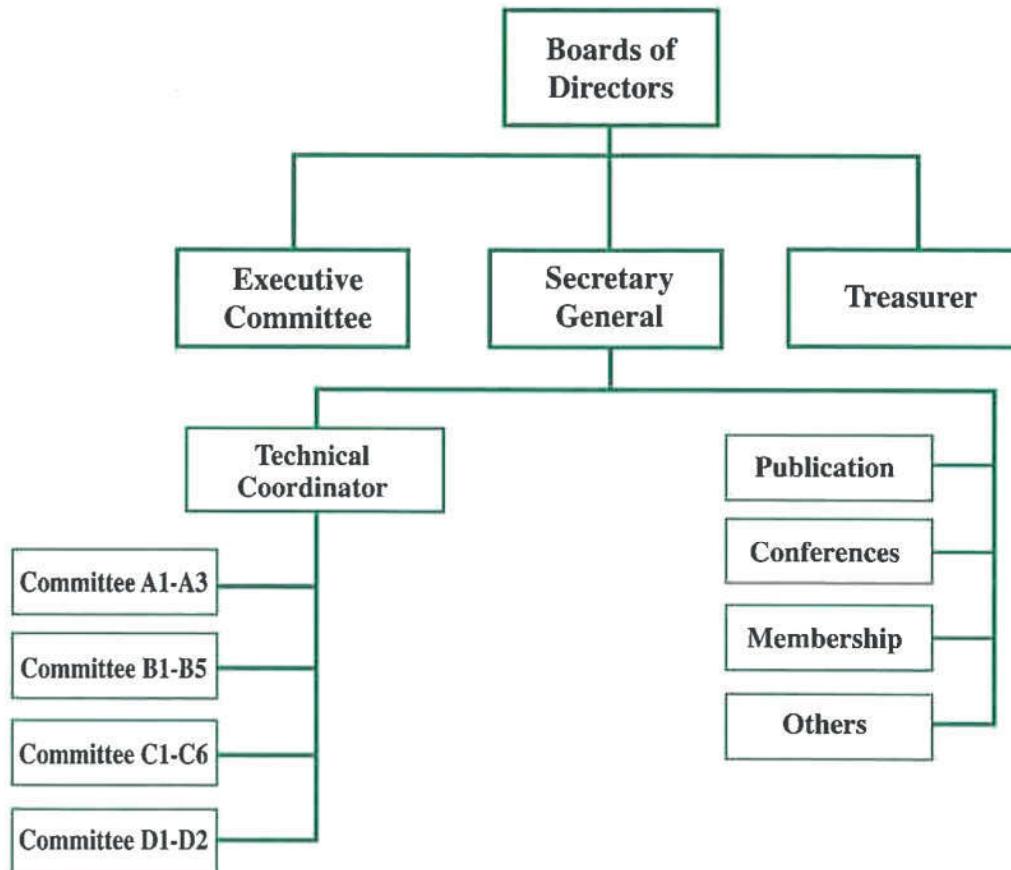
NC Iran counted 13 distinguished members up to end of 2008.

Distinguished Members Iran

No.	Title	Name	Family Name	Year
1	Dr.	Mohsen	Pourrafie Arabani	1998
2	Dr.	Godratollah	Heidari	1998
3	Mr.	Masoud	Hojjat	2000
4	Mr.	Mohammad	Mallaki	2000
5	Mr.	Ali-Reza	Shirani	2000
6	Mr.	Ahmad-Fereydoun	Dorafshan	2002
7	Dr.	Javad	Rouhi	2002
8	Dr.	Mohammad	Ahmadian	2004
9	Dr.	Mahmoud	Moghaddam	2004
10	Mr.	Mohammad	Behzad	2006
11	Dr.	Hassan	Ghafoorifard	2006
12	Dr.	Hassan	Askarian Abyaneh	2008
13	Dr.	Mehdi	Ehsan	2008

New plans:

The general assembly of Feb 2008, decided and approved the following new organization chart for Cigre-Iran.



New Organization chart of Cigre-Iran

Meantime it is planned to organize symposia for interconnection between our neighboring countries and also for new UHV 765kV in Iran as well as 500kV HVDC. Cigre-Iran intends to provide documents for authorized Managers of Ministry of Energy for renewable energy distribution generation and other advanced technology for updating the systems and quality of electricity.

Address of Cigre Iran and new Site:

Add.: No. 37, Vanak Sq. Khoddami Ave., Tehran 1994753486, Iran

Tel: 021-88796546 - Fax: 021-88775010

Site: www.cigre.ir



History of Ireland National Committee of CIGRÉ

Development of a National Electricity System in Ireland

The development of a national electricity system in Ireland began in the 1920s, thus coinciding with the establishment of CIGRÉ. When Ireland became independent in 1922, electricity was supplied by individual commercial undertakings or municipalities in the larger cities and towns, the electricity being generated mainly using imported coal. Many of these networks used direct current. However, Dublin city adopted high-voltage, three-phase AC transmission to convey power from its new Pigeon House power station, 6 km east of the city centre, in 1903.

Ireland's contribution to electricity supply goes back much further, to the early 19th century. Father Nicholas Callan (1799-1864) was Professor of Natural Philosophy at Maynooth College, now the National University of Ireland, Maynooth, just west of Dublin. Fr. Callan was interested in electricity, and is now generally accepted as the inventor of the induction coil, the forerunner of the modern power transformer. In 1837 he produced a giant induction machine. He used a mechanism from a clock to interrupt the current 20 times a second. The machine generated 15-inch sparks and an estimated 60,000 volt, the largest bolt of artificial electricity ever seen at the time.



Reverend Professor Nicholas Callan (1799-1864)
Professor of Natural Philosophy St. Patrick's College, Maynooth, Ireland
Inventor of the Induction Coil

The creation of the national electricity system in Ireland can be traced back to 1923 when a young Irish engineer, Dr. T. A. McLaughlin, a trainee with Siemens Schuckert in Berlin, suggested studying the real case of Ireland rather than an imaginary case as part of his training in the development of hydro-electric schemes. Siemens developed plans for hydro generation on Ireland's longest river, the Shannon, and for extensive networks to deliver electricity throughout the country, and through Dr. McLaughlin presented the plans to the newly-established Irish Government. In 1924 the government submitted the Siemens plans to an international review committee comprising Waldemar Borgquist from Sweden, Eugen Meyer-Peter and Arthur E. Rohn from Switzerland, and Thomas Norberg Schulz from Norway. In 1925 the experts recommended the development of the Shannon on a national basis in line with the plans prepared by Siemens. They pointed out that *"With the exception of a few towns, from the viewpoint of electricity supply, Ireland in 1924 is in the same condition as was Norway, Sweden or Switzerland 15 to 25 years earlier."* They suggested that *"The electrification of Ireland must not be regarded as a purely business affair, but as a great national economic question"* that the goal must be *"a supply of electricity for all under the best possible conditions at the cheapest possible prices, allowing for a moderate return on State-invested capital"*. They added that the research carried out by them had convinced them that Ireland is suitable for a unified electrification plan, and that the development of water power is from the national point of view to be preferred to the development of steam power in a country poor in coal, as long as the energy from water power can be supplied to the user at as cheap a price as from coal. They concluded their report by expressing the hope that the State in conjunction with the towns will succeed in carrying through the electrification of the State.

Thus an agreement was signed between Siemens Schuckert and the Irish Government to construct the "Shannon Scheme", a 60 MW hydro station, and a national electricity supply network with lines at 110 kV and 38 kV to deliver the power to cities and towns throughout Ireland. The power station at Ardnacrusha, went into service in 1929.

The single vertically integrated utility, Electricity Supply Board or ESB was established in 1927 to own and operate the national electricity system. The ESB progressively took over the previous private and municipal undertakings as the national transmission and distribution networks were extended to serve their customers. By 1946, 99.5% of electricity sold to end-users in Ireland was sold by the ESB.

By the late 1940s system demand reached 200 MW and a major programme of rural electrification was under way. Ardnacrusha had been extended to 80 MW by the installation of the world's first Kaplan turbine for a head of over 30m, additional hydro plants had been constructed, and the first power station fired on native peat was commissioned at Portarlington, Co. Laois, in 1950.

Establishment of the Irish CIGRÉ National Committee

In 1948, Dr. Robert C. (Bob) Cuffe, Divisional Engineer of ESB's Planning and Development Division, attended the CIGRÉ session in Paris. In 1952, he became the first individual CIGRÉ member from Ireland and also attended the 1952 session. During the 1952 session Bob discussed with J. Tribot Laspiere, the General Delegate and Vice President of CIGRÉ, the possibility of establishing a National Committee in Ireland.

In April 1953 Bob sent a formal letter to a wide range of people involved in the electricity supply industry and electrical engineering to establish interest in forming a national committee. ESB became a collective member in 1954, and three ESB engineers, including Bob Cuffe, attended the 1954 Session.

A meeting to establish the Irish National Committee was finally held on 31st January 1955. A provisional committee was appointed: Mr. P. G. Murphy, Chief Engineer, ESB, Mr. A. J. Litton, Assistant Chief Engineer, Department of Posts and Telegraphs, Professor J. J. Morrissey, Professor of Electrical Engineering, University College, Dublin, Dr. J. J. O'Doherty, Head of Transmission Department, ESB and Dr. Cuffe. The new committee met formally on 30th March and M. Tribot Laspiere was informed by letter dated 1st April 1955 of the new committee. P. G. Murphy was elected first chairman, and Dr. Bob Cuffe was the first secretary. Interestingly, at that first meeting the committee decided that *"... it would be very valuable to have some younger members on the National Committee..."*.

At the same meeting, the preparation of papers for the 1956 session was discussed. Two papers from Ireland were to be put forward: one on earth faults on the 110 kV and 38 kV systems by Messrs. Leech and Tinney, and one on measurement of generator stability angles by Messrs. Byrne and Carroll. Since then, and even though for many years Ireland did not have a paper allocation, there has been at least one paper from Ireland at every CIGRÉ session. Indeed in 1986, when the Irish National Committee asked for a formal paper allocation, Mme Doury replied stating that there was an unwritten rule that one or two papers from Ireland would always be accepted. Ireland finally received an allocation of one paper in 1998.

Participation in CIGRÉ Study Committees

Dr. Cuffe had been attending meetings of the Protection and Relays Study Committee by invitation, even before the National Committee was established. However, the first Irish appointee to a Study Committee was J. K (Jack) Carrothers, who became a member of Study Committee 14, teletransmission applied to power systems, in 1960. Jack ultimately became Chairman of Study Committee 35, telecommunications, from 1974 until 1980, the only Irish member to this date to have become a Study Committee Chairman. Further Irish members were appointed to Study Committees in 1969: Professor Charles Dillon to Study

Committee 14, HVDC Links, Dr. Derek Carroll (one of the authors of the first Irish paper in 1956) to Study Committee 32, System Operation, Mr. W. P. (Bill) Leech, an author of the other 1956 paper, to Study Committee 33, Insulation Co-ordination (Mr. Leech would later serve as Secretary of the Irish National Committee for a number of years) and Mr. Denis McKenna to Study Committee 34, Protection. By 1978 there were six Irish members on Study Committees: Mr. Eamonn Cantwell on Study Committee 21, HV Cables, Mr. Cecil O'Riordan on Study Committee 31, System Planning, Dr. Derek Carroll on Study Committee 32, System Operation, Mr. Joe Monaghan on Study Committee 34, Protection, Mr. J. K. Carrothers, Chairman of Study Committee 35, Telecommunications, and Mr. Michael McMahon on Study Committee 36, Interference. Since then Irish involvement in Study Committees has increased further, and following the 2002 re-organization of Study Committees there were Irish members on 11 of the 16 Study Committees. The effectiveness of the contribution of Irish members to study committee activities can be seen from the ten Technical Committee Awards that Irish members have received since their inception in 1993.

At the end of 1978 Bob Cuffe retired as Secretary of the Irish National Committee, having held the post since the establishment of the Committee in 1955. The Administrative Council of CIGRÉ, at its meeting in May 1979 acknowledged "the great part which Bob had played in the development and the activity of the Irish committee for which he had acted as secretary for 25 years."

Expansion of National Committee Activities

For most of the first 50 years of its existence, the Irish National Committee's activities had been focused on recruitment of Irish Members for CIGRÉ, obtaining papers for CIGRÉ conferences, selection of members to nominate to Study Committees and making the results of CIGRÉ activities known to members in Ireland. Since there has been little manufacturing and design of electrical equipment in Ireland, interest in CIGRÉ's activities was found mainly in the national electricity utility ESB. However, with the changes to the organization of the electricity industry and the introduction of competition which became a reality in Ireland in 2000, and the growth of renewable generation, there was a wider range of engineers and companies interested in CIGRÉ activities. The Irish National Committee responded to these developments by becoming involved in the organization of a number of technical events. In 2004 the committee collaborated with the Irish Centre of the Institution of Electrical Engineers in organising a one-day symposium on wind power. In late 2003, the committee agreed with the UK National Committee to organise the first joint event, a seminar on renewable generation held in Ireland in September 2005. This was followed by a second event on Low Carbon Energy Systems in Belfast in April 2009. These events are effective in bringing the benefits of CIGRÉ to large numbers of power industry experts in Ireland and in the UK.

Conclusion

The Irish National Committee continues to fulfil its basic role of being an interface between CIGRÉ and its members in Ireland, obtaining top-quality papers for CIGRÉ sessions, nominating well-qualified experts to Study Committees and recruiting new members for CIGRÉ. It is also increasingly organising successful technical events, in conjunction with the engineering institutions in Ireland and/or the UK National Committee. Ireland continues to have an effective involvement in CIGRÉ out of all proportion to its small size.

Irish National	Committee Chairmen	Irish National	Committee Secretaries
1955 - 1965	Patrick G. Murphy	1955-1978	Robert C. Cuffe
1965 - 1971	Anthony Harkin	1978-1984	Willaim P. Leech
1971 - 1983	Sean Tinney	1984-1989	Patrick H. Haren
1983 - 1989	Alf G. Kelly	1989-1994	Dermot P. Byrne
1989 - 2000	J. Gerard Breen	1994-2002	Paul Smith
2000 - 2002	Maurice King	2002-2006	Peter Roche
2002 - 2009	Paul Smith	2006-2009	Eamonn Duggan
2009 -	Eamonn Duggan	2009-	Marie Hayden

Technical Committee Awards

Year	SC	Recipient
1994	37	Cecil O Riordan
1998	22	Cathal Ó Luain
1999	22	Michael Buckley
1999	32	John O'Neill
1999	35	Peter Lynch
2000	21	Eugene Bergin
2000	23	Gerry Breen
2004	C2	Michael Power
2005	A2	Joseph McEnri
2008	C2	Hugh Jones

Dr R. C. (Bob) Cuffe, founder of the CIGRÉ Irish National Committee, was born in Dublin in 1912. He wanted to be an engineer from time he was 12. He graduated in Mechanical and Electrical Engineering from University College Dublin in 1934. After graduation, he spent two years with Metropolitan Vickers in Manchester, UK and then joined the Electricity Supply Board as a Junior Engineer

in 1936. He worked initially on HV line survey and construction and on substation design. Like many other engineers of his generation, he worked on rural electrification from 1947. He then became head of the ESB's Planning and Development Division from its establishment until 1976. As well as being secretary of the Irish National Committee 1956-1978, he was active in the engineering profession in Ireland, ultimately being elected President of the Institution of Engineers of Ireland in 1972-73.



Dr R. C. (Bob) Cuffe



History of Japan National Committee of CIGRÉ

Power Industries before advent of Japanese National Committee of CIGRE

An epoch-making event occurred in 1882 in Ginza, Tokyo, where the Tokyo Electric Light Company, preceding the foundation of the company, demonstrated illumination with an arc lamp, as shown in Figure 1. This was the very first time an electrical light had been seen in public. In 1883, the foundation of the company was approved by the governor of Tokyo. The first electrical power, however, was only delivered four years later in 1887 due to financial difficulties.

The company was reported to be a sort of venture business started with 200,000 yen in capital. Although it was then common for the government to found industrial facilities such as iron works, cotton-spinning works, and telecommunication facilities, the Tokyo Electric Light Company was privately founded.

Small 25-kW direct-current generators provided the electrical power, which were only capable of delivering electricity within a range of roughly 2 km. Power stations had to be built within the vicinity of consumers. However, large alternators were then introduced and power stations with larger capacities were instigated. The Asakusa thermal power plant was founded in 1895. The area was then remote from city centers. The alternator used was made in Germany and it was the origin of the 50-Hz frequency presently used in eastern Japan.

However, the Osaka Electric Light Company founded in 1889 had already introduced alternators and started to use American alternators in 1889, which was the beginning of the 60-Hz frequency presently used in western Japan. These are the reasons Japan has both 50 and 60 Hz even now.

During the period between 1890 and 1900, many illumination companies emerged all over Japan and there were 33 by 1896 with a total of 220,000 lights powered by electricity.

However, the number of companies was later reduced through mergers and acquisitions. In the 1930s, five major electrical companies remained in the major cities of Tokyo, Nagoya, and Osaka. Nevertheless, there was still competition.

World War II played a significant role in electricity markets. The government established Japan Electric Generation and Transmission Company (JEGTCO) in

1939 to control the generation and transmission of electricity. Companies were established for distribution in nine areas. From the technical point of view, JEGTCO eliminated unnecessarily overlapping facilities owned by competing companies. Another advantage of government control was that the commercial frequency was merged to 50 Hz in the east and 60 Hz in the west of Japan.

After the war, these companies were restructured, where JEGTCO insisted on controlling the power industry. Distribution companies, however, insisted on one consolidated company that would control the generation, transmission, and distribution of electricity for each of the nine blocks. This proposal was first rejected by the Diet. Yet in 1951, due to orders by the cabinet, nine companies started to generate, transmit, and deliver electricity.

The Japanese National Committee of CIGRE (JNC) came into effect two years later.



Fig. 1 "And God said, let there be light"
Genesis 1:3- Advent of electric light (Tokyo, 1882)
(in possession of Electric Power Historical Museum,
Tokyo Electric Power Company)

Advent of Japanese National Committee of CIGRE and its Activities

The very first session of the CIGRE was held in 1921, and three Japanese delegates reportedly attended the meeting. Japan kept sending delegates to CIGRE sessions up to 1938 but stopped all international activities after that due to World War II.

After the war, Shigenari Miyamoto (Toshiba), Hirokichi Yoshiyama (Hitachi), and Shoichi Saba (Toshiba) saw the importance of international collaboration, and contacted the CIGRE Central Office in 1952. This turned out to be the main motivating force for forming the Japanese National Committee of CIGRE. Japan

was fortunate to have had such remarkable predecessors as only seven years had passed since the war had terminated and most citizens had not recovered from the devastation and only cared about personal issues.

The Japanese National Committee (JNC) was officially established in October 1953. They sent eight delegates to the 15th CIGRE session in May 1954. The delegates were headed by Setsuo Fukuda (University of Tokyo). It was the first session attended by the Japanese after the war.

The history of JNC can be divided into five consecutive periods, and the activities of each of these are explained below. Table 1 shows the records of the JNC chairman, and the activities and committee/council members for CIGRE.

(1) - Period (I)

Chairmen: Messrs. Y. Anzo and R. Takai (1953–69)

Twelve years after the JNC was founded, the International Electrotechnical Commission (IEC) decided to hold its General Assembly in Japan. Taking advantage of this international meeting, the JNC tried to host a Study Committee (SC) meeting in Japan the same year, i.e., 1965. SC8 (Lightning and Surges) was the first target but at last SC17 (Rotating Machines) was held in 1965. There were 23 attendees from 12 overseas countries who met for the meeting and they participated in a technical visit to the Sakuma Frequency Converter (FC) Station, which connected 60-Hz electricity from the west and 50 Hz from the east of Japan. This was the first international meeting of CIGRE in Japan.

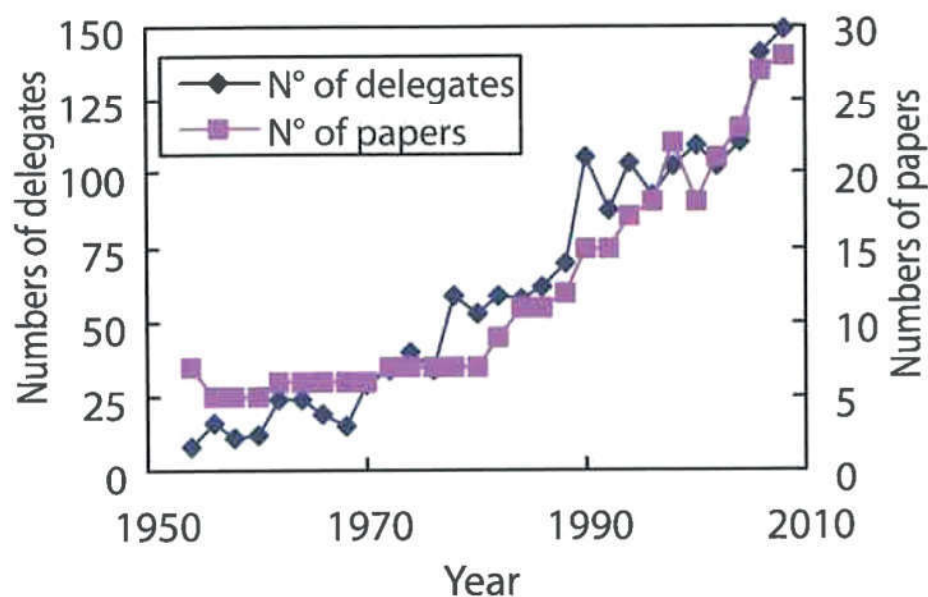


Fig. 2 Number of delegates and papers from Japan for CIGRE sessions

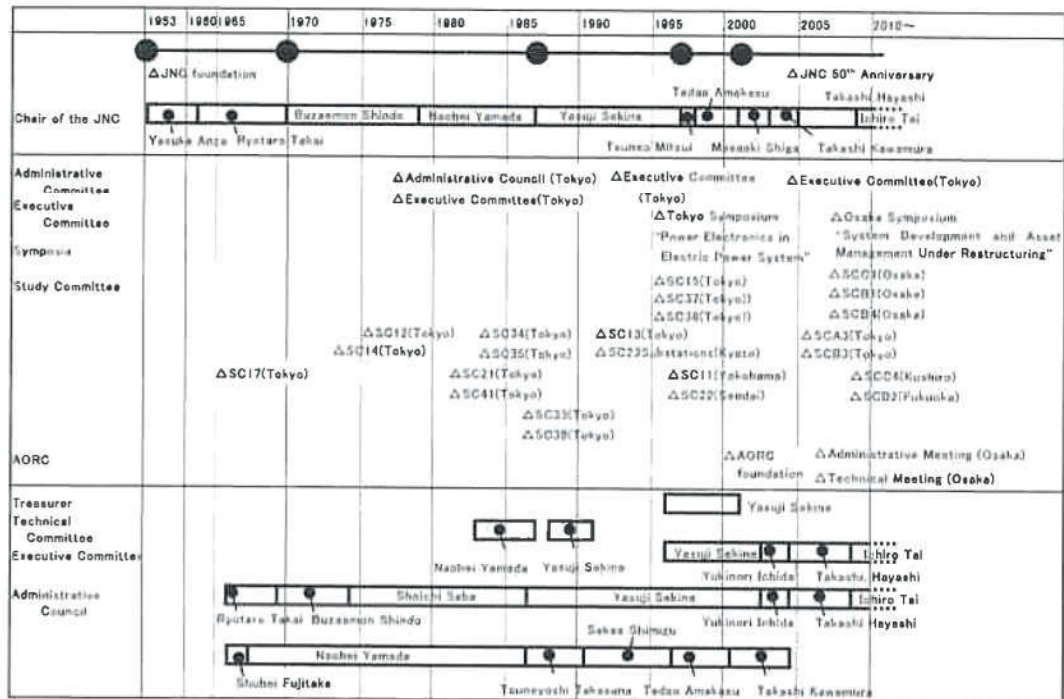


Table 1 Activity of the Japanese National Committee of CIGRE

In 1966, Japan was allowed to send two administrative council members. Messrs. R. Takai and S. Fujitaka were the first Administrative Council members from JNC.

(2) - Period (II)

Chairmen: Messrs B. Shindo and N. Yamada (1970-86)

In the 1970s, international participation by the JNC became more active. This is best demonstrated by the numbers of SC meetings hosted by JNC such as SC14 (HVDC Links) in 1973, SC12 (Transformers) in 1975, SC21 (HV Insulated Cables) and SC41 (Future of Electric Power Transmission & Systems) in 1981, SC34 (Power System Protection & Local Control) in 1983, and SC35 (Power System Communication & Telecontrol) in 1983.

The Administrative Council (AC) meeting was held in Japan in 1977. The AC members from Japan were Messrs. N. Yamada and S. Saba and it was the first AC meeting held in countries other than continental Europe, the United Kingdom, or Russia. Although Japan is located in the Far East and is far away from many member countries, many overseas attendees took part in the meeting. Mr. G. Jancke, then President of CIGRE, and other AC members visited Japan. This collaboration certainly worked to internationalize the Japanese power industry. Although the executive committee (EC) meeting was also held, Japan had no EC members.

(3) - Period (III)

Chairman: Prof. Y. Sekine (1987–96)

JNC's contribution to CIGRE increased drastically during this period, especially in terms of quantity and quality. SC meetings for SC33 (Power System Insulation Coordination) and SC39 (Power System Operation and Control) were held in 1987. SC13 (Switching Equipment) and SC23 (Substations) were held in 1991, SC15 (Materials for Electrotechnology) was held in 1993, and SC37 (Power System Planning and Development) and SC38 (Power System Analysis and Techniques) were both held in 1995.

The EC meeting was hosted by JNC in May 1992. JNC Chairman Prof. Y. Sekine attended as one of the EC members. The President Mr. J. Lepecki and other EC members enjoyed a technical visit to Akagi and Nishi-Gunma, where UHV transmission facilities that had been developed were inspected. They also enjoyed visiting an HV underground substation in Takanawa, located within central Tokyo.

The first CIGRE symposium hosted by JNC was held in 1995 with the theme of "Power Electronics in Electric Power Systems". This was just four months after the tragic Great Hanshin-Awaji Earthquake, which had occurred in January. The keynote speech was delivered by Mr. K. Morii who was a vice chairman of the Kansai Electric Power Company. He reported the damage caused by the earthquake, and stressed the importance of supplying electricity without interruption to electric equipment even after such a disastrous incident. Additionally, a videotape was played that revealed how badly the earthquake had devastated the power-supply system in certain areas and how hard engineers had struggled to restore the system after damage. The video recording seemed to have impressed the audience who offered words of encouragement.

The frequency converter at the Shin-Shinano substation and adjustable-speed pumped storage system at the Okawachi power station were chosen for the technical visit. These are good examples to demonstrate the introduction of power-electronics technologies to power systems. Prior to the symposium, SC37 (Power System Planning and Development) and SC38 (Power System Analysis and Techniques) meetings were held at the same venue. Many of the attendees took part in both the symposium and SC meetings, which resulted in cost savings by JNC and Cigreans. As a matter of fact, the symposium was a great success both in technical and financial terms. It was a good opportunity for JNC to convince the CIGRE of its capabilities for hosting such events.

The number of accepted papers had remained at around seven before this period but increased to 15 in 1990, making JNC third in the number of accepted papers among all countries. JNC came first in having 17 papers published in 1994. This was the result of continuous effort made by all JNC members and that of systems such as referee reading by JNC. Attendees from Japan had a fellowship

banquet during the CIGRE session. Two purposes of the banquet were to exchange information and to get better acquainted with each other. In 1994, this banquet was expanded to an international party hosted by JNC inviting important CIGRE members from overseas. Unofficial casual conversation at parties definitely works well in enabling real exchanges of information.

Formal translation for the name of CIGRE was officially fixed in 1989, which was “Kokusai Daidenryoku System Kaigi”. Before this, we had several other translations in Japanese.

(4) - Period (IV)

Chairmen: Messrs. T. Mitsui and T. Amakasu (1997–2000)

After Prof. Y. Sekine’s tenure, Mr. T. Mitsui was elected chairman in 1997. Mr. T. Amakasu replaced the latter in 1998. Even though the chairman of the JNC had been elected from universities before Mr. Mitsui, Mr. Amakasu was the first chair elected from manufacturers. After this, the chair of the JNC was alternately elected from utilities and manufacturing companies.

JNC’s activities were stable and successful during this period. SC11 (Rotating Machines) was held in Yokohama and SC22 (Overhead Lines) was held in Sendai, both in October 1997. The main topics were superconducting generators in SC11 and the development of overhead lines in Japan including UHV in SC22.

During this period, the ex-chair Prof. Y. Sekine not only served as a member of the AC but also of the EC. He also served as AC representative on the Technical Committee and Treasurer; he was the first Asian to serve as an executive member of the CIGRE’s Central Office. He was chosen as an honorary member in 2000. In the same year, a preliminary meeting to establish the Asia-Oceania Regional Council of CIGRE (AORC) was held under Japanese leadership, which was fully supported by the idea of “region” stipulated in CIGRE’s master plan. As a matter of fact, AORC was the first regional council established in CIGRE.

(5) - Period (V)

Chairmen: Messrs. M. Shiga, T. Kawamura, T. Hayashi, and I. Tai (2001–Current)

CIGRE introduced a tenure system for the Administrative Council during this period. The members were elected in a biannual vote. To further motivate the national panel, JNC encouraged the hosting of CIGRE meetings such as SC meetings and working groups (WG) and set a target to host two SC meetings every two years. JNC also encouraged the recruitment of new members. The number of collective members (II) was increased to 11 compared to the former two. The number of individual members reached over 100 in 2002. The JNC website was created and a mailing service was also started then.

In the same year, CIGRE reorganized 15 SCs to 16 SCs. The JNC elected 16 regular members according to this reorganization.

The AORC was approved by CIGRE's head office in February 2001. The first meeting was held in Bangkok, Thailand in March. The founding chair Prof. Y. Sekine presided over a meeting in Cairns (Australia) and in Seoul (Korea). He chaired the 2002 AORC session in Malaysia.

In 2004, JNC celebrated its 50th anniversary and published an almanac. For the anniversary, Prof. Y. Sekine made a commemorative speech celebrating the achievements of the last half-century. The speech was recorded on DVD and delivered to JNC members and attendees. In the same year, an EC meeting of CIGRE was also held in Tokyo. There were 26 overseas participants who attended the meeting and the one-day technical visit was to Higashi Uchisaiwaicho substation.

Since 2005, JNC has been inviting WGs systematically to Japan. SCA3 (High Voltage Equipment) and SCB3 (Substations) were held in Tokyo in 2005. SCB1 (Insulated Cables), SCB4 (HVDC and Power Electronics), SCC1 (System Development and Economics), and a symposium in Osaka were held in 2007. The theme of the symposium was "System Development and Asset Management Under Restructuring"

Mr. S. Mori, the president of Kansai Electric Power Co., Mr. T. Katsumata, the chairman of the Federation of Electric Power Companies of Japan, and Mr. E. Shoyama, the chairman of the Japan Electrical Manufacturers' Association were the keynote speakers. The presence of the three impressed the importance of CIGRE to the press reporters. The symposium was attended by 339 participants and all the events were very successful. The attendees visited the Kii-Channel HVDC Link including the Kihoku converter station. The first AORC meeting in Japan was also held in Osaka.

As the latest events, SCC4 (System Technical Performance) and SCD2 (Information Systems and Telecommunication) were held with colloquia in 2009. For SCC4, 103 attendees met in Kushiro, Hokkaido while 291 met in Fukuoka for SCD2. Each of the numbers is rather large for an event on a single SC.

3. Current Japanese National Committee of CIGRE

As of December 2009, JNC has 35 collective members (I), eight collective members (II), two honorary members, and 254 individual members. Collective members include universities, institutes, utilities, and manufacturers. While all the JNC activities are basically supported by the voluntary contributors of JNC members, some of the power industry based organizations are playing a very important role to enhance JNC activities.

1990	1995	2000	2005	2010
		△ Yasuji Sekine		△ Takashi Hayashi

1990	1995	2000	2005	2010
	△ Shoichi Saba			
	△ Iwao Miyachi			
	△ Masayuki Ieda			
	△ Yasuji Sekine			
	△ Sakuro Tsurumi			
	△ Tatsuo Kawamura			
	△ Yuzo Ozaki			
	△ Akihiro Ametani			
	△ Katsuhiko Naito			
	△ Tsuneyoshi Takasuna			
	△ Yoshihide Hase			
	△ Misao Kobayashi			
	△ Teizo Sato			
	△ Junichi Toyoda			
	△ Eiichi Tamaki			
	△ Shunichi Ito			
	△ Kazuhiro Takahashi			
	△ Makoto Tari			
	△ Shinichi Iwamoto			
	△ Toshikatsu Tanaka			
	△ Teruo Fukuda			
	△ Nobuo Fukushima			
	△ Tadao Amakasu			
	△ Tsuneo Mitsui			
	△ Teruyoshi Mizutani			
	△ Yukinori Ichida			
	△ Shojuke Mori			

1995	2000	2005	2010
△ Takashi Hayashi			
△ Masayuki Ieda(SC15)			
△ Zensuke Iwata(SC21)			
△ Shunichi Ito(SC23)			
△ Yuji Kubota(SC22)			
△ Kazuhiro Takahashi(SC37)			
△ Katsuhiko Naito(SC33)			
△ Toshikatsu Tanaka(SC15)			
△ Makoto Tari(SC11)			
△ Hiroki Ito(SCA3)			
△ Masayuki Nagao(SCD1)			
△ Makoto Yagi(SCC1)			
△ Masaru Ichii(SCC4)			
△ Akihiro Ametani(SCC4)			
△ Susumu Sakuma(SCB1)			
△ Yukichi Sakamoto(SCB2)			
△ Koji Kawakita(SCB3)			
△ Yukiyasu Shirasaka(SCA2)			
△ Takeshi Yokota(SCB3)			
△ Hitoshi Okubo(SCD1)			
△ Masayuki Yamasaki(SCD2)			

Table2 - Honorary members**Table 3 - Technical Committee award holders****Table 4 - Distinguished members**

The examples are the Federation of Electric Power Companies (FEPC), the Japan Electrical Manufacturer's Association (JEMA), the Electric Technology Research Association (ETRA) and the Institute of Electrical Engineers of Japan (IEEJ). FEPC is an association composed of 10 electric power companies. JEMA consists of major Japanese manufacturing companies in the electrical industry including power and industrial systems, home appliances, and related industries. ETRA members are not limited to utilities and/or manufactures but it contains general infrastructure firms and power consumers. Compared to these, IEEJ is more scientific corporation with a membership of scholars and engineers. Japanese Cigreans belong to several of these associations and provide cutting-edge technical outcomes. IEEJ based R&D committee through 1980s and 1990s is a good example, where members of Japanese national panel (JNP) of SC33 (Current C4) contributed to develop a highly accurate method of analyzing lightning surges. It enabled lightning-surge voltages to be accurately predicted in power systems. In conjunction with hardware technologies, the research enabled a global standard for the insulation design of power systems.

Similarly, other association related to the technical field and JNC cooperate to facilitate and develop the exchange of engineering knowledge.

4. Contribution of Individuals to CIGRE

- CIGRE Title and Award Holders -

Table 2 lists honorary members and Table 3 lists members who received TC awards. Table 4 lists distinguished members. JNC has matured to periodically produce these illustrious members. As of February 2010, JNC has two honorary members, 21 TC award holders, and 27 distinguished members.

5. Technical contributions by JNC to CIGRE

Figure 3 outlines the history of peak electricity demand and transmission voltage in Japanese markets. After World War II, when the nine new electrical power companies inherited Japan Electric Generation and Transmission Company's mission, the highest transmission voltage was 154 kV. After World War II, consumption of electrical energy increased drastically. It has been growing ever since. The highest transmission voltage in 2009 is 500 kV even though some commercially operated equipment is already rated at 1,100 kV and ready for UHV operation.

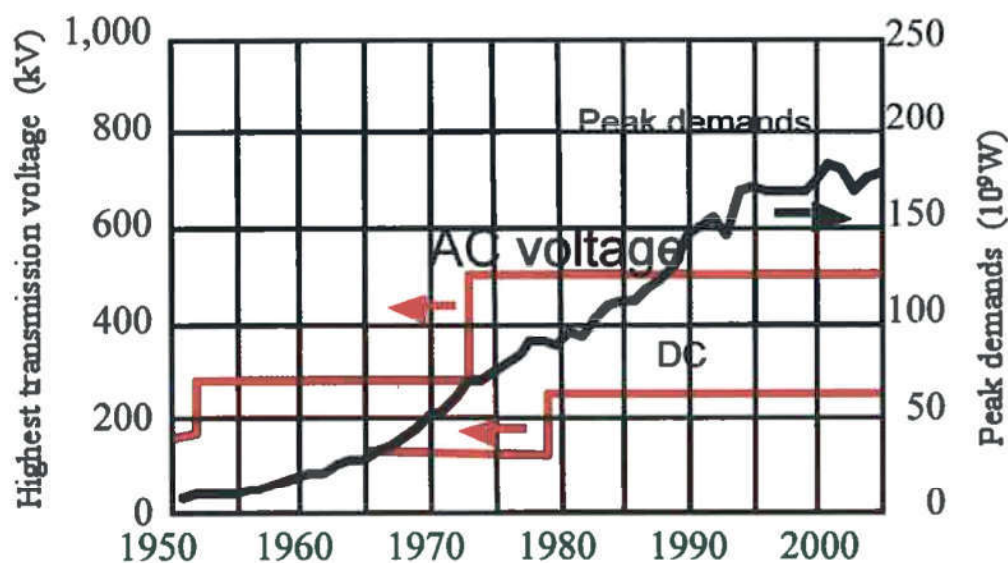


Fig.3 - DC/AC transmission voltage and peak demand of Japan

5.1 Outstanding inventions in Japan

Japan has developed and delivered technologies to the world. Here are two examples of outstanding Japanese inventions. Another example is the utilization of an invention proposed by others.

A varistor using a zinc oxide element as an overvoltage protection device for low-voltage circuits was developed in 1970. Applying its outstanding nonlinear characteristics to high-voltage circuits, a 66-kV-class zinc oxide arrester (the metal

oxide varistor: MOV) was then developed in 1973. In several years, the MOVs came to be a global standard, and IEC-60099-4 “Metal-oxide surge arresters without gaps for a.c. systems” was established in 1991 (SCC4).

A cross-linked polyethylene (XLPE) insulated power cable is another example. It was favorable for fire protection and ease of maintenance. The first XLPE cable was laid in 1988. The XLPE cable with 27-mm wall thickness and straight through joints was laid in 2000 as the “Shin Toyosu Line”. for 500 kV and 40 km long, which is a monumental achievement in the world (SCB1).

As the last example, a cutting-edge variable-speed pumped storage system for hydropower went into operation in 1990 at 85MVA, 13.8kV, 130-156rpm. Variable-speed operation could enable a hydro-generator-motor to control fluctuating frequencies that are also caused by renewable power sources. As of 2009, 9 units have been already in use. The principle of the system was proposed in another country, the practical use is surely realized in Japan. The new stabilizing scheme is now under the spotlight (SC A1).

5.2 Other outstanding technologies associated with each Japanese National Panel

SCA1

Since nuclear-power plants were incorporated in the 1970s and used for base-load operations, thermal and hydraulic power plants were operated to meet variations in load. Due to this, the turbo-generators for thermal power plants faced severe operating conditions such as daily start and stop (DSS). Because of this, Japanese National Panel (JNP) of SCA1 had to have augmented generator technologies to ensure greater reliability. Utilizing high-thermal-conducting insulation is a good example where Japan originated the technique, which drastically improved the reliability of generators. In later technology, superconducting generators were developed and connected to the actual grid and tested. The capacity of 81 MVA is still the highest in the world for a superconducting generator.

SCA2

Japan has concentrated on technology involving high-power-density transformers and the prevention of faults caused by natural disasters.

Techniques of gas insulation, gas diagnosis, and flame-retardant liquids are some of those that have been reported. Maintenance and diagnostic techniques such as analysis of dissolved gas have also been reported. Of these, topics that have been highlighted are static electrification and the development of UHV transformers. In the 1970s, static electrification faults were experienced for the first time at energizing 500-kV transformers. Since then, Japan has been a leader in investigating this phenomenon, and countermeasures and the effects of aging are new items. Results have been continually reported. The prevention of static

electrification caused faults is a key technology to develop compact transformers with high power density.

In UHV technology, UHV transformers of practical size have been developed and field tested. The results of long-term tests have been continually reported.

SCA3

Life-cycle cost of switching equipment has become a main concern of SC A3 due to increased numbers of aged equipment as well as severe competition caused by deregulation in the electrical power industry. First and second international surveys to investigate failures in circuit breakers were carried out in 1974 and 1988. The result showed that low failure rate on gas circuit breakers in Japan was outstanding. The third international investigation was started in 2004, and its scope was expanded to deal with disconnecting switches, earthing switches, and instrument transformers in addition.

In conjunction with the construction of UHV transmissions in China and India, IEC asked CIGRE to investigate the technical requirements for UHV substation equipment. WG A3.22 was formed for this reason and Mr. Hiroki Ito of Mitsubishi Electric Corp. contributed as a convener. In 2008, WG A3.22 submitted Technical Brochure 362 on “Technical requirements for substation equipment exceeding 800 kV” and the final report was submitted in 2009.

SCB1

Japan has been fortunate enough to lead in the field of cable technologies for high-voltage use.

Before the development and wide use of XLPE cables, polypropylene laminated paper (PPLP) insulated oil-filled (OF) cables were developed. These cables have eliminated loss significantly. A 500-kV OF cable was laid on the bridge for the Honshu-Shikoku interconnection line.

Super-conducting cables have been developed and studied that are insulated for low temperatures and have thermally insulated conduits for the temperature of liquid nitrogen. JNP-SCB1 successfully conducted a long-term aging test on a 66-kV triplex cable system in 2001. A manufacturer and a laboratory conducted a test on a 77-kV 500-m-long single core cable in 2004. JNP took part in the “Albany project” in the US in 2006 and the project started transmission via superconducting cables.

In 2011, 66-kV/200-MVA/250-m-long superconducting cables are to be field-tested in an actual grid in Japan.

SCB2

The application-oriented development of composite fiber-optic ground wire (OPGW) technology, has taken place in Japan. JNP-SCB2 has led the approach to

design by achieving large short-circuit current capacity in compact size by using silicon fiber. JNP has also led in systematic methods of evaluating and testing OPGW characteristics. Particularly in terms of electrical characteristics, JNP has played a key role in establishing analysis techniques to determine the temperature of OPGW components when short-circuit current is passed through them, as one way of measuring the various properties OPGW is required to meet.

Even though multiple and diverse OPGW structures have been developed, consideration of electrical characteristics has been a critical factor in evaluation to determine the present OPGW structure. The methods used for evaluation and testing in Japan have directly been adopted such as the short-circuit and arc-resistance tests specified in the IEC standards.

JNP-SCB2 have also made further contributions in the area of maintenance technology in recent years, especially by offering a technique for detecting corrosion parts of OPGW.

SCB3

A topic unique to Japan is the requirement for high power density at substations because designated areas are limited in large cities. For this reason, technologies that have originated in Japan involve compactness at substations. JNP-SCB3 reported on thermal design for 12,000-A bus lines in 1974. European members reportedly had doubts over such a large rating. In 1976, JNP reported on Hybrid-GIS (H-GIS) to achieve compact substations. In due course, H-GIS started to be used worldwide. The low failure rates of GIS in Japan were highlighted in the 1990s and JNP contributed to manufacturing and quality control of GIS. JNP also reported a UHV test field and a 275-kV gas-insulated underground substation in downtown Tokyo. JNP-SCB3 has been conducting further trials on compact GIS substations in the last decade and means of disaster prevention. The result of these studies will continue to be reported.

SCB4

Light triggered thyristors (LTTs) and LTT applied valves represent HVDC technologies that originated in Japan. The world's first LTT was utilized for a thyristor valve to replace a 125-kV module at the Sakuma FC Station in 1983. Improved LTTs were introduced at the Shin-Shinano FC Station in 1992 and they have been used in all HVDC projects in Japan since then. The capacity increased from 6 kV–2.5 kA to 8 kV–3.5 kA for Kii-channel HVDC Link. As LTTs reduce the number of parts to 1/10 of those in electrically triggered thyristors (ETTs), they enable systems to be downsized with a great deal of reliability.

Other technologies that have originated in Japan are voltage source converters (VSC) based flexible AC transmission systems (FACTS) and HVDC systems. The world's first STATCOM equipment started commercial operation in 1991 at the Inuyama Switching Station. Three 53-MVA voltage source converters were

installed as a three-terminal back-to-back (BTB) system in 1998, and through 1999, extensive field testing was carried out at the Shin-Shinano substation where 50/60 Hz power systems are interconnected. The multiterminal VSC BTB system test was an epoch-making event in the technological history.

SCB5

A power system stabilizing system was designed to prevent the risk of out-of-step, abnormal frequency, and voltage collapse before any of the phenomena became critical accomplished by rapidly controlling the generator or load. This technology has progressed despite major blackouts such as that in the Kansai area due to the Mihoro cliff failure in 1965, and that due to the voltage collapse in the Tokyo area in 1987. The technology has also been acknowledged worldwide.

Other countries have also suffered from various blackouts and special protection schemes (SPSs) became major concerns worldwide. WG34.08, on "Isolation and Restoration Policies", was formed in 1999. Mr. Masanori Matsuura of the Chubu Electric Power Company acted as a convener and in 2002 the WG published "Isolation and restoration policies against system collapse". This was the very first occasion where an SPS had been internationally examined.

A new system of protection called the wide area protection system (WAPS) has recently been proposed. Japan originally produced a system for stabilizing power and still continues to contribute to incorporating cutting-edge technologies.

SCC1

One of the remarkable contributions that Japan has made in the area of power-system planning has been to apply DC transmission to bulk-power transmission.

Bulk-power-transmission systems have been required in advanced countries since the 1960s because large-capacity power plants have become major energy sources along with the rapid increase in the demand for power. Bulk-power-transmission systems, which were economically advantageous, were increasingly required in power development and transmission projects that needed long recovery times for investment in the mid 1990s, because deregulation had been introduced to electric-power industries throughout the world. Under such conditions, JNP-SCC1 as a convener of WG37-22's "Bulk Power Transmission" has clarified issues with DC transmission in power-system operation, compared DC transmission with AC transmission through case studies of various HVDC projects including the Kii channel project, and has finally established the concepts underlying the process of determining optimal power systems for bulk power transmission.

SCC2

Japan developed a real-time control system for stabilizing power system for the first time throughout the world, by using its on-line transient stability control

(TSC) system. This system uses on-line data obtained from energy management system/supervisory control and data acquisition (EMS/SCADA), and carries out periodical calculations on transient stability. The on-line system can react flexibly and effectively, based on the actual status of the power system. Also, it has enabled the maximum Available Transfer Capability (ATC) to be increased, as well as facilitating highly secure operation of the power system.

Japan has carried out a research project on a wind farm to stabilize fluctuations using a battery energy storage system (BESS), which was reported at the CIGRE Session in 2008. The project focused on the development of controls to minimize the capacity of a BESS. One of the controls developed by the project was to maintain the battery-charging level within an appropriate range. If the charging level is not regulated, it exceeds the upper or lower limit. "State-of-charge feedback control" has contributed to reduced energy capacity for a BESS while maintaining stable operations.

SCC3

Technologies discussed in this SC that have originated in Japan were countermeasures against corona noise in the vicinity of transmission lines, countermeasures against aeolian noise, and measurements and analyses of audible noise produced by corona discharge from UHV transmission lines. To bolster these contributions, JNP-SCC3 published "Radio interference research in Japan with special reference to E.H.V. transmission" and "Interference produced by the corona effect of electric systems". JNP developed countermeasures against aerolian noise, which was technology that originated in Japan. This was fully reported as the "Development of low noise conductors for 1,000-kV transmission".

The scope of the SC incorporated all environmental aspects in 2002 and "Utilities Practices in a Sustainable Development Performance Indicator" was published to take into account this new aspect. The Japanese utility companies approach to transmission and distribution were incorporated in this document.

SCC4

Japanese researchers proposed the up-and-down method in the 1960s, which enabled an accurate estimation of 50% flashover voltage (V50) with a little number of examinations, instead of the then used interpolation method. A highly accurate method of analyzing lightning surges using Electro-Magnetic Transients Program (EMTP) was developed in 1980s and 1990s. Then, gas-insulation apparatus using SF₆ gas realized compact-designed power apparatuses. Combining the analysis, the zinc oxide arrester, and the gas insulated apparatus, a new technique of designing insulation was developed. This streamlined insulation design in the power systems ranging from 66/77 kV to 500 kV. The up-and-down method, zinc oxide arresters, and the proposed design technique became a global and widely used standard.

A transmission line arrester (LA) was developed in the late 1980s aiming to prevent double circuit outages caused by lightning. In particular, the transmission line arrester with an external series gap (EGLA), which was developed in Japan, has been widely applied to systems from 22-kV to 500-kV systems, mainly applied to 66/77-kV systems. EGLA has been gradually adopted throughout the world for its excellent performance.

SCC5

Deregulation of the power market in Japan commenced in 1995, when wholesale was liberalized. Retail sale for large and medium commercial and industrial sectors has also been liberalized since 2000. Deregulation has contributed to reduction of electricity prices.

In 2005, Electric power system council of Japan (ESCJ) was established to ensure the fairness and transparency of the transmission network usage. ESCJ is a private and neutral organization designated by the government. It establishes grid codes and surveys the compliance of the participant to the network with the published rules in order to enhance competition through multi-regional markets taking into account power system reliability.

In 2005, Japan Electric Power Exchange (JEPX) also started its transaction, including multi-regional spot and forward markets, which are supported by congestion management mechanism provided by ESCJ. JEPX has also been operating multi-regional intra-day markets since 2009.

SCC6

The autonomous demand area power system (ADAPS) consists of loop power-flow controllers, which utilize power-electronics technology to control the power flow and maintain an appropriate system voltage, and supply and demand interfaces, which play the role of smart meters. This new type of power-supply system was proposed as a technology that could not only solve problems with the massive introduction of DER/RES, but would also utilize them.

The microgrid demonstration was presented at the 41st and the 42nd CIGRE sessions. This microgrid system with a total capacity of 610 kW had been demonstrated for two years in the city of Hachinohe, located in northeastern Japan. The system supplied electricity to end-users with complete RES, which consists of photovoltaic, wind turbine, and bio-gas engine generators. The output fluctuations of intermittent generators were compensated for by controllable resources such as bio-gas engines and a storage battery. One-week of islanding operation was also carried out and it was demonstrated that an adequate power quality for voltage and frequency was maintained by using four-layered EMS during this period.

SCD1

Many original electrical insulating material related technologies have come from Japan. Among them, the following are outstanding and now contribute as useful and necessary tools in industries and academia all over the world. In 1980s, computers were introduced in partial discharge (PD) measurement and the phase angle resolved PD measurement technique was developed in Japan. This technique became a trigger and impacted further development of PD based electrical insulation diagnostics of electric power apparatus. In 1990s, the visualization of charge behavior inside electrical insulation materials, which was one of the dreams of electrical insulation researchers and engineers, came to be realized by the development of Pulsed Electroacoustic (PEA) method in Japan. This method is now used all over the world and has become a common tool to investigate space charge distributions inside solid insulating materials. In IEC the standardization of PEA method is now in progress under the leadership of Japan.

SCD2

Japanese EPU's have been constructing state-of-the-art IP networks integrating systems such as supervision and control of electric power systems. Cutting-edge IP technologies enable very flexible and cost-effective use of networks and ensure efficient performance and excellent reliability.

Various optical-fiber technologies were studied by WG15 whose regular members all consisted of Japanese participants. Two TBs were issued in 2004, which were "New Optical Access Technology" and "All-Optical Backbone Technology".

ICT architecture that achieves networking in widely distributed electric-power-control devices in real time has been proposed.

As the outcome of those activities, WG and TF documents are prepared by Japanese conveners. The list of which is attached as Table 5.

Table 5 List of documents published by Japanese conveners

Year	WG & TF	Title/Convener
1988	TF38.02.07	An international survey of the present status and the perspective of expert systems on power system analysis and techniques Prof. Yasuo Tamura (Waseda University)
1989	TF38.04.04	Electric power transmission at voltages of 1,000kV AC or ± 600 kV DC and above. Network problems and solutions peculiar to UHV AC transmission Mr. Yukinori Ichida (Tokyo Electric Power Company)
1991	TF38.06.01	Expert system applied to voltage & VAR control FINAL REPORT Prof. Yasuo Tamura (Waseda University)
1992	WG21.14	Guidelines for tests on high voltage cables with extruded insulation and laminated protective coverings Mr. Hisanori Furusawa (Furukawa Electric Company)
1992	TF33.04.04	Artificial pollution testing of HVDC Insulators: Analysis of factors influencing performance Prof. Katsuhiko Naito (Nagoya Institute of Technology)
1992	TF38.02.08	An international survey of the present status and perspective of long-term dynamics in power systems Prof. Yasuo Tamura (Waseda University)
1993	WG37.08	Adequacy and security of power systems at planning stage Dr. Kazuhiro Takahashi (Central Research Institute of Electric Power Industry)
1993	TF38.02.02	Modelling and simulation of black start and restoration of electric power systems Mr. Takashi Hayashi (Tokyo Electric Power Company)
1994	WG21.06	Accessories for HV cable extruded insulation Mr. Zensuke Iwata (Furukawa Electric Company)
1994	WG37.17	Impact of technological progress on demand-side appliances Dr. Kazuhiro Takahashi (Central Research Institute of Electric Power Industry)
1996	TF38.06.05	Application of expert systems to education and training of power system engineers Dr. Hiroshi Suzuki (Mitsubishi Electric Corporation)
1998	WG11.01	Negative-phase sequence and harmonic-current capability of turbo-generators Dr. Makoto Tari (Toshiba Corporation)
1999	TF33.11.03	Application of metal oxide surge arresters to overhead lines Prof. Tatsuo Kawamura (University of Tokyo)
2002	TF15.06.02 Group A WG15.10	Interfacial phenomena affecting electrical insulating properties in composites - Proposal of test method, results and discussion of CIGRE RRT - Dr. Toshikatsu Tanaka (Central Research Institute of Electric Power Industry)
2002	WG34.08	Isolation and restoration policies against system collapse Mr. Masanori Matsuura (Chubu Electric Power Company)
2002	TF38.01.11	Impact on network structure and control by Task Force 38.01.11 Mr. Seiji Sekine
2004	WG37.33	Development of dispersed generation and consequence for power systems Mr. Makoto Yagi (Kansai Electric Power Company)
2008	WGA3.22	Technical requirements for substation equipments exceeding 800 kV Dr. Hiroki Ito (Mitsubishi Electric Corporation)
2008	WGB3.15	Cost reduction of air insulated substations Mr. Koji Kawakita (Chubu Electric Power Company)

6. Future plans

The Japanese National Committee of CIGRE has been producing a Treasurer and members for the AC, Steering Committee, and TC since 1996. As a leading country in the Asia-Oceania region it continues to contribute to the growth of the power industries of the world with outstanding technologies that have originated in Japan.

With the advent of the new century, the numbers of CIGRE members have rapidly been growing as well as with increasing attention focused on CIGRE in Japan. This was the outcome of the promotion activities related to business groups including universities, and also of the hosting of Steering Committee meetings and the colloquium that encouraged power industries to acknowledge the importance of CIGRE. JNC sent regular members of all 16 SCs on overseas activities. The number of accepted technical papers has been within the top ranking for many years. In the future, JNC will lead us to a low-carbon future apart from original XLPE-cable, ZnO-arrestor, and UHV technologies. Energy-saving devices such as heat pumps, renewable energy such as solar and wind-power systems, pumped storage, and electric vehicles will help us all in the future. To achieve this, sending conveners to WGs/TGs and continuous contributions are necessary. JNC fully supports the election of a Japanese chairman for a study committee, who will be able to contribute to an even brighter future.



History of Korea National Committee of CIGRÉ

1. Characteristics of the Korean Power Grid

Korea is an exotic land of contrasts and harmony with its modernity comfortably blended based on its 5,000-year-old heritage. Korea is a uniquely appealing country endowed with a history and culture thousands of years old. The situation, as a peninsula off the northeast coast of China with Japan to the east across the East Sea, allowed Korea to absorb Chinese influences and to foster its own indigenous cultures. Korea's name originates from the early dynasty name of Goryeo, which means "high and clear", and symbolizes the country's rugged mountains, clear blue skies and rushing streams.

The Korean Power Grid is an island system with no interconnection with other countries. As a single power system, it is considerably large and it is not influenced by an unstable external system since it has no external connection. However, domestic power systems have a disadvantage in frequency control due to the power generation capacity of nuclear power plants that occupies 25% of the entire power generation capacity in Korea. (For safety reasons, nuclear plants adopt governor-free operation.) And also a huge amount of electric power is supplied from non-metropolitan areas through six routes of transmission lines (two for 765kV and four for 345kV).

Moreover, most of power plants are located far from the metropolitan area such as eastern, western and southern coast of Korea. However, it could be pointed out that the power supply and demand is unbalanced in metropolitan areas, for which maintaining a reactive power reserve in metropolitan areas is an important issue when incidents occur on transmission routes supplying power. For this purpose, a Special Protection System (SPS) has been installed for load shedding in case of a failure of the 765kV transmission line.

2. The Electric Era

- 1898: First official public lighting :



Korea's first electric lamp was switched on at Geoncheong-gung, Gyeongbok Palace, in March, 1887.

- 1898: Foundation of the Han-sung Electric Company



The Hansung Electric Company, KEPCO's predecessor, was established by Emperor Gojong following input from American expert Colbran.

- 1899: Streetcar trials



A streetcar test-run took place on May 4, 1899, and many passengers began using the service when it commenced on May 20 that year.

- 1900: First private lighting

Korea's first street lighting was switched on April 4, 1900.

- 1930 - 1945: Large scale hydroelectric power plants



A total of 21 hydroelectric power plants (a total generation capacity of about 1,600 MW) were constructed in the northern regions of Korea from 1930 to 1945.

- 1948: The first blackout (14th May)



With power generation cut-off by North Korea in 1948, Electra, a power generating vessel at Incheon Harbor, and the Dangin-ri Thermal Power Plant started producing electricity for South Korea.

- 1961: Foundation of KEPCO

The Korea Electric Power Corporation was founded in 1961 and started unlimited transmission of electricity in 1964.

- 1964: Start of electrification work



The limited transmission in existence since North Korea's blackout was lifted, and rural electrification work commenced in 1964.

- 1978: First nuclear power plant

A Pressurization light-water type Gori nuclear powerplant was completed in GyeongNam province on April 10, 1978.

- 1996: Nuclear power project in North Korea



KEPCO was a prime contractor in the establishment of a project to develop two light-water reactors in May, 1996. However, in October 2002, all projects were suspended completely. KEPCO won the bidding for the world's largest nuclear power project in the United Arab Emirates in December 2009.

KEPCO's High voltage Testing Center at Gochang

In order to meet the power demand ascribed to the rapid national economic growth exceeding annually 10% throughout the 1980s, the establishment of any large capacity transmission network based on novel technology has been required to transmit the electric power from the remote generation plants to heavily demanding regions. Consequently, Vertically Arranged Two Line 765kV Transmission method was realized for the first time in the world to replace the existing 345kV transmission network. For the experimental investigation in commercial scale, KEPCO established high voltage testing center at Gochang where relevant test facilities were installed in 1989. And now, it is becoming a world-renowned testing center for the technology development required in the fields of distribution, transmission and renewable energy.

The main equipments are as follow: 765kV AC, ± 500 kV HVDC testing line, Test site for underground transmission and distribution power cables, Vibration of overhead line test facility, 4MV Impulse Voltage and 65kA Impulse Current source, 3000A AC test facility, Electrical environment simulation test facility, Outdoor transmission line insulators, Lightning inducing steel tower, Power quality test facility, Magnetic field test facility, and Public Information Center for understanding EM disturbance.

This center provides an important test bed for the R&D program sponsored by KEPCO, power industries and government. In addition, various international and

domestic conferences and training workshops are held exchanging and sharing the current and novel technologies and experiences. Enormous efforts would be put forward to be qualified as an internationally authorized certification organization in the field of power business. Based on these activities, this center can play another significant role to improve the relevant cutting edge next generation power technologies required for realizing Smart Grid within the next two decades.

3. History of Korea National Committee of CIGRE

The “Korea National Committee of CIGRE” was founded in 1979 in order to ensure the progress of technology and to develop overseas markets through an affiliated research group. It has also performed a role as mediator in the integration of global leadership in the development of national heavy electric machinery for three decades.

KNC gained approval to launch the National Committee in 1980 in Paris for which only two members participated. With Japan, the first official meeting as an international exchange between Korea and Japan was held in 1985; since then, some private meetings have been held occasionally to improve mutual relationships through visits.

KNC also began to publish an annual activity report in 1991 and has held an annual workshop on the subject of power technology since 1994 to celebrate its foundation. The first domestic study committee corresponding to SC B1 was founded in 1992 for manufacturers, universities and research institutes with the support of KEPCO.

The number of individual members has been increasing constantly, and KNC entered the ranks of the first top 20 member countries in 2006: 52 in 2000, 115 in 2002, 120 in 2004, 202 in 2006, and 143 in 2008. KNC has also 18 collective members building proper technology and business network with 92 member countries of CIGRE.

Three CIGRE supported activities were hosted by KNC. Korea hosted the AORC 2002 meeting in Seoul attended by around 50 domestic and foreign members, including AORC Chairman Sekine. In 2007, Korea conducted the CIGRE SC A1/D1 Meeting and Joint Colloquium in Kyung-joo, where approximately 201 specialists participated thanks to the financial support of three major Korean manufacturers. In 2009, the SC B2 and SC B5 member meetings and technical symposia were held in Seoul and Jeju Island, respectively. For the former, a large-scale technical visit was carried out, including travelling more than 1000 km over two days.

At the CIGRE General Session in even number years, the number of participants from different organizations was as follow: 22 in 2000, 33 in 2002, 37 in 2004, 64 in 2006, and 62 in 2008. For technical participation in the 16 Study Committees, the number of Regular Members (RM) has increased steadily: 1 in 1988, 4 in 2002,

6 in 2004, 8 in 2006, and 13 in 2008. The number of papers presented at the CIGRE General session has also shown steady growth: 3 in 2000, 5 in 2002, 13 in 2004, 18 in 2006, 11 in 2008, and 13 papers in 2010.

CIGRE KOREA History	
1979	Foundation of Korea National Committee of CIGRE
1980	Approved at the General assembly meeting of CIGRE
1981	Participation in CIGRE SC-21 Meeting as an Observer (The first official dispatch)
1982	10 participants in 29 th CIGRE
1985	Official meeting between Korea and Japan
1986	17 participants and first paper presentation from industry.
1988	First regular member of SC 21 13 participants in 32 nd CIGRE
1991	First activity report of KNC
1992	3 paper presentations and 12 participants in 34 th CIGRE,
1995	First workshop for celebrating 15 th anniversary
1996	4 paper presentations and 20 participated in 36 th CIGRE
1998	10 paper presentations and 13 participants in 37 th CIGRE,
2000	3 paper presentations and 22 participants in 38 th CIGRE,
2002	AORC-CIGRE meeting in Seoul
2004	13 paper presentations and 37 participants in 40 th CIGRE, Prof. Koo,Ja-Yoon as AORC chairman and Administrative Council member
2006	15 paper presentations and 41 participants 41 th CIGRE,
2007	CIGRE SC A1/D1 Meeting and Joint Colloquium in Kyungjoo
2008	11 paper presentations and 64 participants in 42 th CIGRE,
2009	CIGRE SC B2 in Seoul and B5 and Joint Colloquium in Jeju

The organization of the Korea National Committee of CIGRE KOREA is shown in Fig. 1, and the following is an overview of the National Committee's operational organization (Table 1 & Table 2)

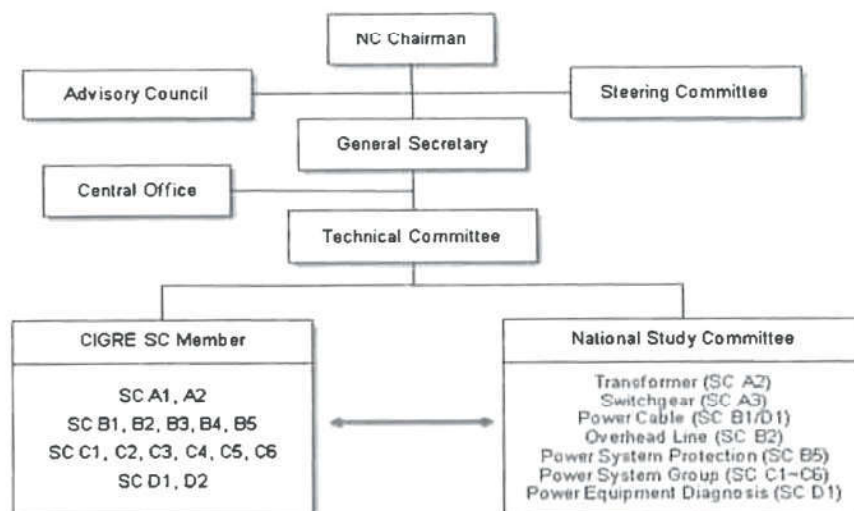


Fig. 1. Korea National Committee of CIGRE**Table 1. Members of the governing body of the KNC of CIGRE in 2010**

Chairman	Chairman Kim, Mun-Deok (KEPCO)
General Secretary	Prof. Koo, Ja-Yoon (Hanyang University)
Vice chairman	Kim, Yong-Joo (KERI), Moon, Young-Hyun (Yonsei University), Koo, Ja-Kyun (LSIS CEO)
Executive committee member	NC Chairman and vice-chairmen, General Secretary Kim, young-Nam (<i>Hyundai Heavy Industries Co.</i>), Cho, Hyun-Mun (<i>Hyosung Co.</i>), Lim, Jong-Uk (<i>Taihan Electric Wire Co.</i>), Heo, Jung-Seok (<i>Iljin Electric Co.</i>), Sim, Jong-Tae (<i>Tae Gwang E&C</i>), Yoo, Byung-Eun (<i>Vitzrotech</i>)

Table 2. Chairman & General Secretary of the KNC of CIGRE since 1979

Term	Chairman	Vice-chairman	General Secretary
May 8th, 1979 Mar. 4th, 1991	Yang, Heung-Seok (Korea Electric Association)		Song, Gil-Young (Korea University)
Mar. 5th, 1991 Apr. 15th, 2001	Song, Gil-Young (Korea University)	Lee, Dong-Ho (91~92) Park, Tae-Su (93~01)	Koo, Ja-Yoon (Hanyang University)
Apr. 16th, 2001 Apr. 4th, 2005	Jung, Tae-Ho (KEPCO)		Koo, Ja-Yoon (Hanyang University)
Apr. 5th, 2005 Mar. 12th, 2009	Koo, Ja-Hong (LS Group)	Kim, Yong-Joo, (KERI) Park, Jong-Geun (Seoul National U.)	Koo, Ja-Yoon (Hanyang University)
Mar. 13th, 2009-Present	Kim, Mun-Deok (KEPCO)	Kim, Yong-Joo, (KERI) Koo, Ja-Gyun, (LSIS) Moon, Young-Hyun (Yonsei Univ.)	Koo, Ja-Yoon (Hanyang University)

The Korea National Committee of CIGRE named experts to improve national prestige and make progress in relevant areas (Table 3) where 13 Regular Members and 3 Observer Members are the representatives for Korea. They participate in the annual SC Members Meeting and convey the Korean point of view based on interests in technology and conduct activities carried out under the direction of the National Committee dealing with the relevant power engineering areas in Korea. They also perform an important role delivering SC activities and results by building a profound international network. Furthermore, they encourage the participation at General sessions and recommend relevant domestic experts to WG, and make plans regarding symposiums, colloquiums and regional conferences under the CIGRE name. The list of Korean SC delegates is shown in Table 3.

Table 3. Korean representatives for the Study Committees of CIGRE

SC	Field of Activity	Korean Delegate		Year of Nomination	Former Representatives
A1	Rotating Electrical Machines	Kim, Yong-Joo (KERI)	RM	2004	Prof. Cho, Gyu –Bok
A2	Transformers	Hwang, In-Soo (Hyundai. Co.)	OM	2004	
A3	High Voltage Equipment	Kim, Jung-Bae (Hyosung Co.)	RM	2008	Dr. Park, Kyong-Yop
B1	Insulated Cables	Jeon, Seung-Ik (LS Cable Co.)	RM	2008	Prof. Koo, Ja-Yoon Prof. Kim, Jeong-Tae
B2	Overhead Lines	Lee, Dong-Il (KEPCO)	RM	2006	Pro. Kim, Jeong-Boo
B3	Substations	Song, Won-Pyo (Hyosung Co.)	OM	2006	
B4	HVDC and Power Electronics	Oh, Tae-Kyoo (KERI)	RM	2006	
B5	Protections and Automations	Lee, Seung-Jae (Myongji University)	RM	2008	Prof. Kim, Il-Dong
C1	System Development and Economics	Chang, Jae-Won (KEPCO)	RM	2004	Dr. Jung, Tae-Ho
C2	System Operation and Control	Bae, Joo-Cheon (KPX)	RM	2008	
C3	System Environmental Performance	Myung, Sung-Ho (KERI)	OM	2006	
C4	Overhead Line System Technical Performance	Shim, Eung-Bo (KEPCO)	RM	2008	
C5	Electricity Markets and Regulation	Park, Jong-Keun (Seoul Nation University)	RM	2004	
C6	Distribution Systems and Dispersed Generation	Moon, Bong-Soo (KEPCO)	RM	2006	
D1	Materials and Emerging Technologies	Lee, June-Ho (Hoseo University)	RM	2008	Prof. Koo, Ja-Yoon
D2	Information Systems and Telecommunication for Power Systems	Yu, Myeong-Ho (KEPCO)	RM	2004	

Table 4. Korean Technical Committee Award Recipients

Name / Affiliation	SC	Year
Prof. Koo, Ja-Yoon / Hanyang University	SC D1	2007

4. Future Vision

Korea has continued to prosper due to its advanced electricity system over the past 30 years. During this time, Korea's electricity demand has increased from 32,734 MkWh in 1980 to 385,070 MkWh in 2008. However, several problems have been encountered as a result of this increase in demand, and combining economic feasibility with environment-friendly ways must be considered without fail to solve these problems. Also, there are many problems with local autonomous entities, governments, shareholders and interested parties, and authorities still have difficulty organizing and installing new facilities due to the NIMBY syndrome.

On the other hand, the interest in New and Renewable Energy is very high as awareness of climate change and pollution problems increase. Consequently, Korea is expanding its nuclear power generation facilities continuously with sophisticated nuclear power generation and operational technologies. In addition, through the development of undeveloped New and Renewable Energy sources (wind power, solar power, etc.), the rate of generation will be expanded from 0.4% to 4.7% in 2020.

Korea was also selected as a Smart-Grid pioneer in the summit meeting of the Group of Eight (G8) industrialized nations held in July, 2009, in Italy, providing worldwide recognition of our technologies and capabilities. Korea has also designated Smart-Grid and executed a newly adopted policy for green development. With Smart-Grid, the application of new technologies will be accelerated and energy efficiency will be improved, leading to reduced costs for electric power supplies and a major reduction in power outages. Also, the growth of New and Renewable Energy sources will reduce pollution. These developments in electricity technologies will show how best to respond to energy and environmental problems, and will be a dynamic force for new growth and a low carbon way of life due to the energy conservation and a reduction in greenhouse gases.



History of Macedonia National Committee of CIGRÉ

CIGRE activities of the Engineering Association in Macedonia go way beyond the history of MAKO CIGRE and relate to Macedonia's membership in JUKO CIGRE (CIGRE National Committee of the SFR of Yugoslavia) 1952, through participation in all of the Conferences organized by JUKO CIGRE organization of the first Conference in Macedonia in 1962, first President of JUKO CIGRE from Macedonia, professor Stanimir Jovanivski, Ph.D. In that period, the Macedonian energy engineering community took an active part as authors, reviewers, expert rapporteurs.

The political turbulences in the early 1990s, followed by the economic difficulties and the inevitable transition in Macedonia as an independent country did not extinguish the Macedonian energy expert public's zeal for organized activity. On the contrary, predominant was the position that under such difficult economic conditions and unknown electricity future, the experts' responsibility for active engagement targeted at improving conditions should grow regardless of the difficulties. As a consequence, the activity of the local energy association was renewed.

At that time, certain issues concerning the development of the electricity system in Macedonia, as an independent system, were raised. A number of active CIGRE members – led by the awareness that development requires broader access to ideas and knowledge, and, in particular, articulated activity of the electricity community – started organizing activities in order to establish an appropriate engineers' association.

Hence, in the period 1992 -1994 an informal group of engineers and professors from the Faculty of Electrical Engineering in Skopje, gathered around a progressive circle of individuals, led by Prof. Risto Minovski, Dimitar Capov and Dimitar Stojanov. Their activities, which were committed to promotion of the idea for establishment of the Macedonian National Committee within CIGRE, Paris, were logistically supported by the electricity transmission enterprise "Elektroprenos – Skopje". They prepared the required documents and acts and organized the founding General Assembly of MAKO CIGRE.

Shortly after, the ambience in the electricity sector in Macedonia changed and

new issues were raised with the first discussions and analyses concerning the restructuring of the electricity sector, and in particular, the vertically organized company for electricity generation, transmission and distribution, which at that time was a publicly owned enterprise. In 2001, the public enterprise (Electricity Company of Macedonia) was transformed into a joint stock company in state ownership, and in 2005 was transformed into four companies in state ownership (for generation, transmission, distribution and liquid fueled thermal power plant, as an independent generator). In 2006 the distribution company was privatized. In those dynamic stages of the restructuring, MAKO CIGRE endorsed constructive environment for promotion of ideas and solutions by organizing seminars, panel discussions and presentation of academic papers.

The Macedonian Committee of the International Council on Large Electric Systems – CIGRE (MAKO CIGRE) was established on 24th of June, 1994, at the founding General Assembly. At that time, the establishing process was driven by the intention for accelerated organization of the first Conference and membership at CIGRE, Paris. For that purpose, the mandates of the chairs of each Study Committee were verified and they were required to establish the relevant Study Committees, prepare a list of preferential topics and encourage interest for papers submission. The appreciation of the activities of the energy community was openly expressed by the officials, as the Deputy Prime Minister of the Government of the Republic of Macedonia, Jovan Andonov, attended the General Assembly meeting.

The first Conference was held in September 1996, and in the same year, the General Assembly of CIGRE, Paris verified the application submitted by MAKO CIGRE for membership in the International association.



The first President of MAKO CIGRE opens the First Conference.

Since 1996, MAKO CIGRE organized six Conferences. The first Conference was attended by 210 registered participants and 79 papers were presented. The following Conferences witnessed the increase in the number of participants, where the third was attended by the highest number – 310. The number of papers presented also gradually increased, and reached its peak on the fifth Conference – 142.

The general review of topics addressed resulted in three groups of papers: the first comprised scientific papers prepared by the academic staff with special contribution from the staff of the Faculties of electrical engineering. The second group of papers emerge from the continuous collaboration between the academic circles and the utility companies, where teams of engineers and scientists propose solutions for various problems. The third consists of papers from the practice of the electricity system addressing plant problems, equipment problems and introducing new solutions and equipment.

Particular attention is paid to cooperation among experts from the energy sector companies and staff of the Faculties of electrical engineering. For the purpose of expanding topics, the association also supports the participation of foreign authors and coauthors. In terms of contribution, the Faculty of Electrical Engineering and Information Technologies in Skopje plays a leading role from the aspect of the number and quality of papers presented.

A major step in the supply of information on the association and its activities for the members, as well as the wider expert public, was the establishment of the website (mako.cigre.org.mk) in September 2001.

Since its establishment, MAKO CIGRE operates as a citizens' association with major interest in the field of electricity systems.

Throughout the years several changes were made to the association's Statutes due to the relevant legislative changes in Macedonia and with a view to improving the statutes in accordance with the reorganization of the CIGRE Technical Committee as put in force in 2002. The present name of the association is "Macedonian Committee on Large Electric Systems within CIGRE".

In 2002, with the decision taken by the Executive Board of MAKO CIGRE, the association was transformed and it currently has 16 active Study Committees.

MAKO CIGRE's governing structure is as follows: General Assembly, Executive Board and Supervisory Board. The General Assembly elects the President and Vice President of MAKO CIGRE, and they hold the same position within the Executive Board. The Executive Board elects the General Secretary. The Executive Board has additional 21 members (the 16 chairs of Study Committees and 5 renowned members of MAKO CIGRE).

The person from whom stemmed the idea and activity towards the establishment of the association and its membership in the International CIGRE, who became the first President of MAKO CIGRE, is Professor Risto Minovski, Ph.D. Not only was he the driving force in the establishing of the National Committee, but he led it throughout its first steps in the most turbulent period and chaired the organization until 2004. As an honorary President he still continues his activities in the association.

Previous Vice Presidents were Stojko Mojancevski and Aleksandar Sekerinski, who both contributed in the growth of the Committee with their unreserved efforts.

The current President, in his second term of office from 2004 is Aleksandar Sekerinski, while since 2004 the Vice President has been Professor Rubin Taleski, Ph.D. The association's General Secretary is Eva Sukleva.

A. Sekerinski, President of MAKO CIGRE, from 2004.



Two to three members from Macedonia participated regularly to the Sessions held in Paris. Macedonian members of Study Committees were: Leonid Grcev, Ph.D., in the period between 1996 and 2000 within SC 36 and Vlastimir Glamocanin, Ph.D. from 2008 within SC C1. Observer Members were: Vlastimir Glamocanin, Ph.D. in the period 2000-2002 within SC 37, Aleksandar Sekerinski in the period 1998-2002 within SC 12, Slobodan Mircevski, Ph.D, from 2008 within SC A1 and Risto Ackoski, Ph.D. from 2008 within SC C4.

Participants in Working Groups were as follows: Leonid Grcev, Ph.D, within JWG 36.04, TF 33.01.04, TF C4.4.06, WG C4.04, WG C4.2.01 and JWG C4.4.02; Ivan Kukoski within WG A1.04, Milan Cundev within WG A1.19, Vlatko Stoilkov within TF A1.20 and Laze Dimitrievski within WG A1.13. Leonid Grcev, Ph.D, presented papers and contributed to discussions at the Paris Sessions in 1996, 1998 and 2004 (papers/contributions to 1996, 1998 and 2004 CIGRE Sessions). Reports were submitted in 2000 and 2002.

In 2009, the total number of members within CIGRE, Paris was 52 Individual members and one Collective Member.

The transformations in the electricity sector in the period of 2005 to 2006 and the economic problems in the period of 2008 to 2009 resulted in the need for MAKO CIGRE to adjust to the current conditions and thus maximally assert its goals, as well as the role and need for the existence of such profiled association in Macedonia. In the presentation of its activity in front of the institutions and the public, MAKO CIGRE's mission is defined as follows: 1) as a member of CIGRE Paris to provide strong link for two-way information flow, 2) to create an ambience in Macedonia for cooperation in the electricity sector, and 3) association's activities to be recognized

as a good opportunity for presentation and affirmation of individuals and companies.

The mission is the pillar around which the goals of the Committee are created and fulfilled. The short-term goals include: (1) membership in the association, in the sense of individual membership without fluctuations, greater involvement of smaller electricity sector companies and affirmation of collective membership at MAKO CIGRE and CIGRE Paris, as well as in a way for continuous and direct presence of companies and institutions; 2) regional cooperation, and 3) new organization structure that would provide for stable funding of Conferences, activities of Study Committees, international activities, etc.

Skopje, 15 September 2009

Prepared by: Risto Minovski, Aleksandar Sekerinski, Rubin Taleski and Eva Sukleva

Aleksandar Sekerinski
President of MAKO CIGRE



History of Montenegro National Committee of CIGRÉ

Initiated by the Montenegrin Electric Enterprise and University of Montenegro, Department of Electrical Engineering, experts from Montenegro who took an active part in the activity of JUKO CIGRÉ and others the Montenegrin Committee of CIGRÉ - MNE CIGRÉ, was founded at the founding Assembly held in Podgorica, 29th of March, 2008.

In the course of 2008, the registration of the MNE CIGRÉ was completed, members of the Steering Committee, the General secretary, an administrator and accountant were appointed, 16 study committees were formed and normative acts were adopted. After meeting necessary conditions, the MNE CIGRÉ was officially recognized as a National Committee of the International CIGRÉ at the 118th meeting of the Administrative Council held in Paris on 23rd of August, 2008.

Montenegro did not start its activities within CIGRÉ in 2008. Since JUKO CIGRÉ foundation in Zagreb, Croatia, on 3rd December, 1951, in accordance with its possibilities, Montenegro has been permanently participating in the activities of this respected Association. From the moment of its foundation JUKO CIGRÉ had a very positive impact on Yugoslav electric power industry and electrical engineering industry. It may be interesting to note some topics, which dominated the First session of JUKO CIGRÉ held in 1953:

- Experience in construction of standard transformer stations;
- Problems in construction of hydroelectric power plants;
- Relay protection;
- Creation of 110 kV systems in the northwest side of the country;
- Numeric marking of phase conductors;
- The problems of regulations for plants and transmission lines;
- Rational size of construction of hydroelectric power plants;
- The operation with decreased technical minimum of thermal power plants.

The last conference of JUKO CIGRÉ (Serbia and Montenegro) was held in Serbia in 1997, when members of JUKO CIGRÉ from Montenegro announced the foundation of the MNE CIGRÉ, because Montenegro became an independent

state. When forming the MNE CIGRÉ, we pointed out that we would make our efforts to cooperate with other national committees of CIGRÉ, especially with those belonging to the ex-Yugoslavia region, with whom we had worked since 1951. There is a common interest in exchanging technical information and experiences, organizing common professional and scientific debates, tribunes and round tables on topical issues in the field of electric power. The present organization of the MNE CIGRÉ, and its activity are the same as those of the parent CIGRÉ. 16 study committees are active out of which some have working groups. The themes are the same ones as at CIGRÉ conferences but extended by specific domestic themes. Round tables or extended meetings of two or more study committees are organized for some current themes.

The MNE CIGRÉ had intensive activities in preparing the First session. Defining preferential themes and accepting 107 papers, conditions for organizing the First session were made possible.

The First session of MNE CIGRÉ was held at the seaside in Budva, from 12th to 16th October, 2009. The Chairman of the MNE CIGRÉ Study Committees, Technical Committee Chairman and Organizing Board made a great effort to prepare and organize the First session. Out of 107 papers, in accordance with the defined rules and preferential themes, 87 were accepted and presented at the Session. A significant number of papers by the authors from ex-Yugoslavia regions who were involved in the works in Montenegro were accepted. A special satisfaction for us was the fact that young experts from Montenegro presented their papers. Many CIGRÉ members from the region participated also at the First session beside local experts.

The MNE CIGRÉ is doing its best to contribute to solving current issues related to exploitation, management and development of power system in Montenegro. That is why a round table on themes related to revitalization of productive objects within Electric Power System of Montenegro, connecting EPS of Montenegro and Italy with undersea cable and the position of electric power organizations on deregulated market of telecommunications related to Montenegro was organized.

A Technical Exhibition of well-known equipment producers was held during the Session: Siemens, ABB, Schneider, Mezon and IMP. EKC, Turboinstitut, Elnos, Mezon, Siemens and IMP presented their producing programs and possibilities for offering services in electric power sector. Also, A2A company from Italy, which has become one of the stakeholders of Montenegrin Electric Enterprise, presented its energetic objects and future plans.

Since its foundation, the MNE CIGRÉ has been joined by 150 individual and 5 collective members. The MNE CIGRÉ manages financing its activity partly from the individual and collective members' membership fees, but mostly by payments of sponsoring companies interested in exhibitions and lectures during sessions.

According to the Statutes the members of the MNE CIGRÉ may be all people interested and ready to actively participate in carrying out the goals of the MNE CIGRÉ, dealing with professional and scientific problems in the field of production, transmission and distribution of electric power and electrical equipment both at national and international level. The members have the right to actively participate in all the fields of the MNE CIGRÉ, to initiate actions that may be of interest for the MNE CIGRÉ, be informed on the work of the MNE CIGRÉ. Beside that, individual members may elect and be elected to the bodies of the MNE CIGRÉ; they may be members of the Study Committees and participate in the work of the working groups.

Looking at the future we have a few challenges standing before us:

To maintain the present mode of operation of MNE CIGRÉ in the conditions of world economic crisis;

To attract young persons to work in MNE CIGRÉ when transition to market electric power industry quickly and increasingly draws them away from the technical issues although we hope and believe it is a transitional phenomenon;

To inspire the government and its bodies in the country where electric power industry is government owned property to closer cooperation with MNE CIGRÉ as regards electric power industry;

To analyze impact of Dispersed Generation based on fossil sources and Renewable Energy Sources on the environment;

To support and encourage Montenegro to build new energy sources based on hydro power and overhead lines having in mind Strategic Environmental Assessment;

To establish a free discussion by individuals at meetings of MNE CIGRÉ if their opinions differ from the opinions of their employers.



History of Netherlands National Committee of CIGRÉ

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Introduction

In the beginning of the twentieth century, the transmission voltages grew rapidly to reduce transmission losses. To improve operating efficiency, power systems started to be interconnected. The reserve power or spinning reserve could be shared and capital expenditure could be reduced. One utility could supply power to another utility whose load was high at times when its own load was low. One of the prime technical problems in the past was the parallel operation of electrical machines.

CIGRE was founded in 1921. The Netherlands contributed to the activities of CIGRE right from the beginning. The Dutch delegation to the first meeting, in November that year, was headed by J.G. Bellaar Spruyt, who was elected Vice-President at that meeting.

In 1927 the organization was structured by means of study committees (SC) and Dutch representatives played an active role in many of them. J.G. Bellaar Spruyt became the first chairman of SC 2 on High-Voltage Cables and was succeeded, after his death in 1929, by G.J. Bakker.

J.C. van Staveren, founder of KEMA, acted as secretary of SC 2 for many years. Later on van Staveren served as chairman and was succeeded as study committee chairman by R.F. Goossens in the early sixties.

The highest transmission voltage level in the Netherlands increased over the years from the 50 kV level towards a grid with connections at 110 kV, 150 kV, 220 kV and 380 kV. The Dutch National Mirror Committees of CIGRE took an active part in the technical journey of expanding power systems. Especially after the Second World War the economies were growing rapidly and the utilities had to meet a constantly increasing load. An important aspect of those times was the technological and engineering issues of power system operation.

The activities within CIGRE were over the years not only driven by the development of the Dutch grid but also by experts from the power industry in the Netherlands: Smit Transformers (which is still a leading transformer manufacturer today), the Dutch Cable Company NKF, Coq/HOLEC Switchgear (the first company to introduce Gas Insulated Switchgear), as well as several enterprises manufacturing Electrical Machines.

CIGRE's Study Committee structure was adjusted a few times, reflecting the technical evolution of that period. In 1946, an Executive Committee was set up, National Committees were organised, and a technical periodical was issued. CIGRE working groups and task forces collected field data and performed system studies, and their reports were used as input for the revision of existing IEC standards. Today IEC and CIGRE have formal technical liaisons, and many Dutch experts are members of the relevant working groups of both IEC and CIGRE.

The Early Meetings

The second meeting of CIGRE in November 1923 was attended by a delegation representing the Dutch utilities. Bellaar Spruyt, Smit Kleine, Bakker, van Staveren and a few others raised discussions about standards for overhead lines and underground cables for very high voltages and about communicating the danger of electricity to the public. At the meeting in June 1925 one of the topics was the concern about large turbo generators that were designed with a small transient reactance to improve the voltage stability of the grid. Bakker and van Staveren contributed by means of presenting a special AC-machine to study these phenomena. Measurements carried out on this analogue machine model confirmed the outcome of the mathematical exercises. Professor Hallo presented a report on the applicability of the method for determining dielectric losses of high-voltage cables to other electrical equipment.

Cables were already a major topic of interest in those days: cable circuits for 60.000 and 130.000 Volt were discussed and not only the construction of the cables but also how they had to be tested. Four or five times the nominal voltage or should one follow the French proposal: up to 40.000 Volt tests with four times the rated voltage and above 40.000 Volt twice the rated voltage plus 40.000 Volt. Other scholars were in favour of relating the test voltage to the thickness of the insulating material.

At the fifth CIGRE meeting in June 1929 in Paris the Netherlands contributed on high-voltage cables (Bellaar Spruyt), test methods for electrical machines (Bakker and van Staveren), the shape of the generator voltage curve (Lohr and van Staveren), how to test transformer oil (Ornstein) and a report about losses in oil due to AC electromagnetic fields. At the sixth CIGRE conference in 1931 there were several Dutch contributions. One of them was a report regarding grounding and safety measures for low-voltage equipment by Ehrenburg and van Staveren.

The seventh CIGRE conference was held in June 1933. Despite the severe worldwide economic crises 751 persons attended the conference. They represented 31 countries from 5 continents. From the 129 reports that were discussed the Dutch delegation contributed with two reports: one on galloping lines, another on the dielectric withstand capability of insulating paper.

The Conferences after the Second World War

The twelfth conference took place from June 24th till July 3rd 1948 in Paris. The topics were divided over four sections:

- Generation, transformation and interruption of electric current;
- Construction, insulation and maintenance of overhead lines and underground cables;
- Operation, coupling and protection of electricity grids;
- Transmission of electrical energy at ultra high-voltages.

The Dutch delegation to the thirteenth CIGRE meeting in 1950 was under the supervision of G.J.T. Bakker and H.C.J.H. Gelissen. The delegation consisted of 34 participants and three reports were issued. H.A. Hidde Nijland wrote a contribution about fundamental aspects of metal enclosed switchgear. C.F. Proos contributed with a report about voltage curves and oscillograms of pressurized oil filled cables. D.T.J. ter Horst presented a report about transient recovery voltages in the Dutch 50 kV distribution grid and the 110 kV transmission network. Bakker acted as special reporter for cables.

At the 1952 conference there was a lively discussion about the Dutch contribution by Provoost about lightning impulse testing of transformers.

The general opinion in those days was that lightning impulse testing had become a mature testing technique and there was no objection to full scale testing anymore. The discussion focussed on chopped wave testing, which had still teething problems and was considered to be in the developing stage. A second point of discussion was the question whether a lightning impulse test was sufficient to verify if partial discharges occur in transformer insulation and, if so, conclusions could be drawn about the quality of the transformer insulation as such.

For high-voltage circuit breakers three items were hot in those days.

- The rate of rise and the peak of the transient recovery voltage;
- The post-arc conductivity of the plasma channel after current interruption;
- Overvoltage caused by interrupting small inductive currents and by switching off unloaded overhead lines.

The actual waveform of the voltage oscillation is determined by the configuration of the power system. The transient recovery voltage or TRV is present immediately after the interruption of the current. When the TRV oscillation has damped out, the power frequency–recovery voltage is active. The duration of the

TRV is in the order of milliseconds, but its rate of rise and its amplitude are of vital importance for a successful operation of the interrupting device.

In the early years of switchgear and fuse design, the TRV was an unknown phenomenon, the recovery voltage was regarded as consisting of the power frequency–recovery voltage only. The duty on circuit breakers was commonly expressed in terms of the circuit voltage prior to short-circuit and the magnitude of the current in the arc. It was, however, experienced that, in practice, other circuit characteristics would affect the duty to an important extent. Improved measurement equipment, such as the cathode-ray oscillograph and later the cathode-ray oscilloscope, made measurements with a higher time resolution possible and revealed the existence of a high-frequency oscillation immediately after current interruption: the TRV was discovered. This resulted in system studies of transmission and distribution networks. Many investigations were carried out in different countries to determine the TRV across circuit breakers while clearing short circuits in networks to provide a base for standardization of the TRV in national rules for type tests on circuit breakers. System studies on transient network analyzers brought insight into the frequencies of oscillations and were verified by real tests in the network. Better understanding of the transient phenomena in the network led to improved testing practice in the high-power laboratories, more accurate measurement of the current-zero phenomena, and consequently resulted in more reliable switchgear with a higher interrupting capability. During that period of time, the end of the 1950s, an effort was made to represent the TRV oscillations by standardized waveforms to be able to create TRVs by lumped elements within the walls of the high-power laboratory.

In the early nineteen sixties, several network studies were undertaken in Japan and in Europe and attempts were made to better define the analogue modeling of the transient phenomena. The tests for TRVs were specified differently in the various national rules, and Subcommittee 17 on High-Voltage Switchgear of the International Electro technical Commission (IEC) asked the Study Committee on Circuit Breakers (named Study Committee 3 in those days) to promote new extensive investigations on an international base. The engineers of KEMA's high-power laboratory, the largest test facility in the world, played an important role in the standardization of transient recovery voltage wave forms and in the development of new test circuits and test techniques. D.Th.J. ter Horst and G.A.W. Rutgers made in those days a major contribution to the understanding of the post-arc current and reported their findings at CIGRE conferences.

The Cable Connection

The reasons why the Netherlands believed in cables from the early beginning were probably: the densely populated country, accessibility of wet soil, short distances and certainly last but not least because of the dominancy and the

perseverance of the pioneers van Staveren, Proos and Bellaar Spruyt at that time, who were really “cable minded”.

After the 2nd World War the Dutch remained committed with CIGRE cable activities, continuing the tradition of offering a disproportionally large contribution to CIGRE in relation to the size of the country and its electricity grid. People like van Staveren (KEMA), Goossens (KEMA), Goedbloed (NKF), Kreuger (NKF) and Boone (KEMA) together with many colleagues contributed substantially to the work of the Study Committee, dealing with a great variety of subjects that were taken into consideration over the years and more than 80 years after the foundation of the cable commission the Dutch are still very active.

No one seemed to have problems with the relatively large input of such a geographically small country. One of the reasons probably was that in the Netherlands, from the beginning of electrification, underground transport of electricity was the preferred option. Overhead lines came later, when the higher voltages such as 110 and 150 kV were introduced, although the first 22 km long 150 kV connection between Rotterdam and The Hague was an underground oil-filled cable circuit, installed in 1937/1938. Preceding the final selection of the manufacturer, several manufacturers were invited to offer their 150 kV cables to be tested in 1934 in a kind of long term pre-qualification test at KEMA's premises. CIGRE SC 2 was certainly the preferred body to discuss the results of this long term testing of 150 kV cables, which was very advanced at that time.

The Dutch played a dominant role in the organization of the SC since 1927 as both its chairman (Bakker, CEO of the utility of The Hague) and secretary (Van Staveren) were from the Netherlands over a long period of time.

In 1927 Bellaar Spruyt, Chairman of the association of managing directors of utilities in the Netherlands, reported on the results of international standardization of HV cables at the 4th CIGRE conference. The discussion about this report resulted in the formation of an international cable commission with 37 members. Bellaar Spruyt became the first chairman of this cable commission. It was not surprising that three papers out of a total of nine on cables at the 1927 CIGRE were written by Dutch engineers.

In 1923 the number of papers on insulated cables was seven of which two were from the Netherlands. The Dutch delegation put on the agenda of the 2nd CIGRE the cable testing practice developed by van Staveren, founder of KEMA, and Proos, chief engineer of the major Dutch Cable Factory NKF. This combination of pushing power and technical expertise appeared to be very effective in promoting innovation. The testing practice of both pioneers Van Staveren and Proos was based on tan delta measurements to assess the degree of ageing of mass impregnated 10 kV cables, caused by partial discharges. This testing proposal implied a long term testing procedure including heat cycles. However the testing methods to improve

reliability of HV cables developed in the Netherlands were controversial and it would take many years of 'heated' CIGRE discussions before the Dutch approach of long-term testing and related standards were internationally accepted. Different technical views, conflicting interests, and feelings of superiority of the key persons involved, gave these discussions an enormous intensity and unthinkable excitement. Opposition from French, German and Italian experts, who were in favour of short term testing, was ongoing until in 1935 when an agreement was reached. However in 1938 at a meeting in Italy, the agreement was rejected by the Italian delegation, stating that the HV cable standards had to include oil-filled cables, invented by Emanuelli in 1920, and internal gas pressure cables as well. Because of the 2nd World War, work was seriously delayed and international standards on cables were established after 1945.

The way of working of the SC changed gradually from a place to discuss problems in the first years to a body that manages work as efficiently as possible, to solve problems. Subjects for working groups are at present well prepared and when the decision is taken to start work, it has to be completed within a period of three years. An important change is certainly to listen more to the user of cables and to produce practical technical brochures to use.

When Study Committee 21 "HV cables" celebrated its 75th anniversary on the 30th August 2002 in Paris, the full Study Committee membership and their guests, among them the acting President of CIGRE, the Secretary General of CIGRE, and all the still living past Chairmen and past Secretaries of the SC, were invited to a banquet offered by the Dutch community to celebrate the 75 successful years of the Study Committee "Cables". The Dutch representative in the Study Committee, at that time, said at his dinner speech: "when we add the years of Dutch chairmanship and Dutch secretary together, we ruled the SC for almost the whole period of 75 years, a lengthy period to be very thankful for and to take the opportunity now to do after all these years something in return."

Study Committee Chairmen, Special Reporters and Working Group Convenors

CIGRE's Study Committee structure was adjusted a few times, reflecting the technical evolution of that period. In 1946, an Executive Committee was set up, National Committees were organized, and a technical periodical was issued. CIGRE working groups and task forces collect field data and perform system studies, and their reports are used as input for the revision of existing IEC standards. Several Dutchmen served in recent years as SC chairman: Th. Ykema and J.A. Wiersma for the SC on substations and J.J. Smit for the SC on materials for electro technology, or served as special reporter like G.C. Damstra and A.L.J. Janssen for the SC on switching equipment. Many others contributed to working groups as convener or as member.

The author is grateful for the contributions from Wim Boone and Geert Verbong and for the comments from the members of the Dutch National CIGRE committee.



History of Norwegian National Committee of CIGRÉ

Introduction

Even though the CIGRÉ-committee in Norway was established the same year as the main committee in Paris, 1921, the historical material from the Norwegian activities in the early years is scarce. Hence there is a lack of some details in this presentation. Important events and persons may to some extent even have been omitted due to lack of knowledge. The main lines, however, in the committee's 88 years of history are correct.

Electricity in Norway around 1900

The first electricity in Norway for commercial use was generated at Laugstolen Brug outside Skien (south-west of Oslo) in 1885. This production was enough "to light up 120 lamps".

In the following years a number of industrial enterprises started private and local electricity generation for industrial purposes.

The first Norwegian town getting electric street lights was curiously enough the world's northernmost town Hammerfest. This was in 1890. Oslo, the capital, followed in 1892.

Beside the municipalities' efforts to provide street light, and for some of them electric trams, too, the development of an electric power generation system in these early days was to a large extent related to an expanding power consuming industry's need for electricity. The dominating single player these days was Norsk Hydro (producing fertilizer from the nitrogen in the air). In 1916 Norsk Hydro alone had an installed capacity of 320 MW while the total in Norway at the same time was 900 MW.

In the first years of electricity in Norway thermal power plants fully dominated the generation picture. But from around 1910 hydro power plants dominated when new capacity should be built. Also here Norsk Hydro, and more specifically its founder, Mr. Sam Eyde, was the driving force. Up to this day hydro power has been the nearly 100% dominating technology for electricity generation in Norway.

In the following years a countrywide discussion developed concerning whether “a number of small private power stations versus one large owned and run by the municipality” should become the way forward. The result was that in the years to come a large majority chose the “municipality model”. This showed to be very efficient and in 1920, at the time of the foundation of CIGRÉ, 64% of all Norwegians had access to electricity.

In 1924 the municipalities had invested 83% of the total capital in the electricity industry in Norway, private industry 10% and the government 7%. This division between private and public investments has lived nearly unchanged up to our days with a slight increase in the private part after World War II. This is due to the increased need for power to the expanding metal melting industry in Norway.

In parallel with the growth of the electricity generating and supply industry a large sector of equipment manufacturing industry cropped up, the oldest one already back in the 1880s. By around 1920 Norway was nearly self supplied with apparatus and components like transformers, cables, circuit breakers and, to a certain extent, generators. The larger part of this industry is still operating, but now as subsidiaries of large international corporations.

In 2008 Norway generated 142 TWh electricity of which more than 96% was from hydro sources. The production in a year with “average” precipitation should be 123 TWh. The inland consumption in 2008 equaled as much as 24 000 kWh per capita. It should also be mentioned that electricity represents as much as 50% of all energy used in Norway.

The early days of the Norwegian Committee

As previously mentioned the history of Norwegian National Committee of CIGRÉ goes back to 1921, the very same year as the mother organization in Paris was founded.

The available documents indicate that the initiative was taken by Mr. Thomas Nordberg Schulz, who was Electricity Director in NVE; Norwegian Water Resources and Energy Directorate. Mr. Nordberg Schulz also became the new committee’s first chairman.

In the first years the National Committee was in Norway always referred to as “the Committee for the Paris Conference”. This reflects that it was regarded as a main task for the Norwegian Committee to facilitate, and inspire, the submission of Norwegian papers for the Paris-event every other year. At the first conference in 1921 four Norwegian reports were presented. These dealt with the influence of load factor on the costs of electricity, domestic consumption in countries with hydropower, large networks in Norway and finally with cooperation between public and private owned hydropower stations. The Committee also appointed “official delegates” to the conference.

In its first years the Norwegian National Committee seems to have been rather loosely organized with a small number of self appointed members. It sought close cooperation with NEK (Norwegian Electrotechnical Committee), which was the Norwegian national body of the global standardization organization IEC, and operated as a kind of a special committee/working party under this organization. It seems, however, to have been very independent. The main reason for this relationship was that at international level close cooperation between CIGRÉ and IEC was established from the very beginning.

It doesn't look as if very much could have been achieved in these first years. There were no Norwegian reports presented at the Conference in 1923, but in 1925 Norway was present again, now with 3 reports. This year Norway also got a Study Committee Chairman, Mr. Norberg Schulz, who became chairman of "Statistics Generation-Transmission".

A permanent organization

In 1927 the CIGRÉ-interested parties in Norway realized that a better structured and permanent organization was required. In August it was decided that the Norwegian National Committee of CIGRÉ should consist of the following three permanent bodies: NVE (Norwegian Water Resources and Energy Directorate), NEF (Norwegian Electrotechnical Association; an association for individual professionals) and NEVF (Norwegian Electricity Industry Association; the association for the utilities). This committee could on its own decide to supplement itself with other members in case it was felt needed.

Mr. Thomas Nordberg Schulz from NVE was again elected chairman. Mr. Johannes Sandberg, Secretary General of NEVF represented that association, and Professor Jens Bache-Wiig from The Technical University in Trondheim represented NEF. The latter was in 1928 replaced by engineer K.F. Oppegaard who had his daily work with Sønnico, a manufacturer of electrical equipment. Mr. Oppegaard became later the Committee's secretary, a position he held for many years (see the list of secretaries later).

In 1927 Mr. Nordberg Schulz in addition to being chairman of the Norwegian Committee held the position as one of CIGRÉ's Vice Presidents. That year he proposed that the Norwegian Committee invite CIGRÉ's Secretary General, Mr. Tribot Laspière, for a 5-day trip to Norway during the Autumn. The main attraction should be visits to large waterfalls utilized for hydropower generation. Another purpose of this invitation was to draw CIGRÉ's attention to Norway and to its vast hydropower potential and already very well developed electricity production and distribution system. All available information indicates that the visit was a success.

Change of secretariat

As already mentioned, in the first years there was a very close cooperation

between the Norwegian CIGRÉ Committee and NEK, the Norwegian IEC-body. It seems as if as years went by, ties gradually loosened. But in 1929, at NEK's General Meeting, a proposal was brought forward by Mr. Nordberg Schulz that all international activities in the field of electrotechnology formally should be gathered under one umbrella, and that should be NEK. He argued that it was very difficult for a small country like Norway to contribute with qualified activities in a number of organizations if there was a lack of coordination between them. If his proposal was accepted NEK should get the chairmanship in the Norwegian CIGRÉ-committee on a permanent basis. The proposal did not, however, win general acceptance, but the General Meeting asked a small group to look further into the matter.

It seems that very little happened in this regard the following years. From the very beginning the Norwegian CIGRÉ-committee had received a small amount of money from NEK as a financial support. This money was in turn part of a yearly government grant to NEK. In 1934 this government grant to NEK was considerably reduced. As a result NEK's financial support to CIGRÉ was stopped.

The Norwegian CIGRÉ-committee now found itself in a very difficult situation. As a result of the discussions inside the Committee itself it was decided that the formal cooperation between the Committee and NEK should be brought to an end and a new solution for the secretarial services should be sought. NEVF (the association for the utilities) came up very fast (1934) with an offer to act as secretariat for The Norwegian National Committee for CIGRÉ. This was accepted.

The year before, 1933, Mr. Thomas Norberg Schulz, left the position as chairman of the Norwegian Committee. He was replaced by Professor Fredrik Jacobsen from The Technical University in Trondheim. At the same time Prof. Jacobsen also became one of CIGRÉ's Vice Presidents. Mr. Norberg Schulz who had served CIGRÉ from the very beginning and probably was "the father" to the Norwegian Committee was that year appointed Honorary President of CIGRÉ. Mr. K.F. Oppegaard was elected secretary for the National Committee. The other members of the Committee were Secretary General Johannes Sandberg, NEVF, and Director Aspestrand, NVE. The Norwegian National Committee kept this composition up to WWII.

From this period it should be also mentioned that at the 1931 CIGRE Session Mr. E. Scholberg-Henriksen from Norsk Hydro presented the first CIGRÉ paper on HVDC transmission: "Transmission and export of energy by high voltage direct current". This opened a series of Norwegian reports on HVDC issues, which in its turn significantly contributed to the national competence necessary to develop and install today's many large subsea HVDC cable interconnections between Norway and the Continent and its land stations.

After the war

The Norwegian National Committee held its last meeting before the war in March 1939, and there was of course no activity during the war.

In February 1946 the secretary Mr. Oppegaard took an initiative to revitalize the National Committee. All except Mr. Aspestrand, who was ill, met. It was decided that so far they should continue with the same composition as before the war. According to this Prof. Jacobsen continued as chairman, and he also represented Norway in the first peace time Administrative Council in Paris the same year. In addition Prof. Jacobsen also was the author of the only Norwegian report which was presented at the Session that year. This dealt with a diagram for calculating sag and strain of conductors of overhead lines.

In 1949 a new Committee was elected. Mr. Carl Berner Blydt, Director for The Norwegian Power Pool, was elected new chairman. The new director of NEVF, Mr. Finn Wilhelmsen, became the committee's secretary. Other members were Dr. Just Quigstad representing NEF and Chief Engineer Ditlef P. Smith from NVE. The outgoing secretary, Mr. Oppegaard, was thanked for his long and dedicated service to the Norwegian Committee.

Up to now The Norwegian National Committee of CIGRÉ had been a more or less self composed body living by rules which to a large extent were created "from case to case". But in their first committee meeting in 1949 the new committee decided that for the future written bylaws were needed. The secretary was entrusted with the task of seeking information about other national committees' bylaws, which could act as models for the upcoming new Norwegian rules.

In the years to follow only a small number of reports were submitted to the Paris Session, but at least one report was presented in every Session from 1950 on. The national quota, however, was as low as 2 reports in these years.

In 1954 The Norwegian National Committee suggested in a letter to Main Office in Paris that the duration of the Conference should be reduced from 10 days to one week. It supported, however, strongly to continue "the experiment" with simultaneous interpretation as an efficient means to reduce the length of Sessions. As we know today many years were to elapse before the reduction to one week actually took place.

At this time (1954) Norway was represented in only 3 Study Committees. The National Committee now asked for membership in 12 more. The first SC-meeting with the Norwegian National Committee as host was held in 1961 and the actual SC was no. 4; Protections and Relays. During the 50's and 60's the Norwegian Study Committee members were strongly encouraged to create their own national group of advisors from various relevant businesses in Norway in order to strengthen the national activities.

A new era

A new era for the Norwegian National Committee started in 1965 when Mr. Olav S. Johansen, the CEO of Norwegian Electric Power Research Institute in

Trondheim (EFI), was elected chairman. Director Wilhelmsen, NEVF, continued as secretary, but NVE and The Norwegian Power Pool was represented with new candidates, respectively Mr. Bjerkebo and Mr. Raknerud.

Beside Mr. Nordberg Schulz in the Norwegian Committee's first decade nobody influenced the development of CIGRÉ activities in Norway to such an extent as Mr. Johansen. In 1964 Norway was represented in 14 Study Committees. We were not represented in only the following SCs: no. 1, 5, 15, 18 and 19. However, after the change of the SC structure in 1966 Norway became represented in nearly every SC and this has been the situation up to our days. Mr. Johansen strongly believed that it was of great importance for a small country to closely follow the development in relevant fields of technology and even to try to have an influence on them where and when possible, especially when Norway represented a high level of electricity production and consumption together with a well developed manufacturing industry.

The national allotment for reports was in the years to come more than filled, and scientists from Mr. Johansen's own institute, EFI, took the role as main authors for more than half of the reports.

Mr. O.S. Johansen himself became chairman of CIGRÉ's Technical Committee in 1966, a position he held up to 1972. From 1972 to 1978 he acted as CIGRÉ's Treasurer.

Change of secretariat once more

The secretary, Mr. Wilhelmsen retired by the beginning of 1971 as director for NEVF, the utilities association. However, he continued as secretary for the national CIGRÉ committee for a number of months. NEVF itself did no longer find it possible to continue as secretariat for CIGRÉ, and a new solution had to be sought. During 1971 the organization entered into an agreement, facilitated by NEVF, with the electrotechnical standardization organization NEK (Norwegian Electrotechnical Committee) that it should undertake the secretariat both for CIGRÉ and the Norwegian body of WEC (World Energy Conference/Council). NEK's director, Mr. Bjørn Ødegård, became Secretary General assisted by a secretary part-time. Mr. Ødegård left the position as Secretary General by the end of 1994, but the main structure in this arrangement lived on until 2007.

Mr. O.S. Johansen continued as chairman for the Norwegian National Committee of CIGRÉ until summer 1980 when he was succeeded by Mr. Jovard Svoen from The Norwegian Power Pool.

The Norwegian National Committee continued to thrive under Mr. Svoen's leadership. In his period the Norwegian national allotment rose to 4 reports and this quota was filled every time. In addition Norwegians always were co-authors to reports for the international allotment, too. Norway was represented in all Study

Committees except Switching Equipment and Substations. The dominating Norwegian members these years were EFI (the research institute) in co-operation with The Technical University, Alcatel (now Nexans Norway, the cable manufacturer), Statskraftverkene (later Statkraft), Samkjøringen (The Norwegian Power Pool) and NVE (Norwegian Water Resources and Energy Directorate). Mr. Svoen was a member of Executive Committee from 1988-1990.

In 1990 The Norwegian National Committee instituted its own CIGRÉ-award named "The Electric Power Prize" (Elkraftprisen). This was first awarded in 1991 and the first laureate was Dr. Nils Flatabø from EFI. Dr. Flatabø is today the chairman of the Norwegian Committee. The prize is given for outstanding contribution to CIGRÉ's fields of work, technically and/or administratively. It comprises a diploma, an engraved crystal plaque and a sum of money. Up to now 17 Norwegian professionals have been granted this award.

In 1992 Mr. Knut Herstad became new chairman for the Norwegian National Committee. At that time he was Managing Director & CEO for EFI. Later he was appointed to the same position in Enfo/EBL (Norwegian Electricity Industry Association - formerly NEVF). During his period, which lasted up till 1998, more or less the same companies and institutions as mentioned above were the dominant players with the exception that Statskraftverkene was divided into Statkraft and Statnett, and the Power Pool became an integrated part of the latter. Mr. Herstad was a member of the Executive Committee from 1996-1998, and in this period the Norwegian national allotment for reports to the Session was increased to 5. Norway continued to be represented in all Study Committees but two, and Norwegian authors were represented in papers for the international or additional allotments as well.

In 1991 a new Energy Act came into force in Norway, opening up for competition in the fields of electricity production and sales. This new "operating environment" caused large changes inside the industry mainly in terms of restructuring and changes of CEOs. The new leaders focused essentially on the "bottom line" which led to a very restrictive attitude towards letting members of the staff participate in external activities such as CIGRÉ. In addition many of these leaders didn't have a technical background, a fact that to a certain extent made it difficult for them to see the benefit for the company in this kind of activities. The result was of course that it became difficult to recruit young people for CIGRÉ work.

In 1998 Dr. Nils Flatabø from EFI became new chairman, a position he also holds today (2009). This year (1998) EFI changed its name to SINTEF Energy Research. He was a member of the Executive Committee of CIGRÉ from 2000-2002, and representative of the Administrative Council on CIGRÉ's Technical Committee from 2002-2004. The difficult situation regarding the recruitment of young professionals continued at least into the first five years of Dr. Flatabø's term of office. In the latter years it seems, however, as if the Electricity Industry in Norway has adapted to the

new competitive environment and also has realized that in-house competence and adoption of new technology is a must also for an electricity company in order to survive in this environment, nationally as well as internationally.

An important and positive development these years was that after the reorganization of the SC-structure in 2002 Norway became represented in all 16 SCs and has since kept this position.

During Dr. Flatabø's period the dominance in CIGRÉ activities in Norway shifted from EFI/SINTEF Energy Research towards Statnett, the national TSO. The reason why was partly that Statnett faced increased challenges in connection with the development of the new common Nordic, and later also the European, Electricity Market and hence had to seek new competence, and partly that the new top management of SINTEF Energy Research no longer had the same focus on CIGRÉ activities as had been the case previously.

The Norwegian National Committee of CIGRÉ had since long before the war cooperated with the other Nordic national committees. They met once a year and exchanged ideas and experiences. Now this was expanded to also include the three Baltic States Estonia, Latvia and Lithuania. This new cooperation was called: Nordic Regional Council of CIGRÉ (NRCC). Besides meeting once a year they also organised symposia and workshops. No doubt the inclusion of these "new" countries in the Nordic cooperation had a positive effect on the development of the CIGRÉ activities in these countries.

Another new secretariat arrangement

In 2007 the arrangement from 1971 with a Secretary General and an assisting Administrative Secretary hosted by NEK came to an end. Dr. Flatabø and the Committee found that this solution represented expenses higher than what in the long run could be afforded. Therefore a less costly set-up which could still maintain the quality of the work was sought. The solution was found when EBL offered to house the secretariat for a very small fee, and Mr. Knut Herstad, the former chairman and now retired from EBL, was willing to shoulder the position as Secretary General without any assistant. The transfer of the secretariat to EBL and Mr. Herstad took place in June 2007.

During the period 2006 to 2008 CIGRÉ in Norway gained a number of new members, especially individuals. By the end of 2008 Norway had 22 collective members and 58 individual ones, two of whom have been granted the Honorary Member Award: Mr. K. Bjørløw-Larsen from Nexans Norway and Mr. K. Schjetne from Statnett. However, up to now only a limited number of these companies and individuals are actively involved in CIGRÉ activities. In order to improve this situation the Norwegian National Committee has in 2009 undertaken some new measures which will be further developed in the years to come.

Chairmen of the Norwegian National Committee:

1921 – 1933	Mr. Thomas Norberg Schulz
1933 – 1948	Prof. Fredrik Jacobsen
1949 – 1966	Mr. Carl Berner Blydt
1966 – 1980	Mr. Olav S. Johansen
1980 – 1992	Mr. Jovard Svoen
1992 – 1998	Mr. Knut A. Herstad
1998 –	Dr. Nils Flatabø

Secretaries:

The secretaries before 1933 are not known.

1933 – 1949	Mr. K.F. Oppegaard
1949 – 1971	Mr. Finn Wilhelmsen
1971 – 1994	Mr. Bjørn I. Ødegård (Secretary General) Mrs. Karin Ødegård (Administrative Secretary)
1995 – 1996	Mr. Kjell Gamlesæter (Secretary General) Mrs. Karin Ødegård (Administrative Secretary)
1997 – 2000	Mr. Per Lund (Secretary General) Mrs. Karin Ødegård (Administrative Secretary)
2000 – 2007	Mr. Jon Tveit (Secretary General) until June 2007 Mrs. Karin Ødegård (Administrative Secretary) until June 2005 Mrs. Ellen Lind (Administrative Secretary) June 2005- May 2007
2007 -	Mr. Knut A. Herstad (Secretary General)

Norwegian Study Committee Chairmen:

1925 – 1929	Mr. Thomas Norberg Schulz (Statistics Generation - Transmission)
1935 – 1939	Prof. Fredrik Jacobsen (Conductors)
1968 – 1974	Mr. Jens Landmark Bråten (SC 34; Power System Protection and Local Control)
1982 – 1988	Mr. Jovard Svoen (SC 39; System Operation and Control)
1988 – 1994	Mr. Kåre Schjetne (SC 22; Overhead Lines)
1992 – 1998	Mr. Kjell Bjørløw-Larsen (SC 21; HV Cables)
2008 -	Prof. Olav B. Fosso (SC C5; Electricity Markets and Regulation)

Oslo in August 2009

Knut A. Herstad



History of Polish National Committee of CIGRÉ

Activities of the Polish committee of CIGRE in relation to development of the national electric sector

The Polish electric sector, represented by the Association of Polish Electrical Engineers, was the founding member of CIGRE at the first International Conference on Large High Voltage Electric Systems which was held on 21-28 November 1921 in Paris.

It should be underlined that only three years earlier, in November 1918, Poland regained its independence, started a fight for secure national borders and initiated the activities aimed at the unification of its lands, administered previously by the Empires of Austria, Prussia and Russia. During this period the existing power industry was not able to establish the continuous supplies of electricity. There existed about 450 power plants, located predominantly in the southern part of the country (in the Upper Silesia region). Their total capacity amounted to 500-600 MW, per capita; consumption of electricity was about 38 kWh (1918) and the length of the electric networks was modest. The commitment of extremely active specialists enabled however to overcome this very difficult situation. The Electric Section, the Union of Polish Electricians and the Union of Electrotechnical Enterprises were created within the Ministry of Public Works. In June 1919 the Association of Polish Electrical Engineers was established. It quickly started to publish the Electrical Review (Przegląd Elektrotechniczny). In March 1922 the Parliament adopted the Electric Act which defined the principles of the electrification activities: rules for the company operation as well as for the licensing of the processes of electricity production and trading.

Later, with some periodical slowing down associated with the global economic crisis, the national electric system started to develop according to the adopted plans of electrification. The power plants were modernised and extended, the regional network utilities were established, several electrical equipment factories were constructed etc. In parallel the activities were conducted in the fields of personnel training, introduction of terminology, legislation and standards, the Polish Committee for Standardization had been created and started its

cooperation with the IEC. The nominal voltages were introduced: 380/220 V for low voltage and 3,3; 5...6; 30 and 60 kV for the medium and high voltages. The following new power stations were constructed: Mościce at the Nitrogen Compounds Works, Pomeranian Group of Hydro Plants (consisting of Gródek and Żur plants), city power plants in Kraków, Lwów and Wilno. The design works were initiated for the railways electrification. Construction of some hydro plants (Poręba at Soła river, Rożnów at Dunajec river, Solina at San river) as well as of Stalowa Wola thermal plant was initiated in order to supply electricity to the new Central Industrial Region, located near the of Vistula and San rivers (Fig. 1). In 1934 the 150 kV line Mościce-Starachowice has been designed and in 1938 its construction was completed. The simplified picture of national electric system development is presented on Fig. 2 which shows the installed capacities and the volumes of electricity generation in Poland in the years 1919-1938.



***Fig. 1. The first water rise on the River Soła, by courtesy
of Zakład Energetyczny Toruń SA
(from collection of Archiwum Historycznego Elektroenergetyki Polskiej)***

The role of the National Committee in the framework of the International Conference on Large Electric Systems, CIGRE, was assumed by the Association of Polish Electrical Engineers, under the leadership of Kazimierz Drewnowski, future Professor of Warsaw Technical University (Fig. 3). The official representatives of Poland in the Conference were nominated by the government authorities which supervised the national electric system. For example, K. Drewnowski and Director H. Zarzycki from the Union of Power Plants had participated in the Second

Conference in 1923. For the Polish participants the most important conclusions of this Conference were: 1) necessity to establish the Polish Electrotechnical Committee in order to cooperate with the IEC, 2) necessity to create the Polish National Committee as the member committee of the International Conference on Large Electric Systems, and 3) necessity to undertake the organisational efforts to create the representation of Polish electric sector for the efficient cooperation with several international organizations (the leading role was envisaged here for the Association of Polish Electrical Engineers).

At the subsequent Conferences, in the years 1925, 1927 and 1929, the number of participants, participating countries and presented papers were continuously growing. In 1925, by the motion of Polish delegation, the number of Conference Vice-Presidents (later the members of the Administrative Council) was increased. K. Drewnowski was elected one of the Vice-Presidents. Also the number of Polish participants in the Conference and the number of papers prepared by them was increasing. In October 1930 the first meeting of the National Committee (NC) of Large Electric Systems was conducted. The following persons were the founding members of the NC: K. Drewnowski – Chairman, T. Czaplicki, K. Straszewski (representatives of the Association of Electrical Engineers), L. Staniewicz, G. Sokolnicki (from the Warsaw and Lwów Technical Universities), A. Hoffmann (Union of Polish Power Plants), Mackiewicz (Union of Polish Electrotechnical Enterprises) and J. Podolski – Secretary.

During the Sixth International Conference in 1931 which celebrated the decade of activity some organisational changes were made and the proposal to create CIGRE – Conference Internationale des Grands Réseaux Electriques à Haute Tension – was adopted.

K. Drewnowski, Chairman of the Polish NC, was one of the founders of CIGRE. He held the post of CIGRE Vice-President until 1939. His activities in the Conference were exceptional and no other representative of Poland may be compared to him in the later activities within CIGRE. The other outstanding representatives of Poland before 1939 were: T. Czaplicki, A. Hoffmann, J.L. Jakubowski, H. Kuhn, A. Malinowski, J. Podolski, J. Skowroński, S. Szpor, W. Szumilin.

In the year 1945 the post-war condition of the Polish electric system was characterised by the large damage of technical infrastructure, serious loss of professional personnel and the diversity of technical solutions in various parts of the country. The installed capacity of power plants amounted to 2353 MW and the annual electricity generation to 5,84 TWh (these figures were slightly higher than in 1938, correspondingly: 1692 MW and approx. 4,0 TWh). After the Second World War the electric sector was nationalised and the new organizations: Central Electricity Board and Central Board of Electrotechnical Industry were established. In 1946 the activity of the Association of Electrical Engineers and the publication

of Electrical Review were reinstated. After the spontaneous post-war reconstruction by the local personnel, the wider plans of power stations and networks construction were prepared. The Three-year Plan of Electric System Development (1946-1949) and the concepts for the construction of high voltage networks of 110, 220 and 400 kV were adopted. In the period of 1945-1965 the scientific, research and design studies in the field of the electric system had seriously developed. The main leaders of these studies were: a) theoretical studies in electrotechnics – M. Jaczewski, J.L. Jakubowski, B. Konarski, Z. Siciński, J. Skowroński, S. Szpor, J.J. Zieliński, b) in the field of transformers: Z. Hastermann, E. Jezierski, Z. Kopczyński, J. Lech, J. Turowski, c) in the field of overhead and cable lines as well as of grid operation: S. Bernas, W. Demel, Z. Jasicki, P. Kiżewski, A. Kłos, K. Kolbiński, S. Kończykowski, A. Kopystiański, R.J. Nowacki, K. Przanowski, Z. Skoczyński, W. Szumilin, d) in the field of substations and its equipment: Z. Ciok, H. Kuhn, A. Myślicki, Z. Nartowski, and e) in the field of protection and network automation: T. Ejsmond, W. Heller, J. Kożuchowski, J. Telesiński, J. Trojak, A. Wiszniewski, J. Żydanowski. In 1946 the National Institute of Electrotechnics was established in Warsaw.

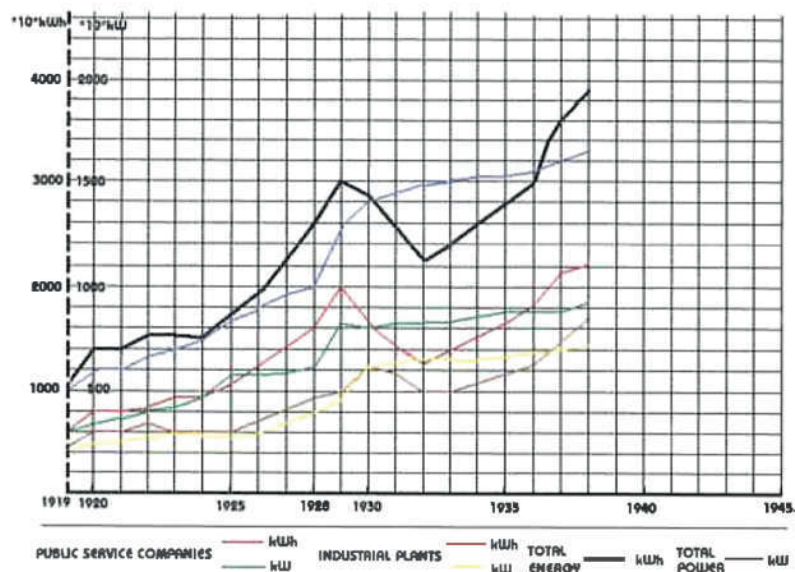


Fig. 2 Installed power of power plants and electrical energy production in Poland between the years 1919 - 1938

Fig. 2. Installed power of power plants and electrical energy production in Poland between the years 1919 – 1938

The research and development activities created the base for the substantial extension of the electric grid: the first 220 kV transmission line Silesia-Łódź, with the length of 161 km, was put into operation in 1947, and the first 400 kV line Mikułowa-Joachimów, with the length of 317 km, in 1964. In November 1953 the Institute of Power Engineering was created in Warsaw.

The initial organisational structure of the state owned electric sector, created in 1945, consisted of 14 Regional Utilities. In 1957 they were replaced by 6 Electric Regions: Central, Lower Silesian, Southern, Northern, Eastern and Western. For a long time these Regions were the centres deciding on the construction and operation of the components of electric system.

The first post-war meetings of CIGRE (1945 – Administrative Council, 1946 – session to mark the 25 years of activity) were attended by K. Drewnowski who was also honoured with the medal “La CIGRE reconnaissante”. Unfortunately the national authorities removed K. Drewnowski from further activity for CIGRE. In 1948 the National Institute of Electrotechnics, which was entrusted with hosting of the National Committee of CIGRE, had created the new Committee with the following staff composition: W. Szumilin – Chairman, A. Myślicki – Secretary, and members: T. Czaplicki, J. Czarnowski, S. Ignatowicz, Mickiewicz, Ostrowski, W. Przelaskowski, L. Taniewski, B. Witwiński, T. Żarnecki.

The following years were a period of continuous development and of organisational improvements and adjustments of CIGRE activities. Technical development of the electric sector in Poland was the reason for the wider participation of Polish experts in various working groups of CIGRE.

During the period 1950-1966 the Polish National Committee directed by W. Szumilin participated in CIGRE activities. In 1950 the NC consisted of 5 collective members: Main (previously National) Institute of Electrotechnics, Central Electricity Board, Central Board of Electrotechnical Industry, Association of Electrical Engineers, State Energy Council, as well as of 7 individual members. The numbers of Polish delegates at CIGRE sessions fluctuated between 0 (1964-1966) and 17 delegates (1956), the number of submitted papers was usually 2-3 (in total 25 papers during the period 1950-1966).

On 22 August 1952 Polish electric sector and the national scientific community suffered a painful loss. Prof. Kazimierz Drewnowski, founding member, Vice-President and Honorary Vice-President of CIGRE, passed away. It was due to his persistent engagement that Polish experts had the opportunity to cooperate actively with one of the leading international organizations of the electric sector - CIGRE. Prof. Drewnowski was the only representative of Poland who had the honour of being the Chairman of Study Committee and the chairman of other CIGRE bodies.

In 1956 the authorities decided to move the National Committee secretariat to the Institute of Power Engineering, without changing the Committee staff composition. In October 1957, on the initiative of its Chairman – W. Szumilin, the Committee hosted the delegation of the Romanian CIGRE Committee: C. Budeanu

– Chairman, I.S. Antoniu, W. Corlateanu, D. Ceapiru. In September 1958 Polish delegation composed of: W. Szumilin, A. Myślicki, E. Zadrzycki revisited Romania. Both visits had created the discussion forum for the issues of the electricity sector development in both countries, principles of thermal power plants operation and the expansion of networks.



Fig. 3. Prof. K.Drewnowski

In June 1959 the first meeting of the Study Committee was held in Poland. This was Committee 14 – High Frequency Teletransmissions. Also in September 1963 the meeting of Study Committee 7 – Towers and Foundations, was held in Poland.

On 17 May 1975 the meeting of the Administrative Council of CIGRE was held for the first time in Warsaw, on the invitation of W. Szumilin, Chairman of the Polish National Committee. Unfortunately W. Szumilin was absent from the meeting due to his health condition. The role of meeting host was played by Prof. M. Jaczewski. W. Szumilin, Chairman of the Polish NC during the years 1948-1976, passed away on 27 January 1977. He was an outstanding expert in the design and construction of the high voltage transmission lines, Professor and Chief of Electrical Networks Department at the Warsaw Technical University. W. Szumilin was honoured with the title of Honorary Chairman of the National Committee. As of 1 September 1976, the functions of the NC Chairman were assumed by M. Jaczewski and the function of secretary by S. Brociek.

The constant development of the electric sector was taking place in Poland. Its special feature was a domination of hard coal and brown coal in electricity generation. The development was characterised also by the growth of the

maximum capacity of single units. The maximum capacities amounted to: 1960-1965 – 120 MW, 1965-1970 – 200 MW, 1978 and 1979 – 500 MW (2 units at Kozienice Power Plant). The lignite fired power stations Pątnów-Adamów-Konin, Turów and Bełchatów were constructed at the locations of lignite deposits. Bełchatów is the largest power station in Poland, with a total generation capacity of 4320 MW (4440 MW at present). Due to the disadvantageous hydrological conditions the development of hydro power stations was limited. The main hydro plants constructed were: Solina at San river, Włocławek at Vistula river as well as the pumping-storage stations Żar-Porąbka and Żarnowiec. The studies aimed at the construction of Żarnowiec nuclear plant were initiated in 1982. The lack of social acceptance was the reason for stopping its construction and the discontinuation of the nuclear power research in Poland.

The 220 kV and 400 kV networks were substantially expanded and the integrated national electric grid was created. It was operated synchronously with the systems of USSR, Czechoslovakia, Hungary and GDR within the common system named "Peace". According to the opinions on the necessity to build the transmission lines of ultra high voltages (750 kV), the segment of 750 kV line and the 750/400 kV substation was constructed in Poland in the vicinity of Rzeszów. The line joined the Polish electric system with the system of Ukraine.

In 1981 the first CIGRE 22-81 symposium, under the title "Overhead lines and the environment", was held in Sweden. The Polish Committee of CIGRE had submitted four papers and their authors participated in the symposium.

During the decade 1980-1990 the National Committee aimed at the participation of Polish experts in all Study Committees of CIGRE; the goal was achieved. Simultaneously some national working groups were created which conducted the research and discussions on the subject matters studied by CIGRE. Several meetings of the Working Groups and Committees of CIGRE were held in Poland. Reports from CIGRE sessions as well as discussions of the main problems studied by CIGRE were published in Polish professional magazines: in the Technical Bulletin of Electric Networks published by the Energoprojekt-Kraków Office of Energy Studies and Designs, and in the monthly Power Industry (Energetyka).

During the period 1985-2000 some organisational changes took place in the field of the energy and electricity sector in Poland. In 1987 the number of economic ministries was reduced and the Ministry of Industry was created. The new Union of Power and Brown Coal was also established. Further changes took place in 1990: the Ministry of Industry and Trade was created as well as the Polish Power Grid joint stock company was established in order to operate and develop the power system. With the next step of the reform the Ministry of Economy was created within which the Department of Energy is supervising the electric sector. Simultaneously in 1997 the Parliament adopted the Energy Act which replaced the legislation being earlier in force. Under this Act the Energy Regulatory Office

was established. Substantial changes took place in the power stations and in the distribution utilities which were first transformed into state treasury companies, and later some of them were privatised.

Concerning the operation of the national power system, the activities initiated aimed at the inclusion of this system in the synchronous operation of UCPTE (currently ENTSO-E). Earlier the national system was operated synchronously with the grids of the neighbour countries which belonged to the Council of Mutual Economic Assistance (CMEA), under the supervision of the Central Dispatching Board in Prague (Czechoslovakia). In 1990 UCPTE had created a working group which studied the conditions necessary to connect the networks of the Central European, Southern European and Baltic countries as well as some other former USSR countries to the common grid of this organization. During the years 1991-1992 the regional CENTREL grid was created, consisting of the transmission networks of Czech Republic (CEZ), Poland (PSE S.A.), Slovakia (SE) and Hungary (MVM Rt.). During the period January-September 1993 the CENTREL grid was still operated in parallel with the system of the former CMEA, and in September it was disconnected from that system in order to test the conditions of independent operation. Positive results of these tests made the base for the constant disconnection of CENTREL grid which was then operated synchronously with the system of VEAG (former GDR). Positive results of the further tests enabled to disconnect in September 1995 the VEAG grid and to synchronise it with the system of UCPTE. Finally on 18 October 1995 the CENTREL grid was connected in synchronous way to the grid of UCPTE and in this way the electric systems of Czech Republic, Poland, Slovakia and Hungary became part of the joint UCPTE system. Four listed countries were at the beginning the associated members of UCPTE and subsequently (2001) the founding members of UCTE. The long lasting actions, tests and negotiations, described here in summary, were successful.

Simultaneously the Polish Power Grid Company in the years 1994 and 1995 carried out studies, activities and negotiations which resulted in the signature of the contract with the Swedish corporation Vattenfall for the construction of the submarine DC cable between Sweden and Poland. In August 2000 the SwePol Link line between the localities of Sterno (Sweden) and Słupsk (Poland) was put into operation, improving the supply reliability for the northern parts of Poland and creating the possibility for electricity exchange between both countries. The basic technical data of the line are as follows: ± 450 kV HVDC, cross section of main cable 2100 mm², cross section of return cable 2 x 630 mm², line length 254 km (of which the segments located under the land: 2 km in Sweden and 12 km in Poland), maximum continuous current 1400A, rated power 600 MW, maximum overload capacity 720 MW.

In parallel with the described fundamental modernisations and improvements of the national power system, the Polish NC of CIGRE was also transformed. The

Minister of Industry and Trade repealed in 1992 the executive order of the former Minister of Energy concerning the supervision over the National Committee of CIGRE. The Director of the Institute of Power Engineering (the institution which hosted the NC of CIGRE) entrusted the temporary leadership of the NC to A. Piłatowicz. During the period October-November 1993, the Founding Committee of the independent association, regulated by the Polish law, was created. The Committee, consisting of 9 persons (Z. Ciok, K. Ilkowski, M. Jaczewski, M. Kozłowski, K. Lipko, P. Molski, A. Piłatowicz, S.J. Słowikowski, L. Twardy), acted as a temporary Board of the NC by the time of the Association registration. The Association was registered in 1994 by the Regional Court in Warsaw. Kazimierz Ilkowski, the secretary of the Polish National Committee, was exceptionally active in the process of the Committee transformation.

The first General Assembly of the National Association of CIGRE was held on 5 April 1995. The following Governing Board, composed of 10 persons, was elected during this meeting: A. Piłatowicz – Chairman, Z. Ciok – Vice-Chairman, K. Ilkowski – Secretary, and members: J. Dąbrowski, R. Frydrychowski, M. Kozłowski, J.F. Machowski, J. Malko, P. Molski, L. Twardy. The period of ordinary activities of the National Committee had begun. The Association Statutes govern the activity of the organization which plays double role of the professional association in Poland and of the National member committee in CIGRE. Such arrangement opened the possibility for wide participation in the activities of both NC and CIGRE, for both individual members and collective members. The opening was confirmed by the growth in the number of Polish members of CIGRE. During the years 1995-2001 the number of members fluctuated within a range of 100-116 individual members and 8 to 9 collective members. The highest number of equivalent members (according to the calculation algorithm of CIGRE) was achieved in 1996: 159 equivalent members (17th position in the ranking of the NC membership). In the years 1995-2001 the numbers of Polish delegates at the CIGRE sessions were in the range of 30 to 40 persons, and the numbers of submitted papers were 4 to 6.

The years 1990-2000 were also for CIGRE a period of intense activities and discussions connected with the evolution of organisational structure and of the subject matters of CIGRE activity. New initiatives became the main topic of the discussion during the Administrative Council meeting in September 1993 in Paris. Discussion was based on the statements concerning the intensive development of the world electric systems and their mutual connections, under the changing conditions of the electricity production, social acceptance and environmental requirements.

During the 1996 Session of CIGRE the 75th anniversary of the organization was celebrated. The key speech on that occasion was given by J. Lepecki, the outgoing President of CIGRE. He stated among others that the main efforts of CIGRE should be directed at the wider public perception of the organization, taking into account

all aspects of the electric systems (economic, environmental etc.), in order to leave the narrow circle of the technical experts. During the programme discussion the Administrative Council of CIGRE assessed the necessity to include in the Study Committee work the issues of the influence of distribution networks (mainly 110 kV) operation on the structures of transmission networks as well as the issues of the organization and changing conditions of electricity networks operation in various countries.



Fig. 4. CIGRE Regional Meeting, Częstochowa, 1998

In May 1998 the Regional Conference of CIGRE was held in Częstochowa under the title "Polish 400 kV transmission system – 35 years of experience". The Conference was organised by: Polish Power Grid Company, National Committee of CIGRE, Polish Electricity Association, Energoprojekt-Kraków Office of Energy Studies and Designs, ELBUD-Katowice company, and the regional distribution utilities Częstochowa and Jelenia Góra (Fig. 4). The following representatives of CIGRE were participating in the conference: Michel Chamia – President of CIGRE, Andre Merlin – Chairman of the Technical Committee and Marc Herouard – Secretary General (nominated in 1998). In total 130 delegates participated in the conference, including the representatives of the National Committees of Croatia, Czech Republic, Islamic Republic of Iran, Sweden and Hungary. The main topics of the conference were: a) experience from design, construction and operation of the first 400 kV line in Poland Mikułowa-Joachimów and of the further parts of the 400 kV system, b) issues of the transmission system operation and control methods in various countries, c) operation and development of interconnections,

including the cooperation of Polish national system with UCPT system, d) issues of 400 kV lines and substations modernisation to the year 2005, and e) modern methods of system operation, technical diagnostics of equipment and the registration of system components operation.

During the CIGRE Session in 2000 the Administrative Council and the Extraordinary General Assembly had adopted the basic decisions concerning the change of CIGRE name to: Conseil International des Grands Réseaux Electriques (International Council on Large Electric Systems), and concerning the new principles for CIGRE organization and methods of activity, according to the proposals enclosed in the document "CIGRE Masterplan".

In the period between CIGRE Sessions 2000 to 2002 lively discussions were conducted concerning the new organization and the Action Plans of activity for Study Committees. Because of the numerous reservations and counter-proposals, 16 National Committees, including the Polish NC, were asked for their opinions, remarks, proposals and suggestions on the discussed issues (in total 46 different remarks were submitted). The Technical Committee, after analysing the remarks and proposals, had presented its final report. At the Administrative Council meeting on 29 September 2001 (Cape Town, Republic of South Africa) the report was finally adopted through the voting procedure. Then it became the base to introduce the changes in the organisational structures and the scopes of the Study Committees activity, starting from the 2002 CIGRE Session.

The new period of CIGRE activity began after the changes were introduced at the Session held on 25-30 August 2002. The changes concerned new names and the revisions of the scopes of several Study Committees. The Committees were divided into four technical areas: A (3 Committees), B (5 Committees), C (6 Committees) and D (2 Committees) – in total 16 Study Committees.

The essential changes took place in the period 2002 to 2007 also in the Polish economy and in Polish electric sector. On May 2004 Poland became the member state of the European Union and on 1st July 2004 the new independent transmission system operator (TSO), named PSE-Operator S.A. started its activity, according to the requirement of the European Electricity Directive. This company enjoys a legal, administrative and managerial independence from the other actors of the electric market. The main objectives of PSE-Operator S.A. activity are as follows: a) assurance of the energy security of the country through the efficient implementation of the function of national and international transmission operator; b) assurance of the safe and economic operation of the national electric system in the conditions of market economy and competition, including the liberal, non-discriminative bulk electricity market in Poland, taking into account the international exchanges of electricity; c) implementation of the function of system operator.

The condition of CIGRE in the recent years, after the revisions have been made in the topics and in the organisation of the activities, indicates the appropriateness and usefulness of the changes introduced in 2002. The number of CIGRE members has considerably increased. Also the number of countries to which the members belong has increased to 91. The new members represent mostly the countries of Latin America (Argentina, Chile, Mexico, Nicaragua, Uruguay, Venezuela), Asia and Pacific (Indonesia, Korea, Malaysia, Pakistan, Singapore, Taiwan, Vietnam), Africa and the Middle East (Algeria, Israel, Jordan, Libya, Morocco, Nigeria, Sudan, Tunisia, Ivory Coast). At the same time the number of European members has slightly decreased.

In the considered period the number of Polish members of CIGRE has slightly decreased, similarly to the other European countries. The number of Polish members was equal to (equivalent members according to the calculation algorithm of CIGRE): 134 members in 2003, 117 (the lowest number) in 2006, 127 – in 2007, 138 members in 2008 and 141 members in 2009.

Since 2005 the Polish National Committee of CIGRE, in accordance with a CIGRE acceptance, translated four CIGRE technical reports into Polish, with distribution of over 400 copies.

**Chairmen of the Polish Committee of Large Electric Systems
and the Polish National Committee of CIGRE**

1. Kazimierz DREWNOWSKI	1921 -1946
2. Włodzimierz SZUMILIN	1948 - 1976
3. Marek JACZEWSKI	1976 - 1992
4. Andrzej PIŁATOWICZ	1992 - 2003
5. Jacek WAŃKOWICZ	2003...now



History of Portugal National Committee of CIGRÉ

HISTORY OF THE NATIONAL GRID

BEFORE 1951

By the end of 1950, the installed generating capacity for public service was only 148 MW, on hydro power plants, and 262 MW on thermal power plants, for a peak demand of 200 MW.

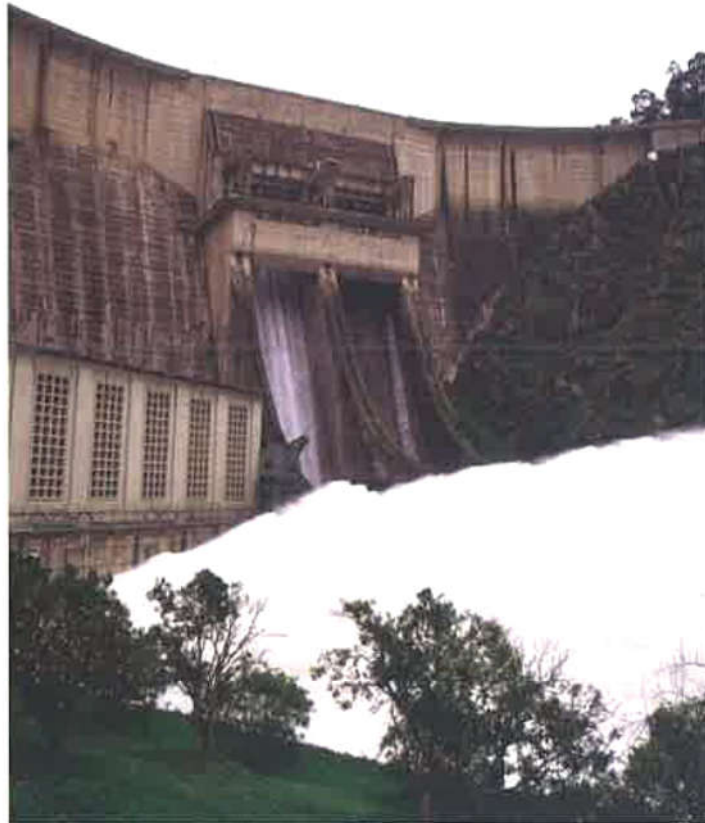
Subsequently to the publication, in 1944, of Law 2002 (National Electricity Law), five new electric companies were created, three in charge of building and operating future large hydro power plants, one for new thermal power plants and one for the launching and operation of the National Grid and the interconnected system. The author of the Law, which at the time was State Secretary for Industry and Trade, was Prof. José Ferreira Dias, who later became the first Chairman of Companhia Nacional de Electricidade (CNE), the National Grid Company. All five new companies had private and public entities as shareholders and at the Distribution level a dozen independent companies, essentially private, continued to operate. We may say that, 50 years in advance, Portugal established a fully unbundled framework, very much in line with what was going to be promoted by the European Commission in the late 90's.

1951 TO 1966

On the 17th January 1951 started the operation of the National Grid with a 150 kV axis from the hydro plant of Vila Nova, in the north of the country, to the city of Oporto (80 km) and another axis (two 150 kV lines) between the hydro plant of Castelo do Bode, in the center of the country, and Lisbon (2 x 113 km). The first two large hydro power plants (Castelo do Bode and Vila Nova) were also commissioned during 1951, as well as the first three substations of the National Grid.

Some years later, new 150 kV axes between Cabril and Zêzere in the centre of the country, and between Lisbon and Setúbal entered into service, as well as the reinforcement of other existing axis. The 220 kV voltage level was introduced in

1958, first through an axis between the hydro power plants in the international branch of the Douro river and Coimbra (the so-called University Town), and later through an axis between the same plants and Oporto and an axis between Coimbra and Lisbon.



Castelo do Bode Dam

The first interconnection with Spain, and thus with the European Grid, was the line Pocinho - Saucelle (30 km), at 220 kV, which entered into service in 1961. Until the end of 1966, eight new large hydro power plants, the first large thermal power plant - oil fired - and eight new substations of the National Grid entered in operation. The railway axis from Lisbon to Oporto (roughly 340 km), as well as the local suburban lines of these cities, were electrified at 25 kV, 50 Hz, reaching almost 400 km in length.

By the end of 1966, 1323 MW of large power plants were connected to the National Grid (150 and 220 kV) and 328 MW of smaller power plants were connected to distribution networks; the National Grid had a total length of 2755 km, and a transformer installed capacity of 2063 MW.

1967 TO 1985

The Grid pursued its development with new 150 kV lines to the southern provinces of Alentejo and Algarve, and new 220 kV lines along the Douro river, near Oporto. At the same time, the reinforcement of other existing axes at those

voltage levels was undertaken. The 400 kV level was introduced in 1979, interconnected with the 150 and 220 kV networks in two new substations 400/220 kV and 400/150 kV. The first two lines at that level were the line between the substations of Rio Maior and Palmela (88 km) and the line Rio Maior - Cedillo (139 km), representing the third interconnection with Spain and the first at 400 kV.

The second and the fourth 220 kV interconnection lines with Spain were both built in the north-eastern part of Portugal, close to the international branch of the Douro river, both ending in Aldeadavila, on the Spanish side, and entered into service by 1976 and 1982. Therefore at the end of 1982 there were 4 interconnections between Portugal and Spain, three at 220 kV and one at 400 kV. In that year the Portuguese peak demand was 3400 MW and annual consumption reached 15,3 TWh. Energy imports from Portugal were about 22% of total consumption.

Along this period, the generating system was enlarged with nine new large hydro power plants and four new large thermal plants (oil and coal fired), as well as with two peaking power plants, with single-cycle gas turbines running on gasoil, one near Lisbon and the other in Algarve. Twenty four new substations of the National Grid entered into service, and some others, already in operation, have had their installed capacity increased.



400/60 kV, 170 MVA transformer at Riba d'Ave

By the end of 1969 the four Generating Companies and the Transmission Company merged into a single company, CPE - Companhia Portuguesa de Electricidade. In 1975, following the 1974 Revolution, CPE passed to the public

sector and the private distributors and small generators were nationalized. Finally in 1976 all the companies were merged into a single company, EDP - Electricity of Portugal, 100% state owned.

By the end of 1985, there were 5079 MW of large power plants connected to the National Grid, while only 333 MW of other power stations were connected to distribution networks; the National Grid was 5291 km long, with a transformer installed capacity of 9485 MW.

1986 TO 2000

Two new 400 kV axes Alto Lindoso - Rio Maior and Palmela - Sines entered into service, as well as a second 400 kV interconnection with Spain, in the north of Portugal, between Alto Lindoso and Cartelle. Several new axes at 220 kV in the Oporto region and a new axis at 150 kV in the south were added to the system as well as several branches to feed the railways traction substations.

As regards generating capacity, two large hydro power plants and two large thermal power plants (CCGT and coal fired) started operating. Transformer capacity of the National Grid was increased with 24 new substations, some of them with GIS technology, and with the refurbishment and capacity increase of others already in operation, sometimes upgrading the voltage level but without service interruption.



220 kV lines approaching Custóias substation

By the end of 2000, installed capacity in large power plants connected to the National Grid was 9039 MW, and additional 913 MW of smaller plants were connected to distribution networks; the National Grid was 6014 km long, with a transformer installed capacity of 16863 MW.

2001 TO 2009

Several new 220 kV lines, some of them replacing old 150 kV ones, several new 400 kV lines and two more 400 kV interconnections with Spain entered into service, as well as several branches to feed new railways traction substations.

Generating capacity was increased through two new large hydro power plants and one large thermal power station (CCGT). The National Grid was reinforced with 13 new substations, capacity increase in some old ones and two new switching stations.

By the end of 2009 total generating capacity of large power plants connected to the Grid will reach about 11000 MW, to which should be added about 3300 MW of wind farms, and around 2000 MW of power plants directly connected to distribution networks;

the National Grid will be about 7600 km long, with a transformer installed capacity of about 27500 MW.



400/150 kV, 450 MVA shifting autotransformer at Pedralva substation

ELECTRIC POWER INDUSTRY

Since the early 1950s the Portuguese power industry has designed and manufactured electromechanical equipment and other devices for hydro and thermal power plants and for substations and switching stations. Towers and cables for transmission lines up to 400 kV have also been designed and manufactured by the Portuguese industry.

Starting also in the late 50's large power transformers have been designed and manufactured by the Portuguese industry with an increasing amount of units exported abroad. All 400 kV transformers of the National Grid were designed and manufactured in Portugal, including 4 large phase-shifting transformers, required mainly for the connection and load flow redistribution of energy from large wind farms.

Along the last three decades, Portuguese power industry increased its conception, design and manufacturing capabilities of control systems for utilities (substations, power plants, dispatching, rail track, etc), with a large share exported all over the world.

PRESIDENTS AND SECRETARIES

The first regular archives of the National Committee of Portugal date back to 1995 but it is possible to list some earlier Presidents:

- a) José Zanatti Aralla Pinto, Deputy Director of EDP, till 1992
- b) Rui Féris Cunha, member of EDP Board of Directors, from 1992 to 1995
- c) José Allen Lima, member of REN Board of Directors, from 1995 to 1998.

Since 20APR1998

- a) President João Nascimento Baptista Chairman and CEO of REN
- b) Secretary A. M. Neves de Carvalho Director of REN

Since 01JAN2001

- a) President Augusto M. V. Vaz Chairman of LABELEC
- b) Secretary J. M. Pombo Duarte Division Adviser of REN

Since 01JAN2003

- a) President Augusto M. V. Vaz Chairman of LABELEC
- b) Secretary Oscar E. M. Ribeiro Adviser to the Board of Directors of REN

Since 16MAY2004

- a) President José R. P. Penedos Chairman and CEO of REN
- b) Secretary Oscar E. M. Ribeiro Adviser to the Board of Directors of REN

PORTUGUESE MEMBERS

According to available records the first Portuguese collective member of CIGRE was registered in 1947. Currently, the oldest individual member is registered since 1973 and is a retired Full Professor of Oporto University.

By the end of 2009, the Portuguese National Committee had 103 equivalent members (one honorary member, 43 individual members and 12 collective members).

After the reorganization of CIGRE and its Study Committees, in the year 2000, João Nascimento Baptista was nominated, by CIGRE Administrative Council, chairman of SC C3 "System Environmental Performance" for the period 2002-

2006. It was the first Portuguese member to be appointed as chairman of a CIGRE Study Committee.

Portuguese CIGRE members are currently present in 14 of the 16 Study Committees. Besides their works in the SCs, their activity is also deployed through participation in Working Groups and in relevant CIGRE meetings and other events taking place all over the world.

LAST YEARS RELEVANT DATA - PORTUGAL

On the 16th November 2005, about one hundred members of CIGRE, including some guests, participated in the Annual Meeting of the Portuguese National Committee, where Study Committees members reported their activities and where were also presented two of the Portuguese papers to the XI ERIAC at Ciudad del Este, Paraguay.

On the 15th November 2006, about one hundred members of CIGRE, including some guests, participated in the Annual Meeting of the Portuguese National Committee, where Study Committee members reported their activities and where were also presented two of the Portuguese papers to the 41st Session of CIGRE, in Paris.

In the same meeting, the Portuguese members approved the Statutes of the Portuguese National Committee and elected José Penedos, Chairman of REN, as President of the National Committee for the period 2006/2010. Oscar Ribeiro was appointed Secretary of the Committee for the same period.

The 2007 annual meeting of the Portuguese National Committee took place on the 20th November, with the presence of nearly one hundred members and some guests. As usual, members of the Study Committees made brief reports of their activities and two of the Portuguese papers to the XII ERIAC at Foz do Iguaçu, Brazil, were also presented.

The 2008 annual meeting took place on the 18th November 2008, with a participation of nearly one hundred CIGRE members and guests. The meeting was mainly dedicated to the presentation of the activities of Study Committees, made by their Portuguese members, and of two of the Portuguese papers to the 42nd Paris Session of CIGRE.

From 20 to 25 September 2009, took place at Oporto the annual regular meeting of SC C3, which was associated with an International Colloquium on "Renewable Energy Sources: Environmental and Social Issues".



Regular meeting of the SC C3, Oporto, Sep. 2009

LAST YEARS RELEVANT DATA - ABROAD

In **May 2003**, Mr. Nascimento Baptista, Portuguese member of CIGRE Administrative Council, and Mr. Oscar Ribeiro, Secretary of the National Committee, in representation of the Portuguese National Committee, participated in Argentina, at Puerto Iguazu, in the X ERLAC (CIGRE Latin-American Regional Meeting), during which the creation of RIAC (Ibero-American Region of CIGRE) was proposed and approved.

In **August 2004**, about fifteen members, including the Chairman and the Secretary of the NC, as well as the SC members, participated in the 40th Session of CIGRE, in Paris.

In **May 2005**, about fifteen members, including the Secretary of the NC, participated in the XI ERIAC (CIGRE Ibero-American Regional Meeting), at Ciudad del Este, Paraguay, presenting twelve papers.

On the **26th May 2006**, the Secretary of the NC, representing the Chairman, attended the founding ceremony of the CIGRE Andean Committee, at Lima, Peru.

In **July 2006**, four members, including the Secretary of the NC, participated in a CIGRE Meeting in Santiago de Cuba, Cuba, presenting three papers.

In August 2006, about twenty-five members, including the Chairman and the Secretary of the NC, as well as the SC members, participated in the 41st Paris Session, presenting four papers.

In **May 2007**, about fifteen members, including the Secretary of the NC, participated in the XII ERIAC, at Foz do Iguaçu, Brazil, presenting fifteen papers.

In **August 2008**, about thirty members, including the Chairman and the Secretary of the NC, as well as the SC members, participated in the 42nd Paris Session, presenting four papers.

In **May 2009**, about fourteen members, including the Secretary of the NC, participated in the XIII ERIAC, at Puerto Iguazú, Argentina, presenting twelve papers.



XIII ERIAC, Puerto Iguazú, Argentina, May 2009



History of Romanian National Committee of CIGRÉ

The condition of the Romanian electro-power industry prior and after the foundation of the Romanian National Committee of CIGRÉ

The beginning of electricity use in Romania may be considered to be the year 1882, when a power plant on steam was commissioned in Bucharest and which supplied the royal palace through an underground cable with a voltage of 2 kV DC.

Two years later, in 1884, in western Romania, Timisoara was the first city in Europe having installed the street electric light on about 59 km and using the power generated by a local thermo-power plant with a power of 4x30 kW, 2 kV DC.

Between 1886 and 1900, relatively low power hydropower thermo-power plants were commissioned in various localities in the country mainly devoted to street lighting. Other notable events, in the same period, were the following: the first electric trams (1894, in Bucharest), the first three-phase electricity generation, 50 Hz (1898), the first interconnected operation of two relatively close power plants (1899).

The development of power energy generation determined the setting up of the General Society of Gas and Electricity, in Bucharest, in 1906, the first organizational entity at the regional level.

In the first decades of the 20th century, the increase of electricity demand both in the public sector in the industry and transport sectors determined the commissioning of new power plants (the Diesel-power plant Bucharest-Filaret, with units of 675 Power Horses, the largest in Europe of the year 1908), of the first power transmission line of 55 kV (1916) and of the first electrified railway of 58 km in length (1913).

The end of the First World War finds Romania in the following conditions:

- the main cities had electricity installed;
- the large localities had their own power plants that were separately operating on coal, oil or gas, with a low hydro-power potential utilised;
- there were no applicable regulations on the energy sector development;
- the technical staff consisted—mainly—of relatively few engineers trained in the Western Europe universities.

Since the third decade of the twentieth century, Romania replenished by reverting to the old borders of some large historical provinces (Transylvania, Basarabia and Bukovina), is entering a stage of transition from an agrarian economy to an industrial and agricultural type one. Under these conditions, the ever-growing demand for electricity the Romanian energy industry faces new technical and organizational problems. Thus, between 1920-1924:

- Romanian Institute of Energy (1926), the precursor of the current National Committee (NC) and the General Association of Power Generators and Distributors are set up to promote the energy sector;
- the first plans are evolved for the electrification of Romania (Eng D. Leonida, 1921) and for achieving a national energy system (Eng D. Leonida, 1938);
- the training of the power engineers is started in the polytechnic universities of Bucharest, Timisoara and Iasi;
- new power plants are commissioned and the first zone interconnections are achieved by electrical transmission lines of 60 kV (1923) and 110 kV (1930), as well as the related power substations.

An important contribution to all the said achievements was brought by the members of the NC and - especially – Mr. C. BUȘILĂ (1877-1949) the architect and organizer of Romania's accession to CIGRE and Mr. C. Budeanu (1886-1959), the founding member and Vice Chairman of the Administrative Board of CIGRE. Shortly, after the end of the Second World War, in a Romania left in the former Soviet Union area of influence, the Romanian energy develops under new conditions characterized by a single political management and a totally nationalized economy, with the main targets:

- electrification of the whole country;
- construction of the national energy system;
- providing electricity at a sustained pace needed for Romania's industrialization.

The more important events that marked the first stage of the energy sector development (1950-1960) were:

- continuation and finalizing the electrification process in Romania;
- setting up of regional power dispatchers (1951) and national power dispatcher (1955);
- constructing the national energy system following the interconnection of the regional sub-systems by electric lines and power substations of 110 kV (1956-1960);
- increasing the installed power by commissioning new generation capacities in hydro and thermo power plant;
- construction and development of the national potential for designing power plants by setting up the Institute for Power Studies and Design (1949) and for scientific research by setting up the Energy Institute of the Romanian Academy;

- ensuring Romanian's own resources for construction and erection of power plants, by setting up of specialized companies;
- starting up of power equipment production for energy facilities;
- speeding up the training process dedicated to specialists in the energy field, by splitting the Electric Engineering Faculty, within the Polytechnic Institute of Bucharest (formerly the Polytechnic School of Bucharest, founded in 1920) in a Faculty of Electrical Engineering and the Faculty of Energy (1952), the latter having electro-energy, thermo-power and hydropower sections.

Developments of the energy education training were performed also at the other traditional technical universities of Timisoara and Iasi.

An important event of this period was the re-creation of the NC CIGRE (1956), after a period of inactivity due to world war II and the to the political regime changes that followed.

In the next two decades (1961-1980) the Romanian energy development was driven by the policy of accelerated industrial growth, with emphasis on the heavy industry, chemical industry and steel that were high electricity consumers and that were promoted by the Romanian state.

Power generation increases rapidly by using its own energy resources-gas, oil, lignite and hydro power potential. Thermo-power plants (Rovinari, Turceni, Isalnita) and hydro-power plants (Stejaru, Lotru, Portile de Fier) are constructed and commissioned.

Simultaneously, the power transmission capacity was also developed by switching to the voltage of 220 kV (1963) and 400 kV (1971). To this end, overhead power lines of 220 kV (with a length of 1.500 km) and 400 kV (with a total length of 3.000 km) were built and commissioned as well as 26 power substations of 220 kV and 29 of 400 kV.

In parallel, new capacities in the electrotechnical industry emerged for manufacturing equipment and materials needed for these power plants: autotransformers of 220 kV / 110 kV (1965) and 400 kV / 220 kV (1973); switching equipment with rated voltages up to 400 kV; measuring transformers up to 400 kV.

Within the same period, interconnections of national power systems were carried out with the power systems of the neighbouring countries (Czechoslovakia, 1963, Yugoslavia, 1964, Bulgaria, 1967).

The needed engineering support was mainly provided by the Institute for Energy Studies and Design - ISPE, by the Energy Research Institute (founded in 1967 and later on (1973) turned into the Energy Research and Modernizing Institute - ICEMENERG) and the Research and Design Institute for Electrotechnical Industry - ICPE.

The activities were carried out by the Romanian firms – Electromontaj for power lines and substations and Energomontaj for the other power plants. New high

voltage testing laboratories were constructed and operated at Electroputere Works of Craiova, Polytechnic Institute of Bucharest, ICPE and ICEMENERG and high power testing at Electroputere Works of Craiova and ICEMENERG.

As regards the high voltage networks operation, the live work was initiated first at a power line of 400 kV (1979).

The scientific research and technological development were driven also by the Romanian specialists' participation in the CIGRE activities, a participation that was particularly stressed in the 1970s.

The ninth decade of the twentieth century brings the Romanian energy sector to an extreme condition due to excessive development of some power highly consuming industries, on the background of a high dependency of imported energy resources and economic difficulties created by the reimbursement of the foreign loan. Aberrant and drastic political decisions prevailed over technical ones aimed at the industrial consumption promotion, to the detriment of the domestic or public consumption, the significant cutting down of operational expenses, elimination - totally - of equipment, materials and energy resources imports. By imposing the frequency reduction in the power system, the lowest value recorded was 46.5 Hz (November 1988), and through a «systematization» action as well of the transmission and distribution networks in terms of their being reduced by ca. 50%, the reliability of the power system was strongly affected.

It should be noted that, even in these difficult conditions, the Romanian power system «survived» and no major damages occurred, which was possible due to high qualities of the specialists operating the power system.

Among the few notable achievements of this period, it is worth mentioning the commissioning of the 750 kV OHL Ukraine-Romania-Bulgaria, and the connection to the Romanian power station by the 750 kV / 400 kV substation Isaccea (1986). During the same period, the increased political isolation and the economic restrictions influenced also the participation of the NC and the Romanian specialists in the CIGRE activities, culminating in the year 1988 with Romania's withdrawal from CIGRE.

Reverting to a democratic state with a market economy, following the Revolution of December 1989, fundamentally changed also the evolution of the Romanian energy sector. The Romanian energy underwent a series of organizational changes, which resulted in the separation of electricity generation, transmission and distribution:

- The National Power Grid Company «TRANSELECTRICA SA, the sole operator of the Romanian power system (2000);
- «Electrica» company, the operator of power distribution networks;
- «Termoelectrica», company, hydro power plants integrator;
- «Hidroelectrica», company, thermal power plants integrator.

Since the 90s, a large scale retrofitting of the power facilities has been performed with the view of the national power system interconnection to the UCTE system, which was started in 2003 and completed in 2005. At the same time, the idea of an open electricity market has been promoted, being thus created a set of markets for trading electricity and derivatives products, markets managed by the Commercial Operator (OPCOM) and which are operated within a framework regulated by the National Authority Energy Regulator (ANRE).

Simultaneously, some regional components of the distribution company Electrica have been privatized.

The commissioning of the first 700 MW unit of the nuclear power plant in Cernavoda (1996) and retrofitting the existing power plants have enabled an increase in the power generation capacities.

The year 1990 also meant resuming of the collaboration with CIGRE and with other specialized international bodies (CIRED, IEC etc.), and starting the cooperation with new electricity companies as well.

Foundation and evolution of the Romanian National Committee-CIGRE

The Romanian National Committee(RNC) of CIGRE was established in 1926 at the initiative of Constantin BUȘILĂ, the designer of the first regional power system in Romania. In the first Management Board besides C. BUȘILĂ, chairman, also participated the Professors Constantin BUDEANU and I.S. GHEORGHIU. The year 1927 marked the first participation of a Romanian delegation in a CIGRE conference, followed by active participations in all the CIGRE congresses until the beginning of the Second World War, when the activity of RNC ceased, being reiterated actually in 1956 under the new economic and political conditions resulting from the war. A new interruption of the RNC activity took place in between 1988-1990, imposed by severe economic and political limitations implemented by the last years of the communist regime existence. RNC was recreated in 1991, with a new structure corresponding to the democratic framework resulting the revolution of 1989 and the Romanian participation in CIGRE has been resumed in 1992 with Session 34. The number of the Romanian members of CIGRE which was initially low, has permanently increased and now totals 21 collective members and 64 individual members. The RNC is represented in all the CIGRE study committees, as well as in many working groups thereof.

At the national level, the RNC created their own study groups, corresponding to the Study committees of CIGRE and chaired by the Romanian members of the latter.

The RNC activity is supported by the Association of the Romanian National Committee of CIGRE founded in 2006.

Annex 1 includes the RNC chairmen since its establishment up to present time. Annex 2 shows the Romanian membership evolution of CIGRE since 2000 until now.

The Romanian specialists' participation in the CIGRE activities is also illustrated by the great number of technical reports submitted on behalf of the RNC to the CIGRE congresses (Table 1).

Table no. 1 – Number of the technical reports delivered on behalf of the RNC to the CIGRE congresses

Year	1927-1998	2000	2002	2004	2006	2008
Number of reports	ca. 42	4	5	4	6	8

Therewith, following their participation in various CIGRE WGs, many Romanian specialists can be identified among the authors of the technical brochures issued by CIGRE.

Annex 1: Chairmen of RNC – CIGRE

- Constantin BUȘILĂ (1926 – 1939);
- Constantin BUDEANU (1956 – 1960);
- Adrian GEORGESCU (1969 – 1970; 1972 – 1976)
- Dumitru POPESCU (1976 – 1978)
- Călin MIHĂILEANU (1991 – 2000);
- Dorin CRISTESCU (2000 -).

Annex 2: Evolution of the Romanian membership of CIGRE, between 2000 and 2008

.Year	Collective members I	Collective members II	Individual members
2000	10	1	9
2001	15	1	16
2002	17	2	22
2003	17	1	23
2004	19	1	43
2005	20	2	47
2006	17	1	64
2007	17	2	65
2008	17	2	64
2009	17	1	64

Annex 3: Notable personalities

Affirming Romania in CIGRE would not have been possible without the sustainable technical, scientific and organizational activity of some topical personalities, such as:

- **Constantin BUȘILĂ, engineer**, (1877 - 1949), initiator and first chairman of the Board of Directors of the Romanian Energy Institute, the precursor and Chairman of RNC and leader of the Romanian delegation at CIGRE (1927 -

1939), elected Vice Chairman of CIGRE Board on the occasion of the Board meeting in 1927 and the Chairman of WG 35 - Overvoltages (1935). Since 1920, he was the pioneer of the first Romanian regional energy system development, consisting of six power plants and several hundred kilometres of electric lines. Professor at Polytechnic School in Bucharest and a specialist involved in the reactive power issues, Professor Bușilă delivered at CIGRE meeting in 1927, a comprehensive report on "Le problème de la puissance reactive".

- **Professor Constantin I. Budeanu** (1886 - 1959), member of the Romanian Academy, co-founder (1926) and Chairman of the RNC (1956 - 1960), founding member and Vice Chairman of the CIGRE Board of Directors (1958-1960), and member thereof (1948 to 1956). A well-known professional in the reactive and distorting power issues, successor of A.-E. KENNELY to the chair of the CIGRE Study Committee for distorting reactive issues, Chairman and key reporter of the Committee of CIGRE study «Improving Power Factor» (1929, 1931) and the Committee of studies CIGRE «Reactive and distorting phenomena» (1956, 1958), author and co-author of several technical reports delivered at the CIGRE congresses. As a professor of power tests and theoretical bases of electrotechnics at the Polytechnic School in Bucharest (1926 - 1959), he contributed substantially in the education of many engineers and researchers within the power grid field, and based on his technical work, he was one of the architects of the Romanian power system construction.
- **Professor Ion S. Antoniu** (1905 - 1987), corresponding member of the Romanian Academy, a famous professional in the distorting electrical modes, author and co-author of technical reports on these modes, presented at CIGRE congresses, inventor of the device for active, distorting and reactive power measurement- PDQ-meter. As a professor of theoretical electrotechnics bases at Polytechnic Institute of Bucharest (1953 - 1975) he brought an important contribution in training the engineers and scientists in the power grid field.
- **Professor Calin Mihaileanu PhD** (1933 - 2008), Chairman (2000 - 2002) and honorary Chairman of the RNC (2002 - 2008), "Honorary member" and «Distinguished member» of CIGRE, a specialist highly active for Romania participation in CIGRE since 1956 and - especially in-over the period 1992 - 2000. A well-known expert in the power systems operation field, he was elected Chairman of WG «Means of helping the consumers to cope with sudden voltage variations" at the CIGRE CS 19 meeting in 1966. He was attributed the «Technical Committee Award" for his activity with the Technical Committee of CIGRE.

Other personalities who particularly stand out both for their activity in the RNC, and in CIGRE are:

- **Professor Martin Bercovici** (1902 - 1971), member of the Romanian Academy, with contributions in the field of power grids and systems.
- **Professor Constantin DINCULESCU** (1898 - 1990), corresponding member of the Romanian Academy, with contributions in the field of power substations and plants.
- **Paul Dimo PhD** (1905 - 1990), member of the Romanian Academy and of the Society of power and power engineers in France, author of Nodal Analysis - REI - Dimo, which he was awarded the Montefiore Prize (1980) for.
- **Professor Gleb DRĂGAN**, member of the Romanian Academy, with contributions in the field of overvoltages and insulation coordination and lightning, an active member of SC 33- Overvoltages and insulation coordination.
- **Professor Dorin CRISTESCU**, member of the CIGRE Board of Directors, Chairman of RNC, «Distinguished member» of CIGRE, specialist expert for his contributions to SC 33 - Overvoltages and insulation coordination and to the SC 36 - Power system electromagnetic compatibility.

Annex 4: CIGRE events held in Romania

CIGRE main events organized and conducted in Romania were as follows:

- Meeting of CIGRE SC 4 - Protections and relays (1965)
- Symposium «Power grids planning and development» (1967)
- Meeting and Symposium of CIGRE SC 33 - Overvoltages and insulation coordination
- Symposium « Man and lightning» (1993)
- CIGRE Black Sea EI - Net Regional Meeting (2001)

RNC also supported the organization in Romania of several meetings of many working groups within the CIGRE study committees, which enabled the even tighter connection of the Romanian specialists to the CIGRE activity.

HISTORY ISSUES of Romanian National Committee - CIGRE

1921 - Setting up of CIGRE in Paris and holding of the first CIGRE

1924 - Plenary Session of the World Energy Council. Constantin BUȘILĂ presents the "Energy policy of Romania.

1926 - IRE is set up based on Constantin Bușilă's initiative; he becomes Chairman of the Board of Directors until 1930. The membership of this Board includes also Professor C. Budeanu, and I.S. Gheorghiu.

RNC is set up and affiliated to the IEC.

1927 CIGRE 4

The Study Committee - Improving the power factor **IPF**

The Romanian delegation was led by **C. BUȘILĂ**, who was elected Vice Chairman of the Board.

The Romanian delegation consisted of the following members: C. Budeanu Prof., Sophian, Al. Proca, G. Petrescu

The following papers were delivered:

- G. Petrescu, "**Self excitation of the alternators connected to high voltage lines**".
- C. Bușilă - Report 76: "**Le problème de la puissance réactive**". Also Professor C. Budeanu participated in the discussions.

1928 - Meeting in Paris (October) of the power factor International Studies Committee headed by Professor C. Budeanu. Questionnaire was answered by outstanding personalities such as Blondel, Brylinski etc.

In discussions at Section 3 - Network Operation, Prof. Budeanu delivered a 5 page comment on "physical vector of reactive power" to the 27 page Report submitted by M. A. Ilievici: "Remarques sur la tarification et la mesure de l'Energie Electrique dans les réseaux Haute Tension "

1929 CIGRE 5

The Romanian delegation consisted of:

Constantin Bușila, representing the Ministry of Industry and Commerce
N.Vasilescu Karpen, representing the Polytechnic School
C.I.Budeanu, representing I.R.E
Ștefan Mateescu, representing the Electric Plant

Independent members:

I.S.Gheorghiu - Polytechnic School
Cristea Mateescu - Electrica Society
Al.Proca representing - Electrica Society in Paris
G.Petrescu, engineer - Electrica Society

General report by Prof. **C.I. BUDEANU** for the Study Committee Improving the power factor

Papers delivered:

- Cristea Mateescu: "**Rules for OHL calculation**";
- Prof. C.I. Budeanu "**Report on the reactive power**".

In Section II - Lines Construction and Insulation, *Cristea Mateescu* presents Report 58 - **Checking the calculation methods of conductors and overhead electrical lines towers.**

Until 1924 the power lines had been built according to VDE prescriptions. A strong gale damaged several OHLs of 60 kV, the highest voltage in Romania at the time. It was therefore absolutely necessary to update these prescriptions to the weather conditions in Romania. Since 1930, the provisions of this report have

been applied. The first 110 kV line in the country was constructed in 1930 in compliance with these provisions.

At Section III, Networks operation and protection, C. Budeanu presents Report 8 - **The issue of reactive power and energy existence in power generation and distribution facilities.**

1931 CIGRE 6

36 countries were represented in this event. Romania participated with a **5 person** delegation.

Al. Proca was also a panel member, Secretary of Section 1, *Protection of current transformer*

The Romanian delegation members were the following:

- Constantin BUȘILĂ – representing the Ministry of Industries;
- Prof. C.I. BUDEANU – representing IRE

and “independent” members as well

- G. Dachler, Director of the Electric Plant of Sibiu;
- Ștefan Mateescu, Vice Chairman of the Electric Plant of Arad;
- Al. Proca representing in Paris Electrica Society.

Professor Budeanu was a Key Reporter for the Committee founded in 1927.

Note: Before the first World War, C.I. Budeanu had attended the Charlottenburg School and had been expert trained in the USA.

The notions of “individual member”, “collective member” and “honorary member” were created.

The paper delivered by Prof. Budeanu – Report 8: «**Improving the reactive power and power factor**».

In 1929, at IEC, following the CIGRE requirement the issue of magnitudes and units of reactive was studied.

At the 1930 plenary session, **VAR** as measuring unit was adopted based on the answers to a Special Questionnaire.

1935 CIGRE 8

Participation in the session of Group 33 - **Grids management and calculation**

Report topics:

- Technical issues on international interconnection
- European super-grid
- Financial and economical solutions for the regional interconnection
- Domestic and international problems

Professor Budeanu made a substantial contribution.

As regarded the international power exchange ambiguous technical issues related to long distance power transmission.

In 1935 the economic solution was far from being clarified. The energy issue is **NATIONALLY** interesting and the domestic economy of many countries is largely based on their own energy policy. The economic relationships should not be disturbed by tackling new issues that cannot be internationally resolved.

As economic barriers still exist among many countries, the price issue for coming back to such a network becomes fundamental.

There are large disparities in energy consumption registered. In Europe of that year, over half of the population consumed 40-50 kWh/capita, while the world consumption of any energy type was of 100 kWh/capita. The first issue was the development of consumption and then the supergrid was to be considered. Only a development of machinery and products trade could lead to this objective. Professor **Budeanu** presented a fundamental report to the UIPDEE Congress- the economic and social role played by the electricity generating industry. In 1931, the merchandise called electricity was more than 20% of the world production of cereals - the economic benchmark. The consumption of the developed countries was about 200 kWh / capita. Only in case of an economic unbounding would it have been possible to raise the issue of an international power grid. It is useless to stress how real these issues are nowadays, 75 years since their occurrence and furthermore the discrepancies have been even more significant.

On this occasion the Chairman of the meeting M. Janiceson (USA) expressed his thanks and congratulated Professor Budeanu for his report no. 264 from the Group 28 "Distorting phenomenon in high voltage installations" appreciated as an **outstanding communication that supplemented his highly valuable research.**

Group 35 Overvoltages

- Chairman - Bușila M., Eng. Romania
- Special Reporter - Prof. Mathias (Germany)

Conducted with high competence, the discussions of this group have addressed and solved many issues which are topical today, too.

It is worth mentioning that not solely the atmospheric overvoltages are currently of interest. It was for the first time that the internal overvoltages were to be the concern of the scientific world. Note must be taken that at the date DRVs faced problems for this long lasting phenomenon "steady state overvoltages, which rapidly occurred and succeeded to one another and those that took a long time". Then we had the rule that the DRV should not have intervened. It is important to note the protective effect of the protective conductors, of a good earthing of the towers, of using the Petersen Coil for

extinguishing the earthing arc – a topic also currently debated - the positive influence of the protection fittings.

A special debate was related to OHLs with wooden towers or mixed, considering the triggering concentration at the metal towers. The solution of some DRVs with explosion fuses was also adopted.

"Danger du bois" expression was also utilized mainly for the end substations connected to such OHLs. To prevent the danger of circulating overvoltages in the substations discussions focussed on strengthening the insulation through the leakage line up to 50 Hz which creates difficulties related to the insulation level in the substations.

It became mandatory to install protection devices in substations - DRV, although the limiting effect of the outlets number was well known. Protection devices were also recommended to be installed at each substation inlet. Discussions also focussed on the operation of the selection protective relays when the tripping is too close, less than 1000 m as regards the transformers operation indoors.

For the same reason, the suggestion was made to install a protection reinforced with three protection wires on the first 2 km of line.

It is estimated that, at the sensational limit, surge arresters should be installed on the line.

As regards the effectiveness of protection wires against lightning, Mathias is not totally in favour of this solution because of the accuracy of the lightning "protection zones" in the active wires, hitting the pole, hitting the protection wires, an issue which had not been dealt with at the time.

Still to be determined is the harmfulness degree of $U_{50\%}$ related to di/dt and consequently completing transformers tests and enhancing the knowledge on earthing resistances. The progress made in the recent years has been due to computer implementation after the war, upgrading the radar and, subsequently, improving the lightning detection systems and the GPS, constructing the surge arresters with metallic oxides subject.

1937 CIGRE 9

No information available

1939 CIGRE 10

No information available

Since the Second World War, CIGRE activity was interrupted until 1946 when it was resumed with **CIGRE 11**

The major political changes in Romania also influenced the RNC-CIGRE activity. RNC-CIGRE restarts its activity and it is recreated in 1956, being chaired by Professor Budeanu.

1946 CIGRE 11

No information available

1948 CIGRE 12

It was structured in 5 Study Committees grouped as set forth in the presentation in Paris, within **4 Sections**.

Based on the CIGRE Chairman's presentation, it resulted that in spite of its activity interruption, there was still a high interest in the session, particularly due to the high value of the reports and discussions.

There were 1144 participants enlisted from 40 countries and more than 1000 reports were delivered.

The participants were active in the following fields:

- construction of electrical material and power lines developers: 428
- electricity generators and distributors: 512
- engineers from governments, teachers, engineers, advisers, other: 204

Romania was represented by 5 persons. Although being an official representative, C. Budeanu, a professor at the Polytechnic School, delegate of the Romanian Academy, did not participate.

Independent members of the Romanian delegation:

- I.S. Antoniu project conductor at the Polytechnic School
- Director of the Enterprise of Timișoara City
- John S. Gheorghiu, Professor at Polytechnic School
- N. S. Trestianu, engineer electrician

Professor C. Budeanu is a member of the CIGRE Board Vice-Chairman of the Council and the Special Reporter of the Third Section.

The work organization in the **4 Sections**:

- Section I - generation, transmission and circuit breaking: 42 reports;
- Section II - conductors, insulation and overhead and underground lines maintenance: 31 reports;
- Section III – Grid operation, maintenance and protection: 35 reports;
- Section IV - Higher voltages transmissions: 17 reports.

Romania delivered 1 report.

The Key report from that particular section, because Prof. **Budeanu** was absent, was delivered by M. Ilievici.

Report 333 by Budeanu on the activity of the Study Committee *Reactive and distorting power*. The meeting was organized in Lausanne, 1946.

Some significant issues defining the distortion coefficient as a ratio between the effective value of the distorting residue and the effective value of the curve.

Distorting residue

This definition was proposed to be adopted by CIGRE and to be communicated for IEC standardization.

Further new items:

- Connection with the issue of voice communication and radio disturbances. **We should note that we are in 1948.**
- A questionnaire is circulated referring to the current industrial facilities condition;
- It is the topic of Report 329 of which very important are the following
 - Conditions specific to the distorting regime existence;
 - Damages caused by this phenomena;
 - General measures taken to mitigate these distorting regimes.

Report 329 by C. Budeanu, I.S. Antoniu: Study on the distorting regime in an industrial

The theoretical conclusions presented were tested in the laboratory for their being applied in the industrial facilities.

The program developed by the Study Committee for Distorting regimes.

The authors made studies on the 5 kV distribution grid of Bucharest. These focussed on some regimes created in a feeder of a mercury vapour-based rectifying substation.

The oscillating test was performed at the alternator gap voltage, the current entering to feeder and the voltage in a grid spot.

The approximate calculation of the distorting power:

$$P_d = D = V \cdot I_d$$

Active power P 750 kW

Reactive power Q = 180 kVAd

Distorting power $P_d = D$ = 212 kVAd

The calculations show that D delivered by the alternator is equal to the one absorbed by the rectifier, energy conservation.

The distorting regime for the feeder studied does not slightly increase the apparent power.

$$P_{ap} = (P^2 + P_r^2 + P_d^2)^{0.5}$$

The Ohm losses increase by ca. 8% in the analyzed cable.

The distorting regime is wrongly defined by the power factor. It should be utilized "distorting residue"

1950 CIGRE 13

No information

1952 CIGRE 14

No information

1954 CIGRE 15

No information

1956 - The 16th Conference of CIGRE [Energetica magazine, vol. 4, 1956, No. 9]

In Romania, the great political changes in between 1944-45 caused also the interruption of the CIGRE activity. RNC-CIGRE was recreated in 1956, at the 16th CIGRE meeting, its chairman being Professor **C.I. BUDEANU**.

The membership of the newly set up RNC-CIGRE:

Chairman: Academician Prof. C.I. BUDEANU

Vice Chairman: PhD. Prof. I.S. ANTONIU

Secretary: Prof. Călin MIHĂILEANU

Members:

Prof. Martin BERCOVICI

Prof. T. TĂNĂSESCU, fellow member of the Romanian Academy

PhD. Prof. A. AVRAMESCU, fellow member of the Romanian Academy

Prof. C.A. PARTENI, Rector of the Polytechnic Institute of Bucharest

Prof. Emil CONSTANTINESCU, expert at ISPE

Prof. C. PENESCU, deputy head electrician at ISPE

Prof. C. APETREI, Scientific Director of the Energy Institute of Academy

Paul DIMO, eng. and head electrician at ISPE

Virgil BUNEA, eng.

Vasile NITU, eng. head of the thermo-project sector at ISPE

Eugen POTOLEA, eng.

Academician Prof. C. MIKLOȘI, Timișoara

Prof. CORLĂȚEANU, Politechnic Institute of Iași

Academician Prof C.I. BUDEANU – Chairman of Committee 16 CIGRE – Reactive and distorting regimes.

The delegation participating in the 16th conference of CIGRE (May 30th – June 9th 1956) consisted of Prof. T. TĂNĂSESCU, Prof. Călin MIHĂILEANU, Prof. C. APETREI and Vasile NITU, eng.

The Romanian delegation delivered no papers.

1958 - the 17th Conference of CIGRE [Energetica magazine, vol. 6, 1958, No. 4]

Four papers were delivered:

- Academician Prof. C.I. BUDEANU: *Report on the session of the International Studies Committees no. 16 of CIGRE for the study on the reactive and distorting regimes;*
- Prof. PhD. I.S. ANTONIU : *Impact of the distorting regime on testing the active power and energy – within the Study Committee no. 16;*
- Prof. C.I. PENESCU : *Considerations on coupling in parallel the alternators by the self-synchronising method;*

- Paul DIMO, eng.: *Graphic analyser based on short-circuits currents for the high voltage grids study.*

1960 - the 18th Conference of CIGRE [Energetica magazine, vol. 9, 1961, No. 8]

RNC-CIGRE:

- Chairman RNC-CIGRE: Adrian GEORGESCU, Deputy General Director of the General Electricity Department;
- Vice Chairman : Prof. Cornel PENESCU, Deputy Rector of the Polytechnic Institute of Bucharest;
- Secretary: Liviu GROZA, eng. Head Designer at ISPE.

Members:

Prof. Martin BERCOVICI, fellow member of the Romanian Academy

Prof. I.S. ANTONIU, Polytechnic Institute of Bucharest

Prof. Constantin APETREI, Scientific Director of the Energy Institute of Academy Nicolae ARMENCOIU, eng. Member of the State Committee for the New Technique

Virgil BUNEA, eng., Designer at the Electrical Machines Works

Prof. Emil CONSTANTINESCU, Head engineer ISPE

Prof. V. CORLĂȚEANU, Polytechnic Institute of Iași

Paul DIMO, eng. ISPE

Ștefan FELDMAN, Head engineer UPDE

Prof. Gheorghe HORTOPAN, Technical Director ICET

Prof. Călin MIHĂILEANU

Paul MILITARU, Head engineer at ISPE

Prof. Nicolae MOLDOVEANU, Head engineer at the Energy Inspectorate

Vasile NITU, Head engineer at ISPE

The delegation participating in the 18th Conference of CIGRE consisted of:

- Adrian GEORGESCU, Deputy Director General of the General Energy Department, Delegation Leader
- Liviu GROZA, Head Designer at ISPE
- Prof. Paul MILITARU, Head Engineer at ISPE
- Prof. C. APETREI, Deputy Director of the Energy Institute of Academy
- Nicolae COCOȘ, eng.

The Romanian delegation delivered 2 papers:

- G. HORTOPAN: *A new relation referring to the voltage transformer impulse testing*, Report 125, Group 12-Transformers;
- E. CONSTANTINESCU, N. BORZA: *Economical safety coefficients of the overhead power lines*, Report 220, Group 23-24 Overhead lines, Vibrations.

1961 - Meeting of the Study Committee 8 – Thunder strike and the atmosphere overvoltages, Athens, September 25th – October 3rd. Prof. Gleb DRĂGAN participated in this event.

1962 - the 19th Conference of CIGRE

No information available

1964 - the 20th Conference of CIGRE [Energetica magazine, vol. 12, 1964, No. 12]

The Romanian delegation delivered 2 papers:

- C. PENESCU : A remote solid-state relay universally usable – Report 317, Group 31 (Protection and relays) ;
- P. DIMO: *Simplifying the grid issue by implementing a new concept. The type equivalent diagram (REI) and its representation* – Report 318, Group 32 (Grid design and operation).

The Romanian delegation consisted of the following:

- Prof. Constantin APETREI, Deputy Director of the Energy Institute of Academy;
- Prof. Emil CONSTANTINESCU, Director of ISPE;
- Paul DIMO, fellow member of the Romanian Academy;
- Liviu GROZA, Head engineer at ISPE;
- Eugen PANTEA, Head engineer at the Energy Construction and Erection Corporation;
- Prof. Cornel PENESCU, fellow member of the Romanian Academy.

Prof. Remus RĂDULEȚ also participated in the conference as Chairman of the International Electrotechnic Commission.

The Romanian delegates participated in the discussions within the study groups and study committees:

- C. APETREI – Group 11, Alternators and Study Committee 17 – Alternators;
- E. CONSTANTINESCU – Study Committee 6, Non-insulated conductors and Study Committee 7, Stands and foundations;
- P. DIMO – Group 32, Grid design and operation, and Study Committee 13, Grid design and operation;
- L. GROZA - Group 32, Grid design and operation;
- C. PENESCU – Group 31, Protection and relays, Group 32, Grid design and operation, and Study Committee 4 – Protection and relays;

1965 - Meeting of Study Committee 4 (Protection and grids) in Bucharest (C. PENESCU)

1966 - the 21st Conference of CIGRE [Energetica magazine, vol. 14, 1966, No. 12]

The Romanian delegation delivered 2 reports:

- G. MORAITE, S. IONESCU, St. FELDMAN, I. CHENZBRAUN : *Issues related to the stability of the loop grids* – Report 332 ;
- G. DRĂGAN, I. ADĂMUȚ, M. PETCU: *Studies on overvoltages occurring when disconnecting the capacitive and inductive circuits by means with analogous computers* – Report 424.

The Romanian delegation consisted of 11 persons:

- Prof. Constantin APETREI, Deputy Scientific Director of the Energy Institute of Academy;
- Tiberiu CIUBOTARIU, eng. Head of Laboratory at the Electrotechnical Design and Research Institute;
- Paul DIMO, fellow member of the Romanian Academy;
- Prof. PhD. Gleb DRĂGAN, Dean of the Energy Faculty;
- Adrian GEORGESCU, eng. Deputy of the Electricity Minister, Delegation Leader, Chairman of RNC-CIGRE;
- Liviu GROZA, Head engineer at ISPE, secretary of RNC-CIGRE;
- Ion ION, eng. Counsellor of the Electricity Minister;
- Prof. Călin MIHĂILEANU, Director in the Electricity Ministry;
- Prof. Cornel PENESCU, fellow member of the Romanian Academy, Vice Chairman of RNC-CIGRE;
- Academician Prof. Remus RĂDULEȚ, Vice Chairman of the Romanian Academy, Director of the Energy Institute of Academy, Chairman of the International Electrotechnical Commission;
- Florin TĂNĂSESCU, eng. Scientific Secretary of the Electrotechnical Design and Research Institute.

Members of the Study Committees:

- Study Committee 4, Protection and relays: Cornel PENESCU;
- Study Committee 12, Transformers : Tiberiu CIUBOTARIU;
- Study Committee 17, Generators : Constantin APETREI;
- C 19, Voltage vibrations: Călin MIHĂILEANU;

Experts in other study committees:

- Study Committee 8, Overvoltages : Gleb DRĂGAN;
- Study Committee 9, Alternating current transmission: Adrian GEORGESCU and Liviu GROZA;
- Study Committee 13, Grid design : Paul DIMO and Liviu GROZA;
- Study Committee 15, Insulation coordination: Gleb DRĂGAN.

Călin MIHĂILEANU was elected Chairman of the Working Group “Means of helping the consumers to cope with sudden voltage variations” in Study Committee 19.

Participation in debates

Group 11 - M.C. Apetrei

Remarks on the optimal sizes of an alternator considering the capitalized value of losses . In Romania, the criterion for sizing the optimal is not the capitalized value of losses but the value related to the specific cost of the machine in its final technological condition.

He suggested to the Committee the collection of data on variation of the

capitalized losses values at the specific costs of the final machine manufacturing.

1968 - the 22nd Conference of CIGRE [Energetica magazine, vol. 16, 1968, No. 12]

Adrian GEORGESCU, eng. Deputy of the Electricity Minister, Chairman of RNC-CIGRE

The Romanian delegation delivered 2 reports:

- C. APETREI, C. BĂLĂ, L. GROZA, G. CANTARAGIU : Criteria for selecting the paramaters of the synchronous machines and of the excitation systems considering the features of the power grids – Report 11-08 ;
- V. NITU, P. DIMO, P. IANCOVICI, N. Bordeianu, C. GOLDENBERG, E. ARIE, M. CONSTANTINESCU, N. TERDIMAN, A. SOCI: Impact of the Romanian power grid structure and development when choosing the unitary power of the Units – Report 32-15.

The Romanian delegation consisted of 11 persons

- Constantin APETREI;
- Tiberiu CIUBOTARIU;
- Ing. Paul DIMO, fellow member of the Romanian Academy;
- Prof. PhD. Gleb DRĂGAN;
- Adrian GEORGESCU, eng. deputy of the Electricity Minister, delegation leader, Chairman of RNC-CIGRE;
- Liviu GROZA;
- G. HORTOPAN;
- D. LĂZĂROIU;
- V. PARTENIE;
- C. PENESCU;
- R. RĂDULEȚ

The main Study Committees:

- Study Committee 4, Relays, C. PENESCU;
- Study Committee5, Insulators, G. DRĂGAN;
- Study Committee8, Overvoltages, G. DRĂGAN;
- Study Committee12, Transformers, T. CIUBOTARIU;
- Study Committee13, Relay design, P. DIMO, L. GROZA;
- Study Committee 17, Alternators, C.APETREI, P. DIMO, R. RĂDULEȚ;
- Study Committee 19, Sudden voltage gaps, P.DIMO;
- Study Committee 15, Dielectric material, G. DRĂGAN;
- Study Committee 34, Protection, automation and telecontrol devices, C. PENESCU.

1970 - the 23rd Conference of CIGRE [Energetica magazine, vol. 18, 1970, Nr. 11]

Liviu GROZA, member of the CIGRE Administration Board (1970-1974), Chairman of RNC-CIGRE.

The Romanian delegation delivered 2 reports:

- D. MORARU, C. POPESCU, M. STOICA, F. TĂNĂSESCU: *Identifying the damages caused by the partial discharges for the impregnated paper insulation types* – Report 15-05;
- P. DIMO, L. GROZA, G. MORAITE, H. CRISTEA: *Improving the grid operation reliability by means of viewing console* – Report 32-13.

Part of the Romanian delegates participated both as members and as experts in some Study Committees:

- Study Committee 11 - Rotating machines, C. APETREI;
- Study Committee 23 - Substations, E. CONSTANTINESCU;
- Study Committee 32 - Grid planning and operation, P. DIMO, L. GROZA;
- Study Committee 33 - Overvoltages and insulation coordination, G. DRĂGAN;
- Study Committee 13 - Circuit breakers, G. HORTOPAN;
- Study Committee 34 - Protection, automation and telecontrol devices, C. PENESCU;
- Study Committee 21 - High voltage insulated cables, P. PETRESCU;
- Study Committee 35 - Teletransmissions, A. SPÎNU.

1972 - the 24th Conference of CIGRE [Energetica magazine, vol. 21, 1973, No. 5]

The delegation consisted of 7 persons and was headed by Adrian GEORGESCU, deputy of the Electricity Minister, Chairman of RNC-CIGRE, member of the CIGRE Administration Board.

The Romanian delegation delivered 2 reports:

- L. GROZA, G. CREȚU, C. OPASCHI, A. VREME, C. ZLATANOVICI: *Abnormal and particular regime operation of the high power hydro-generators with low rotation speed* – Group 11, Electrical machines;
- V. NITU, Gh. HORTOPAN, H. ALBERT, M. BOGDAN, F.D. LĂZĂROIU: *Criteria for sizing the energy facilities* – Group 32, Grids planning and operation;

A Romanian-Yugoslav report was also delivered with the title: the 400 kV interconnection node of Porțile de Fier. The Romanian authors were: P. DIMO, G. MANOLESCU, V. ROMERT, N. BORDEIANU

1972 - Meeting of the Study Committee 34 - Protection, automations and telecontrol devices, Aarhus, Denmark, May 31 - June 7, with the participation of Prof. PhD. Cornel PENESCU and I. CHENZBRAUN, eng.

1973 - Meeting of the Study Committee 33 - Overvoltages and insulation coordination, Krakow, September 17-21, with the participation of Prof. PhD. Gleb DRĂGAN.

1974 - the 25th Conference of CIGRE

1976 - the 26th Conference of CIGRE [Energetica magazine, vol. 25, 1977, No. 5]

Dumitru POPESCU, deputy of the Electricity Minister, was elected member of the CIGRE, Chairman of RNC - CIGRE.

The Romanian delegation delivered 2 reports:

- L. GROZA, G. MORAITE, D. DRĂGAN, C. NECȘULESCU, D. CREȚU, T. KERTESZ: *Possibility of stabilizing that dynamic regimes in the power grids* – Report 32-18, Group 32 – System design and operation;
- C. MIHĂILEANU, C. MUNTEANU, M. DĂNCILĂ, E. POP, V. STOICA, S. CRIȘAN: *Measuring the electrical field in the vicinity of the high voltage equipment and determining its bio-physical disturbing effects* – Report 36-08, Group 36, Disturbances;

1978 - the 27th Conference of CIGRE [Energetica magazine, vol. 27, 1979, No. 5]

Romania participated with a delegation formed by 15 persons (6 persons from the Electricity Ministry, 6 persons from the Polytechnic Institute of Bucharest, one person from the Ministry of Machinery, one person from the Romanian Academy, one person from the Central Council of Economic and Social Activities Workmanlike Control).

Dumitru POPESCU, eng. Deputy of the Electricity Minister, member of the CIGRE Administration Board (re-elected), Chairman of RNC-CIGRE, could not participate in this event and he was represented by Liviu GROZA, secretary of RNC-CIGRE.

Part of the Romanian delegates participated both as members and as experts in some Study Committees. Participation as members:

- Study Committee 23 – Substations, V.I. NITU;
- Study Committee 33 – Overvoltages and insulation coordination, G. DRĂGAN;
- Study Committee 32 – Grid operation and control, P. DIMO;
- Study Committee 32 – Grid planning, L. GROZA
- Study Committee 12 – Transformers, G. TOMA

Participation as experts:

- Study Committee 11 – Rotating machines, C. BÎLĂ;
- Study Committee 24 – Protections, I. CHENZBRAUN;
- Study Committee 31 – Grid planning, P. IANCOVICI.

The proposition was to organise the Meeting of the Study Committee 33 - Overvoltages, in Romania in 1979.

The Romanian delegation delivered 2 reports:

- M. STOICA, F.T. TĂNĂSESCU, G. GIURGIU, A. IFRIM: *The tree phenomenon at the synthetic dielectrics meant for power cables* – Report 15-11, Group 15 - Insulators;

- V.I. NITU, H. BACIU, Z. NEAG, M. STEIN, D. VOINEA: *Considerations on the impact of the extremely severe natural conditions in Romania upon the power grid assets development and operation* – Report 22-11, Group 22, Overhead power lines;

A report was also delivered on behalf of the Study Committee 33 – Overvoltages and insulation coordination, Report 33-13, authors: C. GARY, G. DRĂGAN, D. CRISTESCU, *Attenuation by propagation of overvoltages under the influence of corona effect*.

1990 - Meeting of the Working Group 37-03, Factors that influence the electricity consumption increase, Paris, February 16. PhD. Emil COSTIN participated in this meeting.

Memberships situation

Year	Collective members I	Collective members II	Individual members	Total points	Number of allotted papers	Number of papers delivered
2000	10	1	9	60	1	4
2001	15	1	16	94	---	---
2002	17	2	22	105	3	5
2003	17	1	23	107	---	---
2004	19	1	43	140	3	4
2005	20	2	47	151	---	---
2006	17	1	64	151	3	6
2007	17	1	65	152	---	---
2008	17	2	64	154	3	8
2009	15	1	57	142	---	---

Honorary Member

- Calin MIHAILEANU

Distinguished Members

- Calin MIHAILEANU
- Dorin CRISTESCU
- Stelian GAL
- Mircea EREMIA

Technical Committee Award Recipients

- Calin MIHAILEANU
- Dan ZLATANOVICI
- Anca POPESCU



History of Russian National Committee of CIGRÉ

From the very beginning of organizing of CIGRE (in 1921) the representatives of Russia took an active part in activities of this international organization.

The USSR delegation composed of 7 delegates for the first time participated in the 2nd CIGRE Session (1923).

After certain abatement in the thirties and the forties their participation was resumed in the mid-fifties.

It is necessary to note an active participation in CIGRE activities on the part of a number of Russian scientists and engineers. Over more than 50 years about 250 reports were presented at CIGRE Sessions, in the fields of construction and the development of EHV and UHV transmissions lines, creation of the Interconnected Power Systems, enhancement of Power Systems Reliability of Operation and Long Distance Power Transmission, fault prevention control system etc. Authors were a number of Russian scientists and engineers, namely:

- 1 - L.G.Mamikonyants - 21 reports;
- 2 - V.A.Venikov - 16;
- 3 - G.N.Aleksandrov - 15;
- 4 - I.A.Glebov - 13;
- 5 - S.A.Sovalov - 12;
- 6 - A.F.Dyakov - 12;
- 7 - L.K.Lohanin - 11;
- 8 - S.S.Rokotyan - 11;
- 9 - V.V.Burgsdorf - 10;
- 10 - V.Kh.Ishkin - 10. etc.

CIGRE material was regularly reported in the main magazines of electric power engineering (Electrichestvo, Elektricheskie stantsii, Energetic enc.). New developments are actively discussed and used in practice of electric power enterprises.

Chronology of Russian (Soviet Union) National Committee activities

1923 - The USSR delegation composed of 7 delegates participated for the first time at the 2nd CIGRE session.

1933 - The Soviet report entitled "HF Communication via Overhead Lines in the USSR" was delivered by A.Kruglyakov and Chernyshov. This report described the use of PLC over 10 years (1923 - 1933).

1946 - The representative of the USSR (M.Shatelen) for the first time in history was elected member of the Administrative Council of CIGRE.

1957 - The Soviet National Committee of CIGRE was formed with L.G.Mamikonyants as President and B.P.Lebedev as Secretary General.

1957 - Study Committee meeting 10.

1961 - Study Committee meeting 13.

1963 - Study Committee meeting 17.

1968 - The representative of the USSR (B.P.Lebelev) for the first time in history was elected member of the Executive Committee of CIGRE.

1968 - The representative of the USSR - I.A.Glebov was elected Chairman of SC-11 "Rotating Machines". He also became member of the Technical Committee from the date of its creation.

1969 - The regular meeting of the CIGRE SC-14 took place in Volgograd (USSR) with the demonstration of the Volga station in operation. Members from 40 countries took part in the event. They all noted the big achievements of the USSR in the field of DC transmission Volgograd - Donbass

1970 - The representative of the USSR, L.G.Mamikonyants, was elected member of the Technical Committee of CIGRE.

1971 - The publication of the first report "Rotating Machines" by L.G.Mamikonyants in Electra magazine.

1971 - Study Committee meeting 21.

1976 - The representative of the USSR, Prof.V.V.Burgsdorf, was elected Chairman of SC-22 "Overhead Lines".

1978 - Academician V.I.Popkov took part in the "round table" conference on a theme "The Power Transmission on the boundary of the XXI century". In his statement V.I.Popkov noted that volume of the voltage would be 1500-2000 kV at the beginning of the XXI century and reach 2500-3000 kV in future. According to V.I.Popkov new types of power transmission lines with the equivalent capacity should be considered. **V.I.Popkov** - former President of IEC.

1981- Prof.V.V.Burgsdorf (USSR) held a press conference on the problems of overhead transmission lines impact on the environment.

Prof. V.V.Burgsdorf took part in CIGRE Symposium in Stockholm in the major field of its activity: overhead transmission lines and the environment and held a press conference. 350 experts from 24 countries participated in this action.

Answering the numerous questions of journalists, he noted that the results of some research into the field of transmission lines influence on the environment were too much exaggerated.

1985 - Prof. A.F.Dyakov was elected President of the Soviet National Committee of CIGRE.

1989 - The USSR becomes for the first time venue of the meeting of the Executive Committee of CIGRE organized by A.F.Dyakov and V.A.Mirolubov in Tashkent (USSR).

1989 - The USSR becomes for the first the venue of the meeting of SC-35 and the Colloquium organized by A.F.Dyakov, V.Kh.Ishkin and G.N.Khartonovich in Minsk, Kaunas and Vilnius with the the tours to the Lithuanian State District TherMal Power Station. This Power Plant is one of the best power stations in the USSR, particularly in terms of social amenities: a wonderful swimming pool, a vast ice Palace, Russian hills, etc.

Preferred subjects:

Subject 1: PLC Systems in EHV and UHV networks - Yu.P.Shkarin (USSR);

Subject 2: Applications of Fiber Optic System- U.Hanselmann (Switzerland);

Subject 3: Modern Operating Telephone Systems -T.Olsen (Norway).

1989 - The USSR becomes the venue of the "round table" organized O.A.Nikitin and D.S.Savvaitov at the world's first and unique 1150 kV transmission line. 70 Soviet and 20 foreign experts took part in this action. Twenty reports were presented at the meeting.

The participants became acquainted with the equipment of the 1150 kV Kokchetav substation and with the methods of operation of the UHV - class transmission line.

The special interest of the experts was focused on the live-line management of the phase conductors under voltage.

During the work of the meeting the Chelyabinsk - Barnaul overhead transmission line with the total length of about 2500 km was working at the voltage of 1150 kV (Ekibastuz -Kokchetav and Kokchetav -Kustanay parts) and 500 kV (Chelya-binsk - Kustanay and Ekibastuz - Barnaul parts).

1991 - L.G.Mamikonyants took part in the meeting of the group advisers "CIGRE-2000".

1991 - The Symposium "Compact Overheadt Lines" organized by N.N.Tikhodeev And D,S.Savvaitov was held in Leningrad (USSR).

1991 - The meeting of SC-35-04 "Optical Fibre Communication Lines" organized by V.Kh.Ishkin was held in Leningrad (USSR).

1993 - The meeting of two Working Groups: WG-11-03 "Abnormal and

Transitional Modes of Operation of Synchronous Machines” and WG-11-05 “Unconventional Powerful Generators” organized by L.G.Mamikonyants and I.A.Glebov were held in Russia.

1995 - Russia's hosting of meetings on numerous occasions was of essential importance for CIGRE and included the following main events: meeting of the SC-11 (“Rotating machines”) and its several Working Groups and the joint Colloquium “CIGRE SC-11 and the JSC “Electric Power Institute - VNIIE” on rotary frequency valve systems and seminars for staff in electric power systems of Russia.

All planned international events were held onboard cruise liner bound by the Volga River for the route Moscow - Nizhny Novgorod - Moscow with the calls to the ancient Russian cities of Kostroma, Yaroslavl and Plyos.

The Secretary General of CIGRE, Y.Porcheron, participated in the events upon the invitation RNC CIGRE. Taking advantage of his presence, and of the participation of SC 11 Chairman and members, a meeting with the heads of the electric power systems and the power grids of Russia was organized. This was an opportunity for Russian managers to become acquainted with the priority goals and the activity of CIGRE and SC 11.

The technical tours to the Kostroma State District Power Station and the Thermal Power station of the Yaroslavl Region were organized for the participants at this event.

Participation in the above actions gave Russian experts the opportunity to receive technical information and become better acquainted with the activity and the tasks for the future of CIGRE as a whole and of SC11 in particular. For foreign representatives these were opportunities to better understand the nature of the present state of the art and development prospects for the Russian electric power industry.

2002 - The meeting of the CIGRE Technical Committee was held in Moscow in the President Hotel. 19 members of the Committee from 17 countries: Austria, Belgium, Brazil, the Great Britain, Germany, Spain, Italy, Canada, the Netherlands, Portugal, Russia, Slovenia, UK, the USA, France, Switzerland, Sweden and the Republic of South Africa took part in the meeting.

The Chairman of the Board of the Russian JSC “UES of Russia” A.B.Chubays greeted the participants and noted that “... the major strategic task is the organization of equitable parallel work of the United Power System of the CIS countries and the Baltic states with the TransEuropean Synchronously Interconnected System of Western and Central Europe (TESIS) a creation of the unique Euro-Asian Power Grid System”.

2003 - The International conference “For Synchronous Operation of the East-West Interconnection” took place in St.-Petersburg. It was organized by the JSC “UES of Russia” and CIGRE RNC under the aegis of CIGRE.

Various aspects of synchronous operation of the electric power systems of

Western and Eastern Europe: political, economic and technical were examined at the forum.

The Chairman of the CIGRE RNC A.F.Dyakov opened the Conference. The President of CIGRE, D.Croft, the Secretary General of UTCE, M. Bual, the CIGRE Secretary General, J.Kowal, the Chairman of the Managing Committee of UTCE, F.Warderberg, the Chairman of the Working Group on System Development of UTCE, G.de Montravel, the member of the Board of Euroelectric M.Trampauss, The Chairman of the Executive Committee of WEC A.del Posario, the heads and managers of the large power companies: RWE, CESI, NGC, Fortum, Fingrid, Statnet, Alstom, ABB, Siemens, Ukrenergo, Belenergo, Azenergo, KEGOC and others, representatives of several Russian companies and organizations were among the leading speakers. More than 140 delegates and accompanying visitors from 23 countries took part in the forum.

The representatives of UK, R.Urwin and C.Ray - the Chairman of the SC C1 were among the main organizers of this conference.

The various points of view for the nearest and distant prospects of development of the process of electric power systems of the East and the West were expressed at the conference.

Participants of the conference visited the Northwest power station.

2005 - The regular meeting of the Executive Committee took place in Irkutsk with the discussion of the following questions: the approval of the financial report and the budget for the forthcoming year, the report of the Technical Committee, which defined the programme of scientific research of CIGRE, question of preparation for the Session 2006, etc.

In addition to the direct meeting of the Executive Committee the conference "Russian day" where presentation of the Russian and foreign participants were introduced was organized.

The Director General of the JSC "Irkutskenergo" V.V.Kolmogorov made the detailed presentation on the prospects of development of the electric power industry of Siberia. The Director General of the Energy Systems Institute of the Siberian Branch of the Russian Academy of Science N.I.Voropai spoke about the reform of the Russian electric power industry and problems of investments.

The Director of RTE, Andre Merlin, delivered a presentation on the development of the electric power markets in Europe. The President of the Hydro-Quebec TransEnergo Company, Yves Filion, focused on the peculiarities of electric power systems and ways of improving reliability and quality of power supply. The Vice-President of the American institute EPRI, Clark Gellings, spoke about the significant growth of a number of black-outs in the electric power Industries of the USA and other countries over the last ten years and possible ways of

enhancing reliability and operation of electric power systems. The Chairman of the CIGRE Brazilian National Committee Paulo Esmeraldo spoke about the development of the Brazilian electric power industry.

2005 - CIGRE SC A2 Colloquium on "Transformers Reliability and Effects of Transients" took place in Moscow, for the first time in Russia, upon the invitation of the CIGRE RNC and the Lenin Electrical Engineering Institute of Russia (VEI).

Experts from different countries presented 35 reports and spontaneous contributions on two preferential subjects at the Colloquium:

- 1 - Transformer Reliability on Technical, Economic and Strategic aspects.
- 2 - Effects of Transients.

More than 60 Russian specialists took part in the Colloquium. The regular meetings of the SC four Working Groups were held within the framework of the Colloquium. All working actions took place in the President Hotel and VEI. The eventful programme of the Colloquium also included two technical visits (the Moscow "Insulator" factory and the Centre for Cosmonauts Training).

In total about 140 specialists in the field of the electric power engineering, representing the leading electric power companies from 30 countries of Europe, Asia, America, Africa and Australia (ABB, Siemens, JSC UES of Russia, Federal Grid Company of UES of Russia, VEI, JSC "Electrozavod" and others) took part in the work of this Colloquium.

2006 - The RNC CIGRE and the System Operator for UES of Russia held the International Scientific Conference and Exhibition "Monitoring of Power System Dynamics Performance" in Moscow.

The conference comprised 2 Tutorials:

Tutorial 1 - Methods and means of synchronized phasor measurements A.G Phadke (USA).

Tutorial 2 - Methods of processing provided information on use of monitoring results for power system dynamic characteristic analysis W.Sattinger (CH).

and 2 Technical sessions:

Session 1 - Technology of the synchronized registration of the transients' parameters, principles of WAMS organization and control N.Novikov (RU) and A.G.Phadke (USA);

Session 2 - Transients monitoring and enhancement of the Power systems' operation control quality L.Koshcheev (RU), W.Sattinger (CH).

Russian specialists presented several reports:

IPS/UPS transients' monitoring

B.Ayuev, A.Gerasimov, A.Esipovitch, Y.kulikov;

The registrator of parameters of the transient states "SMART WAMS" and its

testing A.Gerasimov, A.Esipovich, G.Kiryenko, M.Korolev, Y.Kulikov, R.Mogilko;

Synchronized measurement experiment and trail WAMS/WACS structure in the Russian far East interconnected power system A.Grobovoy, N.Lizalck, N.Bondareva, S.Sirazutdinov, V.Stepanov (RU), E.Atienza (US), M.La Scala (IT), A.Germond (CH);

Perspective scopes of use of the transient states monitoring system in a synchronous zone of UES of Russia and electric power systems of the neighbour states, by L.Koshcheev;

Centralized system for power system dynamic monitoring, by Y.Asanbaev, T.Gorelik, S.Lobanov.

2006 - Publication of the book: "International Council on Large Electric Systems - CIGRE History activity 1921-2006" (V.Kh.Ishkin).

The history of the leading international organization in the field of scientific and technical problems of electric power engineering is described.

Specific examples of experts' participation in the work of the Study Committees and their Working Groups, Sessions, Symposia and Colloquia are presented.

The big contribution of scientists and engineers who took an active part in the work of CIGRE, first of all, in the field of development of EHV and UHV transmission lines, creation of large power systems and their management is set forth in this work.

This book was prepared in agreement with the decision of the CIGRE Administrative Council (Bangalore, September 2005).

2007 - "International Conference Relay Protection and Substation Automation of Modern Power Systems"

The conference, under patronage of the President of Chuvash Republic and his administration took place in Cheboksary, one of main ancient ports on the Volga River, some 650 km east of Moscow.

This conference was organized by the RNC CIGRE and the All-Russian Relay Research, Design and Technology Institute (VNIIR), with the System Operator for UES of Russia and the Federal Grid Company.

The conference was called to analyze and summarize the World experience in development, manufacturing, operation and maintenance of facilities, tools and systems for relay protection and substation automation. The main purpose of the conference and associated exhibition was to put forward all the newest achievements and lines of development in the field and to encourage a dialogue between experts, manufacturers and users from all over the World.

The conference decided to establish a Russian National "Mirror" Study Committee B5 - Protection and Automation.

2007 - The book about Russian (Soviet Union until 1991) National Committee CIGRE activities, 1957 - 2007 (V.Kh.Ishkin) - 224 p. was published. Examples of

experts' participation from Russia in the work of the Executive Committee, Administrative Council, Study Committees and their Working Groups, Sessions, Symposia, and Colloquia are presented.

The big contribution of the Russian scientists and engineers, first of all, in the field of development of EHV and UHV systems, creation of large power systems and their management are described.

Also in this book is the list of all reports on CIGRE Sessions and their authors.

2008 - The book about History of the leading international organization in the Field of scientific and technical problems telecommunication and telecontrol Systems in Power Utilities - SC 14/35/D2. 60th Anniversary. 1948 - 2008 (V.Kh.Ishkin, M.V.Solntsev), was published.

The significant contribution of scientists and engineers from many countries who took an active part in the work of CIGRE, first of all, in the field of development of optic fibers, PLC, mobile telecommunication, telecontrol systems In Power Utilities must be noted.

This book was presented in Paris on 28 August 2008 at SC D2 meeting. All members and experts SC D2 received this book.

Many Russian scientists and engineers of international standing participated actively in CIGRE's Study Committees and Working Groups. Here are their names: G.N.Aleksandrov, V.V.Burgsdorf, Yu.E.Vinitskiy, I.A.Glebov, V.Kh.Ishkin, M.P.Kostenko, M.V.Kostenko, V.D.Kovalev, S.D.Lizunov, A.K.Lokhanin, L.G.Mamikonyants, G.V.Mikutskiy, I.B.Peshkov, S.Ya.Petrov, Yu.N.Rudenko, V.A.Semenov, V.A.Stroev, V.V.Khudyakov, V.A.Shkaptsov, Yu.P.Shkarin, among others...

The following persons representing Russia (or the USSR until 1991) have been actively contributing to the CIGRE Governing Bodies (the Administrative Council, the Executive Committee and the Technical Committee): V.V.Burgsdorf, I.A.Glebov, A.F. Dyakov, V.Kh.Ishkin, N.V.Kurochkin, B.P.Lebedev, L.G.Mamikonyants, V.I.Popkov, D.S.Savvaitov, M.Shatelen, I.M.Smirnov, Yu.N.Starshinov.

One Russian company - OPTEN (the President - B.I.Mekhanoshin) took part in the Internaional Technical Exhibition CIGRE - EXPO almost each Session.

They demonstrated the newest engineering solution in the field of telecommunication - the fiber - optical technology with the suspension of communication cables at supports of transmission lines. This company built the world's largest fiber-optic line with the length of more than 3500 km with the suspension of the communication cable in the overhead ground - wire cable.

V.Ishkin



History of Slovenia National Committee of CIGRÉ

Background

History of electricity in Slovenia starts at the beginning of the electricity usage. The first introduction of electricity was in **1882** in Thermal bath Lasko, when owner Theodor Gunkel from Vienna renewed spa and added two DC dynamos 5 kW both to waterwheel at near stream for electricity light and pumping thermal water between pools. For the first time hydro was being used for generating electricity. In those early times of electricity Slovenia was part of the Austrian Empire. It is well known that famous inventor Nikola Tesla had a first job in Maribor, Slovenia in 1879 as assistant engineer in one of the electro-mechanical workshops.

The first AC hydro power plant started operating in **1897** in Ljubljana for the paper industry Vevče using two three-phase generators each 650 kVA with 3 kV and 42 Hz. It was just two years after Niagara Power Station 2 in USA, which showed AC systems taking over as opposed to DC and the beginning of world electrification.

In period between 1921 (1st CIGRE Session in Paris) and 1939 (10th CIGRE Session in Paris) Slovenia was part of the first Yugoslavia, which was in that time United Kingdom of Serbians, Croats and Slovenians. For that period we don't have any data on the participation of Slovenian experts at CIGRE Sessions or in working bodies. But the electricity sector was in that time at quite a dynamic stage in Slovenia. The first large AC Hydro power plant Fala at Drava river started commercial operation in 1918 (installed power was 5x5.2 MVA) and in 1932 with two new generators each 8.7 MVA. From this hydro power plant in 1924 was erected the first 80 kV overhead line connecting hydro and new thermal power plant Trbovlje with emerging load centres.

CIGRE activity really starts in Slovenia with university professor Milan Vidmar at the beginning of the 1950s and after attainment of independence developed into leading experts from non-governmental society in energy sector.

Slovenian participation in the former Yugoslav CIGRE Committee activities (1952 - 1991)

In 1948 during 12th CIGRE Session in Paris, the secretary general Jean Tribot Laspiere invited Slovenian professor Vidmar, who participated in that session, to establish Yugoslav Committee of CIGRE. In October 1949 in accordance with the official requirements of the time the Yugoslav society of engineers and technicians submitted to Federal department for foreign affairs an application for establishing what was called the Initiative group of the Yugoslav Committee of CIGRE chaired by professor Vidmar, who was a famous expert, director of the new institute for electrification and author of many books on electricity issues (his book «Die Transformatoren» from 1932, in German language was very popular in many universities in Europe).

So, at the next (13th) CIGRE Session in Paris in 1950, the participation of Yugoslav experts at CIGRE was organised for the first time. The first two Yugoslav papers were presented: "Aluminum Transmission Conductors without mechanical reinforcements" written by professor Milan Vidmar from Ljubljana University and «Automatic Control of time and load division among generating stations in interconnected systems" written by Ilija Obradovic from Belgrade.

Later in December 1951 the establishing assembly of Yugoslav Committee of CIGRE was called. The first chairman to be elected was professor Milan Vidmar from Ljubljana, Slovenia; the first secretary was Herman Mates from Zagreb, Croatia. Milan Vidmar was chairman up to 1960.

The first Yugoslav national conference of CIGRE was held on May 25-27, 1953 in Ljubljana, Slovenia. At that conference 100 experts participated presenting 21 papers. In the attached table 1 is evidence of statistics for all 20 Yugoslav CIGRE conferences. Four of them were held in Slovenia, the first in Ljubljana and others in Bled. Yugoslav CIGRE conferences were for many years the main event for electricity experts where they had discussions on crucial technical solutions, technology decisions, standards improvements and developments of energy sector in the period of fast electrification of the country. Head offices were all the time in Zagreb, Croatia.

Participations in the CIGRE activity in Paris became much more evident. Many experts from Yugoslavia had participated in different study committees and working groups. For example university professor Anton Ogorelec from Slovenia organized the first international Colloquium on protection in Ljubljana in 60'. It was very successful and supported by many experts, particularly protection manufacturers who were seeking to establish closer relationships with industry. All together Slovenian authors contributed 4 papers in Paris Sessions up to 1991 and 374 papers in Yugoslav CIGRE conferences.

The Slovenian authors who contributed the largest number of papers at Yugoslav CIGRE conferences up to 1991 were Franc Jakl (19 papers), Marjan Plaper (17 papers) and Anton Ogorelec (15 papers).

Beside them 217 Slovenians contributed papers at the former Yugoslav CIGRE Conferences in the period between 1953 and 1991.

Table 1: The list of conferences organized by Yugoslav National Committee of CIGRE in period 1953 to 1991

Number of conferences	Location	Republic	Year	Number of participants	Number of papers	Papers from Slovenia
1	Ljubljana	Slovenia	1953	100	19	2
2	Sarajevo	Bosnia & Herzg.	1954	135	23	2
3	Niška Banja	Serbia	1956	205	35	4
4	Opatija	Croatia	1958	253	30	3
5	Ohrid	Macedonia	1960	291	46	4
6	Budva	Montenegro	1962	350	77	18
7	Bled	Slovenia	1964	550	93	23
8	Mostar	Bosnia & Herzg.	1966	650	102	11
9	Vrnjacka Banja	Serbia	1968	713	99	11
10	Dubrovnik	Croatia	1970	830	163	20
11	Ohrid	Macedonia	1972	860	152	31
12	Budva	Montenegro	1975	1091	193	34
13	Bled	Slovenia	1977	1170	180	25
14	Sarajevo	Bosnia & Herzg.	1979	1058	185	24
15	Beograd	Serbia	1981	1016	215	32
16	Opatija	Croatia	1983	1023	255	21
17	Struga	Macedonia	1985	1110	262	29
18	Bečići	Montenegro	1987	1330	271	21
19	Bled	Slovenia	1989	1210	283	36
20	Neum	Bosnia & Herzg.	1991	Not available	216	23
Total					2899	374

In 1975 one of Slovenian experts, also active in the NC CIGRE, contributed outstanding works to electricity sector with novel ideas of large size interconnections. It was professor Vladimir Šlebinger, UN energy expert, who was involved in research and was the first ever to publish a study report on *«Interconnection between Africa and Europe with intention to exploit large hydro resources in central Africa»*. As a United Nations energy expert, working in Abidjan in the period 1968-1972 he was very well acquainted with the African energy situation. His extraordinary study on exploitation of large hydro resources in central Africa (Congo River basin, 100 GW installed power) analyzed the possibility of large transit of electricity across African continent to Europe under the Mediterranean Sea. Presently, similar projects «Desertec» consider the large scale exploitation of solar energy to Europe. Šlebinger in the 1970s also contributed a lot of new ideas regarding energy efficiency issues and needs for changing energy framework for Europe. His topic was dispersed generation and renewable resources more than 20 years before it became official European energy policy.

Establishing the Slovenian National Committee of CIGRE

Slovenian attainment of independence in 1991 brings along a major change in the organization of the national committee of CIGRE. From former one Yugoslav CIGRE committee six new national CIGRE committees were to be created.

In February 1992 a group of old Cigreans organized a committee for preparing the establishing assembly of Slovenian National Committee of CIGRE. The interest of the Slovenian energy experts was very high. The establishing assembly was held on March 17, 1992 with the presence of 106 people and 21 utilities. The first president, professor Ferdinand Gubina, was elected. At the beginning 12 national study committees were set up as mirror CIGRE study committees and 200 experts expressed the wish to participate in the activity of the National CIGRE as well as in the international activity. Two months later new society of electric power engineers with first name SLOKO CIGRE was registered in accordance with Slovenian Law.

At the next CIGRE Session in Paris, the Administrative Committee of CIGRE on August 30, 1992 recognized the Slovenian National Committee of CIGRE as new member of CIGRE family.

The Slovenian Electricity Supply Industry is rather small size with app. 3000 MVA installed capacity, peak load about 2100 MW and annual consumption of some 12 TWh. The transmission network consists of circuits length of overhead lines (510 km of 400 kV, 328 km of 220 kV and 2.300 km of 110 kV) and 21 substations with transformer capacity of 4.000 MVA (see fig.1). The average age of the physical assets is about 30 years. The generation system is ideal with one third hydro, one third thermal and one third nuclear resources. Altogether app. 9000 employees serve this electricity system. The population of the country is about 2 million. It was very important for small systems to cooperate and exchange information and knowledge in the international community. For this reason organization of CIGRE in Slovenia is very well accepted and representing some kind of new academia for the electricity sector.

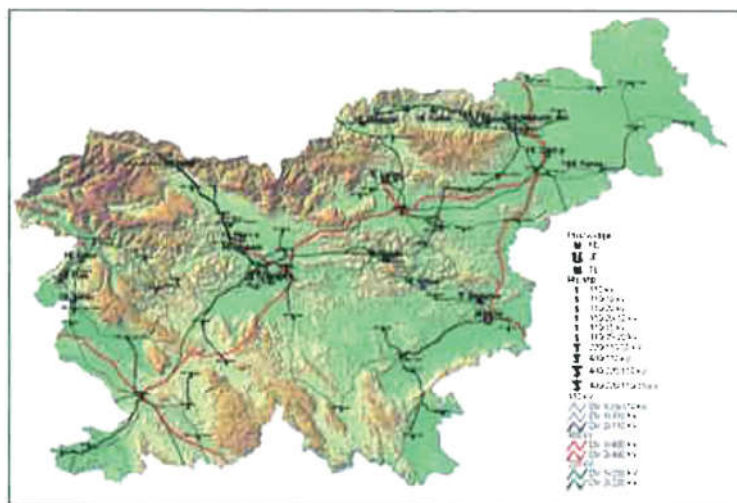


Fig. 1: Slovenian Transmission network in GIS environment

Slovenian NC CIGRE continued a good practice and tradition from former Yugoslavia with biennial national CIGRE conferences in odd years. First national conference was launched on 25 May 1993 in Ljubljana. It was a coincidence that exactly 40 years after the first Yugoslav CIGRE conference in Ljubljana on the same day in the same the city the first Slovenian national CIGRE conference had been held. In the period 1993 to 2009 Slovenian NC CIGRE organized 9 biennial national conferences. Attendance at the conferences was very high (over 400 experts) with average number of papers 142. Considering the size of the system and limited number of experts CIGRE events proved to arouse very great interest. Slovenian electricity engineers expressed their strong wish for mutual exchange of information and improvements of the system through CIGRE activity. Participation and contribution of papers in new National CIGRE organization became almost ten times higher than at the time of the previous Yugoslav CIGRE organization.

Similar situation was regarding the participation and activities at the level of CIGRE Paris. Between 1952 and 1991 Slovenian engineers contributed only four papers to CIGRE General Sessions in Paris against 30 papers in the period 1992-2009, after establishing their own national committee.

Table 2: The list of the conferences of Slovenian NC CIGRE from 1993

National CIGRE Conferences	Location	Year	Number of papers
1	Ljubljana	1993	83
2	Maribor	1995	90
3	N. Gorica	1997	122
4	Thermal Spa Rogaska	1999	120
5	Bled	2001	133
6	Portoroz	2003	184
7	Velenje	2005	193
8	Thermal Spa Catez	2007	184
9	Kranjska Gora	2009	164
TOTAL			1273

With nine national CIGRE conferences between 1993 and 2009 more than 600 authors contributed over 1200 papers. The authors with the largest contribution over the last 16 years were, Kresimir Bakic (35 papers), Rafael Mihalic (35 papers), Ferdinand Gubina (31) and Franc Jakl (26 papers). Regarding the contribution to CIGRE General Sessions in Paris, the three most active authors (or co-authors) were Kresimir Bakic (10 papers), Ferdinand Gubina (5 papers) and Rafael Mihalic (4 papers).

Main topics of the Slovenian National CIGRE conferences were:

- Development of the electricity industry in the new structural environment,
- Institutional arrangements of Electric supply Industry in Slovenia,
- Opening the internal electricity market in EU,
- Complexity of the central Europe electricity power flows, parallel flows issues,

- Fast development of Information Communication Technology in power sector,
- Environmental issues and implementation of EU directives regarding market issues,
- New EU energy policy, future electricity networks, etc.



Figure 2: The first SLOKO CIGRE national conference in Slovenia, 25 May 1993. Member of the board of UCPTE Dr. Janez Hrovatin presented situation in European transmission network.

Participation of the Slovenian members to CIGRE activities and CIGRE Awards

Before the Slovenian National Committee of CIGRE was founded in 1992 only two Slovenian experts participated in the work of Study Committees: Kresimir Bakic in SC 37 (System Planning and development) and Ferdinand Gubina in SC 39 (Operation and Control of System). With the setting up of the National Committee, the activities of the Slovenian experts on Study Committees became more intensive and more frequent. In the period 1996 – 2002 before re-organization of CIGRE SCs, the Slovenians, who actively participated beside the two aforementioned, were Franc Jakl (SC 22 – Overhead lines), Maks Babuder (SC 33 – Insulation Coordination), Robert Golob (SC 39 - Operation and Control of System) and Tatjana Muha (SC 35 – System Communication and Telecontrol). In period 2002 – 2008 K. Bakic was regular member of SC C1. Z. Marcenko became an observer in SC C2 up to 2004, after him G. Skubin in period 2004 - 2006 and P. Omahen in period 2006-2008 and M. Pantos 2008-2010. In SC C3 Mrs. B. Cestnik became the Slovenian observer up to 2006. Slovenian members in SC C5 were R. Golob (2002-2004), J. Koprivnikar (2004-2008)

and latest one Mr. D. Paravan. Slovenia also counts observers in some other committees. In 2010 first time since establishment of the National Committee, Slovenia nominated members in all CIGRE SCs. CIGRE Paris approved all of them: two as regular members and others as observers.

Many other experts from Slovenia participated in a number of working groups, particularly in SC 37, SC 22, and SC 39, and later in new CIGRE technical organization in SC C1, SC B2, SC D1 and SC D2.

In 2002 Slovenian member Ferdinand Gubina as member of the TC CIGRE was appointed as convener and chairman of Electric Power Engineering Education panel 2002 at General CIGRE Session in Paris.

Slovenian member Kresimir Bakic was special reporter at two CIGRE Symposia:

- 1997, Neptun Symposium on Impact of DSM, IRP and Distributed generation on Power System,
- 2005, Athens Symposium on Power systems and Dispersed Generation, technologies, Impacts on Development, Operation and Performances.

CIGRE events in Slovenia

Slovenian NC CIGRE organized for the first time a CIGRE Symposium in Ljubljana in 2004. This Symposium actually replaced the Symposium which was to be held in China in 2003, and was cancelled due to SARS (severe acute respiratory syndrome), taking into consideration the recommendation of WHO (world health organization).

Ljubljana Symposium in April 2004 was titled «*Development and operation of interconnection in a restructuring context*» involving four SCs: C1, C2, B2 and B4.

In period 1995 to 2009 Slovenian NC CIGRE organized every year 2-3 working group meetings.

In 2010 Slovenian NC CIGRE during mandate of its member Kresimir Bakic organized the annual meeting of Technical Committee CIGRE in Bled, Slovenia.



**Figure 3: President of CIGRE Mr. David Croft
at opening session in Ljubljana CIGRE Symposium 2004**



Figure 4: Members of TC CIGRE in the island of lake Bled, Slovenia in June 2010

CIGRE Awards

A . CIGRE central Office Paris bestowed following awards to Slovenian members:

CIGRE Technical Committee Award:

2004 – Kresimir Bakic (SC C1 – Development and economy of the system)

CIGRE Distinguished Members:

1998 - Anton Ogorelec,

2000 - Ferdinand Gubina,

2002 - Kresimir Bakic,

2004 - Maks Babuder and Franc Jakl.

2010 - Ivan Leban in Maja Koncan-Gradnik

B. Slovenian National Committee every two years during National CIGRE conferences assigns different level of awards as follows:

- **Ambassador of CIGRE** to members who participated to enlarge CIGRE's importance worldwide.

- The winners in 2010 were Mr. Jean Kowal and emeritus professor Dr. Anton Ogorelec

- **Awards for life work** in CIGRE (national and international)

1999 - Dusan Povh

2001 - Marjan Plaper

2003 - Anton Ogorelec

2007 - Ferdinand Gubina

2009 - Janez Hrovatin

Beside those two most important awards, Slovenian NC CIGRE also grants at national level following awards:

- **Awards for extraordinary contribution to work of CIGRE** (national and international)
- **Awards for excellent work in certain national electricity project** (national)
- **Biennial prize for best journalist reporting on energy sector** (national)
- **Prizes for best doctoral theses, masters and university diploma work** (national)
- **Prizes for the best study committee paper at conference** (national)



Figure 5: Slovenian NC CIGRE awarded Mr. Jean Kowal and emeritus professor Anton Ogorelec with Ambassador of CIGRE, in Bled in June 2010



History of Spain National Committee of CIGRÉ

Evolution of the CNE-CIGRÉ Presidency and Secretariat

In 1970 the CNE-CIGRÉ was composed of:

D. Carlos E. Montañés (President)

D. Marcial Campos (Secretary).

Carlos Montañés was a highly prestigious engineer in the electrical sector and Marcial Campos was an engineer with ENDESA.

When Mr. Montañés sadly passed away, Teodomiro González-Baylín, Director of UNESA and President of ASINEL (Spanish Association for Industrial Electrical Research), was appointed President, with Mr. Marcial Campos continuing in his role as Secretary.

At that time the only representative on the Technical Committee was José Carrasco Tutón (IBERDUERO), who was member of the SC 22 Overhead lines. Thanks to his initiative others began to collaborate in the Working Groups (WGs) of the Committee, Fernando Perez-Soba (HE) formed part of the Foundations WG and Antonio Fernandez de Navarrete (UE) of the Vibrations WG. Also worthy of acknowledgement was the work and effort of the collaborators of Jose Carrasco in IBERDUERO, such as Ignacio Obieta, Ángel López Suero and Jesús Novales.

The first article that was presented at the Paris Session (1976) corresponds to this period and it was called: *Études de Vibrations Éoliennes des Conducteurs de Lignes Aériennes effectuées en Espagne* ("Studies on overhead transmission lines conductors' susceptibility to Aeolian vibrations in Spain") which summarised the work carried out at INTA (Spanish Institute for Aerospace Technologies) and coordinated by ASINEL.

Spanish involvement increased spectacularly from the moment González-Baylín took over the presidency of the Committee, especially regarding participation in the Study Committees (SCs).

In 1981 Carlos Zapata, who had been acting as Vice-Secretary, became Secretary of the CNE-CIGRÉ

The willingness of the then Secretary General, René Pélissier, who wanted to give the Mediterranean countries a more important role, and also the efforts of the President and Secretary, made it possible to have a Spanish member in almost all the Study Committees (SCs) in just a few short years, noteworthy at this first stage, were the following:

11 Rotating Electrical Machines	Francisco Sáenz de Tejada
12 Transformers	Félix Cabezón
13 Switchgear	Alfonso Ruiz de Lobera
22 Overhead lines	José Carrasco
23 Substations	José M ^a Domingo
31 Grid planning	Juan Kariger
32 System Operation and Control	Alberto Aparicio
34 Protections	Eduardo Insunza
35 Telecommunications	Antonio Llobet
36 Disturbances	Paulino Montané

All this, along with a notable increase in the number of articles presented, was why it was necessary to request an increase in the CNE-CIGRÉ quota which, at the outset, was two and which subsequently proved insufficient considering the number of paper proposals received.

Regarding organizational aspects, it is worth pointing out that the Board of Directors of the CNE, which initially was formed by just the President and Secretary, was extended to include all the members of SCs, therefore obtaining an evermore active involvement.

A milestone of this period was the Administrative Council meeting held in Palma de Mallorca, Spain, in 1979, which turned out to be a great success.

Finally, when in 1997 Mr. González-Baylín stepped down on account of his age, it paved the way for a new structure. Thus, in June of that same year the CNE-CIGRÉ statutes were drafted, which, in its Article 8, established a transition period of 6 years during which Iberdrola assumed the presidency of the Committee between 1 June 1997 and 1 June 2000, and at which time REE assumed the presidency for the following three years.

Similarly, Article 9 of these statutes established that the Secretariat would permanently be held by REE.

Below are the names of those who have exercised the position of President and Secretary since 1997:

From June 1997 to September 1999:

- President: Javier Arriola (Iberdrola)
- Secretary: José A. Frías (Red Eléctrica)

From October 1999 to May 2000

- President: Javier Arriola (Iberdrola)
- Secretary: Luis Martín (Red Eléctrica)

From June 2000 to October 2000

- President: Luis Martín (Red Eléctrica)
- Secretary: Fernando Soto (Red Eléctrica)

From November 2000 to March 2005

- President: Francisco Salamanca (Red Eléctrica)
- Secretary: Fernando Soto (Red Eléctrica)

From April 2005 to November 2009

- President: Fernando Soto (Red Eléctrica)
- Secretary: Juan Prieto (Red Eléctrica)

From November 2009 to February 2010

- President: Fernando Soto (Red Eléctrica)
- Secretary: David Alvira (Red Eléctrica)

Since March 2010:

- President: Luis Ímaz (Red Eléctrica)
- Secretary: David Alvira (Red Eléctrica)

CNE-CIGRÉ Technical Meetings

In order to disseminate the information discussed and topics addressed during the biennial CIGRÉ Sessions held in Paris to all the interested Spanish experts and, especially to all those who cannot attend them, the CNE-CIGRÉ holds the Spanish Technical Meetings every two years, coinciding with the same dates as the aforementioned sessions. The objective is to promote amongst Spanish experts the debate and analysis of the different “state-of-the-art” technologies that are discussed in the SCs, their relation with the current challenges in Spain and to strengthen the Spanish presence in CIGRÉ activities, and, in particular, in the Working Groups.

The Technical Meetings in 2000 were a one-day session, with presentations from the different SCs and from the following Panels: Maintenance Techniques, Insulating Materials, Major Incidents, Electro-magnetic (EM) Fields and Health, and Electric Power Systems Education. The number of attendees reached 166.

The Technical Meetings in 2002 were a two-day session, organised in three parallel sessions. They included, in addition to the presentations of all the SCs of CIGRÉ, 3 monographic sessions and 3 panel presentations. The panel presentations were the following: Large Disturbances, The Security of Supply in Liberalised Electricity Markets, and the New Organization of CIGRÉ. The monographic sessions were: Switchgear and Substations, Protections and Communications and Insulation Coordination. There were 240 attendees belonging to both the business and university circles.

For the first time, these Technical Meetings were sponsored by Spanish companies, on this occasion the sponsors were: ABB T&D SYSTEMS, ALSTOM T&D, ARTECHE, IBERDROLA, MESA, RED ELÉCTRICA, SAFT NIFE IBÉRICA, SIEMENS, UNIÓN FENOSA and ZIV.

The 2004 Technical Meetings were organised, as on previous occasions, in three parallel sessions over 2 days, they included, the presentations of all the SCs, 3 monographic sessions and 2 panel presentations. The panel presentations were: Large Disturbances and Electric Power Engineering Education. The monographic sessions: Wind Power Generation, Insulated Cables and Facts-HVDC. These sessions were attended by around 240 people.

For the second time, these Technical Meetings were sponsored by Spanish companies, which in this case were the following: ABB, AREVA, EHN, IBERDROLA, PIRELLI, RED ELÉCTRICA, SIEMENS, UNIÓN FENOSA and ZIV.

The 2006 Technical Meetings were organised in 2 parallel sessions over 2 days, which included, apart from the presentations of all the SCs of CIGRÉ, 2 monographic sessions, 1 panel presentation on Electric Power Engineering Education and one presentation on "Energy without Borders". The monographic sessions were: Solar generation and the Security of Supply. The attendance was around 250 people.

As in prior years these Technical Meetings were sponsored by Spanish companies, on this occasion being: ABB, AREVA, ENDESA, GENERAL ELECTRIC, IBERDROLA, INABESA, RED ELÉCTRICA, SIEMENS, SOLUCAR, TEAM ARTECHE, UNIÓN FENOSA and ZIV.

The last Technical Meetings held, until now, were in 2008. These consisted of 2 parallel monographic sessions on Security of Supply and Grid Development on the first day and different panel presentations regarding the SCs during the second day. About 325 people attended these sessions.

Again, as in previous years, these Technical Meetings had sponsorship from Spanish companies, on this occasion the sponsors were: ABB, COBRA, ENDESA, GENERAL ELECTRIC, IBERDROLA, RED ELÉCTRICA, SGS, SIEMENS, UNIÓN FENOSA and ZIV.

The next sessions will take place in December this year and will have a monographic session entitled '*Objective 20/20/20*' divided into the following thematic blocks: the Electric Car, Energy Storage Systems, Sustainability and Security of Supply. All SCs activities will also be presented.

Technical Meetings regarding Overhead Lines

For many years, the Overhead lines Spanish CIGRÉ Committee has been organising a biennial technical session in which they have been dealing with

the most up-to-date technical aspects and exchanging experiences that affect the field of the overhead high voltage electricity lines.

The sessions held to date have been:

- Session I: Compound insulated cables (May 1997)
- Session II: Conductors and Fittings (May 1999)
- Session III: Environmental conditioning factors in the design, construction and maintenance of overhead lines. (May 2001)
- Session IV: New techniques and materials used in the design, construction and maintenance of overhead lines. (June 2003)
- Session V: Increases in transmission capacity. Influence of meteorology on overhead lines. (June 2005)
- Session VI: Availability and reliability of lines. Unique projects (June 2007)
- Session VII: New experiences in materials. Design, construction and maintenance (June 2009)

The number of people who have attended the above sessions has been increasing year after year due to the interest aroused amongst the different Spanish technicians. The attendance has been:

Technical Session I	: 120 attendees
Technical Session II	: 142 attendees
Technical Session III	: 182 attendees
Technical Session IV	: 190 attendees
Technical Session V	: 225 attendees
Technical Session VI	: 248 attendees
Technical Session VII	: 220 attendees

Some of the events have benefited from the participation of foreign experts, mainly Portuguese, Brazilian and Bolivian.

Other Sessions

R&D Session February 2007.

Event held in the Higher School of Industrial Engineering (ETSII) of the Universidad Politécnica de Madrid, it was attended by 64 people. It was divided into two discussion workshops: Company Perspectives, with 10 presentations, and Activities in Universities and Educational Centres, with 8 presentations.

R&D Session February 2009.

Event held in the Catholic Institute of Arts and Industries (ICAI), Madrid, it was attended by 110 people. It was divided, like the previous one, into two discussion workshops: Company Perspectives, with 12 presentations, and Activities in Universities and Educational Centres, with 9 presentations.

Demand-side Management Session. February 2010.

Event held in the Higher School of Industrial Engineering (ETSII) of the Universidad Politécnica de Madrid, it was attended by 141 people. The discussion workshops were divided into: Experiences of Demand-side Management and Demonstration Projects (4 presentations), Demand-side Management Tools and Applications (3 presentations), Demand-side Management and Smart Grids (3 presentations) and Scientific Instrumentation Technologies (ICT) for Demand-side Management (3 presentations).



History of Swedish National Committee of CIGRÉ

by Åke Sjödin and others

Present structure

ELFORSK on behalf of ABB, the Swedish National Grid and the Swedish Energy Secretariat of ELFORSK administer the Swedish CIGRE activities.

The leading body is the Swedish National Committee of CIGRE. Members of the Swedish National Committee may be up to nine in number. Committee members are appointed as follows: Elforsk can appoint four members, one of whom is secretary of the committee, ABB appoints two members, Chalmers and KTH each one member. The National Committee is entitled to appoint another member from outside the above companies. Members' term of office is four years. The parties shall cooperate to ensure the necessary continuity through the election and gradual renewal of the committee members. ABB and Elforsk take turns to appoint a President for two years.

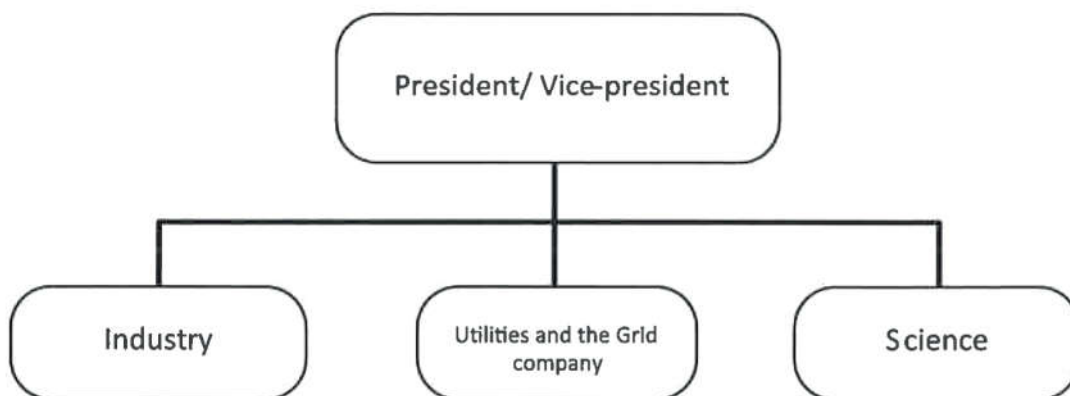


Fig. 1 Structure of the Swedish National Committee of CIGRE

Currently (2009) there are 165 individual and 22 collective Swedish members of CIGRE. In addition, there are about 50 experts participating in study committees, working groups and similar.

At the Paris Session, which takes place every two years, about 20 papers represent Sweden. From Sweden 50 to 70 delegates normally participate at the Session.

Sweden has one delegate with two votes in the Administrative Council.

Sweden is represented in all study committees by ordinary members or in some cases by an observer. Sweden also has a number of experts in the relevant working groups.

The National Committee meets twice a year. Before each session in Paris there is a meeting where each study committee member presents the Swedish contributions.

Historical development

After World War I much of the transmission infrastructure was destroyed and the maintenance was abandoned while, at the same time, consumption of electricity increased. This was one of the reasons why a number of countries met in Paris in 1921 at the first CIGRE Congress, which was held between 21st and 26th November 1921. Among the participants Sweden was represented by Waldemar Borgquist, Chief Engineer at the Swedish State Power Board (Vattenfallsstyrelsen) and F V Hansen Director General within the same organization. Other delegates from Sweden were Körner, Velander and N. Ericson. Sweden immediately took a leading role at that meeting and Borgquist was elected a honorary vice-chairman.

Since 1923 Waldemar Borgquist had represented the Scandinavian countries in the Organizing Committee. In 1927 the Congress invited member countries to establish national committees. In 1929 Waldemar Borgquist became its chairman and Edy Velander its secretary.

Since 1931, the international CIGRE had an established solid organization.



Fig 2 Waldemar Borgquist
(*Chef Engineer, 1909-1938 Swedish State Power Board, Director General, 1938-1947 Swedish State Power Board, Chairman 1933-1953 Ericsson*)

One of the important issues raised in 1929 was cooperation with IEC (International Electrotechnical Commission). IEC had participated in the formation of CIGRE and CIGRE's task was to prepare topics for standardization. In 1929 Sweden was represented by W Borgquist, J Ottosson, S Malmfors and KE Nylander.

In 1931 two Swedish papers were submitted to the Congress. One was written by H. Norinder about atmospheric overvoltages. The other one, written by Sten Velander, was about porcelain insulators. Delegates from Sweden were Sten Velander, B. Andersson and Edy Velander.

In 1933, the management of the Congress in Paris requested that Sweden should contribute financially to the organization. In response, Borgquist requested the department of communication to provide the desired amount of money. In his letter he pointed out several times how active the Swedish State Power Board had been in the formation of CIGRE.

In 1937 the Swedish National Committee for International Conferences of High Voltage was founded and became in particular responsible for the CIGRE NC. There was also another organization in Sweden, namely the Swedish National Committee for the World Power Conference, which was responsible for organization of the WPC (World Power Conference) and CIGB (The International Commission on Large Dams, Commission Internationale des Grands Barrages).

In 1941 both these two organizations formed «Svenska Centralkommittén för internationella ingenjörskongresser (SCII)». This body was formed by the government with responsibility, among other things, to manage the Swedish operations within CIGRE and WPC. Waldemar Borgquist, who was then the Director of Vattenfall Board, became its President and Professor Fredrik Dahlgren became the Secretary.

During World War II no CIGRE congresses were held but the activities revitalized in 1946. One of the most active persons was once again Waldemar Borgquist. In 1948 Waldemar Borgquist was considered as candidate to become the new chairman.



Fig 3. Gunnar Jancke

Gunnar Jancke was active in CIGRE since activities were resumed in 1946. He was a member of several committees, the Executive Committee and the Administrative Council from 1959. In 1972 Gunnar Jancke was elected president of CIGRE, succeeding to A.R. Cooper.

In 1996 Michel Chamia became the President of CIGRE. He had previously been Chairman of SC 34, then Chairman of the CIGE Technical Committee from 1990 to 1996.



Fig 4. Leaders of CIGRE SC34 S.H. Horowitz, M. Chamia and C. Corroyer

Swedish representatives in the international organization CIGRE since 1921:

Presidents of the International CIGRE

1972-1976 Gunnar Jancke

1996-2000 Michel Chamia

Presidents of the Swedish National Committee (NC)

1921 - Waldemar Borgquist

Åke Rusck

Eric Grafström

1968-1972 Gunnar Jancke

1972-1979 Torsten Lindström

1979-1982 Gunnar Engström

1982-1986 Per Danfors

1986 - Bengt Kredell

Per Smedsfelt

Allan Lundberg

1994-1996 Staffan Nordin

1996-1998 Jan Martinsson

1998-2000 Stig Goethe

2000-2002 Michel Chamia

2002 - present Kjell Isaksson

Chairmen of Study Committees

SC 6 (Overhead Lines) 57-62 OD Zetterholm
 SC 6 / 22 (Overhead Lines) 62-68 S Smedsfelt
 SC 10 (Direct Current) 45-54 W Borgqvist
 SC 10 (Direct Current) 54-56 B Rathsmann
 SC 14 (HVDC Links and AC Power Electronic Equipment) 66-76 S Smedsfelt
 SC11 (Rotating Machines), S Thorén
 SC 12 (Transformers) 74-80 B Sollergren
 SC 15 (Insulation Coordination) 48-58 I Herlitz
 SC 34 (Power System Protection and Local Control) 86-90 M Chamia
 SC 35 (Power System Communication and Telecontrol) 80-86 T Jöransson
 SC39/C2 (System Operation and Control), S Larsson
 SC B1 (Insulated cables) F Rüter

Examples of commitment and effort by Swedish participants in the international CIGRE work.

Sweden has traditionally had a strong position in CIGRE's Study Committee D2, Information systems and telecommunication. The Committee (SC14/35/D2) celebrated 60 years with a commemorative publication 2008. The Swedish position was well established in the 1980s during the presidency of Torsten Jöransson and was developed further by the following Swedish representatives Jan-Erik Brask, Erik Sandström, and Göran Ericsson. In 2008, Sweden had both the Advisory Group AGD2.01 "Core Business Information Systems" headed by Eric Sandström and the "Treatment of Information Security for Electric Power Utilities" WG D2.22 headed by Göran Ericsson.

Through the years, Sweden has played an active role in SC A3 (former SC 13). Sten Berneryd convened WG 13.02 Switching of small inductive currents, from the start in 1974, until the work was finished. Carl Sölver convened WG 13.04 Switching test methods, from 1990 to 1995. During this period, the WG dealt with switching of capacitive currents. From 2002, Carl Sölver is the convenor of WG A3.06 Reliability of HV equipment, and from 2009, Anne Bosma is the convenor of WG A3.26, Capacitor bank switching and impact on equipment. In addition, Sweden has been active in development of new types of switching equipment. Disconnecting circuit-breakers, combining the functions of traditional circuit-breakers and disconnectors into a single device, and their applications, have been described in a number of Swedish Cigre papers from 1998 and onwards.

Because of a strong manufacturing industry, ASEA and thereafter ABB as well as academics of the Swedish technical universities have actively contributed to the work of different network component oriented CIGRE Study Committees (SC). Worth mentioning here is the committee dealing with material questions, e.g. SC 15 – Materials for Electrotechnology, followed after the reorganization in 2002 by

SC D1 – initially named Materials and Emerging Technologies and presently Materials and Emerging Test Techniques. The committee fulfils a service role to the other committees and Swedish representatives were Professor Roland Eriksson of KTH (until 2002) and Stanislaw Gubanski (until 2010). Swedish engineers and researchers have been actively participating in the committees working groups and task forces. Examples of the contributions are numerous technical brochures and Electra publications that concern diverse practical challenges. Among many one can name here elaboration of minimum property requirements for polymeric materials for use in outdoor high voltage insulation or recommendations for use of diverse diagnostic procedures for condition estimation in power transformers.

Engineering from the beginning of CIGRE and onwards

In 1921 Waldemar Borgquist described the Swedish power system at the congress. This was one of the 70 contributions by 50 representatives from 12 countries. At that time, Sweden had about 150 km (44 kV-132 kV) power line. The expansion of the Swedish power grid had just begun. Already in 1922, a transmission line from Trollhättan to Västerås had been built, moreover, that was Europe's first line of 130 kV, but built for 200 kV.

In 1946 the Committee «DC Power Transmission» (Group 10) also had its first meeting, presumably formed on Swedish initiative. The President of the committee was Waldemar Borgquist, B Henning and Å Vrethem were secretaries. From an abstract from the first meeting in 1946, it is obvious that, among other things, many countries have the need for power lines with higher transmission capacity, which would enable transferring with High Voltage Direct Current. They also suggested possible improvements in order to use alternating current, such as series capacitors. Still, one of the conclusions was: «the transfer of power over long distances with high-voltage direct current system allows a much better use of lines which well compensate the rising costs of substation facilities. The use of high-voltage direct current can thus be most likely expected to yield significant economic benefits for very long power transmission».

In Sweden in 1952, ASEA together with Vattenfall, began the construction of the HVDC link from the mainland to the island of Gotland, a distance of 96 km.

In 1948, Sweden produced a report that describes the Swedish 380 kV system. The authors were U. Lamm, S. Lalander and G. Jancke.

Sweden's new 400 kV system led to considerable international attention. This meant that Sweden had the honour of responding to the «main issue» at the opening of CIGRE Conference in Paris in May-June 1952. The Director General of the Swedish Power Board (Vattenfallsstyrelsen) Åke Rusck made the presentation of the Swedish 400 kV system in English and the director of the same company, Bo Rathsman, made the presentation in French.

On 25th March 1975 the CIGRE Executive Committee had a meeting in Stockholm; Gunnar Jancke was at the time President of CIGRE.

The Swedish National Committee organised on 23-25 June a symposium on «Transmission Lines and the Environment» at the Swedish Exhibition Centre in Stockholm in 1981. SC22 Overhead Lines, SC33 Overvoltages and SC36 Interference held the symposium jointly.



Fig 5. Gunnar Engström

Gunnar Engstrom ASEA delivered the welcoming speech. Special guest was the Swedish Minister of Energy Ingemar Eliasson. Chairman for the symposium was L. Paris, Italy.

During the course of the years the technical innovation of the joint Swedish power transmission industry has led to the introduction of several new products and system solutions that have subsequently won acclaim, acceptance and widespread use throughout the world. They have all been reported at CIGRE meetings, discussed and penetrated in Working Groups and have subsequently given rise to new standards and in most cases consensus on applicability. We may here mention for instance:

Series capacitors (SC) to compensate the inductance of long power lines, the first installation was made in 1950 at 230 kV. Already in 1952 the first SC was built in the then brand new 400 kV system in Sweden.

Static Var Compensation with thyristor valves, (SVC) for local voltage regulation and flicker compensation at industries and for voltage regulation in the network on the utility level is another Swedish innovation. The first industry installation was ordered 1970 to compensate the electric arc furnace in Domnarvet, Borlänge, Sweden. On the utility side, the first order was placed 1976 by a utility in USA.

Thyristors have also been employed to control Series Compensation to mitigate resonances that may occur between the network and generators. The first such Thyristor Controlled Series Capacitor (TCSC) was installed in 1996 in the USA.

Voltage Source Converters for use in HVDC transmission, so called VSC Transmission were first introduced on a commercial scale with the 1999 inauguration of Gotland HVDC Light, carrying up to 50 MW wind power from the south of the island to the consumer center in the north.

A relative to the VSC Transmission is the SVC based on Voltage Source Converters. A breakthrough in flicker compensation capability was achieved with the 1999 commissioning of the 44 MVar Hagfors SVC Light, compensating an electric arc furnace in the town of Hagfors in Sweden to the extent that the visible flicker in electric lighting was totally eliminated.

The latest addition to this list is the DC Grid, seen as a possible future solution for the restructuring of the generation and transmission system that many see as inevitable due to the increasing pressure on CO₂ reduction and increased use of distant renewable energy sources. The DC Grid is in the beginning of its journey when in 2009 started WG B4-52 of Cigré with the convener Gunnar Asplund.



History of Swiss National Committee of CIGRÉ

Introduction

The “International Council on Large Electric Systems” (CIGRÉ) was founded in 1921 at a time of great economic, political and social tension. Compared with nowadays, CIGRÉ in those days was only a small conference, but one which quickly began to play an important, highly-regarded role in the electricity industry. Right from the start, the National Committee of Switzerland, as a founder member of CIGRÉ, exerted considerable influence on the organization’s work. After the Second World War, CIGRÉ entered a new phase. This was characterised by rapid progress on increasing output, thanks to new technologies and materials. The key issues were high voltage and increasing transmission voltages. At this time, too, the Swiss members were again very active, providing the President of CIGRÉ, two chairmen of the Association and of the Executive Committee and two Financial Directors. One representative from Switzerland always was and still is a member of the Executive Committee. In addition, Swiss representatives were in charge of more than 20 Study Committees, for periods of from four to 16 years. Swiss representatives occupying important positions in CIGRÉ in general and on the Executive Committee in particular include or have included: M. Schmidt (President from 1948 to 1957), H. Meyer (Chairman of the Technical Committee from 1972 to 1978), K. Abegg (Treasurer) from 1982 to 1984), L. Erhart (Treasurer) from 1984 to 1990) and K. Fröhlich (Chairman of the Technical Committee since 2006).

At the end of the 1970s, the global economy suffered a deep recession followed by a long period of stagnation. Nevertheless, the important work of CIGRÉ and the Swiss representatives continued undiminished. The liberalisation phase in global power markets caused many members to reconsider their commitment to CIGRÉ, which was unjustified in view of the importance of the institution. It was only after strenuous efforts were made that a successful reorganization took place in 2002 and the number of members began to rise again (Fig. 1).

From the very beginning, Switzerland, with its world-famous electricity industry, was very well represented on the Study Committees and working groups of CIGRÉ. At around the start of the millennium, Switzerland had a representative

on all the Study Committees and on numerous working groups. In 2002, the chairmen of three Study Committees came from Switzerland. Numerous Swiss engineers volunteered to be members of working groups. The Swiss always supported sessions to share experience and helped prepare for them. The quality of the Swiss reports and their contributions to debates at conference sessions were highly regarded around the world. Many Swiss representatives are also Honorary Members of CIGRÉ or have received an award from CIGRÉ.

Table 1: Numbers of Swiss members of CIGRÉ

Year	Collective members	Individual members
1988	36	95
2000	29	84
2008	40	142

The National Committee of CIGRÉ is part of Swiss Electrical Engineering Association (SEV).

Historical development of CIGRÉ before the Second World War

After the First World War, the power supply system in Switzerland began to develop quickly. In the 1920s, annual power consumption grew by 6 to 8%. Despite the relatively high price of electricity, more and more of it was being used to supply industry and the general population. This steady increase in electricity consumption meant that new and larger power stations were required. The output from individual generators increased from a few MW to tens of MW. The growing use of hydroelectricity in the Alps called for electricity to be transported over longer distances and at higher voltages.

Similar technical problems arising in different countries demanded coordination and standardisation so that components from different manufacturers could be used in the same network. To overcome the challenges facing the electricity industry, leading representatives from industry, power supply companies and universities convened a conference in Paris. Over 200 representatives from about ten countries took part in it. At the founding meeting of CIGRÉ in Paris and at the first few sessions, Switzerland was represented by Prof. Laundry, Dr. Bauer and Dr. Perrochet. In 1925, they formed the first Swiss National Committee, presided over by Prof. Laundry. Dr. Bauer had a seat on the CIGRÉ committee in Paris as Vice-President.

The need soon emerged for permanent working groups, on which Switzerland was represented from the very start by experienced delegates and played an important role in solving technical problems. During this early phase, for example, the working groups defined and implemented the distribution voltages of 110 and 220 V. The medium high voltages of 6, 10, 12, 16 and 22 kV and transport

voltages of about 50 or 65 kV were agreed as the basis for the country's internal supply. The transmission system voltages of 220 and 380 kV later became the standard throughout Europe after the Second World War.

In 1925, well-known industrial companies such as Brown Boveri & Cie. (BBC), Landis & Gyr, Haefely, Sprecher und Schuh, Ateliers de Sécheron (SAAS), Ateliers de Constructions Mécaniques de Vevey (ACMV), Charmilles, Maschinenfabrik Oerlikon (MFO), Micafil Isoliertechnik AG and Langenthaler Porzellan AG were operating throughout Europe and reported regularly to CIGRÉ about their technical advances and innovations. The CIGRÉ experts from Switzerland regularly presented numerous articles on these subjects to the conference in Paris on a voluntary basis. The Swiss representatives on Study Committees provided valuable support in their role as members of industry and power supply companies. Using standardised products was a key competitive advantage which Swiss companies knew very well how to exploit. Often the Swiss contributions formed the basis for global standards from which the Swiss power industry also profited directly.

Technical contributions

Many of the Swiss reports tackled fundamental problems and challenges at the level of basic research. They laid the foundations for new solutions, for example in connection with standardisation, and they led to significant progress being made on the main systems for transporting and distributing electricity and also on generators, i.e. the electrical part of production. Key concepts included: short-circuit proofing, insulation coordination, circuit breakers, insulators, power transformers, generators, converters and protection.

Lightning research

One notable example of basic research at this time was the lightning research carried out by Prof. Karl Berger, which he became interested in after problems with a railway power line. At the end of the 1920s, he devoted himself to the subject, making measurements with a cathode-ray oscillograph (in the μs range). At the experimental centre on Monte San Salvatore (near Lugano) he carried out research work which led to numerous papers appearing in CIGRÉ publications. The results of his experiments are among the most important ever made on lightning. Berger worked on them with the South African colleague called Schonland and the Swedish colleague called Norinder. When, in May 1937, Prof. Berger set up the FKH as a permanent organization (Research Commission of the SEV and VSE on high-voltage matters; SEV = Swiss Electrical Engineering Association / VSE = Association of Swiss Electricity Companies), this created a sound financial base for further lightning research, concentrated on the San Salvatore site. Between 1931 and 1968, Berger published more than 65 papers about his lightning research in CIGRÉ publications, mainly on voltage patterns, high-voltage surge arresters and statistics for network problems. Berger was also

co-founder of a European Conference on Lightning Protection which still takes place every two years.

CIGRÉ and the upturn after the Second World War

After the war, the Swiss economy experienced rapid growth. Indeed, the electricity companies had difficulty meeting the demand with their own power production and had to import electricity. Since the cross-border movement of electricity is only possible with an extensive transmission network, and Switzerland was keen to share the benefits of hydraulic generation from the Alps with its neighbouring countries, in 1951, with other countries, it founded the Union for the Coordination of Production and Transmission of Electricity (UCPTE). The use of transmission voltages of 220 and later 380 kV developed rapidly in Europe. Swiss industry worked successfully to increase capacity, for example from rotating machines, and to improve network stability. This was an important requirement when building large-scale power stations.

When the International Conference on Electricity Distribution (CIRED) held its first conference in May 1971 and began to develop as an organization, Switzerland decided to have a joint national committee for CIGRÉ and CIRED and so became the first country to combine the two institutions in a single National Committee. The main work of the National Committee was to select reports from those which were submitted and to monitor their technical quality. By maintaining a general overview of power generation, transmission and distribution, the National Committee was indirectly in touch with the standardising work of the IEC (International Electrotechnical Commission). During this phase there were two particular sessions relating to transformers, in 1953 in Zurich and in 1963 in Vitznau.

Technical contributions

The main topics for Switzerland's technical contributions were as follows: rotating electrical machines, high-voltage surge arresters, circuit breakers, 765 kV networks, power transformers, cables and lines, insulating materials, systems for temporary and transient overvoltage, protection and substation automation.

Rotating electrical machines

Hydro and turbo generators, the main power production elements at power stations, underwent rapid development. The main features were growth in unit capacity, better utilisation of materials and components and the introduction of new technologies, and Swiss power companies made important contributions to their development.

In the 1950s, hydro generators with outputs of up to about 100 MVA were being built. In subsequent years, generators with even higher outputs required more intensive air cooling - and at the highest level even water cooling. As early

as 1964, two entirely water-cooled hydro generators were successfully put into operation in southern Switzerland. Water cooling of the stator winding was essential for many huge hydro generators such as those with a unit capacity of 824 MVA for the Itaipú power station (Brazil/Paraguay 1984) and 840 MVA for the Three Gorges power station (China 2003, see Fig. 2). With turbo generators, unit capacity increased in the 1970s to over 1500 MVA, and has now reached nearly 2000 MVA. Cooling is by hydrogen in pressure-resistant machine housings or by water. For lower output, there are less complex air-cooled turbo generators, which are nevertheless able to reach 400 MVA today due to their sophisticated design. Along with these technical advances, the rated voltages of the generators also increased and, thanks to excellent insulation systems, could reach 27 kV for the highest unit capacities. The Swiss electricity industry can rightfully claim to have played an important part in all these developments.



Fig. 2: One of the 84-pole 700 MW/20 kV hydro generators for the Three Gorges power station in China in 2003 while the rotor was being inserted in the stator bore. (Source: ALSTOM Power Hydro)

High-voltage surge arresters

Generally used to protect against lightning overvoltages were spark gap arresters, and in some cases only protective spark gaps, but these did not provide adequate large-scale protection for whole systems or transformers. By replacing spark gap arresters with metal oxide surge arresters, the Swiss power industry

took a quantum leap forward. Subsequent development of metal oxide surge arresters ultimately made effective overvoltage protection possible.

Circuit breakers

For several decades, the specifications for circuit breakers in networks were a topic for debate in CIGRÉ. From the original dead-tank oil circuit breakers, minimum oil breakers were developed using a single chamber or multiple chambers for higher voltages and ratings. There were similar developments in the field of air blast circuit breakers. How to control breaking currents of up to 63 kA and reduce overvoltages were subjects of concern to CIGRÉ. The breakthrough of being able to use SF₆ gas in switching technology was a major development in making high-voltage installations smaller and more economical. To demonstrate the progress that was made, Fig. 3 shows a first generation minimum oil circuit breaker with ten breaking chambers for 420 kV, and in the foreground an SF₆ gas circuit breaker with two chambers, both with spring-loaded drive.



Fig. 3: 420 kV substation (1985) with minimum oil circuit breakers and SF₆ circuit breakers with two breaking chambers, both with spring-loaded drive. (Source: Areva)

Power transformer technology

Transformers have been an integral part of the work of CIGRÉ since 1949. MFO, BBC and SAAS were the main Swiss companies connected with this work. Weidmann in Rapperswil played an important role in developing insulating systems for power transformers. Large supply companies such as the Aare-Tessin AG (ATEL) for electricity and BKW FMB Energie AG (BKW) and the Nordostschweizerische Kraftwerke AG (NOK) also helped with CIGRÉ's research work on power transformers.

High-voltage direct current transmission (HVDC)

The Swiss power industry became involved at a relatively early stage with developing power electronics for electrical energy transmission, whether for high-voltage direct current transmission (HVDC) or for static compensators. BBC was a member of the AEG-BBC-Siemens working group (AEG has been founded in 1887 as "Allgemeine Elektrizitäts-Gesellschaft") and carried out pioneering work on systems engineering, converter technology and control systems, resulting in many presentations to CIGRÉ sessions in Paris. BBC's extensive experience with first and second generation HVDC systems such as Cabora Bassa (Mozambique, South Africa), Nelson River (Canada) and Itaipu (Brazil) set the benchmark. Special mention should be made in this context of the development and introduction of the world's first 500 kV direct current high-voltage circuit breaker at the Celilo plant belonging to the Bonneville Power Administration (BPA) in the USA.

Technical progresses during the 1970s

Following the first oil crisis, the global economy sank into a deep recession. This period marked the start of the use of renewable energies (tidal power plants in France, solar and wind-powered power in Germany etc.) and also saw the start of restructuring in the industry, with mergers, takeovers and closures in order to cut costs and over-capacity. However, the pressure to cut costs also had a positive effect on the technology, with some notable advances being made at this time. Swiss contributions to CIGRÉ concentrated on the further development of components for power-generation, high-voltage networks, network management and automation systems and insulation coordination. Advances in electronics and, especially, power electronics, led to countless papers on load control and the first proposals for monitoring systems.

Technical contributions

The most notable contributions were made in the fields of variable reactive power compensators allowing better utilisation of transmission systems, gas-insulated switching systems and system/component protection and network security.

Reactive power compensators

In a CIGRÉ report in 1974, the authors, from BBC, presented a development based on compensating inductance coils originally developed for reactive power compensation in 550 and 765 kV systems which allowed continuous control of the reactive power. The system immediately acquired the name "static VAR compensator" in the literature. Variable reactive power compensators enabled better utilisation of transmission systems. Furthermore, on the basis of this work and similar developments, a new system category was developed called "Flexible AC Transmission Systems" (FACTS), characterised by power electronics, regulators,

inductance coils and capacitors. Nowadays, elements of FACTS are essential to AC power transmission.

Gas-insulated switchgear (GIS)

In the early 1970s, the switchgear from different manufacturers still varied greatly in its technical design. One of the main areas of interest was the behaviour of GIS (Fig. 4) in the event of internal flash-overs, i.e. arcing faults. After many years of discussion, the working group came up with the recommendation that there should be no external effect within the first stage of short-circuit protection (<100 ms). This recommendation was then included in the third revision of IEC Regulation No. 517 and still applies today. The commercial success of GIS is also based on the fact that the CIGRÉ working group 23.03 and its successors carried out such good basic work and from there were able to identify the measures required to manufacture and operate these systems up to the highest nominal voltages (800 kV in 1980, 1000 kV in 2008).



Fig. 4: Switzerland's first 125 kV GIS system at the Sempersteig substation in 1965. (Source: ABB)

System protection, component protection, network security

As a result of the increasing availability of central computers in network control centres, in 1970 a Swiss report to CIGRÉ presented a concept for centrally coordinated backup protection, which, regardless of local secondary protection components, would monitor the functioning of primary protection equipment and, if they failed, identify and clear the problem. The same report also proposed a procedure based on comprehensive analysis of the failure of power circuits, power generators and power transmitters, substations and networks using stationary load flow calculations. Today, this method has been introduced as the standard procedure in control centres, known as the (n-1) failure calculation. The

report can therefore be regarded as having been ground-breaking at the time.

At the CIGRÉ session in 1988, these two ideas were expanded upon in a comprehensive report on managing serious breakdowns by using the computer support available at the time such as data capture, optimal load flow, corrective switching, network restoration.

Protection and substation automation

The Swiss power industry always showed great commitment in tackling important topics in its contributions. In 1986, the chairman of a Swiss Study Committee was also responsible for a publication entitled “Use of equipment for built-in automatic testing, self-checking and monitoring with a view to improving reliability”. This contribution helped to resolve the important question of the level of periodic checking that was required for protective systems with built-in self-monitoring.

When the SC34 Study Committee was turned into the SC B5 for “Protection and Automation”, Switzerland played an important part in ensuring that the Study Committee dealt with the broad topic of secondary technology. Important further contributions were made on unified systems for protecting and controlling substations and on new standards and their implications for protection and control, which ultimately led to an industry standard (IEC 61850).

Consolidation and liberalisation of the electricity market

As a result of the first oil crisis and the political situation, economic growth slowed. In view of this stagnation, the industry had to streamline its structures. The first phase of mergers in the industry took place in the 1960s and 70s, when, for example, MFO and BBC merged and then took over Sécheron. In the second phase – 20 years later – BBC merged with ASEA (Allmänna Svenska Elektriska Aktiebolaget) from Sweden, forming ABB (Asea Brown Boveri). In 1986 Sprecher & Schuh joined GEC Alstom and then Alstom T&D which became Areva T&D. In the mid-90s, Landis & Gyr became part of Siemens but is now partly independent again. These developments were associated with the closure of some production sites and some job losses. This also affected the number of CIGRÉ members, with the number of collective members in particular declining.

During the 1990s, interest in CIGRÉ and its business fell away markedly. One of the reasons for this was that the topics discussed by CIGRÉ had now reached a certain degree of maturity and no more groundbreaking new technologies were emerging. More important, though, was the fact that, as a result of the liberalisation that began in the 1990s, the focus of interest for power utilities and the industry in general had shifted away from purely technical issues, such as had previously mainly been discussed at CIGRÉ, to more economic considerations. Furthermore, leading positions at the power supply companies were increasingly

occupied by experts with different technical backgrounds, and it was no longer mainly engineers who were recruited. These people would not be interested in CIGRÉ's work if it concentrated on purely technical matters. Lastly, environmental issues were becoming more and more important.

At the end of the 1990s, the European Union decided on a gradual liberalisation of the electricity market, with a charge for using the network, regardless of distance (the "copper plate" concept). These changes made the traditional type of CIGRÉ report less relevant and led to a refocusing of the CIGRÉ organization. The Swiss National Committee had suggested to CIGRÉ very early on that it should pay less attention to its traditional areas of activity and instead focus more on economic operation, management and the sensible use of power, and on ways of using renewable energies.

In 1988 - 1990, a CIGRÉ working group managed by the Executive Committee was tasked with reorganising CIGRÉ and came up with the key elements. However, at the beginning of the 1990s, it proved impossible to implement the results produced by Prof. Glavitsch in his paper entitled CIGRÉ 2000. In about 1997 a new attempt was made and a group was instructed to reform CIGRÉ. That was when the vision and mission for CIGRÉ were defined which still apply today. In an initial Master Plan for the years 1999 to 2009, the measures were identified which would be needed in order to reach the goals which had been set. At the same time, the organizational changes were pushed through (reform of the Administrative and Executive Committees, the formation of regional areas and of course, especially, reform of the Study Committees) which led to the organization of CIGRÉ as it is today.

During the 1990s, a number of events took place in Switzerland (Fig. 5). As well as two colloquia and a session of the Technical Committee, there was a conference in Lausanne on the subject of "High-voltage systems and Electromagnetic Compatibility" (EMC). The symposium concentrated on the growing use of sensitive digital electronic devices in modern high-voltage systems, especially regarding the question of EMC. The selection committee accepted 78 papers which were discussed in six sessions over a period of three days. The main topics were: sources of interference, coupling mechanisms and model characterisation of the EM environment, measurement and testing and EMC design criteria. A total of 168 participants from 31 countries took part.

Table 5: CIGRÉ events in Switzerland

Year	Event	Place
1953	Colloquium on transformers	Zurich
1963	Colloquium on transformers	Vitznau
1993	Technical Committee session	Interlaken
1993	Conference on "High-voltage systems and Electromagnetic Compatibility"	Lausanne
1999	SC 23 colloquium "The Future Substation"	Zurich

2005	Annual meeting of SC A1 "Rotating Electrical Machines"	Lausanne
2006	Technical Committee session	Interlaken
2007	SC D2 colloquium "Information Systems and Telecommunication"	Lucerne

Technical contributions

The main focuses for CIGRÉ's work were SF6 systems and circuit breakers, superconductivity and noise emissions in relation to transformers. The areas of work were similar for committees on rotating machines, primarily as a result of higher operating voltages as well as other high stresses on materials and components. The main issues were: partial discharge, ageing, system monitoring and protection, diagnosis, reliability and service life. Important contributions were also made in the area of power transmission, especially in relation to aerial lines. This included composite insulator technology, new concepts for transmission and the problem of cable vibration in overhead lines.

SF6 circuit breaker technologies

Between 1965 and 1980, Switzerland led the way in developing SF6 circuit breaker and the first switches for 245 kV and 40 kA using innovative operating mechanisms. The SF6 switchgear with breaking chamber, self-blast technology and spring-loaded drive became a standard used worldwide.

HV-switchgear and the development of GIS

Between 2000 and 2009, the development of switchgear and GIS, especially in relation to environmental protection and the best use of materials, but also workplace safety, maintenance and modernisation, were all topics for CIGRÉ papers. The work produced a range of solutions using modular or hybrid structures for AIS (Air-Insulated Substations) and extremely compact GIS systems. The highly reliable spring-loaded drives can now be found in virtually all systems.

Power transformer technology

Swiss experts were particularly involved in committees on diagnosis (in various fields) and economic, maintenance, disposal, short-circuit proofing, specification and thermal issues. These experts also produced reports for the Paris sessions and colloquia on a number of subjects, such as noise, superconductivity, transformer losses, component reliability, thermal issues, high-voltage effects, cellulose material, diagnosis (various aspects), monitoring, repairs, fleet evaluation, transformer drying, hybrid insulation and on-site measurements.

Superconductivity and high-temperature superconducting (HTS) transformers

In 1997, the first 630 kVA HTS transformer was put into operation and

installed in a public network (Fig. 6). This project was the result of a partnership between Électricité de France (EDF), ABB Sécheron and SIG (Services Industriels de Genève). HTS transformers are environmentally friendly, as there is no risk of water contamination or air pollution if there is a fire. The electrical and mechanical design had to be approved using special tests (carried out by EDF) such as dynamic short-circuit testing and surge voltage testing. It may be possible to achieve a current-limiting capability in HTS transformers by using a self-limiting and resettable HTS conductor.



Fig. 6: HTS transformer station (630 kVA, 18000/420 V) at a SIG plant in Geneva. (Source: ABB Sécheron)

Noise reduction in transformers

Reducing noise emissions is becoming an increasingly important matter of concern to environmentally-aware companies. Supply companies are now researching all kinds of ways of reducing ambient noise. With the development of modern digital signal processing and patented algorithms, active noise prevention concepts have already been successfully applied to tackle the problem of transformer noise. Active noise prevention operates using an “anti-noise frequency” which is phase-shifted by exactly 180° to the “noise frequency”. Active noise prevention systems are designed to reduce noise by up to 15 dB and have been installed on transformers by ABB Sécheron in Sweden, Belgium and Switzerland with the help of the Ecole Polytechnique Fédérale de Lausanne (EPFL) and other institutions.

Overhead Lines

Composite insulators date back a long way in Switzerland. It was as long ago as 1975 that the first cable terminations with silicon composite insulators were introduced by Dätwyler. Composite insulators for overhead lines and railways that

have been manufactured by the “Schweiz. Elektrotechnische Fabrik AG” (SEFAG) since 1979 played an important role in ensuring the reliable operation of the Lötschberg tunnel. With composite insulators, new concepts for overhead lines became possible, such as the compact 420 kV line owned by Energie Ouest Suisse (EOS) which went into operation near Lausanne in 1998 (Fig. 7). At the time, this was the world’s first 420 kV line to use the innovative idea of insulating cross-arms (braced line posts) for resolving the limitations on the right of way existing in this particular area.



Fig. 7: Braced line posts on the compact 420 kV line near Lausanne.
(Source: EOS)

Current status and future of CIGRÉ

The present and future work of the National Committee falls essentially into three areas. The first and most important task is to ensure that Switzerland plays an active role on committees. This applies particularly to Study Committees but ideally also to the Executive Committee and the Board. Secondly, the tradition of regular colloquia and symposia held by Study Committees in Switzerland should be continued. Thirdly, the Committee provides regular advice on Swiss contributions to the Technical Committee ready for the conference in Paris. After the meeting in Paris, the results are regularly disseminated at high-level conferences in Switzerland.

In terms of subject matter, in future decades CIGRÉ will deal with all kinds of topics such as environmental issues, insulation coordination, cabling, power electronics, decentralisation, secure power supply and lifecycle management. Particular importance should be attached to the area of future intelligent distribution and transmission networks.

As a result of the growing importance of solar and wind energy, power generation is subject to very high fluctuations. Integrating these intermittent new power generating systems into European networks will be a central issue in future

years. The alpine region, with its peak load hydroelectric power stations can make a major contribution towards compensating for these fluctuations. Transport over long distances is one of the challenges. Transmission networks will also become more and more complex. Liberalisation and privatisation affect networks and load flow. The growing rate of energy transportation – including across national borders – presents new challenges for systems and components as well as for management of the entire network. For CIGRÉ this means tackling not only technical issues but also regulatory and economic ones. Furthermore, the reliability and availability of components and systems will play an ever more important role. All these questions are already being discussed in CIGRÉ committees and Swiss contributions will concentrate on them more and more. The specialists on the Swiss National Committee have always been particularly involved with CIGRÉ and this tradition will continue in the future. For example, a colloquium of the SC A2 on the subject of power transformers is planned to be held in Switzerland in 2013. The sharing of technical expertise at events all over the world and at the sessions in Paris helps all members of the electricity industry to make progress, and in the end this must also benefit consumers.



History of Thai National Committee of CIGRÉ

Background

Thailand, by the Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, has applied for CIGRE membership since 1974. With increasing CIGRE members in Thailand after DEDE has promoted and disseminated useful information and activities of CIGRE to the agencies of public and private sector, Thai National Committee of CIGRE (TNC-CIGRE) has then been established to facilitate the communication, technical information sharing and technology transfer between members and CIGRE.

TMC-CIGRE Constituents and Functions

2.1 Constituents *

- 1) Prof. Dr. Boonrod BinsonChairman
- 2) Director-General, Department of Alternative Energy Development and Efficiency (DEDE) (Mr. Krairit Nilkuha)Vice Chairman
- 3) Governor, Electricity Generating Authority of Thailand (EGAT) or Representative (Mr. Ratanapong Jongdamgerng, Deputy Governor)Vice Chairman
- 4) Governor, Metropolitan Electricity Authority (MEA) or Representative (Mr. Pornthape Thunyapongchai)Vice Chairman
- 5) Governor, Provincial Electricity Authority (PEA) or Representative (Mr. Pongsakorn Tantivanichanon, Deputy Governor)Vice Chairman
- 6) Dean of Engineering Faculty, Chulalongkorn University (Assoc. Prof. Dr. Chumpol Antarasena Head of Electrical Engineering Department)Member
- 7) Precise Electric Manufacturing Company Limited (Mr. Surawut Kanchitvinijkul, Manager)Member
- 8) Charoong Thai Wire & Cables (Public) Company Limited (Mr. Sathit Tabpech Asst. Managing Director, Quality Assurance)Member
- 9) Ratchaburi Power Company Limited (Mr. Manoj Pongpalee Director, Engineering and Efficiency)Member
- 10) Dr. Soon Kaewchansilp / Glow Company LimitedMember

- 11) Mr. Kittipetchsanthad / EGATMember
- 12) Mr. Vidhya Rugpong / EGATMember
- 13) Mr. Varavoot Siripol / EGATMember
- 14) Mr. Pattana Sangsrirojana / EGATMember
- 15) Mr. Somchai Chareonsrikasem / EGATMember
- 16) Mr. Permsak Kuansatit / EGATMember
- 17) Mr. Chatchawan Chalermwattanachai / EGATMember
- 18) Mr. Sopon Lertpornpakdeewong / EGAT.....Member
- 19) Dr. Pradit Fuangfoo / PEA.....Member
- 20) Mr. Payon Punjad / PEAMember
- 21) Deputy Director-General, Department of Alternative
Energy Development and Efficiency (DEDE)
(Mr. Thammayot Srichuai)Member & Secretary

Remarks: * Updated as of the year 2010

2.2 Functions

- 1) Coordinate and cooperate with CIGRE Central Office and other National Committees
- 2) Promote, research, disseminate, and exchange the knowledge and information on electricity in terms of generation, transmission, construction, and technology for safety system and environmental protection
- 3) Encourage TNC members to submit technical papers for the technical meetings organized by CIGRE and other national committees, and take part in the Study Committee, and other activities of CIGRE
- 4) Certify the academic institutes, agencies of public and private sectors, as well as other interested people interested in applying for CIGRE membership
- 5) Have full authority to establish sub-committees to proceed further with the activities within the function scope
- 6) Other tasks as assigned

3. Contact details

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History of the United States National Committee of CIGRÉ (1921-2010)

The National Committee of CIGRÉ in the United States of America is known as the U.S. National Committee (USNC). It was formed to provide a mechanism for U.S. experts to participate in CIGRÉ's international cooperative efforts. Through the USNC, U.S. technical knowledge has been made available to other nations, technical knowledge from other nations has been provided to the United States, and the overall knowledge among the various national participants has been advanced.

The following historical information provides insight as to how CIGRÉ grew, the role of the USNC in this growth, the specific areas in which the USNC has made important contributions, and some of the members of the USNC who played important roles.

Chronology of Key CIGRÉ and USNC Events

Time Period	Event
November 1921	CIGRÉ formed to be a non-governmental international organization. Proposed and funded by Jean Tribot-Laspière of France in association with Frederic Attwood of the United States. A.E. Kemelly of the United States was one of three Vice Presidents appointed. Frederic Attwood became the first Chairman of the U.S. National Committee.
November 1923	Second CIGRÉ Session 11 U.S. delegates attended. First Study Committee appointed to study "rational use of fuel." Decision made to hold conference biennially (every two years) in Paris, France. Formation of national committees recommended.
1925 - 1931	CIGRÉ formed a number of additional study committees.
1933 - 1939	CIGRÉ Sessions continued with total number of delegates attending each biennial conference increasing.
1939 - 1945	World War II - CIGRÉ activities ceased.
June 1946	First post-war CIGRÉ Session. 17 U.S. delegates attended. Agreed to resume biennial (every two years) meetings.
July 1951	CIGRÉ Administrative Council of 35 members met. Philip Sporn was one of the Vice Presidents and represented the U.S.
1951	Relay Protection Research Group organized with 39 persons from 11 countries, including the U.S.

1956	S.B. Crary of GE chaired the Study Committee on Stability and provided information on the research underway in the U.S.
1958	CIGRÉ Session, 39 U.S. delegates attended.
1960	CIGRÉ Session.
1962	CIGRÉ Session, 52 U.S. delegates attended.
1964	CIGRÉ Administrative Council created a special six-person Working Committee on the preparation of new statutes for CIGRÉ. Philip Sporn represented the U.S.
June 1964	20 th CIGRÉ Session held. A key meeting was that of the EHV AC Transmission Study Committee, chaired by Philip Sporn. Sporn also presented arguments to the Administrative Council to increase the number of papers allocated to the United States.
June 1966	21 st CIGRÉ Session, 86 U.S. delegates attended.
August 1968	22 nd CIGRÉ Session, 81 U.S. delegates attended.
May 1969	CIGRÉ Executive Committee and Administrative Committee met in Italy where Pope Paul VI welcomed them and noted the important role of CIGRÉ in international cooperation and peace-keeping. CIGRÉ Study Committee on Overhead Lines met in Richmond, Virginia with emphasis on the VEPCO 500 kV experience.
August 1970	23 rd CIGRÉ Session, 79 U.S. delegates attended. Paper "Initial Experience on the 765 kV System of AEP" was an important contribution.
1971	Study Committee 32, System Planning and Operation, chaired by Charles Concordia, met in Philadelphia, PA (United States).
August 1972	24 th CIGRÉ Session. Focus increased greatly on development of power grids.
August 1974	25 th CIGRÉ Session, 87 U.S. delegates attended.
August 1976	26 th CIGRÉ Session (UNESCO Building). 89 U.S. delegates attended.
August 1978	27 th CIGRÉ Session (UNESCO Building). 99 U.S. delegates attended. Round table on "The Transmission Boundaries of the XXI Century" was a key factor in which Lionel O. Barthold represented the United States.
August 1980	28 th CIGRÉ Session (U. of Paris – Assas Law School). 88 U.S. delegates attended. Major reports on voltages above 1000 kV included Bonneville Power Administration's presentation on results of tests on a 1200 kV transmission line.
September 1982	29 th CIGRÉ Session (U. of Paris – Assas Law School). 95 U.S. delegates attended. Significant reorganization of CIGRÉ Study Committees.
September 1984	30 th CIGRÉ Session (U. of Paris – Assas Law School). 100 U.S. delegates attended. Structure of Administrative Council revised. Willis S. White, Jr. (USNC) elected President of CIGRÉ.
November 1985	Africon Conference held in Dakar, Senegal, with several presentations from the United States on development of power systems in Africa, including one by Joseph Swidler, former Chairman of the U.S. Federal Power Commission.
September 1986	31 st CIGRÉ Session (U. of Paris – Assas Law School). 85 U.S. delegates attended.
August 1988	32 nd CIGRÉ Session (Palais des Congrès). 127 U.S. delegates attended.

1989	"CIGRÉ 2000" Committee approved with Lionel O. Barthold representing the United States.
August 1990	33 rd CIGRÉ Session (Palais des Congrès). 154 U.S. delegates attended.
September 1991	CIGRÉ Study Committee on Overhead Lines met in Fort Worth, Texas.
August 1992	34 th CIGRÉ Session (Palais des Congrès). 144 U.S. delegates attended.
August 1994	35 th CIGRÉ Session (Palais des Congrès). 119 U.S. delegates attended. Attention increasingly placed on systems of developing nations. Session combined with CIGRÉ-EXPO '94 for first time for presentations of equipment and source by more than 50 companies. This was the first time CIGRÉ deviated from its past strong history of no commercial activities in presentations.
May 1995	Major colloquium held in Tokyo, Japan on "Organizational and Legal Actions for the Development of Power Systems." Major reports were made by John A. Casazza of the United States.
August 1996	36 th CIGRÉ Session (Palais des Congrès). 100 U.S. delegates attended.
August 1998	37 th CIGRÉ Session (Palais des Congrès). 105 U.S. delegates attended.
1999	CIGRÉ Study Committees on Switching Equipment and on Rotating Machines met in the United States.
August 2000	38 th CIGRÉ Session (Palais des Congrès). 97 U.S. delegates attended.
June 2001	CIGRÉ Study Committee on Power System Planning & Development met in the United States (Washington, D.C.)
August 2002	39 th CIGRÉ Session (Palais des Congrès). 100 U.S. delegates attended.
October 2003	The Electric Power Research Institute, on behalf of the USNC, hosted the meetings of the CIGRÉ Executive Committee and the CIGRÉ Administrative Council in the United States (Palo Alto, CA).
August 2004	40 th CIGRÉ Session (Palais des Congrès). 100 U.S. delegates attended.
August 2006	41 st CIGRÉ Session (Palais des Congrès). 118 U.S. delegates attended.
August 2008	42 nd CIGRÉ Session (Palais des Congrès). 110 U.S. delegates attended.

A general meeting of the membership of the USNC is held once a year, usually coincident with and at the location of the annual meeting of the IEEE Power and Energy Society. At this meeting, reports are given on the administrative status and activities of the USNC to the membership and elections of officers take place. This general meeting is followed by a meeting of the USNC Executive Committee, which is comprised of the officers of the USNC. The annual USNC general meetings were initiated in the 1960s and began performing some of the functions (such as the election of USNC officers) previously performed by the earlier Executive Committees, which had previously directed all activities of the USNC.

In association with the biennial CIGRÉ Sessions, formal receptions are held in the evenings by several CIGRÉ national committees often at historic locations. Typically, the National Committee of France and various other national committees each hold receptions on different nights of the conference week that provide opportunities to meet delegates from various countries. The USNC has sponsored a reception at each CIGRÉ biennial conference, with one of the most memorable occurring in 1976, the U.S.'s bicentennial year, at the U.S. Embassy and its gardens. Unfortunately, the reception size and security issues now prevent holding the USNC reception at this location. In the last several conference years, the USNC reception has been held at the Pavillon Gabriel on 5, avenue Gabriel, Paris. The USNC also holds an information meeting for its participating members in Paris, France, at the Palais des Congrès conference facility just prior to the opening of the CIGRÉ Session.

Presidents of U.S. National Committee

The leadership of the USNC is provided by its chairmen or presidents, its Executive Committee, and its Technical Committee. Key among its officers was Frederic Attwood who served for 33 years as President and Philip Sporn who served for 18 years. The USNC presidents often were industry leaders and chief executives in their companies. Their positions enabled them to enlist both the necessary financial support from industry and dues paying individual members. They also had sufficient stature to represent the USNC in the international committee activities of CIGRÉ. The importance of the roles of Frederic Attwood and Philip Sporn, and the high regard with which they were held, cannot be over emphasized.

Presidents of U.S. National Committee of CIGRÉ (1921–2010)	
1921 – 1954	Frederic Attwood (Retired as Vice President & Director, Ohio Brass Company)
1954 – 1972	Philip Sporn (President – American Electric Power)
1973 – 1978	William R. Gould (President – Southern California Edison)
1979 – 1981	W. Donham Crawford (President – Gulf States Utilities)
1982 – 1984	Willis S. White, Jr. (President – American Electric Power)
1985 – 1986	Harold W. Sonn (President – Public Service Electric & Gas)
1987 – 1992	George A. Maneatis (President – Pacific Gas and Electric/Consultant)
1993 – 1998	Harold N. Scherer, Jr. (President – Commonwealth Electric Company/Consultant)
1999 – 2004	Hans E. Weinrich (Vice President – ABB Power T&D/Consultant)
2005 – 2010	Clark W. Gellings (Vice President – EPRI/EPRI Fellow)

The President of the USNC also serves as the Chairman of the Executive Committee of the USNC, the governing body of the USNC. The members of the Executive Committee are elected by the USNC's general membership and currently include a President, Secretary, Treasurer, the immediate Past President and 16 Vice Presidents. Each Executive Committee member serves a two-year

term and may be re-elected for successive two-year terms. However, no person who has served as President for three successive two-year terms is eligible to be elected until at least two years have elapsed.

USNC Technical Committee, Secretary, and Treasurer

Much of the technical operation of the USNC is the responsibility of its Technical Committee. One of the USNC Vice Presidents is appointed by the USNC President with the approval of the Executive Committee to serve as Chairman of the USNC Technical Committee. The Technical Committee membership is comprised of those USNC members that serve as USNC representatives to the CIGRÉ Study Committees. Membership in the Technical Committee covers a broad range of industry and university technical experts. The major duties of the Technical Committee include selecting and recommending the U.S. papers to be put forth for the CIGRÉ Sessions, and recommending to the USNC Executive Committee for its approval U.S. appointments to CIGRÉ Study Committees.

Chairmen of the USNC's Technical Committee (1964 – 2010)	
1964-1972	Daniel T. Braymer (Editor - Electrical World)
1972-1980	John A. Casazza (Vice President – Public Service Electric & Gas)
1980-1984	Andrew F. Corey (Vice President - Boston Edison)
1985-1990	Harold N. Scherer, Jr. (Sr. Vice President – American Electric Power)
1991-1998	Thomas E. Sharp (Principal Engineer – Public Service Electric & Gas)
1999-2003	Arun D. Phadke (Distinguished Professor - Virginia Polytechnic Institute)
2003-2008	B. Don Russell (Regents Professor, Electrical Engineering – Texas A&M University)
2009-2010	John D. McDonald (General Manager, Marketing – GE Energy T&D)

The USNC Secretary and Treasurer functions were provided for many years by Ebasco at no charge to the USNC with Larry Mulligan serving for most years in this role, followed at Ebasco for a short time by Herbert Limmer. In 1984, Andrew F. Corry was hired as a paid general manager and held the USNC Secretary-Treasurer position until 1994. He was succeeded in 1995 by the staff at Virginia Polytechnic Institute (contract agreement) under Professor Arun G. Phadke, USNC Secretary-Treasurer and a member of the USNC Executive Committee. The USNC Secretary-Treasurer functions were next performed over the 2000-2004 period under contract by the North American Electric Reliability Council (NERC) under Virginia C. Sulzberger, NERC's Director-Engineering and USNC Secretary-Treasurer. Virginia C. Sulzberger, as an independent contractor, also performed the USNC Secretary-Treasurer functions from 2005 through 2008.

Beginning in 2009, the Secretary-Treasurer functions were divided into elected, volunteer, and separate Secretary (Charles (Ted) Witham, Telemetric Corporation) and Treasurer (Thomas W. Cease, Consultant) positions and a contracted Secretariat (Texas A&M University) function. USNC Vice President-Administration Dr. B. Don Russell, Regents Professor-Electrical Engineering, oversees the USNC's Secretariat function at Texas A&M University.

U.S. National Committee Membership

The two general categories of CIGRÉ membership include:

- **Individual Member (IM)** – individuals such as engineers, managers, researchers, and professors, etc. are Type I individual members. CIGRÉ honorary members are also individual members. Students and young engineers (under 35) are Type II individual members and pay 50% of the annual individual Type I membership fee. The USNC's individual membership (mainly Type I) has averaged about 350 members over the last five years. The high mark of USNC individual membership over the last 10 years was 434 in 2003.
- **Collective Member (CM)** – public or private enterprises of an industrial and/or commercial nature, administrative bodies, scientific and technical organizations, and research institutes are Type I collective members. Educational bodies such as universities, colleges, and libraries are Type II collective members and pay 50% of the annual collective Type I membership fee. The USNC's collective membership (mainly Type I) has averaged about 23 members over the last five years. Collective membership has been increasing and reached a high mark of 29 members in 2008.

The USNC for many years has been one of the top five national committees of CIGRÉ from a membership perspective. As CIGRÉ activities increased in value and importance, growth in equivalent (IMs plus CMs, where a CM = 5 IMs) CIGRÉ membership in the USNC grew from 79 members in 1970 to a high of 577 members in 1999 with USNC membership averaging about 465 members over the last five years.

Many executives and top managers from utilities and equipment manufacturers were individual USNC members through the last decades. In addition to individual membership, many companies, including some utilities, equipment manufacturers, and consultants, were "collective" members, which covered a number of individuals in their respective organizations.

CIGRÉ Study Committee Chairmen from the U.S. National Committee

From its beginning, CIGRÉ's technical activities have been organized into Study Committees. The direction of these activities and their success depended in large measure on the leadership of the Study Committee Chairman in selecting

“preferential subjects” for discussion and the Chairman’s skill in developing international cooperation in the ongoing activities. The USNC played an important role, having provided the following Study Committee Chairman through the years.

CIGRÉ Study Committee Chairmen from the USNC

Study Committee	Subject	Years	Chairman
1, 15, and D1	Material for Electrotechnology	1992-1998	Clive W. Reed
2, 21 and B1	H.V. Cables	1970-1974	A. Sidney Brookes
3, 13 and A3	Switching Equipment	1996-2002	John H. Brunke
4, 34, and B5	Relaying	1980-1986	Stanley H. Horowitz
9	A.C. Very High Voltages	1945-1960	Philip Sporn
9, 31	A.C. Very High Voltages	1960-1968	Howard C. Barnes
10, 14, and B4	Direct Current	1988-1996	Narain G. Hingorani
Former 13, 32	Power System Stability	1947-1960	S.B. Crary
Former 13 and 32	Power System Stability	1960-1970	Charles Concordia
31, 32	System Planning and Operation	1964-1982	Charles Concordia
37	System Planning and Development	1982-1983	Ted J. Nagel
38 and C4	Power System Analysis and Techniques	1986-1992	Ralph S. Gens
41	Future of Electric Power Systems	1976-1982	Lionel O. Barthold
C5	Electricity Markets and Regulation	2002-2008	Kenneth W. Laughlin

CIGRÉ and USNC Awards to U.S. National Committee Members

For their role in international CIGRÉ activities and U.S. National Committee activities, a number of USNC members have received special awards from CIGRÉ and the U.S. National Committee.

- CIGRÉ Honorary Member - The title “Honorary Member” was initiated by CIGRÉ in 1992. It is the most prestigious designation to be granted by CIGRÉ. It is awarded to members who have made significant contributions through their service on international committees (CIGRÉ Steering Committee (formerly Executive Committee), Administrative Council, and/or Study Committees.) These USNC’s CIGRÉ Honorary Members are listed below:

CIGRÉ Honorary Members from the USNC

1992	Ralph S. Gens
1992	Willis S. White, Jr.
1996	Dr. Narain G. Hingorani
1998	Dr. Clive W. Reed
2000	Harold N. Scherer, Jr.
2002	Dr. John H. Brunke
2004	Hans E. Weinrich

- CIGRÉ Technical Committee Award - Others from the USNC that received awards from the CIGRÉ Technical Committee are listed below. The Technical Committee Award was initiated by CIGRÉ in 1993. It is given to recognize the outstanding contributions of a select number of CIGRÉ Study Committee members to the work of their respective Study Committees. Generally, only one or two candidates are nominated annually per CIGRÉ Study Committee.

CIGRÉ Technical Committee Awards to USNC Members

Year	USNC Award Recipient	CIGRÉ Study Committee
1993	D. Jack Christofersen	DC Links and Power Electronic Equipment
	Allan Greenwood	Switching Equipment
	Charles L. Rudasill, Jr.	Power System Planning and Development
	William A. Mittelstadt	Power System Analysis and Techniques
1994	Andrew R. Hileman	Overvoltages and Insulation Coordination
	John W. Chadwick, Jr.	Protection
1995	Thomas L. Weaver	DC Links and Power Electronic Equipment
	Raymond M. Maliszewski	Power System Planning and Development
	Arun G. Phadke	Protection
	Leonard Sagan	Power System Electromagnetic Compatibility
1996	John A. Casazza	Power System Planning and Development
1997	William N. Kennedy	Transformers
	Mark A. Reynolds	HVDC Links and AC Power Electronic Equipment
	Ingo P. Thurein	Power System Operation and Control
1999	Joe C. Pohlman	Overhead Lines
2000	Robert E. Fenton	Rotating Machines
	B. S. Bernstein	Materials for Electro Technology
	Charles J. Mozina	Power System Protection and Local Control
	Erich W. Gunther	Power System Electromagnetic Compatibility
2001	William F. Reinke	Power System Planning and Development
2002	Ivars Vancers	HVDC Links and AC Power Electronic Equipment
2003	Keith E. Lindsey	Overhead Lines
2004	John W. Harley	Transformers
2005	John J. Vithayathil	HVDC Links and Power Electronics
	Roy W. Alexander	High-Voltage Equipment
	Mietek T. Glinkowski	Transformers
2006	Dennis K. Holstein	Protections and Automations
	Pouyan Pourbeik	System Technical Performance
2007	Alexander Apostolov	Protection and Automation
	Dale A. Douglass	Overhead Lines
	Walter Zenger	Insulated Cables
2008	Richard A. Wakefield	System Development and Economics
2009	Willis F. Long	HVDC and Power Electronics
	Albert M. DiCaprio	Electricity Markets and Regulation

CIGRÉ Distinguished Member Award - In 1996, a “Distinguished Member” status was introduced in CIGRÉ. This award is a tribute to seniority (over 10 years membership) and to active participation in the work and development of the CIGRÉ association – within Study Committees and/or National Committees.

CIGRÉ Distinguished Member Awards to USNC Members

1996 Lionel O. Barthold John H. Brunke John A. Casazza Stanley H. Horowitz George A. Maneatis Clive W. Reed Harold N. Scherer, Jr. Thomas L. Weaver	1998 Allan Greenwood James A. Oliver Carson W. Taylor	2000 Thomas F. Garrity Ian S. Grant Thomas E. Sharp	2002 F. Paul DeMello Frank A. Denbrock Arun G. Phadke Hans E. Weinrich
2004 Harold W. Adams, Jr. Alan H. Cookson Hamid Elahi Robert E. Fenton Stanley R. Lindgren	2006 Thomas W. Cease Clark W. Gellings Stig L. Nilsson William F. Reinke Tapani O. Seppa Virginia C. Sulzberger	2008 John W. Harley Dennis K. Holstein Keith E. Lindsey Pouyan Pourbeik Mark A. Reynolds Walter Zenger	2010 Narain G. Hingorani Willis F. Long Ivars Vancers Richard A. Wakefield

- **USNC Philip Sporn Award** - In addition to the CIGRÉ international awards, the U.S. National Committee presents awards to its qualifying members. The Philip Sporn Award is given from time to time to a person who has had some affiliation with CIGRÉ and who is currently active. The citation reads “for cumulative career contributions to the advancement of the concept of system integration in the theory, design, and/or operation of large, high voltage electric systems in the United States.”

USNC Recipients of the USNC Philip Sporn Award

1989	Charles Concordia
1993	Lionel O. Barthold
1994	John A. Casazza
1995	Gregory S. Vassell
1998	A. Robert Hileman
2002	Harold N. Scherer, Jr.
2005	Narain G. Hingorani
2006	Arun G. Phadke
2007	Hans E. Weinrich
2008	John J. Vithayathil
2009	John G. Anderson
2009	Carson W. Taylor
2010	John H. Brunke

USNC Attwood Associate Award - The USNC’s Attwood Associate Award is given to individuals who have made notable contributions to CIGRÉ over an extended period of time. This award is made to honor the contributions and

memory of Frederic Attwood of the United States, who, with Jean Tribot-Laspière of France, foresaw the need for an international organization in the field of high-voltage power engineering and who became the first chairman of the U.S. National Committee upon the founding of CIGRÉ in the year 1921.

USNC Recipients of the USNC Attwood Associate Award

1983 Howard C. Barnes Sterling Beckwith Peter L. Bellallschi Fred Chambers Charles Concordia Fremont Felix Eric T. B. Gross Herman Halperin Richard J. Hopkins Lloyd F. Hunt Edgar L. Kanouse John T. Lusignan Melvin L. Manning Howard L. Melvin Stephen B. Morehouse Lawrence M. Robertson Eugene C. Starr Herbert R. Stewart Joseph Sticher Roy L. Webb Stanley W. Zimmerman	Daniel T. Braymer John A. Casazza Clifford C. Diamond I. Birger Johnson	Charles L. Rudasill, Jr. David Silver
1984 Charles Almon, Jr. Eugene W. Boehne Thomas J. Brosnan William Z. Brownlee Bradley Cozzens Edward S. Halfmann Charles T. Hatcher Allen Kidder Vernon M. Marquis Theodore Nagel George B. Scheer Richard F. Stevens Edwin R. Whitehead	1987 Louis C. Aicher John W. Batchelor Vincent Caleca Thomas W. Dakin Lee A. Kilgore Robert J. Ringlee Frank Von Roeschlaub Walter R. Wilson	1994 F. Paul De Mello Thomas Dy Liacco
1985 Joseph K. Dillard Byron Evans Charles H. Hoffman Hollis K. Sels Robert W. Werts Eugene S. Zobel	1988 James A. Beehler Allan Greenwood Thomas H. Lee Sampson Linke J. R. Ruhlman T. M. Swingle Charles L. Wagner	1995 Theodore A. Balaska
1986 J. Lewis Blackburn	1989 John G. Anderson	1996 Clarence Baldwin William J. McNutt Jan Panek William Thue
	1990 John W. Chadwick, Jr. John J. Dougherty Ralph S. Gens Stephen A. Mallard James C. Poffenberger Louis H. Roddis, Jr.	1997 Stanley H. Horowitz
	1991 Wallace L. Chadwick C. John Essel S. Harold Gold Herbert H. Woodson	1998 Glenn D. Bauer Lester H. Fink Robert W. Flugum Narain G. Hingorani Harold N. Scherer, Jr.
	1992 Lionel O. Barthold	1999 Vernon L. Chartier Ian S. Grant Robert H. Harner Raymond M. Maliszewski James A. Oliver Arun G. Phadke John M. Thorson, Jr. T. Robert Woodward
	1993 Andrew F. Corry A. Robert Hileman Joe Pohlman	2000
		2001
		2002 S. A. Annestrand Thomas F. Garrity M. Shawky A.A. Hammam Stephen A. Sebo Frank S. Young Luciano E. Zaffanella

2003 James S. Edmonds John W. Estey Clark W. Gellings Stig L. Nilsson William F. Reinke	2006 Anjan Bose Thomas W. Cease Chen-Ching Liu B. (Ben) R. Shperling James S. Thorp Thomas L. Weaver	2008 Harold W. Adams, Jr. Hamid Elahi Mladen Kezunovic Carson W. Taylor
2004 George G. Karady Willis F. Long Duane R. Torgerson Hans E. Weinrich	2007 John H. Brunke D. Jack Christofersen Robert E. Fenton Stanley R. Lindgren Clive W. Reed Herman M. Schneider Tapani O. Seppa Virginia C. Sulzberger	2009 John W. Harley Shirish P. Mehta Nicholas W. Miller Rana Mukerji P. Jeffrey Palermo Mark A. Reynolds
2005 Alan H. Cookson Frank A. Denbrock Anthony M. Di Gioia, Jr. Philip R. Nannery John J. Vithayathil		2010 George Gela George Gross Dennis K. Holstein Keith E. Lindsey Richard A. Wakefield Walter Zenger

CIGRÉ Publications of U.S. National Committee Members

The contributions of the USNC members to CIGRÉ and worldwide technical knowledge are demonstrated by the many CIGRÉ papers and articles they authored, the many key discussions in which they participated, and the symposia they helped organize. The CIGRÉ papers presented at the biennial Paris meetings are available at the U.S. Library of Congress and CIGRÉ Paris headquarters.

Both CIGRÉ members and non-members have access to the new (2007) CIGRÉ online library (www.e-cigre.org) for obtaining CIGRÉ publications. Many of these publications are now available in electronic format for downloading by members, and hard copies of the non-digitized publications are also available through the CIGRÉ Paris headquarters. CIGRÉ members enjoy significant benefits in accessing CIGRÉ publications both in terms of speed of delivery and in reduced fees charged for hard copies.

Through 2008, the U.S. National Committee membership contributed over 325 papers to CIGRÉ Sessions. If all papers involved with the CIGRÉ Sessions, CIGRÉ symposia, and special Study Committee reports are counted, including those papers in which U.S. authors participated but were not the main author, the USNC's contribution to total CIGRÉ publications approaches 550 papers or reports through 2008.

One can map the change of the times and what became important to U.S. Cigreans by reviewing the subject material of their papers as time progressed. In the 1920s and 1930s, overvoltage and insulation coordination dominated the U.S. reports made to CIGRÉ at 30% of the total U.S. reports produced. That was followed by transmission systems (22%) in the decade of the twenties, and

insulators (16%) in the short decade of meetings in the thirties. Over the following four decades, the transmission system was the predominant topic growing to 40% of the reports produced in the 1950s and 1960s. Generation edged out direct current (DC) topics in the U.S. reports in the 1980s, but DC dominated in the 1990s and the early 2000s.

While listing the over 325 papers contributed by U.S. authors to CIGRÉ is not possible in this chapter, it is appropriate to remember a sampling of those early USNC members who worked hard to produce their reports and contributed greatly to the benefit of the electric industry. Therefore, noting a few authors and their papers in the context of the times in which the papers were developed seems the highest recognition the USNC can give its entire group of authors.

The first five papers authored by USNC members were for the inaugural CIGRÉ meeting in 1921 and are listed below. The industry has come a long way since these 1921 papers were written, but without these authors and their international peer reviewers, it is unlikely that the USNC and CIGRÉ would have advanced.

U.S. Authors	U.S. Paper Titles (1921)
M.W.S. Murray	Creation of an Electric Interconnection System in the Areas between Boston and Washington
W.W. Lewis	High Voltage Electricity Transmission
C.A. Powell	Some Aspects of the Problem of Switchgear with a View to Its Adaptation to High Voltage Transmission
A.O. Austin	The Insulation of Transmission Systems Comprising Large High Voltage Lines
F.W. Peek	Factors on Which the Insulation of Transmission Lines Depend

The next U.S. authors being recognized are those who were the last to write their USNC papers just prior to the cessation of CIGRÉ meetings due to World War II. Curiously, there also were five papers that year and “that year” was 1939.

U.S. Authors	U.S. Paper Titles (1939)
P.L. Bellaschi	Coordination and Protection of Station Insulation against Lightning
P. Sporn, I.W. Gross	The Counterpoise, Its Theory, Application and Performance in Reducing High Voltage Transmission Line Outages
W.W. Lewis	Lightning Currents on Transmission Lines
J.J. Taylor	Duration of Load and Its Influence on the Strength of Suspension Insulators
P. Sporn, C.A. Muller	Experience with High-Speed Fault Clearing and Ultra High-Speed Reclosing of High Voltage Transmission Lines

Many questions still remain today about some of these subjects even though the 1939 authors may have believed that the improvements the electric industry was to achieve would have solved most of these technical problems.

The third group of U.S. authors being recognized are those who were the first from the USNC to submit papers once CIGRÉ commenced its activity at the

conclusion of the war. The U.S. had 17 delegates in attendance at the 1946 CIGRÉ Session, and the following seven U.S. papers were discussed. The rapid recovery of the collaborative process within CIGRÉ was amazing.

U.S. Authors	U.S. Paper Titles (1946)
L. Bellaschi	Progress in Power Transformer Insulation and Protection
P. Sporn, J.H. Kinghorn	Ultra High Speed Reclosing Demonstrates Its Value
O.K. Marti	Status of Mercury Arc Power Rectifiers
R.E. Pierce	Interconnected Power System Automatic Load Frequency Control
P.M. Ross	Calculation of Power Station Insulators for Optimum Impulse Performance
C. Doble	Advances in Maintenance of High Voltage Insulation in the USA
W.W. Lewis	Lightning Investigation on Transmission Lines

These 17 papers and their authors are perhaps not more worthy of note than those of their more recent or earlier colleagues, but they do reflect to some degree the interests of the electric industry at three points in time. In large measure, the ability for the electric industry to continue to progress as it has was made possible because of the dedicated efforts of these authors and their CIGRÉ colleagues to bring solutions and share experiences so that all of CIGRÉ membership might benefit, improve their systems, and operate a more reliable and environmentally friendly electric system within fiscal constraints imposed by regulators and customers and within a reasonable bound of nature's more dramatic forces. CIGRE, and indeed all large electric systems, owe much to these men and women who provided the intellectual capital, labored within diverse committees to understand and collaborate, and then produce the papers that were the very catalysts of improvement for the electric industry. It is clear that the electric industry would not have achieved what it has without them.

In Conclusion

The first document prepared on the "History of the U.S. National Committee of CIGRÉ" covered the 1921 - 2007 period. It was prepared at the request of USNC President Clark W. Gellings by John A. Casazza, a distinguished member of the U.S. National Committee and CIGRÉ since the 1960s. This detailed USNC History document is available on the USNC website (<http://cigre-usnc.tamu.edu>) and was the basis for this short chapter on the history of the USNC. The 2007 USNC History document also lists the publications of the U.S. authors from 1921 through 2007. The intent is to maintain the detailed USNC History document as a living document and to update it from time to time.



History of Venezuela National Committee of CIGRÉ

The Venezuelan National Committee of CIGRE (CNV-CIGRE) was founded in 1982. At that time the Venezuelan electric industry was giving one of its most important steps in the development of its infrastructure, with the construction of the final stage of Guri Hydroelectric Plant, to bring its generating capacity to 10,000 MW. In fact by the date of its commissioning in the year 1986, this plant was the second largest in the world in capacity.



Guri Hydroelectric Plant, 10,000 MW.

Also, by that time, it was building the Transmission System Guri-Center at 765 kV, which would carry the electricity generated in the south of Venezuela to the consumer centers located more than 600 km away in center, eastern and western of the country. With the commissioning of this system in the year 1986, Venezuela became the fifth country to have that level of Voltage.

To achieved the commissioning of this extensive expansion of the system, many Venezuelan professionals, whom some of them were members of the Venezuelan National Committee of CIGRE, had made extensive technical evaluations related primarily to engineering studies and conceptual planning of the transmission system at 765 kV, overvoltage and insulation coordination studies, static and dynamic compensation studies to define the protection by overvoltage and loss of synchronism of the system, also the emerging technologies for the use of SF₆ gas on circuit breakers and the use of metal oxides in the arrester manufacture.

As can be evidenced, for the first decade of creation of the CNV-CIGRE, much of the technical problems that prevailed were related to the design, construction

and operation of systems of extra high voltage transmission and hydroelectric generation units with large capacity.

For this period, it can be highlighted the participation of Gustavo González, president of CNV-CIGRE (1982-1994), Alberto Alazrachi, Joaquín Da Silva and others whom promoted, among Venezuelan professionals, the approaching with CIGRE for capturing and sharing knowledge.

In 2000, in order to improve the legal basis of the National Committee, it was created a non-profit civil association whose name is «The Venezuelan National Committee of the International Conference on Large Electric Systems, CNV-CIGRE, SC.». It was established in its statutes that the management and administration of the organization is governed by a General Assembly of Associates and a Board of Directors, this last integrated by one president, one secretary, one Treasurer and a maximum of two vocals.

From this date, greater efforts have been made to ensure the participation of Venezuelan professionals in CIGRE activities at national and international level, through attendance and presentation of technical papers in various events, as well as through the participation in various international technical committees as a member. Also the CNV-CIGRE has organized technical events in the country.

Since 2000, it can be highlighted the contributions of Enrique Chacín, president of CNV-CIGRE (2000-2002), Evelio Padilla as secretary and other contributors who made efforts to promote the consolidation of the organization in Venezuela.

With regard to the participation of the Venezuelan professionals in regional and international events of CIGRE, it can be mentioned the following:

- Presentation of technical papers in the Latin American Regional Meetings of CIGRE (ERLAC) and the Latin American Regional Meetings of CIGRE (ERIAC) held from 1987 to until 2009. It is important to make the mention that CNV-CIGRE was one of the co-founders of ERIAC with Brazil, Argentina and Paraguay.
- Presentation of technical papers at the CIGRE's biennial meetings in Paris. For the period 2000-2010 a total of 10 papers were accepted for discussion in Paris.

In 2009, the Venezuelan representation in the international Studies Committees was as follows:

Study Committee	Observer Member
A1 Rotating Electric Machines	MILLAN, Alexander
A2 Transformers	Varela, Jairo
B2 Overhead Lines	GARCIA, Carlos
B3 Substations	SERRANO, Alfredo
B5 Protections and Automations	Ceballo, Luis
C4 Technical Systems Performance	VILLA Alessandro
C6 Distributions Systems and Dispersed Generation	ACEVEDO, Ruben

At the international level it can be highlighted the organization in Venezuela of the annual meeting of the Substations Study Committee and the Symposium

«Technology Trends in Substation and Environmental Conditions, its Scope and Impact on the Functionality and Operation» held in October 2001 at the hydroelectric plant facilities of Macagua of the EDELCA Company, with the participation of 125 delegates representing seven countries (Australia, Canada, Colombia, Sweden, Netherlands, Czech Republic and Venezuela).



***Macagua hydroelectric plant:
Place of the meeting of Substations Study Committee
and the Symposium in 2001.***

At the national level it can be highlighted the achievement of the Venezuelan

Congress of Networks and Electric Energy, conducted in November 2007 and June 2009, involving in each one more than 340 delegates, with participation mainly of Venezuela but also with participation of other countries like Colombia, Spain, Mexico, Peru, Sweden, Switzerland, etc., presentation in each one of over 135 technical papers in 16 subject areas of CIGRE and over 10 technical conferences given by representatives of more than 21 industrial exhibitors. These events could meet an important representation of the electricity sector of Venezuela.

For this period, Gonzalo Rodriguez, president of CNV CIGRE (2002-present), Alessandro Villa as secretary, and Pietro Carucci, Jorge Ramirez and Roberto Acquatela, whom integrate the current Board, and other contributors, have made efforts to keep the organization active.

Currently, the Committee is integrated by 21 individual members, three universities and four companies such as collective members. Several of its members participate in the activities of the various Study Committees covering different areas as Electrical Machines, Transformers, Substations, Transmission Lines, High Voltage Equipment, Electric Systems Performance, Protection and Automation, Distribution Systems and Distributed Generation.



History of Yugoslav/Serbian National Committee of CIGRÉ (Period 1951-1990)

Foundation

The Yugoslav National Committee CIGRE (JUNAKO CIGRE) was founded in 1951, with its head office in Zagreb, Croatia. Numerous prominent experts from electric power system operators, universities and manufacturers of electrical equipment of the time actively supported the initiation, formation and setting up of the Yugoslav National Committee CIGRE, and subsequently also contributed to its operation.

The first president of JUNAKO CIGRE was Prof. Milan Vidmar, PhD, of the Technical Faculty of Ljubljana. Members of the first Executive Committee delegated from Serbia included: Prof. Milivoje Rakić, of the Faculty of Electrical Engineering, Belgrade; Prof. Vladimir Ljubojević, of Elektrobiro-Energoprojekt Beograd, and Ilija Obradović, PhD, of the Institute at the Ministry of Electricity.

The original name JUNAKO CIGRE was later contracted to JUKO CIGRE (Yugoslav Committee CIGRE).

Economic Situation

At the time of JUNAKO CIGRE formation, the economic situation in the country was serious. Consequences of World War II were still very much felt and Yugoslavia was under huge political, military and economic pressure after it parted ways with the Soviet Union and the Eastern Bloc countries in 1948.

Electric power facilities at the time shared the fate of the majority of other economic facilities in the country – they were nationalized and State-owned.

Public authorities and institutions were responsible for planning the development of electric power facilities, providing finance and planning and recruitment of necessary human resources for the construction and operation of those facilities.

From the mid 1950s, Yugoslav economy managed to achieve and maintain stability. This enabled the country to plan and develop electric power facilities on

stronger and clearer economic principles and foundations. Funding was initially provided by a State-owned fund known as the General Investment Fund; later on, the General Investment Fund pooled with the Republic Investment Fund to provide resources, while the 1970s and 1980s saw a shift to financing from the contributions of economic operators associated with chartered investment bank, from own funds of electric power system operators and from loans and credits approved by international investment banks (WB, IBRD, EIB and others).

Until the mid 1970s, all existing and newly-build electric power facilities were owned by the State.

From the mid 1970s to late 1980s, Yugoslavia practised a specific form of social and economic relations, the so-called “self-management”. All means of production passed from State ownership to social ownership – they were effectively placed under the management of workers of the respective organizations. However, throughout the entire period, regardless whether means of production were State-owned or socially-owned, the State was responsible for passing or approving electricity generation and consumption balances, tariff systems and prices and electric power system development plans.



Run-of-River and pumped storage HPP Bajina Basta Serbia

Institutional Organization of the Electric Power Industry

From the foundation of JUKO CIGRE in 1951 to its transformation in 1991, the electric power industry of Yugoslavia, and that of Serbia as part of it changed a number of institutional organization forms. Under the Law in force at the time of formation of JUKO CIGRE, the functioning and operations of the electric power industry were managed by the Ministry of Electricity. Legislative amendments introduced in 1958 resulted in the formation of Republic-level Unions of Electric Power Enterprises, which were under an obligation to associate and form a Yugoslav Electric Power Union. The Republic-level Unions of Electric Power Enterprises included enterprises responsible for electricity generation and transmission. This organizational structure remained until 1962.

In 1966, duties and responsibilities for electricity supply were transferred from the Federation to its constituent Republics. At that time, Serbia formed the Associated Electric Power Enterprise of Serbia that included all existing generation and transmission enterprises, which acquired the status of Organizations within that associated enterprise.

This organizational structure remained in effect until 1972 when, following the enactment of Constitutional Amendments and the Law on Associated Labor, a number of changes were introduced in the organization and status of the electric power system of Serbia and the enterprises that made it up. A specific, cumbersome organizational structure, in particular its time-consuming process of decision-making and the ensuing difficulties in management, resulted in the repeal of the Law on Associated Labor in 1990.

During the existence of the Yugoslav Electric Power Union, and subsequently also the Associated Electric Power Enterprise of Serbia, these institutions were responsible for passing electricity generation and consumption balances, proposing tariff systems and prices, harmonizing the norms of necessary generation costs and passing of construction plans for generation and transmission facilities. All these instruments were approved by the Federal or the Republic Executive Council respectively.

Technical Issues

The Yugoslav National Committee CIGRE strove since its inception to keep abreast of new developments in electric power systems worldwide, essentially adhering to the issues addressed and the orientation affirmed by the international CIGRE organization. However, the dynamic developments in electrification of Yugoslavia due to its intensive industrialization after the end of World War II meant that the Committee also had to address a number of specific and current issues pertaining to the local needs of the country. This trend was subsequently continued and it shaped the activities of the majority of individual and collective members and JUKO CIGRE itself as a national institution.

As virtually all major issues in connection with the design, construction and operation of the electric power system of Serbia were initiated, reviewed and resolved at sessions and other forms of work of JUKO CIGRE (CIGRE Serbia), the following key facts about the development of the Serbian electric power system in the period 1951-2007 bear perhaps the most eloquent and succinct testimony to the importance of JUKO CIGRE:

Year	1951	2007
- Installed capacity of power plants, MVA	188	8,355
- Generation, GWh	581	38,897
- Consumption, GWh	491	37,785
- Length of overhead lines, km	498	9,864
- Installed capacity of transformer stations, MVA	35	17,381

Furthermore, as an illustration of the activities of JUKO CIGRE, below is a selection of major issues and topics addressed at sessions of JUKO CIGRE and its bodies:

- Normalization and standardization of transmission line parameters for all voltage levels
- Selection of parameters and elements of transformer stations and substations
- Selection of unit powers of electricity transformers and generators and their parameters
- Issues of equipment standardization from the aspect of rationalization of spare parts
- Issues of parallel operation in normal circumstances and in circumstances of outage of transmission network facilities
- Issues of parallel operation with neighbouring electric power systems
- Specific issues associated with plants such as: insulation coordination, overvoltages, functioning of protective devices, electricity dispatching, adoption of national and internal technical regulations and recommendations
- Modernization of dispatching
- Introduction of primary and secondary load regulation
- Introduction of a modern communication system
- Addressing the issue of shifting to higher voltage levels of 110, 220 and 400 kV
- Analysis of functioning of the electric power system from the aspect of its static and dynamic stability
- Issues of reactive power compensation in the system
- Analysis of current status and development of short circuit power etc.

Development of the National Committee CIGRE as an Institution

The development of the National Committee followed the pace of

development of the electricity sector and the electric power system. To expert members of the National Committee, Sessions held every even year and Symposia held every odd-number year provided a valuable opportunity to publish their works, share priceless experiences and acquire knowledge on recent developments in the fields of development, design, construction and use of large electricity networks, thereby affirming their work and the firms that employed them.

The National Committee has its Statutes, harmonized with the CIGRE Statutes, and ancillary bylaws on study committees, on rewards, diplomas and plaques and on organization of Symposia and Sessions. Sessions are attended by about 1000 participants with some 200 papers, while Symposia usually have 200-300 attendees who present about 50 papers.

The number of collective members varied from 20 to 40, with about 150 individual members.

Prominent Contributors

Numerous renowned and distinguished individuals from all parts of Yugoslavia contributed to the operation and success of the Yugoslav National Committee CIGRE. The majority of professors from all Yugoslav universities in the field of electrical engineering, in particular those specialized in electric power industry, actively took part in the operations of JUKO CIGRE and CIGRE. Eminent experts from institutes of electrical engineering, design organizations, electric power companies and generation and contractor organizations, each in their own specific way, both individually and collectively, gave invaluable contributions to the development of the Yugoslav National Committee CIGRE. Some of them contributed more than others, but no names will be mentioned here, thus avoiding any undue omission.

Contribution of our Experts to the Operation of CIGRE

Members of JUKO CIGRE took part in all CIGRE sessions and were actively involved in discussions on specific issues, achieving praiseworthy results. The actual number of our members who attended the Sessions depended on CIGRE regulations concerning the financial contribution from each of its members.

Between 1951 and 1990, our members submitted 15 papers addressing various issues, including:

- Automated control of time and load of generation units in an interconnective system
- Impact of the electric power system on frequency management
- Interconnection of Djerdap Hydro Power Plant at 400 kV grid
- Decentralized approach to automated inter-connective system management
- Reduction of the silhouette of 400 kV overhead line towers.

In addition to their contribution through submission of papers and discussions, our experts also participated in CIGRE colloquia and Symposia and served as members of a number of international working groups.



Run-of-River HPP Djerdap 1 Serbia

Yugoslav National Committee CIGRE, later Serbian National Committee CIGRE (period 1991-2009)

Foundation

In 1991 and 1992, Yugoslavia as a joint state broke up. The events associated with this also brought about a transformation of the former Yugoslav National Committee CIGRE. The new state union, which continued under the name of Yugoslavia, included only Serbia and Montenegro of the six former Republics.

Aware of the importance of and the need for continued operation and participation in the activities of CIGRE, experts from the remaining two Republics launched an initiative for continuation of JUKO CIGRE. They sought and obtained approval from CIGRE bodies for the new national committee, which retained the former name – Yugoslav National Committee CIGRE or JUKO CIGRE in the abbreviated form – to be accepted as the successor to the former Yugoslav National Committee CIGRE.

Later on, in 1997, the new national committee was acceded by experts and stakeholders from the Republic of Srpska (Bosnia and Herzegovina).

The session of JUKO CIGRE in its new composition was held under the title “21st JUKO CIGRE Session” in October 1993.

After the secession of the Republic of Montenegro from the joint state (in the meantime renamed Serbia and Montenegro), Montenegrin experts formed their own national CIGRE committee, and consequently the name of JUKO CIGRE was changed to CIGRE Serbia (2007); this organization retained continuity with the original Committee formed in 1951.

Economic Situation

The economic situation in the country at the time of renewal of JUKO CIGRE was highly disadvantageous, especially for the electric power industry. The dissolution of the joint state tore apart many economic, commercial and financial flows established over the years. War broke out, first in Croatia and then in Bosnia and Herzegovina. Serbia suffered from astronomic-figure inflation, which culminated in 1993. In 1992, the United Nations imposed an embargo on Yugoslavia (Serbia and Montenegro), thus disrupting and virtually breaking all economic, financial, commercial and even expert and scientific relations with foreign countries.

Activities of the electric power industry were restricted to the barest minimum needed to keep the electric power system functional and to supply the necessary quantities of electricity to consumers. It could be said that these tasks, even with all the difficulties, were achieved successfully, owing to the high level of commitment from the staff and the relatively sound construction of generation, transmission and distribution capacities.

However, construction of new electric power facilities was not an option in those days. The system stagnated, even deteriorated. The situation was particularly serious in 1999, when NATO forces bombed the country for 78 days, destroying many commercial and electric power facilities. The air campaign devastated a number of generation, transmission and distribution capacities. Links with the neighbouring countries were disrupted, collapse of the electric power system was imminent and on several occasions it was even necessary to operate the system on an insular basis.

Following the peace agreement with NATO forces and their entry into Kosovo, the political and subsequently also the economic situation began to stabilize. Reconstruction of destroyed electric power facilities was initiated, supported in part by foreign donors. In recent years, capacities have been repaired, revitalized and modernized, and plans for the future envisage the construction of new electric power facilities.

Institutional Organization of the Electric Power Industry

Although JUKO CIGRE included Montenegro until 2007 and still includes the Republic of Srpska, this text deals only with the organization of the Serbian electric power industry.

Reorganization of the electric power industry in Serbia was launched in 1989 and completed in 2005. Pursuant to the provisions of the Law on Electric Power Industry (1989), the Law on Public Enterprises (1990) and the Energy Law (2004), the electric power industry is organized in two public, State-owned enterprises, namely:

- Public Enterprise for Electricity Generation, Distribution and Trade "Elektroprivreda Srbije", Belgrade, and
- Public Enterprise for Electricity Transmission System and Market Operator "Elektromreže Srbije", Belgrade.

This organizational structure remains in force to this day.

Technical Issues

In its operations, JUKO CIGRE made efforts to keep pace with the situation and development in large electricity networks worldwide through the participation of its members in CIGRE Sessions, its standing and ad hoc working groups, various hard and soft copy information provided by CIGRE, attendance of regional meetings etc. It chose preferential topics for its sessions, symposia and round tables according to the current issues faced by the Serbian electric power system.

The new organization of CIGRE in 2002, with supplemented and reorganized topics addressed by specific study committees, has been reflected in the operations of JUKO CIGRE. As an illustration, below is a selection of issues addressed by JUKO CIGRE between 1991 and 2007:

- Issues concerning the operation of hydro and turbo generators; replacement of turbo generator coils; problems involved in the purchase of hydro generator actuating system; introduction of partial discharge monitoring in hydro generator coils
- Diagnostic methods, supervision technique, revitalization, testing of transformers; installation of transformers on site; transformer loading, ageing of insulation system, useful life of transformers; construction, manufacture, testing and supervision of measurement transformers
- Utilization of experiences and maintenance of circuit-breaking equipment; numeric methods of circuit breaker stimulation; characteristics of new devices and their comparison with the existing ones
- Current situation and tendencies in the development of high-voltage direct current power transmission systems; energy converters and regulators
- Application of new technologies and materials in the construction of new power lines; analysis of existing regulations pertaining to overhead power

- lines; problems associated with the repair of power lines damaged during the war; analysis of powering occurrences related to transmission line breakdowns; overloading of conduits; earthing issues
- Short circuits at plants; earthing and safety measures; reliability, maintenance and use of plants; SF6 gas-insulated plants; revitalization of plants
- Coordination of system insulation
- New equipment and plant protection systems; arc fault detection on transmission lines; commissioning of the first microprocessor protection; revitalization of the existing protection and management system
- Analysis of telecommunications routes; analysis of proposed telecommunications system solutions; new telecommunications equipment; OPGW cables
- Analysis of operation of the electric power system - EPS; measures and activities aimed at enhancing the power factor; calculation of electricity losses; EPS voltage and power flow analysis
- Modernization of dispatching; problems associated with the operation of Serbian EPS in the Balkans Interconnection
- Contribution to the preparation of the National Integral Cadastre of Polluters;
- Regional electricity market in Southeastern Europe
- Calculation of electricity losses in the transmission network of Serbian EPS.

Development of the National Committee CIGRE as an Institution

After the secession of Montenegro from JUKO CIGRE (2007), the former name of the Committee was changed to CIGRE Serbia. This National Committee includes as its members experts and organizations from the Republic of Serbia and the Republic of Srpska (Bosnia and Herzegovina).

CIGRE Serbia operates as an association founded by the Ministry of Public Administration and Local Self-government of the Republic of Serbia. CIGRE Serbia is a non-profit, non-governmental organization with the following bodies: Executive Committee, Supervisory Committee and Assembly.

Contribution of our Experts to the Operation of CIGRE International

From 1991 to 2009, the experts of JUKO CIGRE (CIGRE Serbia) took part in all CIGRE Sessions in Paris, contributed to the operation of international working parties and study committees as regular or observer members, submitted reports in writing on the activities of the National Committee at the Forum of National Committees, ensured the payment and distribution of the ELECTRA magazine to a number of JUKO CIGRE members, proposed the distribution and distributed the ELECTRA magazine to students of electrical engineering university schools and provided papers and other materials from CIGRE files to interested experts.

In addition to the above activities, JUKO CIGRE also participated in the "Large Disturbances" Workshop (2000) with a contribution on devastation and recovery

of the electric power system destroyed by the NATO bombing campaign in 1999.

In 2001, JUKO CIGRE was a co-organizer (together with Greece) of CIGRE Black Sea El Net, organized by the Romanian National Committee.

In May 2003, Belgrade hosted the International Colloquium on Overhead Lines Revitalization. A report from this international meeting was published in the ELECTRA issue number 214.

As a key contribution of experts of CIGRE Serbia in this period, CIGRE accepted 20 papers prepared by CIGRE Serbia and included it in its Session materials. Below is a selection of topics addressed by those papers:

- Rapid ageing of transformer insulation
- Lifecycle management and impact on its extension for hydro generators of Djerdap Hydro Power Plant
- Operator performance requirements and training needs in a commercial environment
- Measurement and fee payment in electric power plants regulation in decentralized electric power industries
- Development and application of overhead power line revitalization methodology
- Thermal monitoring of high-voltage cables.



TPP Nikola Tesla A Serbia

Challenges and Objectives Ahead

CIGRE Serbia will continue for many years its cooperation with CIGRE, making its contribution within the available means. At the same time, it will be very much

interested in the contributions and experiences of other national committees and regional experts and institutions, in an effort to transpose their positive experiences in its practice.

Aware of current global tendencies, particularly in the field of electric power industry theory and practice, in 2003 we adopted the new organizational structure and spheres of interest of specific CIGRE committees and we developed their activities accordingly.

The reorganization of power utility companies of Serbia and the Republic of Srpska ("Elektroprivreda Srbije" and "Elektroprivreda Republike Srpske" respectively) and their closer ties will open a whole range of issues in connection with their joint operation.

Strengthening of existing relations – technical and economic – and establishment of new ones with the electric power industries of the neighbouring countries will be a crucial field of activity for CIGRE Serbia.

The issues of environment protection, economic aspects of electricity generation, transmission and distribution and safety of supply of sufficient quantities of good quality electricity to consumers expand the scope of interest and engagement of experts at CIGRE Serbia.

Alternative sources of energy, use of available hydro potential and rational electricity consumption are emerging as unavoidable issues of interest for the wider research and development community in the country, and thus also for the expert members of CIGRE Serbia.

CIGRE Serbia, for its part, expects even higher commitment and organizational, financial and moral support and assistance from competent commercial and public authorities for the purpose of its improved performance and, above all, in the practical application of the results achieved by this organization in its highly committed and useful efforts.

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Founded in 1921, the International Council on Large Electric Systems now counts 57 National Committees over the World. Many of these have traced back the creation and development of their Committee to complement the work on the history on the Association. Their contributions are collected under this second book on the history of CIGRE.

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