International and Austrian Smart Grid Activities and Projects

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The electrical grid structure will shift towards a Smart Grid

<table>
<thead>
<tr>
<th>19th Century</th>
<th>20th Century</th>
<th>Early 21st Century</th>
<th>End of 21st Century</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrification of society</strong>&lt;br&gt;&quot;Age of Coal&quot;</td>
<td><strong>Extensive generation of electrical energy</strong>&lt;br&gt;&quot;Age of fossil fuels&quot;</td>
<td><strong>Shift towards SMART GRIDS</strong>&lt;br&gt;Challenges require rethinking: 1.) Demographic change 2.) Scarce resources 3.) Climate change</td>
<td><strong>The SMART GRID</strong>&lt;br&gt;Electricity will be the energy source for most applications in daily life. ➔ Integrated energy system with power grid as backbone</td>
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<tr>
<td><strong>Unsustainable energy system</strong></td>
<td><strong>Unsustainable energy system</strong></td>
<td><strong>Sustainable energy system</strong></td>
<td></td>
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<tr>
<td>&quot;Generation and load closely coordinated&quot;&lt;br&gt;Supply island with stochastic load</td>
<td>&quot;Generation follows load&quot;&lt;br&gt;Integrated network, central generation, load stochastically predictable, unidirectional energy flow</td>
<td>&quot;Energy system shifting&quot;&lt;br&gt;Increasingly decentralized, fluctuating generation &quot;consumer&quot; becoming &quot;prosumer&quot;</td>
<td>&quot;Load follows generation&quot;&lt;br&gt;Central + decentralized generation, intelligence with ICT ¹), bi-directional energy flow</td>
</tr>
<tr>
<td>Fossil energy source, hydro</td>
<td>Fossil energy sources, hydro, nuclear</td>
<td>Fossil energy sources, hydro, nuclear, biomass, wind, solar</td>
<td>Renewable energy sources (solar, wind, hydro, biomass), &quot;clean&quot; coal, gas, nuclear</td>
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</tbody>
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1) ICT = Information and Communication Technologies

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Energy Sector
Siemens takes the lead in integrating Smart Grid solutions

Smart Grid

Transmission grid  Distribution grid

Planning and modeling – back office / front office

Smart generation

Reliability and efficiency planning

Managed operational reliability

Resource optimization

Smart Grid solutions

Power electronics

Decision support system integrity protection

Advanced Energy Mgmt. System (EMS)

Asset management

Distribution Management Systems (DMS)

Meter Data Management (MDM)

Common information models and communications protocols

Wind power

Distant solar power

Distributed energy resources

E-cars, batteries

Industrial and commercial loads

Residential loads

E-cars, batteries
Smart Grid around the world: DSO initiative Smart Grid Europe

DSOs Smart Grids Model

- **Level 5: Smart Customers**
  Customers aware and actively participating

- **Level 4: Smart Energy Management**
  Management of end-use energy efficiency, aggregation, retail

- **Level 3: Smart Integration**
  Renewable energy, DG, electric vehicles, electricity storage and aggregation

- **Level 2: Smart Distribution network and processes**
  More automated MV distribution networks with self-healing capabilities. Monitored and controlled LV networks. ICT supported processes

- **Level 1: Smart Pan-European Transmission network**

- **Level 0: New generation technologies**

Distribution Network

Transmission Network

Electricity generation

Customers
List of local implementation projects

1. Smart urban network
2. Smart rural network
3. Smart solar district
4. Web based information portal
5. Smart Grids for rural areas
6. Smart substation monitoring
7. Utilization of HVDC light 4 high penetration of RES
8. LV network monitoring and control
9. Grid integration of RES
10. E-mobility concept validation
11. AMI uses and Smart Homes
12. Active Informed Customers
13. Renewables & storage
14. Meshed Infrastructure Network
15. PHEV recharging infrastructure
16. IP Communication Infrastructure
17. Urban area Smart Grids with DSM + PHEV
18. Large scale integration of PV
19. Design of a self healing MV grid

- 1,5 Mln customers involved
- 50,000 km of power lines
- 20,000 substations
Masdar project is a comprehensive Smart Grid reference opportunity

Masdar Smart Grid / Smart Building project

**Masdar Project**

**Background:**
- Vision: "To become global 'no. 1' in clean technologies by leading Smart Grid / Smart Buildings vision, research, development, and implementation"
- Masdar plans to become first carbon neutral city

**Scope:**
- DMS, EMS, Energy Automation
- MV Power Network
- Building Management
- Smart Meters
- Water Management
- IT
- Solar Power Generation

**Next steps:**
- Oct, 2009: Detail preparation
- Jan 2010: Implementation
Singapore could be the Smart Grid lighthouse project for Asia

**Background:**
- Client is Energy Market Authority

**System:**
- Distribution automation
- Smart metering
- Demand response systems
- IT
- Consulting
- Building Management
- Outage Management
- e-car infrastructure

**Scope:** (not defined yet, estimated)

**Next steps:**
- Nov 19, 2009: Prequalification
  - Tender announcement at Energy Week Singapore
- Dec 19, 2009: Evaluation and clarification of Proposal
  - Hand-in of prequalification document
- Jun 10, 2010: Award of contract
Shaanxi Smart Grid project in China

Shaanxi Smart Grid project

- Client is Shaanxi Local Electric Power Co., Ltd. (regional energy company)
- Project is in definition phase, Tender for consulting / planning of project announced

Scope:

- Grid Intelligence
- IT
- Communication
- Demand Response
- Renewable integration
- e-car infrastructure
- Business processes

Next steps:

- Proposal prep.
- Consulting / Project Plan
- Shaanxi Project implementation

Shaanxi Project implementation
Smart Grids
Model Region Salzburg

- **Combination** of the questions out of the sub projects **in a Model Region**
  - Using Synergies
  - Dependencies and Interactions
  - Integration horizontal and vertikal Approaches
  - Consequent Integration of Customer Needs

- **Realisation** of the integrated overall system **in Real Networks** with actual problems and Customer Needs

- **Realisation of Lighthouse Projects**, where they get visible as overall project
S&R Smart Grid environment
Currently activities driven by US, IEC picking up speed

**U.S.**
- EISA Mandate 2007
- Smart Grid Interim Roadmap
- Project Lead: EPRI
- IEEE P2030 (Guide for Smart Grid)
- IEEE-SA-SCC21
  - NEMA SG Advisory Panel
  - ANSI VTAG
  - etc.

**World**
- SMB Standardization Management Board
- SG 3 Smart Grid Strategic Group
- IEC Smart Grid Standardization Roadmap
- TC57 WG 19 (Taskforce Smart Grid)
- TC 8 system aspects
- TC 57 energy automation
- TC 64 LV installations
- TC 65 industry automation
- TC 82 solar
- TC 88 wind
- Etc.
- TC 205 building automation
- Etc.

**China**
- Currently no activities known
- Probably CEPRI activities ongoing
- SAC *
- CEEIA TC 82 (mirror to IEC TC 57)
- SAC TC 426 (mirror to ISO TC 205 WG 3)

* Activities not yet started
  lot of influence through NEMA (US)
Turning the entire energy conversion chain into a smart infrastructure

- Decentralized energy management system
- Communications solutions
- Smart substation automation
- Condition monitoring/asset management
- Power transmission
- Distribution automation
- Smart metering
- Building automation
Thank you for your attention!