



PROGRAMME



Application of Line Surge Arresters in Power Distribution and Transmission Systems

Cavtat/Dubrovnik, Croatia

May 25-29, 2008



INTERNATIONAL COLLOQUIUM

**Application of Line Surge Arresters
in Power Distribution and Transmission Systems**

PROGRAMME

Cavtat/Dubrovnik, Croatia, May 25–29, 2008
Hotel Croatia

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1. WORD OF WELCOME

Dear Colleagues and Friends,

Welcome to the International Colloquium on “Application of Line Surge Arresters in Power Distribution and Transmission Systems” to be held in Cavtat, Croatia.

The Colloquium is organized under the umbrella of the CIGRÉ Study Committee C4 (System Technical Performance) in cooperation with the Croatian National Committee and Study Committees A3 (High Voltage Equipment) and B2 (Overhead Lines).

The goal of the Colloquium is to examine the various aspects of line surge arresters application and it is addressed to power utilities, equipment manufacturers, design engineers, system operators, universities, testing laboratories, research institutes and other organizations in the electricity industry. The Colloquium offers an opportunity for all participants to discuss key current topics about the line surge arresters.

On behalf of the Organizing Committee, I warmly welcome you to the Colloquium and I hope that you will have an enjoyable time discussing and exchanging ideas with each other.

I also wish you a great stay in Croatia – the land of the thousand islands.

Prof. Ivo Uglešić
Chairman of the Colloquium

2. TECHNICAL COMMITTEE

I. Uglešić (Croatia) Chairman
S. Sadović (France) Co-Chairman
A. Xemard (France) Co-Chairman
M. Babuder (Slovenia)
W. A. Chisholm (USA)
M. T. Correia de Barros (Portugal)
A. da Costa Oliveira Rocha (Brazil)
B. Dalle (France)
A. Dutil (Canada)
M. Ishii (Japan)
T. Lassaigne (France)
C. Neumann (Germany)
C. A. Nucci (Italy)
S. Pack (Austria)
M. Puharić (Croatia)
B. Richter (Switzerland)
A. Sekso (Croatia)
M. Waldron (United Kingdom)

3. ORGANIZING COMMITTEE

Ivo Uglešić – Chairman
Ante Marušić
Viktor Milardić
Miroslav Mesić
Gordan Mirošević
Josip Moser
Irena Tomiša

4. HOST OF SESSION



HEP-Transmission System Operator Ltd.

5. SPONSORS

DALEKOVOD – SILVER SPONSOR

SIEMENS – BRONZE SPONSOR

ABB

BRODOMERKUR

EDF

HEP

HUBBELL POWER SYSTEMS

KONČAR

MAR-KO-ING

RTE EDF TRANSPORT

SEVES – SEDIVER

TYCO ELECTRONICS RAYCHEM represented by ENCRON

6. PRESENTATIONS OF SPONSORS

HUBBELL POWER SYSTEMS

Frank Lopez:

HUBBELL POWER SYSTEMS, POLYMER INSULATORS AND LINE ARRESTERS FOR TRANSMISSION APPLICATIONS

- Quick introduction about HPS
- Quadri*Sil polymer insulators
- Protecta*Lite line arresters

SEVES-SEDIWER

Damien Lepley:

POLYMER HOUSED HIGH VOLTAGE SURGE ARRESTERS

MAR-KO-ING/TRIDELTA

Volker Engelhardt:

TRIDELTA SURGE ARRESTERS – THE NEW TECHNOLOGIES PRESENTED IN CROATIA

ABB

Frederik Persson:

MAKING ARRESTERS MORE ROBUST BY DESIGN

Bernhard Richter:

ABB MEDIUM VOLTAGE SURGE ARRESTERS–DIMENSIONING, TESTING AND APPLICATION IN MV NETWORKS

HEP-TSO

Jadranko Radovanović, Dalibor Škarica, Goran Čubra, Mario Gudelj, Miroslav Mesić:

EXPERIENCE ON INSTALLATION AND OPERATION OF LINE SURGE ARRESTERS (LSA) ON LINE

7. INVITED LECTURES

INVITED LECTURE I

Masaru Ishii:

CIRCUIT MODEL FOR EVALUATION OF PERFORMANCE OF LINE SURGE ARRESTERS

INVITED LECTURE II

William A. Chisholm:

ISSUES IN LONG-TERM RELIABILITY OF TRANSMISSION LINE SURGE ARRESTERS

INVITED LECTURE III

Salih Sadović:

DIFFERENT APPLICATIONS OF LINE SURGE ARRESTERS

8. MAIN TOPICS

1. Interaction between LSAs and electrical system
2. Line performance improvement in terms of continuity of service
3. Different applications of LSAs
4. LSA designs (gapless, gap-type)
5. Apparatus aspects of LSA, standardization, testing
6. Simulation/selection tools
7. LSA Selection
8. Installation practice of LSAs/mechanical aspects
9. Field experience with LSAs/reliability
10. LSA monitoring

9. PAPERS

1.

Installation of LSA on a 400 kV Double-circuit Line in Russia
L. Stenström, J. Taylor, N.T. Osipov, F. Persson

2.

Application of ANN and Genetic Algorithm for Evaluation the Optimum Location of Arresters on Power Networks due to the Switching Overvoltages
Reza Shariatinasab, Behrooz Vahidi, Seyed Hossein Hosseini, Akihiro Ametani

3.

Reduction of the number of double-circuit flashovers on a 400 kV overhead line
A. Xemard, J. Michaud, F. Maciela, T. Lassaigne, F. Sauvegrain, P. Auriol, J. G. Roumy, O. Saad, Q. Bui Van, A. Dutil

4.

Line surge arresters potential applications on Hydro-Québec TransÉnergie transmission system
P. Prud'homme, A. Dutil

5.

Decreasing backflashover numbers on medium voltage overhead lines located in regions with high soil resistivity
D. Mišković, I. Uglešić

6.

Pilot study on the use of gapless transmission line arresters (TLA) as an alternative to gapped TLA in TNB transmission system
Iryani M. Rawi, M. Pauzi Yahaya

7.

Evaluation of Energy Stress on Line Arresters
I. Uglešić, V. Milardić, B. Filipović-Grčić, A. Tokić

8.

Application of Line Surge Arresters in Power Transmission Line in China
ZHANG Cui-xia, FAN Jian-bin, GE Dong, CHEN Xiu-juan

9.

Application of gapless surge arresters for lightning protection of transmission and distribution lines
M. G. Comber

10.

Basic Study on Deterioration of Transmission Line Arrester
Yamada, M. Nakagami| N.

11.

Real-time remote monitoring of line surge arresters
M. Muhr, T. Sadović

12.

Line surge application on the compact transmission lines
S. Sadović, D. Lepley, E. Brocard, J. M. George

13.

Current standard practice in EHV/HV Italian substation design:
Oriented modelling and simulation of lightning protection system for improving design criteria
F. Delfino, G. B. Denegri, P. Girdinio, M. Invernizzi, R. Procopio, M. Rossi, D. Falorni, A. Freddo, V. Iuliani, G. Toschi

14.

Surveillance of Lightning Strokes Near Transmission Lines
Andreas Wuerl, Hans D. Betz, Kersten Schmidt, Wolf P. Oettinger

15.

Modeling of overhead transmission lines with line surge arresters for lightning overvoltages
M. Jaroszewski, J. Pospieszna, P. Ranachowski, F. Rejmund

16.

The possibility of insulation level reduction on 110 kV overhead line with built-in post insulators using line surge arresters

S. Vižintin, I. Kobal, M. Bečan

17.

Experience of Tyco & Antamina in the Lightning Performance and Reliability Improvement of 220 kV Transmission Lines in Peru

Jorge Luiz De Franco, Craig Sutton, Carlos Riva, Jorge Tuesta Rivera, Jose Francisco Montes, Wilson Alonzo, Mussolini Tarazona, Manuel Contreras

18.

Improvement of the transmission and sub transmission overhead lines lightning performance using line arresters – Experience in Brazil

Jorge Luiz De Franco, José Pissolato Filho

19.

Reduction of the visual impact of overhead transmission line systems through utilization of line surge arresters as lightning protection

T. K. Soerensen, J. Holboell

20.

Case Study for Application of Transmission Line Arresters on Croatian 400 kV Line along the Adriatic Coast Mountains

L. Klingbeil, Z. Baus, S. Nikolovski, I. Ivanković

21.

Lightning performance improvement of 110 kV line Ston – Komolac by use of line surge arrester

M. Puharić, M. Mesić, M. Lovrić, J. Radovanović, S. Sadović

22.

Line surge arresters applications on the multi circuit overhead lines

S. Sadović, T. Sadović

23.

Line arrester application on a 110 kV high alpine overhead line to reduce lightning-caused outages

T. Judendorfer, S. Pack, M. Muhr

24.

Romanian Field Experience In Mounting And Exploitation of Line Arresters On High Voltage Overhead Electric Lines

Stelian Alexandru Gal, Traian Fagarasan, Marius Oltean, Constantin Matea

25.

Performance of parallel surge arresters

A. Haddad, H. Griffiths, M. Osborne

26.

Testing Requirements and actual IEC Work on Transmission Line Arresters

Volker Hinrichsen

27.

Design Features and Performance of Gapped Transmission Line Arresters

Makoto Yamaguchi, Hiroki Kajino, Hiroki Saito, Shinji Ishibe

28.

Lightning Protection of Overhead Transmission Lines with Surge Arresters – Development of Line Arresters and the Technology in Japan

Masaru Ishii, Hiroyuki Kado, Kazuhiko Shimoda, Kenji Tsuge, Katsuaki Komatsu, Makoto Yamaguchi, Hideto Watanabe, Takeshi Iwaida, Takehiko Akedani, Hirotoshi Kohno

29.

Specific Consideration on Follow Current Interruption and Anti-pollution Performance of External Series Gapped Type Line Surge Arrester (EGLA)

Yoshihiro Ishizaki, Kenji Tsuge, Misao Kobayashi, Kunikazu Izumi

30.

Calculations of lightning-induced voltages in distribution lines with LSA

P. E. Munhoz Rojas, C. L. da S. Pinto

31.

Application of line surge arrester on a 230 kV transmission line CEMIG's Experience
A. C. O. Rocha, L. V. Cunha, L. C. L. Cherghiglia, S. O. Moreira, D. C. Cunha

32.

Lightning Phenomena and Related Accidents to Humans
G. Berger

33.

Line Arresters on Distribution Lines in Hilly Regions
A. Sekso, I. Sekso, J. Trbus

34.

Brazilian production development of class 2 polymeric surge arresters for transmission line application (TLA)
A. A. Dellallibera, A. D. Andrade, A. C. Guar Bezerra, J. V. P. Duarte, P. M. B. Gois, R. L. Markiewicz

35.

Lightning Protection Of Electric Power Overhead Distribution Lines by Long-Flashover Arresters in Russia
G. V. Podporkin, E. S. Kalakutsky, V. E. Pilshikov, A. D. Sivaev

36.

On the Mitigation Effect of Surge Arresters on the Lightning Performance of Overhead Distribution Lines
A. Borghetti, F. Napolitano, C. A. Nucci, M. Paolone

37.

Mapping Lightning Thunderstorms for Saudi Arabia for Better Selection of Ground wires and Lightning Arresters
M. H. Shwehdi

38.

First Experience in Monitoring of Line Surge Arresters Installed on 110 kV Transmission Line Ston – Komolac in Croatia
S. Boji, I. Doli, A. Sekso, J. Radovanovi, D. Škarica

10. TIME-TABLE

INTERNATIONAL COLLOQUIUM

Application of Line Surge Arresters in Power Distribution and Transmission Systems
Croatia, Cavtat, May 25 – 29, 2008

Sunday, May 25		hall
10.00 a.m. – 5.00 p.m.	IEC TC37 MT4 Meeting	<i>Saloon 6</i>
6.30 p.m. – 7.30 p.m.	Welcome Cocktail Party	<i>Hotel Croatia</i>
Monday, May 26		
9.00 a.m. – 10.30 a.m.	Opening Ceremony + Invited Lecture I.	<i>Orlando</i>
10.30 a.m. – 11.00 a.m.	Coffee Break	
11.00 a.m. – 11.45 a.m.	Invited Lecture II.	<i>Orlando</i>
11.45 a.m. – 12.30 p.m.	Invited Lecture III.	<i>Orlando</i>
2.30 p.m. – 4.00 p.m.	Session – part I. (Topic 1)	<i>Orlando</i>
4.00 p.m. – 4.30 p.m.	Coffee Break	
4.30 p.m. – 6.00 p.m.	Session – part II. (Topics 3 and 10)	<i>Orlando</i>
Tuesday, May 27		
9.00 a.m. – 10.30 a.m.	Session – part I. (Topics 4 and 8)	<i>Orlando</i>
10.30 a.m. – 11.00 a.m.	Coffee Break	
11.00 a.m. – 1.00 p.m.	Session – part II. (Topics 7 and 6)	<i>Orlando</i>
12.00 a.m. – 6.00 p.m.	IEC TC37 MT4 Meeting	<i>Saloon 6</i>
2.30 p.m. – 3.00 p.m.	Sponsor presentation – HUBBELL POWER SYSTEMS	<i>Orlando</i>
3.15 p.m. – 3.45 p.m.	Sponsor presentation – SEVES-SEDIVER	<i>Orlando</i>
4.00 p.m. – 4.30 p.m.	Sponsor presentation – MAR-KO-ING/TRIDELTA	<i>Orlando</i>
4.45 p.m. – 5.45 p.m.	Sponsor presentation – ABB	<i>Orlando</i>
6.00 p.m. – 6.30 p.m.	Sponsor presentation – HEP-TSO	<i>Orlando</i>
Wednesday, May 28		
9.00 a.m. – 10.30 a.m.	Session – part I. (Topic 2)	<i>Orlando</i>
10.30 a.m. – 11.00 a.m.	Coffee Break	
11.00 a.m. – 1.00 p.m.	Session – part II. (Topics 2 and 5)	<i>Orlando</i>
3.00 p.m. – 10.00 p.m.	Technical Visit/Dinner – Overhead Line 110 kV Ston – Komolac	
Thursday, May 29		
9.00 a.m. – 10.30 a.m.	Session – part I. (Topics 5 and 8)	<i>Orlando</i>
10.30 a.m. – 11.00 a.m.	Coffee Break	
11.00 a.m. – 12.30 p.m.	Session – part II. (Topic 8)	<i>Orlando</i>
12.30 a.m. – 1.00 p.m.	Closing Session	
3.00 p.m. – 6.00 p.m.	C4.301/A3.17 Working Groups Meeting	<i>Saloon 6</i>
Friday, May 30		
9.00 a.m. – 1.00 p.m.	C4.301 Working Group Meeting	<i>Saloon 6</i>

PAPERS PRESENTATIONS:

Monday, May 26

2.30 p.m. – 4.00 p.m. Session – part I. (Topic 1)

Paper 32:

Lightning phenomena and related accidents to humans
(G. Berger)

Paper 5:

Decreasing Backflashover Numbers on Medium Voltage Overhead Lines Located in Regions with High Soil Resistivity
(D. Mišković, I. Uglešić)

Paper 13:

Current Standard Practice in EHV/HV Italian Substation Design: Oriented Modelling and Simulation of Lightning Protection System for Improving Design Criteria
(F. Delfino, G. B. Denegri, P. Girdinio, M. Invernizzi, R. Procopio, M. Rossi, D. Falorni, A. Freddo, V. Iuliani, G. Toschi)

Paper 16:

The Possibility of Insulation Level Reduction on 110 kV Overhead Line with Built-in Post Insulators Using Line Surge Arresters
(S. Vižintin, I. Kobal, M. Bečan)

Paper 20:

Case Study for Application of Transmission Line Arresters at Croatian 400 kV Line Along the Adriatic Coast Mountains
(L. Klingbeil, Z. Baus, S. Nikolovski, I. Ivanković)

Paper 33:

Line arresters on distribution lines in hilly regions
(A. Sekso, I. Sekso, J. Tribus)

Monday, May 26

4.30 p.m. – 6.00 p.m. Session – part II. (Topics 3 and 10)

Paper 12:

Line Surge Arresters Applications on the Compact Transmission Lines
(S. Sadović, D. Lepley, E. Brocard, J. M. George)

Paper 19:

Reduction of the visual impact of overhead transmission line systems through utilisation of line surge arresters as lightning protection
(T. K. Soerensen, J. Holboell)

Paper 22:

Line Surge Arresters Applications on the Multi Circuit Overhead Lines
(S. Sadović, T. Sadović)

Paper 11:

Real-Time Remote Monitoring of Line Surge Arresters
(M. Muhr, T. Sadović)

Paper 38:

First Experience in Monitoring of Line Surge Arresters Installed on 110 kV
Transmission Line Ston – Komolac in Croatia
(S. Bojić, I. Dolić, A. Sekso, J. Radovanović, D. Škarica)

Tuesday, May 27

9.00 a.m. – 10.30 a.m. Session – part I. (Topics 4 and 8)

Paper 6:

Pilot Study on the Use of Gapless Transmission Line Arresters (TLA) as an
Alternative to Gapped TLA in TNB Transmission System
(Iryani M. Rawi, M. Pauzi Yahaya)

Paper 27:

Design Features and Performance of Gapped Transmission Line Arresters
(Makoto Yamaguchi, Hiroki Kajino, Hiroki Saito, Shinji Ishibe)

Paper 1:

Installation of LSA on a 400 kV Double-circuit Line in Russia
(L. Stenström, J. Taylor, N.T. Osipov, F. Persson)

Paper 9:

Application of Gapless Surge Arresters for Lightning Protection of Transmission and
Distribution Lines
(M. G. Comber)

Tuesday, May 27

11.00 a.m. – 1.00 p.m. Session – part II. (Topics 7 and 6)

Paper 7:

Evaluation of Energy Stress on Line Arresters
(I. Uglešić, V. Milardić, B. Filipović–Grčić, A. Tokić)

Paper 2:

Application of ANN and Genetic Algorithm for Evaluation the Optimum Location of
Arresters on Power Networks due to the Switching Overvoltages
(Reza Shariatinasab, Behrooz Vahidi, Seyed Hossein Hosseinian, Akihiro Ametani)

Paper 15:

Modeling of overhead transmission lines with line surge arresters for lightning
overvoltages
(M. Jaroszewski, J. Pospieszna, P. Ranachowski, F. Rejmund)

Paper 30:

Calculations of lightning-induced voltages in distribution lines with LSA
(P. E. Munhoz Rojas, C. L. da S. Pinto)

Wednesday, May 28 9.00 a.m. – 10.30 a.m. Session – part I. (Topic 2)

Paper 3:

Reduction of the double-circuit flashovers on a 400 kV overhead line
(A. Xemard, J. Michaud, F. Maciela, T. Lassaigue, F. Sauvegrain, P. Auriol, J. G. Roumy, O. Saad, Q. Bui Van, A. Dutil)

Paper 4:

Line Surge Arresters Potential Applications on Hydro-Québec TransÉnergie Transmission System
(P. Prud'homme, A. Dutil)

Paper 14:

Surveillance of Lightning Strokes Near Transmission Lines
(Andreas Wuerl, Hans D. Betz, Kersten Schmidt, Wolf P. Oettinger)

Paper 35:

Lightning Protection of Electric Power Overhead Distribution Lines by Long-Flashover Arresters in Russia
(G. V. Podporkin, E. S. Kalakutsky, V. E. Pilshikov, A. D. Sivaev)

Wednesday, May 28 11.00 a.m. – 1.00 p.m. Session – part II. (Topics 2 and 5)

Paper 36:

On the Mitigation Effect of Surge Arresters on the Lightning Performance of Overhead Distribution Lines
(A. Borghetti, F. Napolitano, C. A. Nucci, M. Paolone)

Paper 37:

Mapping Lightning Thunderstorms for Saudi Arabia for Better Selection of Ground wires and Lightning Arresters
(M. H. Shwehdi)

Paper 10:

Basic Study on Deterioration of Transmission Line Arresters
(N. Yamada, M. Nakagami)

Paper 25:

Performance of Parallel Surge Arresters
(A. Haddad, H. Griffiths, M. Osborne)

Paper 26:

Testing Requirements and Actual IEC Work on Distribution and Transmission Line Arresters
(V. Hinrichsen)

C. A. Nucci: Ongoing activities in Insulation coordination within SC C4

Thursday, May 29 9.00 a.m. – 10.30 a.m. Session – part I. (Topics 5 and 8)

Paper 29:

Specific Consideration on Follow Current Interruption and Anti-pollution Performance of External Series Gapped Type Line Surge Arrester (EGLA)
(Yoshihiro Ishizaki, Kenji Tsuge, Misao Kobayashi, Kunikazu Izumi)

Paper 34:

Brazilian production development of class 2 polymeric surge arresters for transmission line application (TLA)
(A. A. Dellallibera, A. D. Andrade, A. C. Guar Bezerra, J. V. P. Duarte, P. M. B. Gois, R. L. Markiewicz)

Paper 8:

Application of Line Surge Arresters in Power Transmission Line in China
(ZHANG Cui-xia, FAN Jian-bin, GE Dong, CHEN Xiu-juan)

Paper 17:

Experience of Tyco & Antamina in the Lightning Performance and Reliability Improvement of 220 kV Transmission Lines in Peru
(Jorge Luiz De Franco, Craig Sutton, Carlos Riva, Jorge Tuesta Rivera, Jose Francisco Montes, Wilson Alonzo, Mussolini Tarazona, Manuel Contreras)

Paper 18:

Improvement of the transmission and sub-transmission overhead lines lightning performance using line arresters – Experience in Brazil
(Jorge Luiz De Franco, Jos Pissolato Filho)

Thursday, May 29 11.00 a.m. – 12.30 p.m. Session – part II. (Topic 8)

Paper 21:

Lightning Performance Improvement of 123 kV Line Ston – Komolac by Use of Line Surge Arresters
(M. Puhari, M. Mesi, M. Lovri, J. Radovanovi, S. Sadovi)

Paper 23:

Line Arrester Application on a 110 kV High Alpine Overhead Line to reduce Lightning-Caused Outages
(T. Judendorfer, S. Pack, M. Muhr)

Paper 24:

Romanian Field Experience in Mounting and Exploitation of Line Arresters on High Voltage Overhead Electric Lines

(Stelian Alexandru Gal, Traian Fagarasan, Marius Oltean, Constantin Matea)

Paper 28:

Lightning Protection of Overhead Transmission Lines with Surge Arresters –

Development of Line Arresters and the Technology in Japan

(Masaru Ishii, Hiroyuki Kado, Kazuhiko Shimoda, Kenji Tsuge, Katsuaki Komatsu,

Makoto Yamaguchi, Hideto Watanabe, Takeshi Iwaida, Takehiko Akedani, Hirotoshi Kohno)

Paper 31:

Application of line surge arrester on a 230 kV transmission line CEMIG's Experience

(A. C. O. Rocha, L. V. Cunha, L. C. L. Cherghiglia, S. O. Moreira, D. C. Cunha)

11. REGISTRATION AND INFORMATION OFFICE

All participants should register immediately after arrival at HRO CIGRÉ Registration and Information Office (in front of the hall *Orlando*) where they will receive all conference materials and information regarding the Colloquium.

12. INFORMATION FOR SPEAKERS AND TECHNICAL EQUIPMENT

Authors will have available 10–12 minutes for their presentations and a few minutes for discussions. Please limit your presentation to approximately 10–15 slides. Authors are kindly requested to be present in the *Orlando* hall 15 minutes before the scheduled session in order to receive final information and instructions from the session chair.

Orlando hall will be equipped with:

DATA projectors (DATASCOPE) for computer presentation
(resolution up to 1024 x 768 pixels)

Video projections (DVD)

Notebook or PC with Windows XP operating system and Microsoft Office 2007

Authors should bring their Power Point presentations 15 minutes before the beginning of the session on CD–ROM or USB memory stick. Version MS PowerPoint 2003 is recommended. The technical support will be available. Colloquium Staff will make sure that your presentation is downloaded on the computer. A technician or a hall attendant will be in *Orlando* hall to provide assistance when needed. If you have questions, please contact your chair or a staff member in the *Orlando* hall.

13. TECHNICAL VISIT/Wednesday, May 28, 2008

Dress code: casual

Technical Visit to the Overhead Line 110 kV Ston – Komolac (Pole No. 38)



- Bus departure in front of the *Croatia* Hotel in Cavtat 3.00 p.m.
- Bus journey across the bridge and along the coastal road; arrival at the Pole 38 location (60 km) 3.00 p.m. – 4.00 p.m.
- Presentation of the main features of the overhead line and initial experiences with the pilot project for application of line surge arrester 4.00 p.m. – 4.10 p.m.

- Viewing of the location – Pole No. 38 and installed line surge arresters, panoramic view of the Pelješac Peninsula; taking photographs 4.10 p.m. – 4.20 p.m.
- Return by bus along the coastal road to the Gruž harbour 4.20 p.m. – 5.30 p.m.

Dinner

Option 1:

- Embark on m/s Tirena 6.00 p.m. – 10.00 p.m.
- leisure cruise along the city walls of Dubrovnik to the nearby island of Lokrum– the ship will be anchored in the Portoč Bay and dinner will be served on boat; during the dinner the guests will be entertained by a Dalmatian vocal band
- return cruise to Cavtat after dinner



Option 2:

- In case of bad weather conditions 6.00 p.m. – 10.00 p.m.
- after the technical visit (6.00 p.m.), coach transfer to Dubrovnik; dinner will be organized at *The MIMOZA* restaurant (a newly renovated restaurant is located at Pile, just outside Old Town Dubrovnik and across *Hilton* Hotel; after dinner transfer back to the hotel by coach

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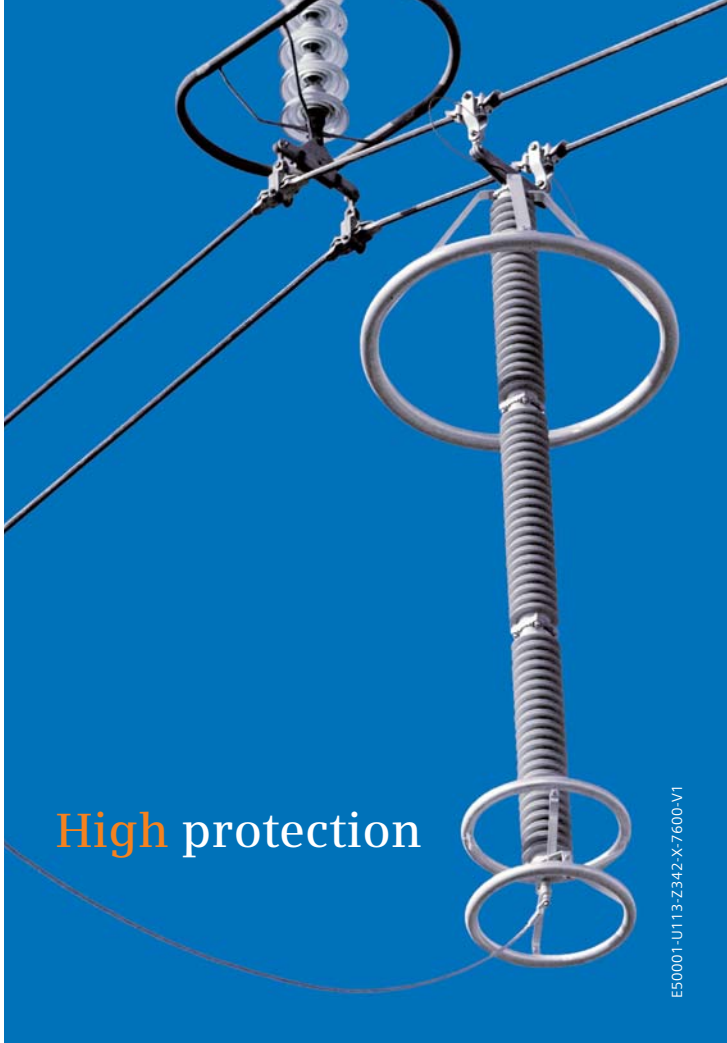
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Harsh
conditions



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Transmission line surge arresters from Siemens provide maximum reliability for high- and medium-voltage networks.

In high- and medium-voltage networks, one thing counts above all: maximum reliability under even the harshest conditions – such as high ground flash density in mountains. Transmission line surge arresters from Siemens reliably protect your overhead power lines against hazardous lightning or switching overvoltages. Adaptable to all installations, compact, and economical: These aspects make it the solution of first choice – as an alternative to additional guard wires or other expensive measures.

Contact us – we'll gladly provide an analysis of your line conditions:

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High Voltage Division

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EDF Research and development

**Creating value for the Group EDF
and preparing for the future**





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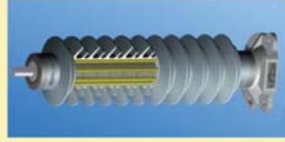
***THE NEW TECHNOLOGIES ON CROATIAN MARKET
PRESENTED TO YOU BY OUR COMPANY***



TRIDELTA Überspannungsableiter GmbH

TRIDELTA Überspannungsableiter GmbH, Germany manufactures surge arresters for high voltage and midvoltage electrical systems

TRIDELTA surge arresters are suitable for adaptation to every environment



The silicon injection moulded surge arresters of cage design are the recent TRIDELTA development form

We recommend you to protect your switchgears, transformers and power lines with TRIDELTA surge arresters

www.tridelta.de

RTE

Europe's largest electricity transmission system



RTE is the French electricity Transmission System Operator

responsible for operation, maintenance and development. With a system which is the largest in Europe - 100,000 kilometres of high voltage and extra-high voltage circuits and 46 cross-border interconnections, plus a strategic location at the geographical hub - RTE has played a key role in the development of the European electricity market.

RTE is a public service company guaranteeing the efficient operation and reliability of the French power system, and provides equitable access to all system users. The company is part of the EDF Group, but has totally independent management and administration, as required by law. In 2005, RTE became a limited liability company, with an Executive Board and Supervisory Board; this corporate status guarantees due neutrality in providing service for all players on the electricity market.

Key figures

- **4 billion euros turnover in 2005**
- **8,300 employees**

RTE

Premier réseau européen de transport d'électricité

RTE est le gestionnaire du réseau français de transport d'électricité, qu'il exploite, entretient et développe. Doté du réseau le plus important d'Europe, avec 100 000 kilomètres de circuits à haute et très haute tension et quarante-six lignes transfrontalières, ainsi que d'une situation géographique centrale, RTE contribue de manière déterminante au développement du marché européen de l'électricité.

Entreprise de service public, RTE est garant du bon fonctionnement et de la sûreté du système électrique français. Il assure un accès équitable à tous les utilisateurs du réseau. Il constitue, au sein du groupe EDF, une entreprise dont la totale indépendance de gestion et de management est voulue par la loi. Société anonyme à Directoire et Conseil de surveillance depuis 2005, RTE est en effet doté d'un statut qui garantit sa neutralité au service de tous les acteurs du marché de l'électricité.

RTE EN CHIFFRES

- 4 milliards d'euros de chiffre d'affaires en 2005.
- 8 300 salariés.



Gestionnaire
du Réseau de Transport d'Electricité



Energy Division

Bowthorpe EMP Transmission Line Arrester

Key Features

- HV arrester suspended from a transmission line giving enhanced transmission line performance.
- Increasing system line voltage on standard insulated transmission lines.

Benefits of TLA Installations

- Minimising circuit breaker operation with possible system outage resulting from back flashover on the transmission line.
- Switching overvoltages are absorbed over the length of the line reducing the severity of surge at the substation.
- Transmission systems can be operated even where sub-soil gives poor tower footing resistance.
- Eliminating interrupted supply for power supply for sensitive industrial processes.
- Installing Transmission Line Arresters on a standard 3 phase voltage system along the line, at calculated intervals, allows for optimum performance of the TLA, to give an increased system line voltage. Therefore eliminating the need to increase the standard insulation level required on conventional system upgrade.



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