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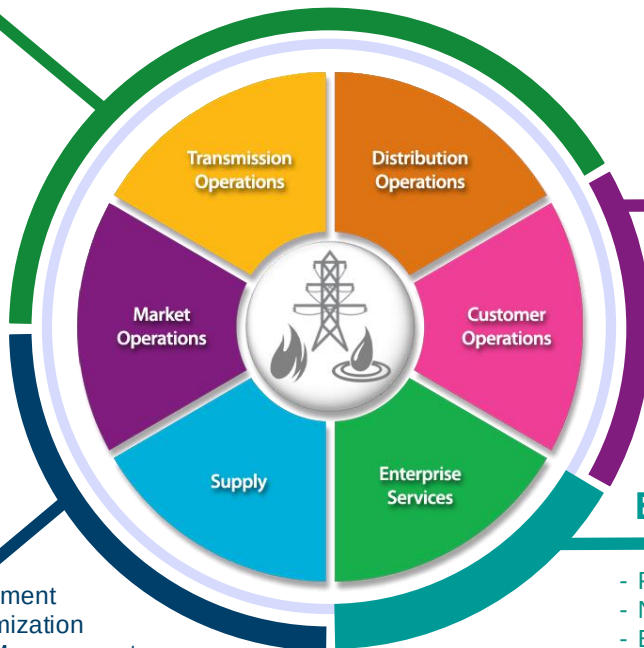
IBM's Approach to Energy & Utilities

Transform the Utility Network

- Grid Operations
- Network Communications
- Smart Metering & Beyond
- Work & Asset Management
- Electric Vehicle Enablement Platform

Improve Generation Performance

- Asset Performance Management
- Market Engagement & Optimization
- Plant Lifecycle Information Management



Transform Customer Operations

- Customer Systems
- Customer Experience & Engagement
- Contact Center

Enterprise Solutions

- Planning, Analysis & Forecasting
- Narrative Reporting & Disclosure
- Exceptional Work Experience
- B2B Integration
- Facilities Management

Changing environment and operational conditions drive shift to analytical approach



Industry trends

- OpEx & CapEx reduction pressures
- Need to Increase asset reliability and flexibility
- Aging workforce and 'new' digitally savy workforce
- Changing conditions in field of consumption and generation

61%

of OPEX is spent on preventive and corrective maintenance at a typical utility

50%

of Utility employees will leave in the next decade

20%

extra power can be generated if turbines are operated below or at capacity over its life.

12%

Fleet wide profit improvement by energy market bid optimization

41% (far more in CEE)

of analytics initiatives are still limited to basic analytics with reporting functionality

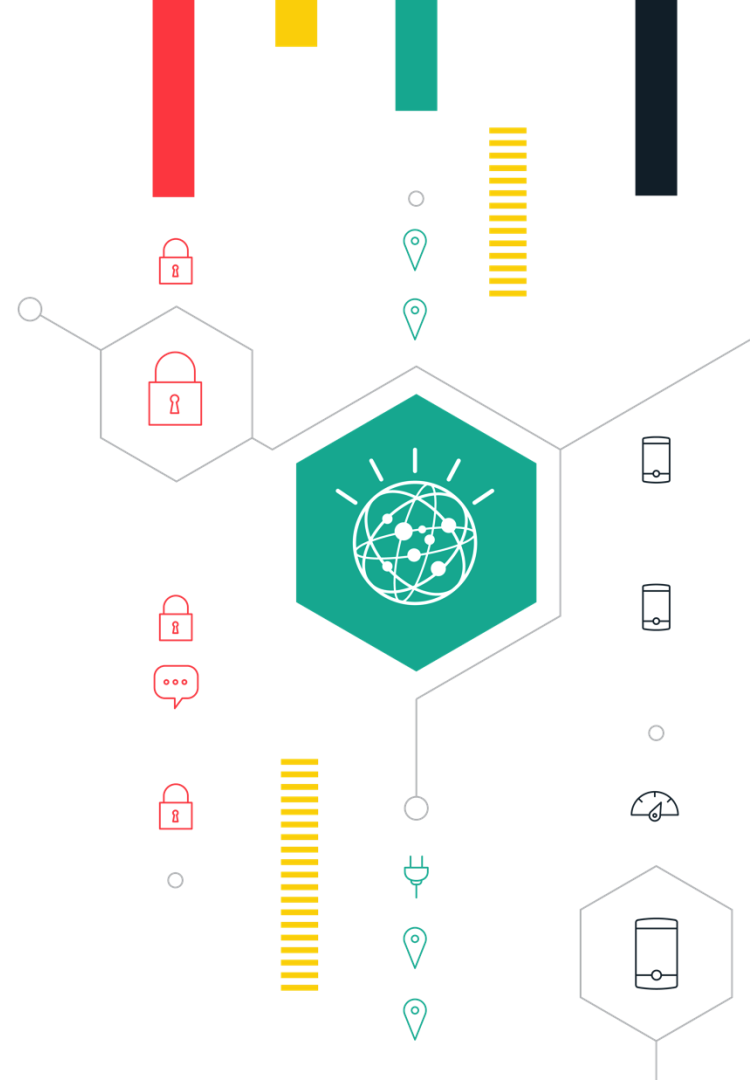


Optimize asset & workforce

- Asset Analytics
- Predictive Maintenance
- Real-time Optimization
- Outage Optimization and penalty reduction
- Workforce Optimization, QA for assistance
- Integrated Planning optimization

IBM **Watson IoT**

Reliability Centered Approach to Asset Management

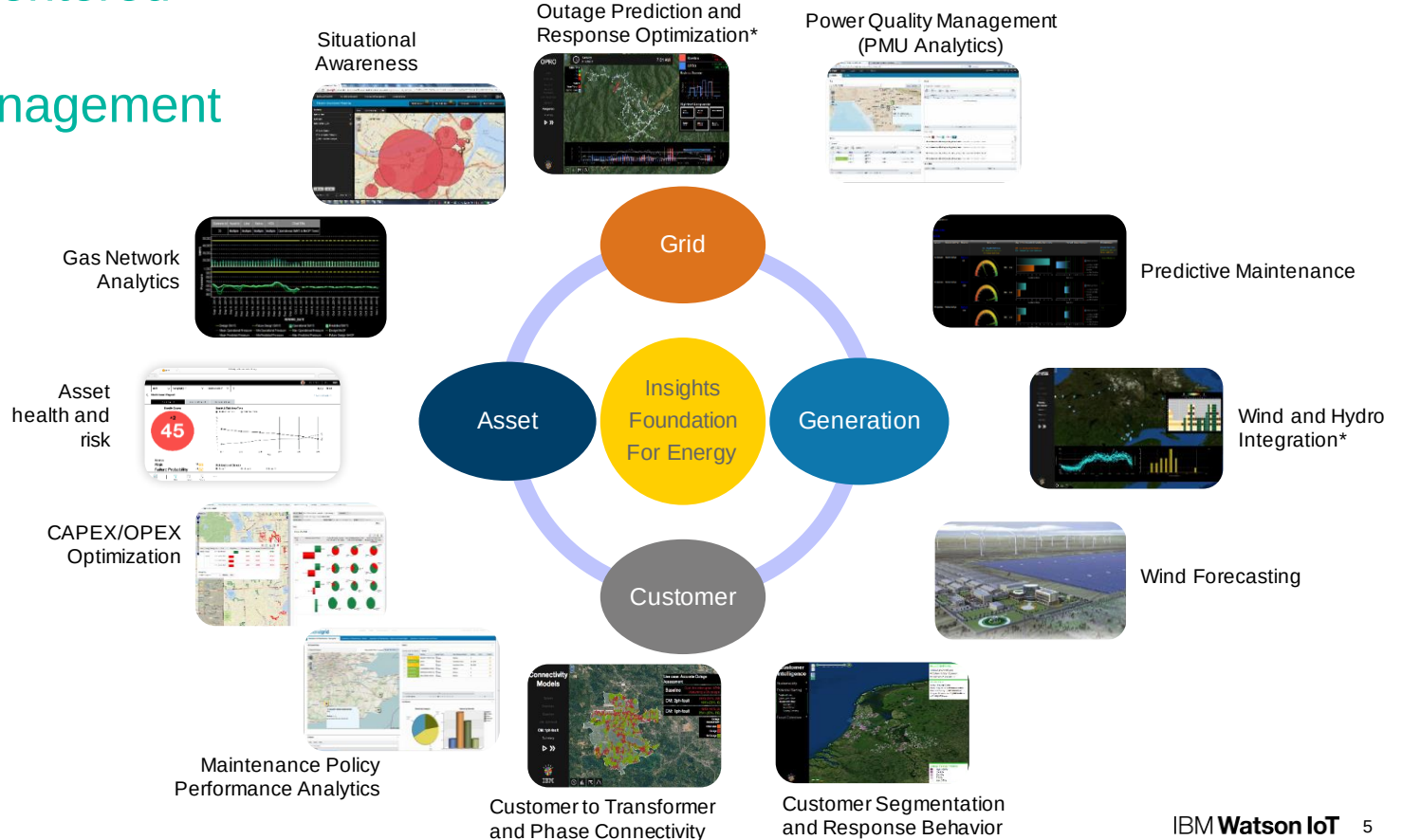


Predictive Asset Management Support in 90s of 20th century and today

- Concentrated on „**Reliability Centered Maintenance**“
- Analysis based on fault frequency and statistical evaluation of time to failure within various segments
- Complexity and robustness reflecting concurrent analytical tools

- Multi-attribute and multi-dimensional analysis of behavior **using both structured and unstructured data**
- Utilization of advanced robust analytical tooling, supercomputing, cognitive computing

Reliability Centered Approach to Asset Management by IBM



National Grid UK uses predictive modeling and big data analytics to implement predictive based Asset Management

23% reduction

in operating expenses with condition-based maintenance

Provides alerts

facilitating proactive rather than reactive responses

Eliminates costs

of implementing or replacing infrastructure by using cloud-based hosting



£2.4bn Capital investment in 2012/13 UK Transmission



27000Km Electricity transmission network in England and Wales

Key drivers for SAM:

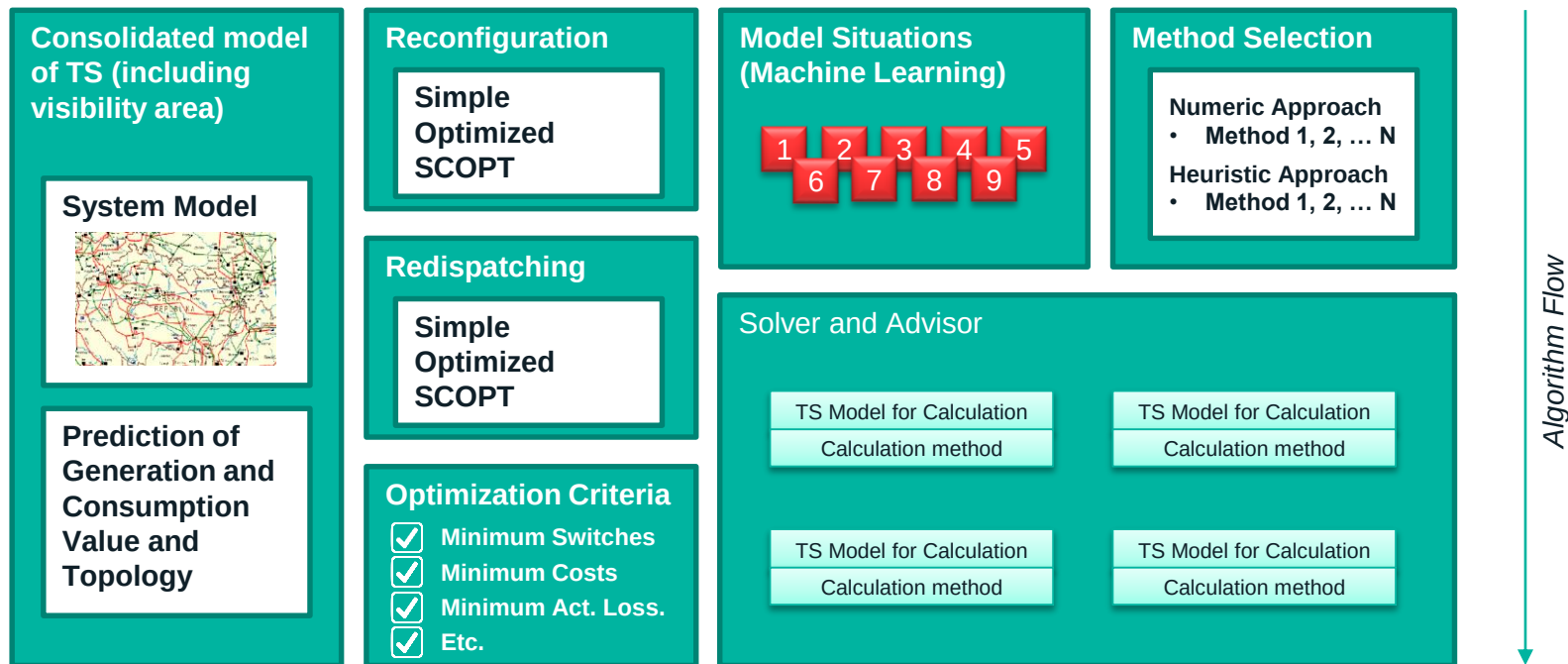
- Regulatory framework implemented by OFGEM, guiding investment in the UK's energy networks
- Network Evolution - movement towards less predictable renewable energy sources
- Aging assets and limited funds for renewal

Major European DSO's Proof of Concept Sample Results

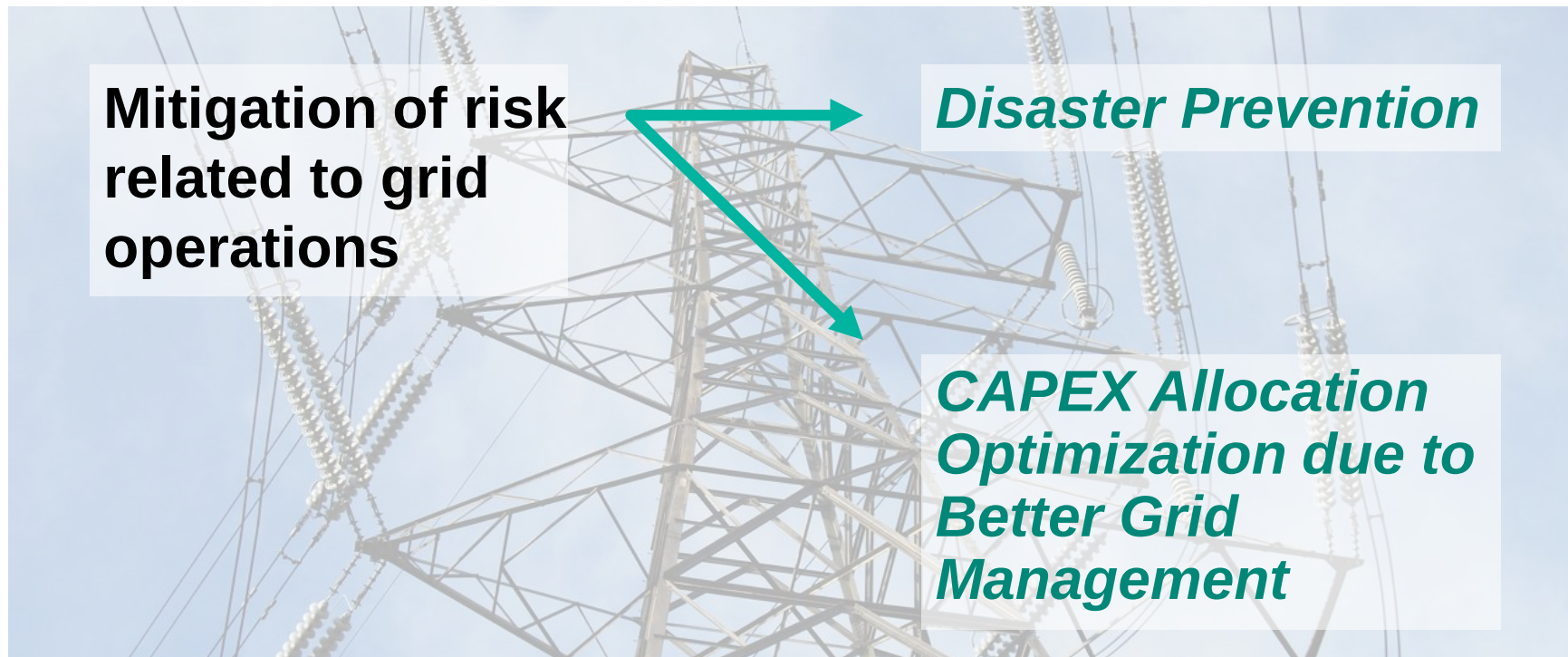
- Predictive Maintenance for Substation Transformers
- **Identified Top 6 failure predictors**
 - Number of Power Overload events from 100-125%
 - Number of Power Overload events from 125-150%
 - Oil Moisture over threshold
 - C2H4 Ethene
 - Number of Severe log alerts
 - Number of Tap Changer actions (from logs)
- 3 PoC Risk Cluster for 4422 Transformers resulting in changes to the maintenance policy
 - **Red** – double the maintenance frequency
 - **Orange** – keep current maintenance policy
 - **Green** – defer maintenance by 12 months
 - Increase frequency of oil testing on “**Red**” transformers

**Impact on annual Maintenance Budget,
with savings of 900k EUR/year with the
same reliability level**

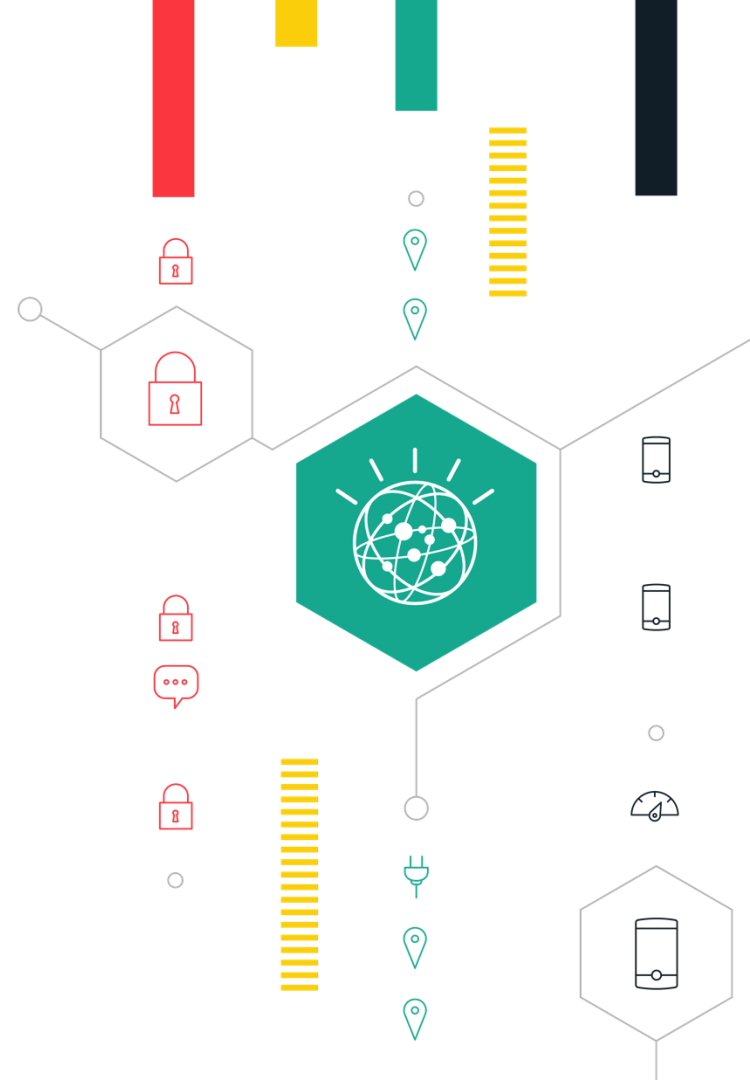
Security Constrained Optimization of the Grid



Business benefits of SCOPT



Dealing with the aging workforce
and 'new' digitally savvy workforce



Watson for Operational Instructions for Dispatchers



WORK ORDER 952332519

Line 400 kV WR641s has been **overloaded by 7.28 %** for consequent 7 minutes

Serial Nr. TS02-13876BX6

 IBM Corp
Gold Customer

 11500 Burnet Rd
Austin, TX 78758

 N-1 condition fulfilled

 2 Purchased in June 2013

 Service History

Symptoms and Issue

Notification gained from TSCS, first notification of unexpected event at 7:29:11 LT



Best Solution

Application of redispatching and reconfiguration as per Operational Instruction TSO17_29_1997

https://14.156.123.10/tsomanres/OI/TSO17_29_1997

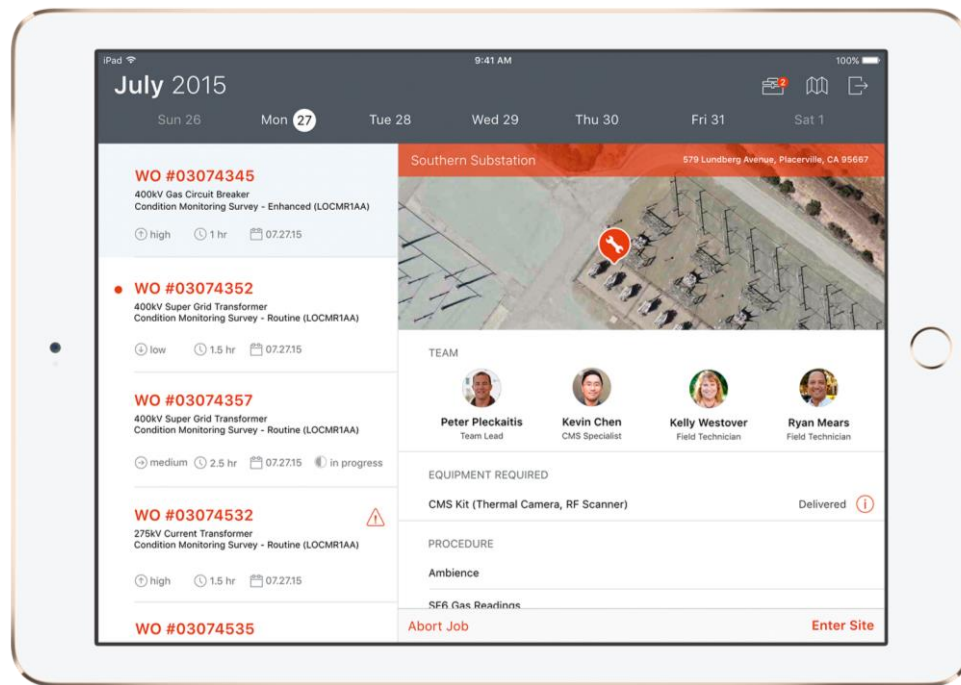
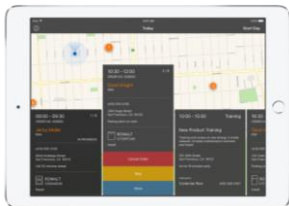
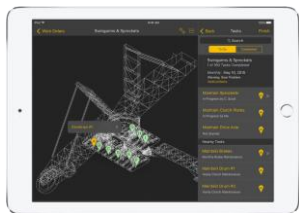
58 additional passages found

Start

 7 min

 90% success

Field Engineer Enablement

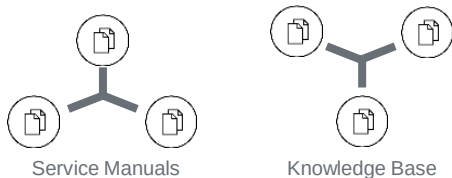


Watson for Equipment Repair and Maintenance

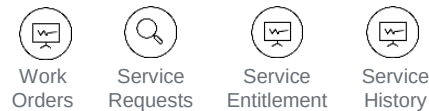
Field Technicians are overwhelmed with information and lack an effective way to diagnose and resolve issues quickly, which impacts operational efficiency and CSAT



Internal Knowledge



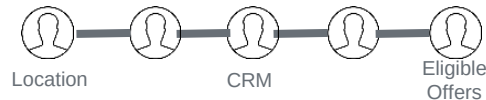
Field Notes



Collaboration Sources



Customer Data



Aggregated Data Views

Cognitive Learning

Point of Impact Insights

Business Benefits

- Field Engineers Enablement
 - Hours of working time saved due to effective gaining of information
 - Inefficiencies avoided due to know-how saved
 - Time of dispatchers saved due to digitization
- Digitization of Operational Instructions
 - Mitigation of risk related to grid operations
 - Inefficiencies avoided due to know-how saved

***Tens of %
Optimization
in OPEX***

***CAPEX Allocation
Optimization due
to Better
Grid Management***

Who we work for in CEE



RWE



EnBW



We offer to our customers Proof of Concept of our technology with business case evaluation based on back-testing on real data.

Thank you for your attention





Further Details...

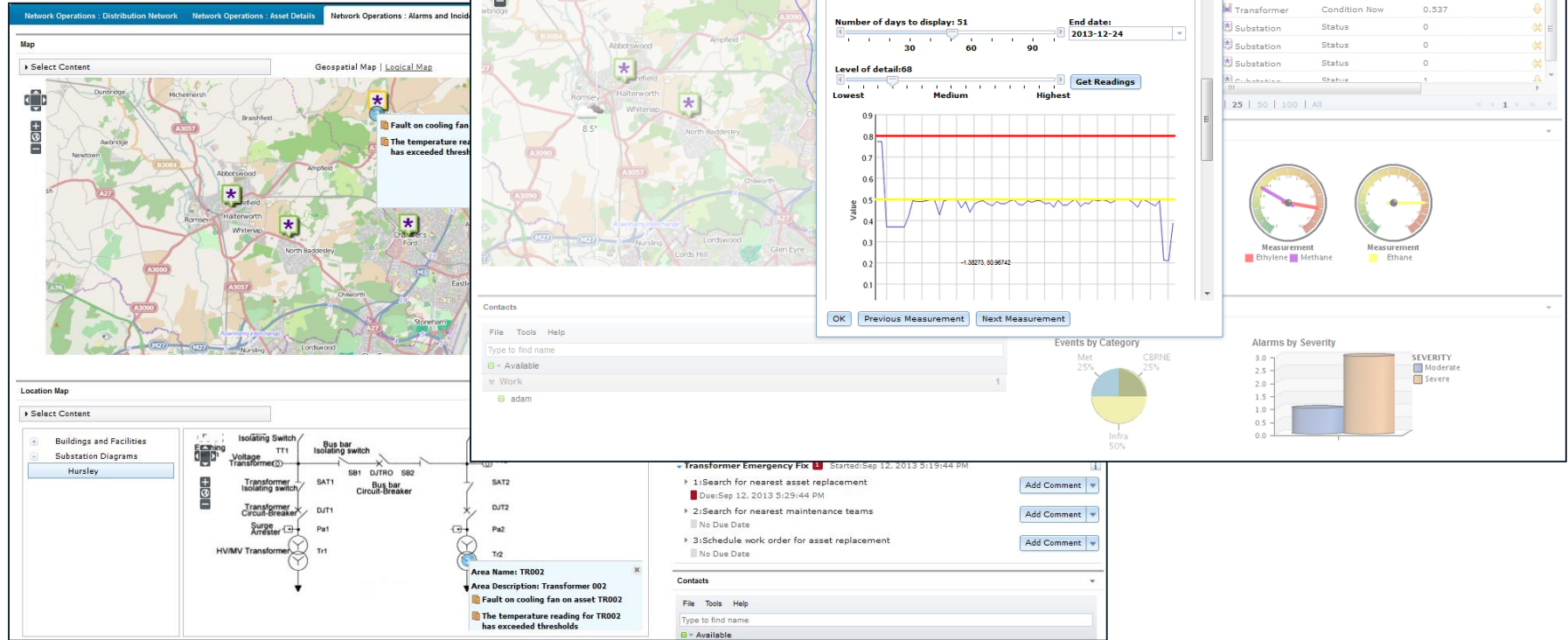
The Asset Analytics Journey

Utilities are developing enterprise wide analytics roadmaps across a variety of business domains

Nearly 200 analytical models created for NG so far



Strategic Asset Management at NG



Substation Transformer Model Base

