Incentivizing the Deployment of Smart Grids

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Highlights

• About future …
• … about smartness …
• … and about economy (of the grids)
• So: what / why / how to incentivize ?
• Prospects
Highlights

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Future of Electric Power Grids (Electric Power Systems)

- 20/20/20 by 2020 (?)
- Competitive market environment
- Sustainable security and quality of supply
- Move from infrastructure to service providing

So it’s about:
- environment
- competition (€ …)
- security & quality
- service
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Traditional & smart:

Phones

Planes

Phonos

...
Traditional & Smart Grids

Today: Highly centralised power and little DG

Emphasis on Energy Value

Tomorrow: Integrated secure network combining central and DG

Emphasis on Information Value

Initial stage

Intermediate stage

Final stage

Power Flow
“SmartGrid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.” ([www.smartgrids.eu](http://www.smartgrids.eu))
... meaning and purpose

Smart Grids is a common term for the way how the electric power grids are to be:

- planned,
- built,
- operated,
- maintained,

to support achieving the 20/20/20 targets, secure & sustainable electric power supply.
SmartGrids Deployment Priorities in the Electric Power Supply Chain (→ SDD)
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SmartGrids = a new Regulatory Dimension (?)
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Challenges & Solutions

• Infrastructure
  – Licensing & permissions (EIA, etc.)
  – Coordination (3rd Package 10-y dev. plan)
  – Cooperation (SAF, generation adequacy)

• Infrastructure and wind
  – HV-DC for "collecting" wind into the grid
  – Offshore grids: development, non-discriminatory access, usage, operation, regulation
Challenges & Solutions (cont’d)

- Wind integration + incentive for balance and for storage *

Challenges & Solutions (cont’d)

- Information & Communication Technology

![Diagram showing communication networks and control centres](www.smartgrids.eu)
Challenges & Solutions (cont’d)

Needs for the Future:
1. Communication moves down to the customers for:
   • Decentralized energy management
   • Smart metering
   • Distribution automation
2. Common data models and services everywhere
   • Plug and play
   • Interoperability
   • Efficient engineering
3. Use of existing T-infrastructure
   • Telecommunication provider
   • Distribution line carrier
   • WEB services

www.smartgrids.eu
Challenges & Solutions (cont’d)

• Network Operation & Usage
  – Short-circuit power / network services
  – Fault location & management
  – Distributed state estimation in sync. areas
  – Dynamic / probabilistic contingency analysis
  – Expert & decision support systems for operational security, control actions, emergency control & restoration

• Advanced Q-V control: HV, MV, LV

• Coordinated load flow mgmt. →→→
Challenges & Solutions (cont’d)

DG & Active Distribution Grids

- Bi-directional protection concepts*
- Losses
- V-Q control at the MV/LV level
- Substation monitoring → → →

DG & Active Distribution Grids

Substation monitoring

- 150 MV/LV substations
- Measurements / phase
  - Voltage
  - Current
  - Active & reactive power
- Fault id. & location
- Protection & switch control
- Information available at the MV and LV side!

New Markets, Users, Services

- Hundreds of customer segments
- Tailored tariffs / flexible contracts
- Customer driven markets / e-Energy
- Active Houses
- Value added services / Multi-metering
Challenges & solutions: summary

2009  2012  2015  2020  >2030  >2050
Short-term  Medium-term  Long-term

I
Coordinated load flow control  Automation
(phase shifters, FACTS (?))

II
Automatic Metering Infrastructure (AMI)  Smart Metering

III
Commercial usage of micro-turbines  New technologies

IV
Ancillary services by DG, distributed CHP community  Distributed „Prosumer“

V
Acquisition and processing of the grid elements/parameter  Sensing - MDM

VI
Displays, access, management  Customer information systems

Networks (I, II, V)
Generation (III, IV)
Storage (I, III)
Consumers (II, V, VI)

Control, regulation  MV automation  LV automation

Source: W. Friedl, PhD Thesis
Roles & Responsibilities

• TSOs & DSOs
• Research & Development institutions
• Grid Users & Society
• Industry
• Authorities
  – Advocate the interests and needs of the customers / grid users and society
  – Incentivize and integrate into regulation
  – „Think globally act locally“
    (no single approach fits all of Europe)
Develop „Criteria for Smartness“!

**Global / strategic**
- Effective DG embedding
- Sustainable security and quality
- Effectiveness and efficiency
- Enabling electrical transportation / vehicles
- Smart „last mile“ (metering, billing, switching)
- Intelligent user services (DSR, peak load mgmt, etc.)
- …

**Local / specific**
- Network design & services (short circuit current / impedance, etc.)
- Efficient fault detection and removal
- Preventive control
- Minizing losses
- „Dynamic“ wind integration support
- …
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3. Package & Smart Grids

• Introduction (21a) of the New Electricity Directive:
  “Member States should encourage the modernisation of distribution networks, e.g. through the introduction of smart grids, which should be built in a way that encourages decentralised generation and energy efficiency.”

• § 3 7a of the New Electricity Directive:
  “In order to promote energy efficiency, Member States, or when the Member State has so provided, the regulatory authority shall strongly recommend that electricity undertakings optimise the use of electricity, for example by providing energy management services, developing innovative pricing formulas or introducing intelligent metering systems or smart grids where appropriate.”
Regulators' Activities

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<th>EWG Deliverable</th>
<th>Smart grids:</th>
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<tr>
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<td>- ERGEG Position Paper on Intelligent Electricity Networks</td>
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- Public consultations: Yes
- Public hearings, workshops: -
- Finalisation: Q3 2010

The objective is to prepare a position paper addressing the regulatory aspects of smart grids. This will include issues like a stable and predictable regulatory framework to achieve long-term investments in the grid, to provide incentives for innovation and to achieve a pan-European perspective. It will also address cost, unbundling and grid access issues.

www.ergeg.org → Work Programme 2009
Next steps

• ERGEG Workshop on Smart Grids in Summer 2009
• Regulators’ position on Smart Grids
• Applicability for national implementations of the provisions from the 3. Package
Thank you for your attention!

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