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GRID

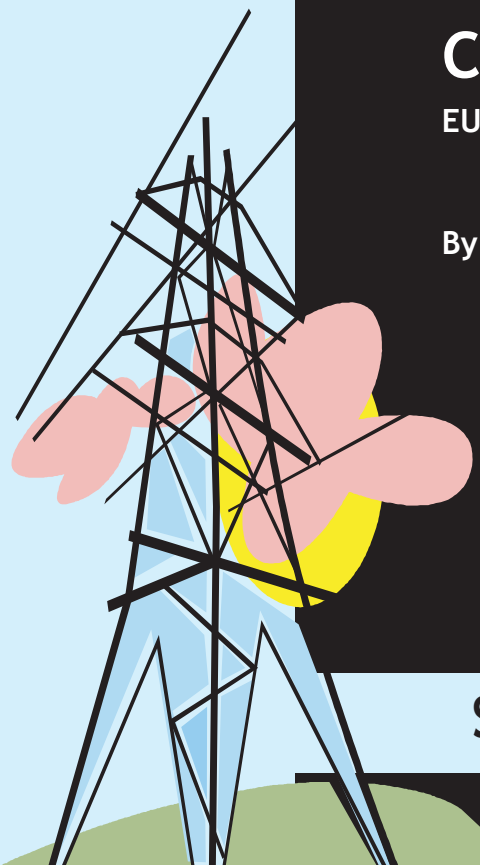
A COORDINATION ACTION ON ICT VULNERABILITIES OF POWER SYSTEMS AND THE RELEVANT DEFENCE METHODOLOGIES

The GRID European Conference on:
Vulnerabilities of power system infrastructures: the role of ICT - towards a research agenda
Stavanger, June 15, 2006

Conference Report

EUR 22538 EN

By Alberto Stefanini



SIXTH FRAMEWORK PROGRAMME - PRIORITY 2

Proposal/Contract no.: 26923 GRID
Date of preparation: July 31, 2006

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EUR 22538 EN

ISSN 1018-5593

Luxembourg: Office for Official Publications of the European Communities

Printed in Italy

Summary

This report summarises the key outcomes from the Conference held in Stavanger on June 15th, 2006 entitled "Vulnerabilities of power system infrastructures: the role of ICT - towards a research agenda" This Conference was organised by the **GRID** Coordination Action of the IST programme to achieve consensus at the European level on the key challenges raised by power systems vulnerabilities and ICT applications, through a debate among policy makers, industrial stakeholders, and research. Such a discussion was meant to be instrumental to highlight research priorities in areas covering ICT security, dependability, interdependencies with critical infrastructures, control of energy security and grid stability, so as to contribute to the preparation of the next EU framework programme on R&D (FP7).

The Terms of Reference for the Conference, a copy of this report and all other relevant documents can be found on the GRID web site (http://grid.jrc.it/) The agenda of the workshop and a list of participants can be found in annex of this report.

Introduction

Power infrastructure vulnerabilities appear to be growing due to the liberalisation of national markets, the growing demand, and the escalating transactions and flows among national, regional and local systems. This results in an infrastructure that is more complex and difficult to manage. Major recent blackouts over Europe and North America, which presented similar root causes, pointed out inadequacies of current power system controls in that context. While innovative information & communication technologies (ICT) offer a chance to better cope with this increased complexity, they may also increase the exposure of the infrastructure to accidental failures and malicious threats. A key concern is the interdependency between the power and the information infrastructures.

This Conference was organised by the **GRID Coordination Action** of the IST programme to achieve consensus at the European level on the key scientific and technical issues and challenges raised by power systems vulnerabilities and ICT applications. This was pursued with a debate among policy makers, industrial stakeholders, and research on the challenges driven by the transformation of the European power infrastructure.

Thanks to this debate, the conference marked a progress towards establishing a research agenda on innovative Information and Communication technologies for enhanced control and protection, so as to provide a useful input to the forthcoming 7th Framework Programme.

As confirmed by a previous **workshop** [https://rami.jrc.it/workshop_05] organised in Brussels on February 2005, the most urgent issues to discuss were related to *risk assessment methodologies* and *on-line controls including modeling and regulation*

aspects in particular. Those subjects appear to need a fundamental rethinking in order to address increasing vulnerabilities, in a context where the map of jurisdictional responsibilities has changed with liberalisation and unbundling, the regulatory framework is evolving, and innovative ICT technologies are introduced on a continuous basis.

Conference Structure

The Conference was initiated with an **introductory session** where policy makers and industrialists discussed the current landscape of the power infrastructure, including the key drivers for the electric grid enhancement and the interactions with ICT. A keynote speaker from GRID presented the main motivations for the Conference, and a first overview of the main issues involved.

These issues were further discussed in two **technical sessions** attended by experts coming from stakeholders (utilities, operators, regulators, manufacturers) and research institutes. These technical sessions addressed:

- Methods to assess reliability, security and risks affecting the power grid, taking into account vulnerabilities arising from the increased control complexity and exposure to malicious threats;

- The ongoing review of control and protection schemes for the power system in view of growing integration of the EU electricity market, and the challenges posed by the adoption of innovative power system control technologies.

Each session was introduced by a leading keynote speaker followed by a set of technical presentations, and a conclusive panel discussion.

The Conference closed with a **concluding panel session**, where a chairperson from GRID led the discussion among a set of panelists and the floor towards the clarification of the key drivers needs and R&D priorities.

The Conference was attended by 31 attendees, well representative of the involved stakeholders, both in terms of categories (TSOs, authorities, utilities and manufacturers) and geographical coverage. All presentations were both relevant and interesting and gave raise to a lively debate, making the event successfull. The practical organisation of the day was very efficient, and contributed to a fruitful day of discussion.

Introductory session

This session was chaired by Nouredine Hadjsaid, INPG who also introduced the session with a presentation of GRID as a Coordination Action aimed at achieving consensus at the European level on the key issues involved by power systems vulnerabilities, in view

of the challenges driven by the transformation of the European power infrastructure. This will be achieved trough a well structured consultation process, the main outcome of the project being the assessment of the needs from the stakeholders.

The GRID Conference was the launching event of this process.

Angelo Marino, GRID's project officer from DG INFSO, on behalf of Jacques Bus, Unit Head D/4, stressed the importance of the issue from the EU perspective, discussed its relevance to the forthcoming 7th framework programme, gave an anticipation about the expected timing for the definition of the framework, and overviewed also the European Programme on Critical Infrastructures Protection (EPCIP). He commented on the GRID objectives by emphasizing on :.

- Interacting with stakeholders on the methodology and hypotheses;
- Sharing and gathering key R&D needs concerning the ICT systems for the power infrastructure;
- Progressing towards a research agenda on innovative information and communication technologies for enhanced control and protection;
- Contributing in providing a useful input to the forthcoming 7th Framework Programme;

The other presentations of the session were well balanced, including two presentations from TSOs: Trygve Kierulf, Stattnett, and Jose Luis Mata, REE, and two presentations by R&D/innovation leaders in ABB (Christian Rehtanz) and Siemens (Michael Weinhold). These presentations gave a good overview of the state of the art of the issues, pointed out several challenges.

Among the outstanding challenges we mention :

- the increase information saturation in the power systems;
- the difficulty to keep the system under control;
- the vulnerability of components using ICT in power grids.

The needs expressed can be summarized as such :

- the need to develop methods for risk and vulnerability analysis;
- the need for higher flexibility in normal and emergency operations through new technologies and applications;
- the need for integration of dynamic online operation data and market information;
- the need for common ICT standards in power systems and the need to harmonise regulations;
- the need to have an efficient, reliable and secure supply.

Hence R&D issues include :

- autonomous, self-adaptable applications for power system monitoring, control and operation under market conditions, including advanced decision support for the EMS operators;
- new network control architectures based on common ICT standards, able to integrate distributed generation and renewables into a virtual power plant;
- design of advanced middleware for Power Systems and of 'Virtual private networks' for usage of standard communication channels.

In conclusion, future systems will require :

- more and more monitoring;
- more and more virtual power plants for integrating distributed energy resources;
- more intelligent control to handle complex situations much better than today;
- a vision and strategy for europe's electricity networks of the future with the example of Smartgrid.

Risk session

This session, chaired by Nils Flataboe, Sintef, was introduced by a keynote speech prepared by Marcelo Masera and given by Alberto Stefanini, JRC. The other presentations were given by Uffe Strandkjaer, Danish Energy Authority, Terje Aven and Hermann Wiencke, Univ. of Stavanger, and Gerard Doorman, Sintef.

These presentations gave an overview on the practical challenges and the conceptual open points involved by risk assessment in front of the evolution of power system controls, and the relevance of the issue of ICT vulnerability in that context. They outlined the different views on risk related concepts between the power and the ICT sectors, and the spread of divergent methodologies and standards for the assessment of ICT related vulnerabilities. It was pointed out that major challenges are to amalgamate the risk analysis of electrical contingencies with cyber security analysis and to protect the systems in a dynamic way, reacting to the condition of the power system and new information on vulnerabilities, threats, attack modes etc. Analysis has to focus on a broad range of issues from complete control and communication systems to single installations, both at company level and at a national infrastructure level. Actors, criteria for risk and standards differ. While avoidance of blackouts is the major issue at a national level, companies are concerned with financial loss, manipulation of data etc. Therefore the no single risk assessment method is sought for. However, there will be benefits from common concepts and compatible approaches. An overview was given over relevant standards from NERC (North American Reliability Council), NIST (National Institute of Standards and Technology), IEC, IEEE (Institute of Electrical and Electronics Engineers), ISA (Instrumentation, Systems, and Automation Society) and CIGRE.

In summary, the session pointed out how the lack of a broadly accepted conceptual basis for risk assessment hampers the development of consistent methodologies in the sector.

These are substantial for the establishment of best practices, which may pave the way towards provision of appropriate technical and financial services in this area. The GRID approach to requirements elicitation in this area was also outlined.

The presentation of the representative of the Danish Energy Authority has pointed the role of regulations and harmonisation for the risk assessment. This is especially relevant in a situation with many different actors that own and operate physical infrastructure like TSOs, producers, distribution companies, and where the behavior of each of these has an impact on the total system vulnerability. Issues treated in this presentation were risk and emergency planning, vulnerability assessment and identification of critical infrastructure. A model for the analysis of risks and vulnerabilities in a systematic way was presented.

Controls session

This session, chaired by Alberto Stefanini, was introduced by a keynote speech by Laurent Schmitt, AREVA, followed by presentations by Wil Kling, TENNET, Diego Cirio, CESIRICERCA, and Jean-Pierre Rognon, INPG.

These presentations gave a survey on the forecast evolution of the EU grid in view of progressive enhancement and integration of the EU markets with respects to system vulnerabilities. The main challenges TSOs have to face were discussed, e.g.:

- congestion handling;
- stabilisation of large interconnected systems;
- information exchange and communication with various actors.

Among other factors, the 2003 Italian blackout lead to a review of inter-TSO agreements and a subsequent review of supervisory, control and protection systems in the area. This review may however lead to further vulnerabilities, due to the complexity of innovative ICT to be deployed, which requires – among others - an alignment in data exchange format.

In summary, data and information integration in future EMS is about to require a paradigmatic shift in the architecture of these systems, which will have to provide far more enhanced decision support, presentation and interaction capabilities. The GRID approach to requirements elicitation in this area was presented.

Panel session

This session, chaired by Nouredine Hadjsaid, was partitioned into four parallel panel discussions:

- Risk and Vulnerability assessment Methods (chaired by JoseLuis Mata, Red Electrica, Spain)
- Emerging Control Technologies and Architectures (chaired by Christian Rehtanz, ABB, Switzerland)
- Support Modeling and Simulation Methods (chaired by Paul Friessem, FhG, Germany)
- Regulation and the policy risk scenario (chaired by Uffe Strandkjaer, Danish Energy Authority)

The main outcomes of the panel discussions were the following:

Risk Assessment

This panel session discussed first the differences between public perception of risks and technical meaning of risk (also in view of the related social aspects). Then the panel discussed :

- the need to integrate sociological, economic and psychological aspects when trying to elaborate a qualitative and quantitative assessment of the perceived degree of danger;
- the need to take into account not only the final risk, but also all intermediate/partial losses due e.g. to loss of information, impact on operation, etc.
- the lack of information about actual cyber problems utilities had to cope, due to fears on the perceived impact on the public confidence, lack of mutual trust, lack of sharing information etc.
- the substantial need to elaborate a common vocabulary on risk;
- how to estimate technology dependent risk;
- the methods for dealing with ICT system for the power sector;
- the needs for simulation tools combining ICT and power systems;

Emerging Control Technologies

This panel session agreed on the awareness that the events of 2003 have a high degree of likelihood to repeat, and on the common viewpoint that R&D must focus on containment and counter-reaction (because of the lack of efficient all time procedures to counteract instabilities) as well as on monitoring and assessment.

Then the panel further deepened on the likely impact of energy market development and integration, which are believed to require massive adoption of emergent measurement

technologies, and discussed whether these technologies are likely to introduce enhanced cyber problems. However, the security margin is shrinking and the results is an increased vulnerability.

The panel agreed that the enormous amount and flow of data, the need to integrate those and make the situation intelligible to the operator are likely to require a paradigmatic shift in the way the Energy Management Systems architecture is organised. This is deeply contrasting with the current architecture of these control systems, which is basically hierarchical, and will made very difficult to integrate this new vision with existing legacy systems.

Also, the general structure of ICT is getting more complex because of additional requirements from the market.

A way out might be to partition the monitoring and control architecture into local, self-organising areas, which will incorporate architectural principles from telecom systems. Emerging R&D will have to focus on methodologies and algorithms able to cope with those new paradigms.

Modelling and Simulation

- This panel session debated on the best approach to study grid vulnerabilities and their consequences. Which way should we model the interconnected systems and their vulnerabilities? New modeling paradigms should be able to analyse and assess the different states of the system like telecom protocols do. These models must provide a time simulation of the grid behaviour as an ICT support to real-time operation. Requirements include:

    - scalable modelling and simulation tools to study the vulnerability of a power grid and to show up consequences of potential failures;

    - analysis tools for the electronic communication between grid component and SCADA systems similar to the analysis tools for telecommunication protocols;

    - real time simulation tools for the behaviour of a power grid to check consequences of intended operator actions;

    - a common description language for the object models so as to create a common information model;

    - tools to share object descriptions between different players;

    - tools to automatically feed an information model from reality;

    - interfaces between modeling and simulation tools and other applications / humans;

Regulation and the policy risk scenario

This panel tried to figure out the main trends of evolution of the electric system and its vulnerabilities in a 15-20 years perspective. How will it be in that range of time? It will grow more complex, more stressed, any problem will be made heavier.

The role of control rooms and the tasks of the operators will become more and more critical. They will need to be better paid and trained. Tools for real-time decision support will play a major role. The clash between decision supported operation and fully automated response will be enhanced. A key issue will be harmonisation among different systems and the capability to exchange information between different models and systems. Decision support systems will have to build on the experience of past crises, but also be able to handle new situations on their own. In that process:

- "plans are nothing – planning is everything"
- faster than real-time simulation must give operators information on the likely outcome of projected manoeuvres;
- handling the crisis cannot be left only to the power sector;
- control rooms should develop into info centres, possibly open to the public.

Conclusions

- The Conference met its aim of providing a broad assessment of the main current requirements by stakeholders in the sector of power systems controls in view of the emerging vulnerabilities of ICT, enhanced by the increased deployment of innovative ICT systems in this sector. Representatives from policy makers, authorities, transmission systems operators, manufacturers and research institutions took part in the debate.

- In a landscape where the main trends (liberalisation and trade, EU integration, increased use of innovative equipment) will concur to grow the system more complex and stressed, two requirements appear to be outstanding:

    - with reference to *risk assessment*, there is a need for well integrated methodologies, founded on a sound and unambiguous conceptual basis. These are substantial to be able – among others – to value the cost of security, hence for the provision of services of any kind (assessment, protection, insurance, communication etc.) in this area;

    - with reference to power systems *controls*, the debate made clear that the main challenge is to integrate innovative control equipment with the legacy control systems of the sector. This integration will be challenging because innovative controls, based on distributed intelligence, will bring about a paradigmatic shift with respect to the conventional control systems, which have a hierarchical architecture. New control systems will require new approaches as far as data exchange formats, decision support and man-machine interaction are concerned.

The two aspects should be supported by appropriate models integrating ICT and power as well as regulation aspects.

Annex 1 - Final Programme

with presentations outline

- **09.00 – 11.00 Introductory session**

- Chair: Prof. Nouredine Hadjsaid, INPG, France

- Nouredine Hadjsaid, GRID Project Manager, INPG, France: **Overview of the GRID Coordination Action:** *key objectives, milestones, methodology.*

- Dr. Jacques Bus, European Commission, Directorate-General Information Society: **ICT R&D related to CIP: towards EU-FP7.** *Importance of the issue from the EU perspective. Related ongoing activities within the area. Relevance to the 7th framework programme. Expected timing for the definition of the framework.*

- Trygve Kierulf, Statnett, Norway: **Stattnett and ICT security.** *Outline of the current situation within NORDEL. Which work has been done or initiated within NORDEL with respect to ICT vulnerabilities. Impact of ICT vulnerability on regulations or recommendation. Impact on relevant activities and systems at Statnett. Perceived vulnerabilities. Way ahead.*

- Dr. Christian Rehtanz, ABB, Suisse: **Information and Communication Technologies for Flexible Transmission Network Security** *The increase of electrical power and the changing paradigm from providing reserves to market enabling interconnections has led to congestions and, even more seriously, blackouts. The volatility of energy market activities and the higher usage of existing network installations require higher flexibility in network operation. The integration and coordinated control of new technologies like Wide Area Monitoring, Power Electronic Network Controllers, innovative protection systems, and new lines based on HVDC technology, require a new control system architecture based on common ICT standards. Fast and flexible data and information access need to be guaranteed in a non hierarchical way enabling the implementation of new applications for flexible transmission system security.*

- Dr. Michael Weinhold, Siemens Power Transmission & Distribution, Germany: **Drivers for Grid enhancement and their impact on ICT.** *Recent blackouts and emerging new requirements - such as for temporary operation under overload conditions - are posing new challenges for grid automation and monitoring systems. An emerging trend is to operate larger regional areas with less manpower. Temporary operation under overload conditions also means that overload/temperature-protection systems must be integrated into the grid automation system in such a way that the parameters for operation must be adapted dynamically according to the actual situation. This calls for a fully integrated grid automation,*

protection and monitoring system, where data exchange and communication protocols become a key element. Outline of the global market trends and requirements for which manufacturers have to be prepared. Importance to know about the vulnerabilities of power grids based on ICT-systems and their possible solutions.

- Jose` Luis Mata, Red Electrica, Spain: **Challenges in the ICT development for Transmission System Operators.** *Outline of the current situation within UCTE. Which way the issue of ICT vulnerabilities is impacting on the definition of the UCTE regulations or recommendations? Relevant activities and systems at REE. Perceived vulnerabilities. Way ahead.*

- **11.00 – 11.15 Coffee Break**

- **11.15 - 13.00 Risk session**

- Chair: Nils Flataboe, Sintef, Norway

- Marcelo Masera and Alberto Stefanini, Joint Research Centre of the EC: **Risk assessment of ICT dependent power systems: open questions.** *Evolution of the power system. Relevance of the issue of ICT vulnerability. The clash of terminology between the power and ICT sectors. Methodologies and standards for the assessment of ICT related vulnerabilities.*

- Uffe Strandkjaer, Danish Energy Authority: **Risks and emergency planning by the Danish Energy Authority with respect to the power sector**. *Risk assessments are the basis for the emergency planning in the Danish power sector. The presentation outlined how emergency planning is organized and regulated and coordinated with such planning for the entire society.*

- Prof. Terje Aven and Hermann Wienke, Univ. of Stavanger Norway: **A framework for the selection of risk/vulnerability assessment methodologies for ICT dependent infrastructures** *The purpose of risk and vulnerability assessment methodologies is to support effective decision making to reduce vulnerabilities and risks in the society. The perspective taken is that in order to make the right decisions, a set of different methods of varying levels of detail are required. Different types of decision situations call for different types of risk and vulnerability assessments. A holistic framework for risk and vulnerability assessments, covering both accidental events and security problems, must provide guidance on the selection of suitable methodology for various types of decision situations, reflecting different levels of potential consequences and associated uncertainties.*

- Dr. Gerard Doorman, Sintef, Norway: **Risk assessment - the GRID approach to road mapping**

- **13.00 – 14.00 Lunch Break**

- **14.00 - 15.45 Controls Session**

- Chair: Alberto Stefanini, Joint Research Centre of the EC

- Laurent Schmitt, Areva T&D, France: **Strategic IT challenges to improve Transmission Security across European Grids.** *Strategic environmental challenge, unbundling, growing complexity in roles and data flows, integration of distributed energy resources require new approaches to control system design for the EU electricity market. New requirements for data exchange standards and interoperability. Change in the decision support tools landscape and new approaches to EMS design.*

- Prof. Wil Kling, TENNET & TU Delft, the Netherlands: **Overview of supervision, control and protection for the power grid.** *The outstanding challenges a regional transmission system operator must face: congestion handling, stabilisation of large interconnected systems, information exchange and communication with customers. Impact of emerging control technologies and their integration with legacy systems.*

- Diego Cirio, CESI RICERCA, Italy: **Monitoring and Control in the Italian power system following the 2003 black out.** *Causes of the Italian blackout. Review of inter-TSO agreements. Review of supervisory, control and protection systems in Italy. Perceived vulnerabilities of the current situation.*

- Prof. Jean-Pierre Rognon, INPG, France: **Control systems for the power grid: the GRID approach to road mapping**

- **15.45 – 16.00 Coffee Break**

16.00 - 17.30 Conclusive Panel Session (Chair : Prof. Nouredine Hadjsaid). *The objective of this session is to foster active interaction between the audience and the GRID methodology. The approach was to organize the panel in working groups with wrap up discussions.*

organization

venue

The GRID European Conference on Vulnerabilities of power system infrastructures will be held on the 15th of June 2006 within ENERGEX 2006 at the Stavanger Forum. This venue is located 15 minutes from Stavanger airport Sola and five minutes from the city centre. The city can be reached via Stavanger airport Sola, which has direct flights from London, Amsterdam, Frankfurt and Copenhagen as well as Oslo. More information can be found on http://www.energex2006.com

energex

Energex is recognised as the leading international forum for presentations and discussions on energy consumption, production and climate change. Energex 2006 is the 11th Energex conference, and is held in Stavanger, Norway. The theme for the conference is energy systems in transition towards sustainable development. Business, policy, technology and science are all part of the solution for sustainable development, and are equally important elements at Energex 2006.

registration

The GRID European Conference fee is 1000 NOK. The additional fee to attend each day of the ENERGEX Conference is also 1000 NOK. You may register through the ENERGEX web site at http://www.energex2006.com/ (see Registration on the left side menu).

Concept & Organisation

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about GRID

GRID

GRID is a Coordination Action funded by the IST programme within the 6th framework, to achieve consensus on the key issues involved by power system vulnerabilities and the relevant defence methodologies, so as to establish a Roadmap for collaborative research in view of the forthcoming 7th framework programme.

participants

- Institut National Polytechnique de Grenoble, France
- Joint Research Centre, European Commission
- SINTEF Energiforskning, Norway
- CESI RICERCA, Italy
- Fraunhofer Institute for Secure Information Technology, Germany
- Katholieke Universiteit Leuven, Belgium

Partners in GRID are mostly research institutes and organisations from the energy and ICT communities. They will conduct the evaluations, organise and chair the workshops and conferences, extract and disseminate the roadmaps and recommendations.

contact

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The GRID European Conference on

Vulnerabilities of power system infrastructures: the role of ICT

Towards a research agenda

Stavanger (Norway)
15 June 2006

context

Power infrastructure vulnerabilities appear to be growing due to the liberalisation of national markets, the growing demand, and the escalating transactions and flows among national, regional and local systems. This results in an infrastructure that is more complex and difficult to manage. Major recent blackouts over Europe and North America, which presented similar root causes, pointed out inadequacies of current power system controls in that context. While innovative information & communication technologies (ICT) offer a chance to better cope with this increased complexity, they may also increase the exposure of the infrastructure to accidental failures and malicious threats. A key concern is the interdependency between the power and the information infrastructures.

As confirmed by a previous workshop organised in Brussels on February 2005 [see https://rami.jrc.it/workshop_05], the most urgent issues are related to risk assessment methodologies and on-line controls. Both subjects appear to need a fundamental rethinking in order to address increasing vulnerabilities, in a context where the map of jurisdictional responsibilities has changed with liberalisation and unbundling, the regulatory framework is evolving, and innovative ICT technologies are introduced on a continuous basis.

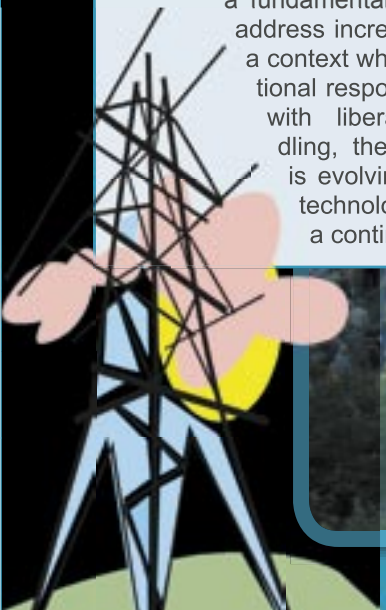

Photo: S. Sigbjørnsen

objectives

This European Conference aims at reaching consensus on the key R&D needs concerning the ICT systems for the power infrastructure, and progress towards a research agenda on innovative information and communication technologies for enhanced control and protection. A main objective of the conference is to provide a useful input to the forthcoming 7th Framework Programme.

Who should participate?

The Conference wants to stimulate a debate among policy makers, industrial stakeholders, and research on the challenges driven by the transformation of the European power infrastructure. Hence it addresses specifically:

- Regulators
- Transmission System Operators
- Manufacturers of Power System Controls
- Utilities (power generation and distribution)
- Academic and Industrial Research in the Power sector

Organisation and Structure

The Conference leaves important space to consultation via panel discussions, organised by working groups.
The Conference will initiate with an introductory session where policy makers and industrialists will discuss the current landscape of the power infrastructure, including the key drivers for the electric grid enhancement and the interactions with ICT.
These issues will be further discussed in two technical sessions attended by experts coming from stakeholders (utilities, operators, regulators, manufacturers) and research institutes. These will address:

- Methods to assess reliability, security and risks affecting the power grid;
- The ongoing review of control and protection schemes for the power system in view of growing integration of the EU electricity market.

The Conference will close with a concluding panel session, where a chairperson from GRID will lead the discussion among the panelists and the floor towards the clarification of the key drivers and R&D priorities.

agenda

09.00 - 11.00
Introductory session

N. Hadjsaid, INPG, France

J. Bus, European Commission, DG INFSO

T. Kierulf, Statnett, Norway

C. Rehtanz, ABB, Suisse

M. Weinhold, Siemens, Germany

J.L. Mata, Red Electrica, Spain

11.00 – 11.15 Coffee Break

11.15 - 13.00
Risk session

M. Masera, Joint Research Centre (keynote speech)

U. Strandkjaer, Danish Energy Authority

T. Aven and H.S. Wiencke, University of Stavanger, Norway

G. Doorman, Sintef, Norway

13.00 – 14.00 Lunch Break

14.00 - 15.45
Controls Session

L. Schmitt, Areva T&D, France (keynote speech)

W. Kling, TENNET and TU Delft, The Netherlands

D. Cirio, CESI RICERCA, Italy

J.-P. Rognon, INPG, France

15.45 - 16.00 Coffee Break

16.00 - 17.30
Conclusive Panel Session

European Commission

EUR 22538 EN – DG Joint Research Centre
Institute for the Protection and Security of the Citizen

The GRID European Conference on:
Vulnerabilities of power system infrastructures: the role of ICT - towards a research agenda
Stavanger, June 15, 2006
Conference Report

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Luxembourg: Office for Official Publications of the European Communities
2007 – pp. 15 – 21 x 29.7 cm
EUR - Scientific and Technical Research series; ISSN 1018-5593

Abstract
This report summarises the key outcomes from the Conference organised by the GRID Coordination Action of the 6th framework programme to achieve consensus at the European level on the key challenges raised by power systems vulnerabilities and Information and Communication Technology (ICT) applications, through a debate among policy makers, industrial stakeholders, and research. Such a discussion was meant to be instrumental to highlight research priorities in areas covering ICT security, dependability, interdependencies with critical infrastructures, control of energy security and grid stability, so as to contribute to the preparation of the next EU framework programme on R&D (FP7). The Conference was attended by 29 attendees, well representative of the involved stakeholders, both in terms of categories (TSOs, authorities, utilities and manufacturers) and geographical coverage.

Mission of the JRC

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.