The role of research in Smart Grids

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Inhalt

- A vision is needed
- EU offers a vision
- R&D means
- International smart grids activities
- The Austrian approach

A reality…

- Infrastructure lifetimes of 30, 40 and more years
- The process of renewing the infrastructure therefore point the way for its functionalities and opportunities for many decades

Driving forces…

- Liberalisation
- High Oilprice
- Climatic change discussion
- Renewable Energy Use
- New enabling technologies (Power Electronics, ICT,…)
- …

Topics to be adressed…

- Network Architecture
- System Planning
- Energy Management
- Storage
- Ancillary Services, and many more…

…always having in mind that the high quality of the electricity system has to be guaranteed.

Research…

- ***… is obliged to think not only of tomorrow, but of the day after tomorrow! (2020, 2050, 2100)***
- ***A clear vision and out of that: TARGETS are essential!***

… as well as a clear Strategy, in order for the vision to come true…

- Energy Master Plan
- National „Vision Report of „Electricity System of the Future““

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Scientific Board of German Government

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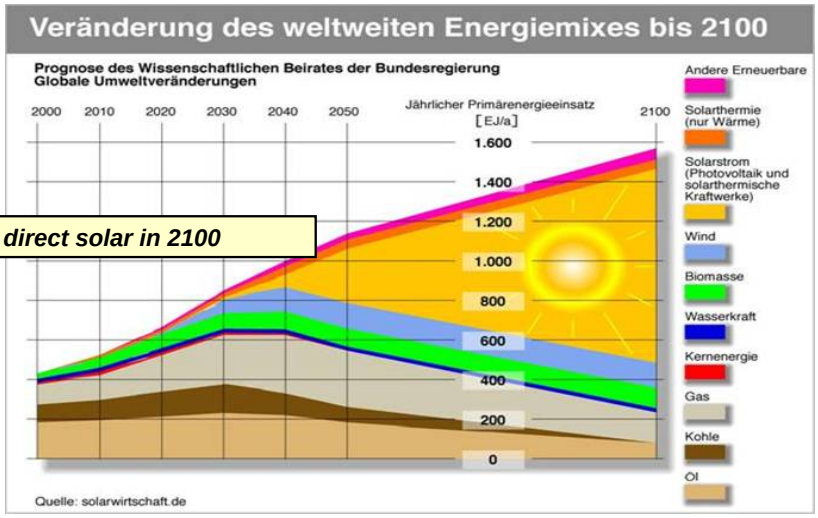
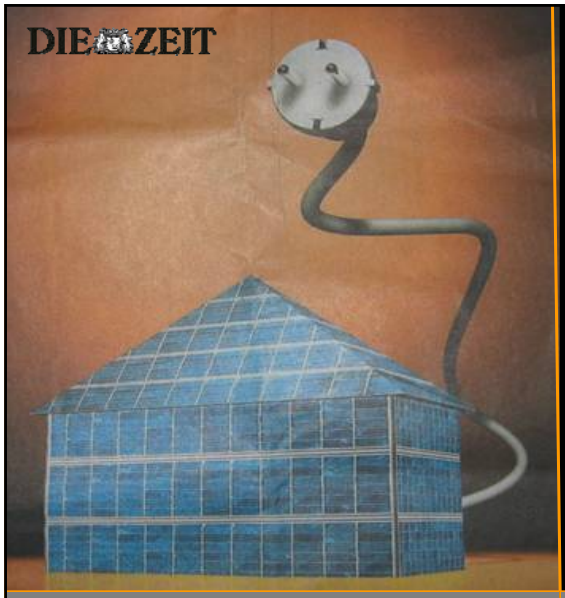


68% direct solar in 2100



Buildings of the future…

No fossil heating without electricity generation

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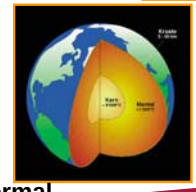
Energiesystems without fuel costs will take over

Hydro

Wind

Solar



Geothermal

Wave-Energy

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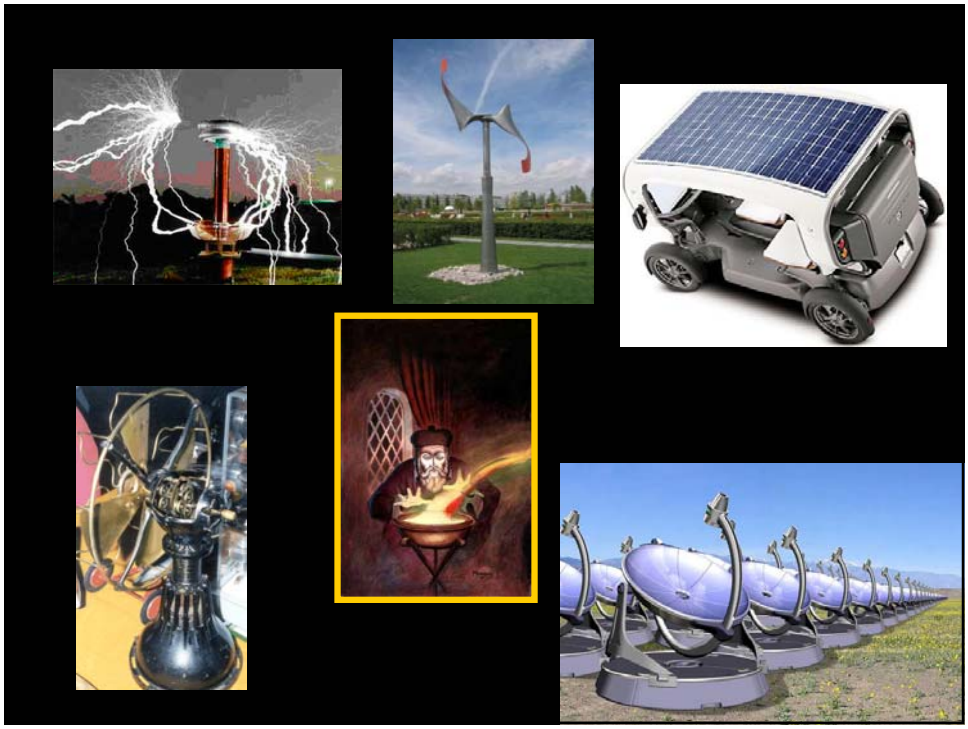

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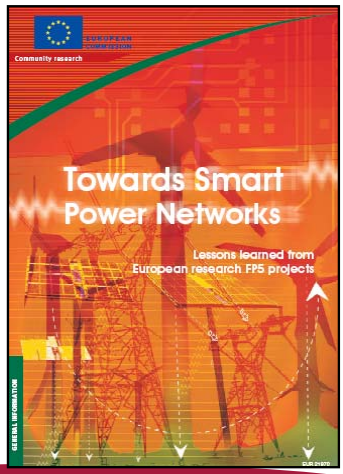
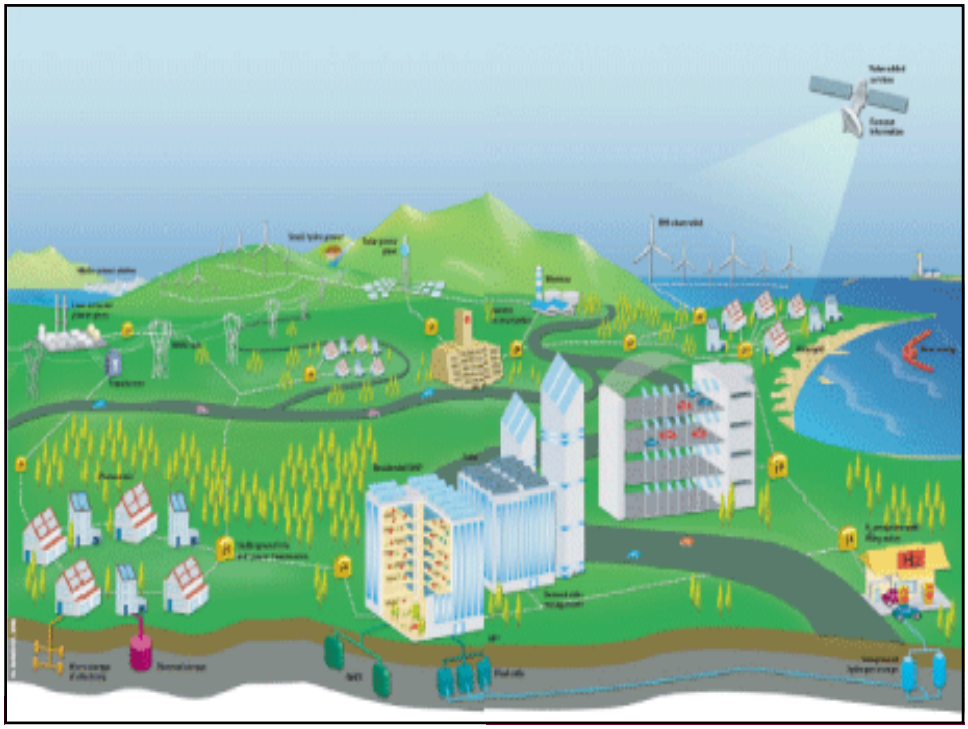
The EU offers a Vision…





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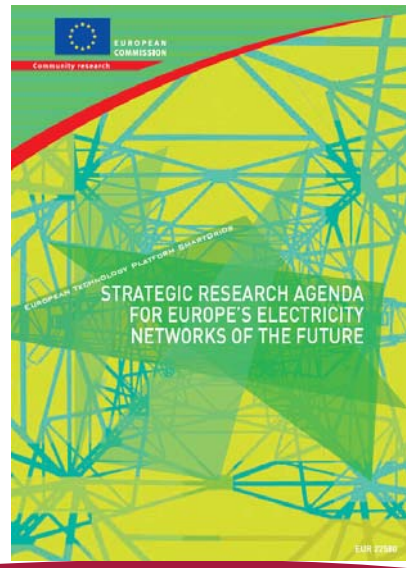
- … and has developed a research agenda



SmartGrids: Research Areas and Research Tasks
Headline Summary

Resesearch Area	Research Task
RA 1 – Smart Distribution Infrastructure (Small Customers and Network Design)	RT 1.1: The distribution networks of the future – new architectures for system design and customer participation RT 1.2: The distribution networks of the future – new concepts to study DG integration in system planning
RA 2 – Smart Operation, Energy Flows and Customer Adaptation (Small Customers and Networks)	RT 2.1: The networks of the future – a system engineering approach to study the operational integration of distributed generation and active customers RT 2.2: Innovative energy management strategies for large distributed generation penetration, storage and demand response RT 2.3: The distribution networks of the future – customer driven markets
RA 3 – SmartGrid Assets and Asset Management (Transmission and Distribution)	RT 3.1: Network asset management – Transmission and Distribution RT 3.2: Transmission networks of the future – new architectures and new tools RT 3.3: Transmission networks of the future – long distance energy supply
RA 4 – European Interoperability of SmartGrids (Transmission and Distribution)	RT 4.1: Ancillary services, sustainable operations and low level dispatching RT 4.2: Advanced forecasting techniques for sustainable operations and power supply RT 4.3: Architectures and tools for operations, restorations and defence plans RT 4.4: Advanced operation of the high voltage system – seamless smart grids RT 4.5: Pre-standardisation research
RA 5 – Smart Grids Cross-Cutting Issues and Catalysts	RT 5.1: Customer Interface Technologies and Standards RT 5.2: The networks of the future –Information and Communication RT 5.3: Multiple Energy Carrier Systems RT 5.4: Storage and its strategic impact on grids RT 5.5: Regulatory incentives and barriers RT 5.6: Underpinning Technologies for Innovation

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Research projects…

- **Catalyst projects *to address barriers*** that had been identified to wide-scale commercial adoption, such as developments needed to regulatory, legal or technical standards frameworks.
- **lighthouse projects** (demo-projects) - facilitating a faster and more widespread adoption of innovation benefits; the perceived risk of adopting new technology will be mitigated and commercial adoption will follow when companies know it works.

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Field test & Laboratory Research:

- Demonstration projects are an important innovation process in power networks because it is only by this means that pioneering solutions are validated in an appropriate environment and become proven for widespread adoption. Testing and investigations, which would have implications for the electricity users has to be performed in a laboratory; only the combination of both can create a purposeful research environment.

e2050 NACHHALTIGwirtschaften

Austria is active: 38 Projects so far…

repotec, VATECH HYDRO, ANDRITZ, Salzburg AG, TU Graz, PROFACTOR, TU WIEN, ENERGIE AG, LINZ AG STROM, oekostrom, SIEMENS, KW Vorarlberger Kraftwerke AG, arsenal research, ifz, VEO, ATB TBB, W.S. WALLNER & SCHAUER, Infineon, Verbund, Fronius, STADTWERKE, hei, eec, Energy Economics Group, reNet AUSTRIA

bmvit Ein Strategieprozess des Bundesministeriums für Verkehr, Innovation und Technologie

Member of …

- Independent European Laboratory „For Distributed Energy Ressources“ – since 2006 – EU Network of Excellence“

Austrian SIMTECH-Labor

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• Experimentelle Umgebung für Forschung/Entwicklung/Prüfung an elektrischen Netzen und netztechnischen Komponenten, sowie an Komponenten der dezentralen Einspeisung.

• Dezentrale Stromerzeuger sollen in einer flexiblen, hardwaremäßig realisierten Netzumgebung aufgebaut werden, die mittels einer simulierten Netzumgebung verschiedenste Zustände der übergeordneten Netzstrukturen nachbilden können („hardware in the loop“).

• Ein ergänzender Rechnerraum soll das Hantieren mit verschiedenster „smart grids“ kompatibler komplexer Netzberechnungssoftware ermöglichen.

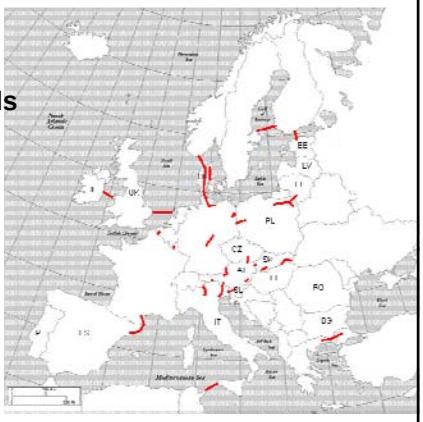
Result of Smart Grids Research

- Development of new methods for
  - Grid-control
  - Energystorage
  - Market mechanism
  - Energymanagement
  - Metering
  - Forecastmodels
  - Asset-Management,…

- Recommendations for new …
  - Regulation, Legislation, Standardisation, Grid Codes,

Further European Initiatives

- **EU- Technologyplatform Smart Grids**
- **ERA-Net Smart Grids**
  (european Programm-coordination)



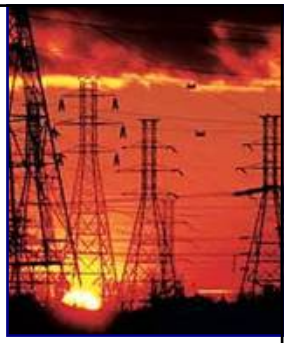
New Austrian Initiative

- **Technologyplattform Smart Grids Austria**
  (Chair: Siemens; advisory board members: e.g. BMWA, BMVIT)

IEA – Int. Energy Agency

ENARD will develop as an authoritative, comprehensive and unbiased international source of information, data and advice, such as to inform Governmental officials, policymakers and key industry stakeholders of the pertinent issues relating to current and anticipated developments in electricity T&D networks.

Int. Energieagentur (IEA): ENARD



First R&D Activity:

DG-System Integration in Distribution Networks

Participating countries:

UK, NOR, DK, SWE, ITA, U.S.A., FIN, FRA, CH, CAN,…

Chair: Austria

Operating Agent: ***DI Helfried Brunner, arsenal research***

New Austrian Smart Grids Technology Platform

- To bring together all relevant stakeholder
- To develop an Austrian SG-Research Strategy
- To use maximum synergies by coordinated research
- To develop a deployment strategy
- To be driving force for changes in legislation, regulation and standards

Conclusion

- The Vision is not yet very clear nor widely known
- Driving force is the European Commission
- Not enough incentives to go towards smart grids
- Catalyst and lighthouse projects, Laboratory research
- A lot of international R&D activities are on the way
- Research can and must contribute, but only in close collaboration with industry and authorities
- The Austrian Technology Platform „Smart Grids“ is founded

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