Anlagen der Zukunft – Gibt es noch Raum für Innovation?

Die Sicht der Forschung

DI Dr. Wolfgang Hribernik
Head of Business Unit Electric Energy Systems
Energy Department
Austrian Institute of Technology

Introduction Wolfgang Hribernik

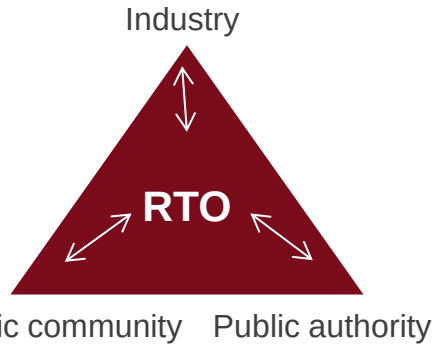
- 2009 – today: Head of Business Unit Electric Energy System, AIT Energy Department (Deputy Head of Department)
- 2005 – 2009: scientific fellow Arsenal Research, development and testing of power system components
- 2002, 2003: research studies at Boneville Power Administration (BPA), Portland, Oregon, model-based determination of switching transients
- 2000 – 2005: PhD student and research assistant Swiss Federal Institute of Technology Zürich (ETH Zürich), High Voltage Laboratory, model-based diagnosis of power transformers
- 1994 – 2000: diploma study “Elektrotechnik” im Studienzweig “Automatisierungs- und Regelungstechnik” TU Wien, Diploma Thesis at ETH Zurich, graduation with Distinction.

AIT Austrian Institute of Technology

The AIT is **Austria's** largest non-university research institute

Funding

Research and Technology Organisation



Ownership structure

50.46% Republic of Austria

49.54% Federation of Austrian Industries

AIT focuses on **Infrastructure-Research**

- Energy
- Mobility
- Safety & Security
- Health & Environment
- Innovation Systems

Employees

1,150

Europe: Development of installed capacity (TYNDP)

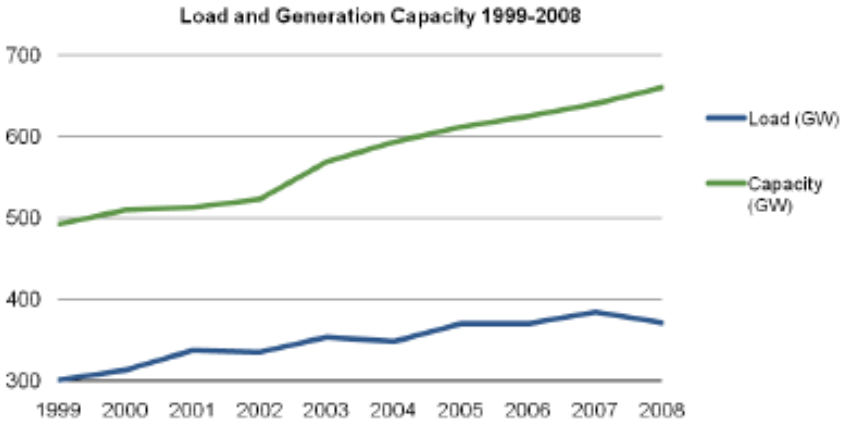
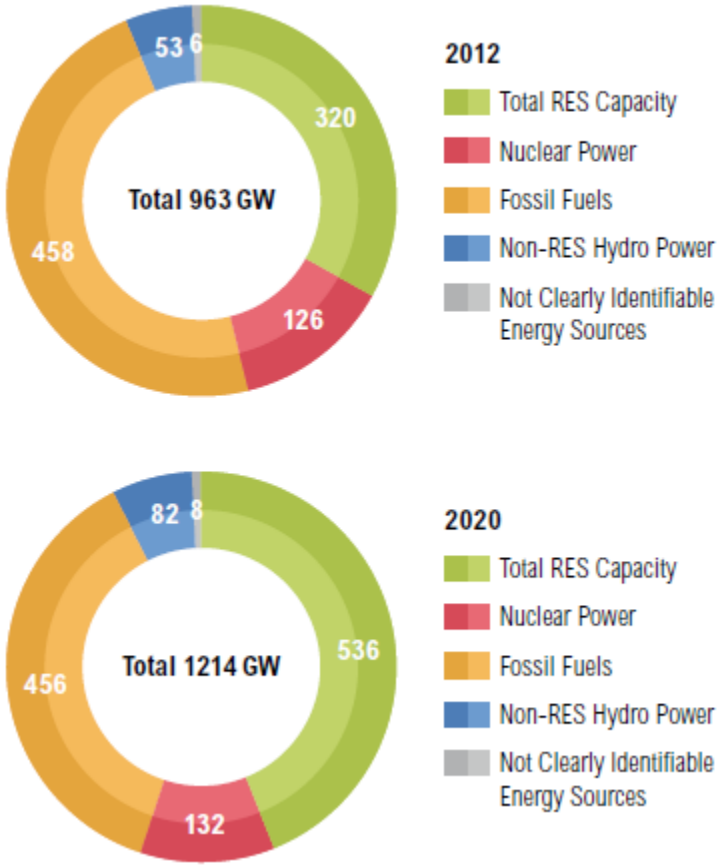
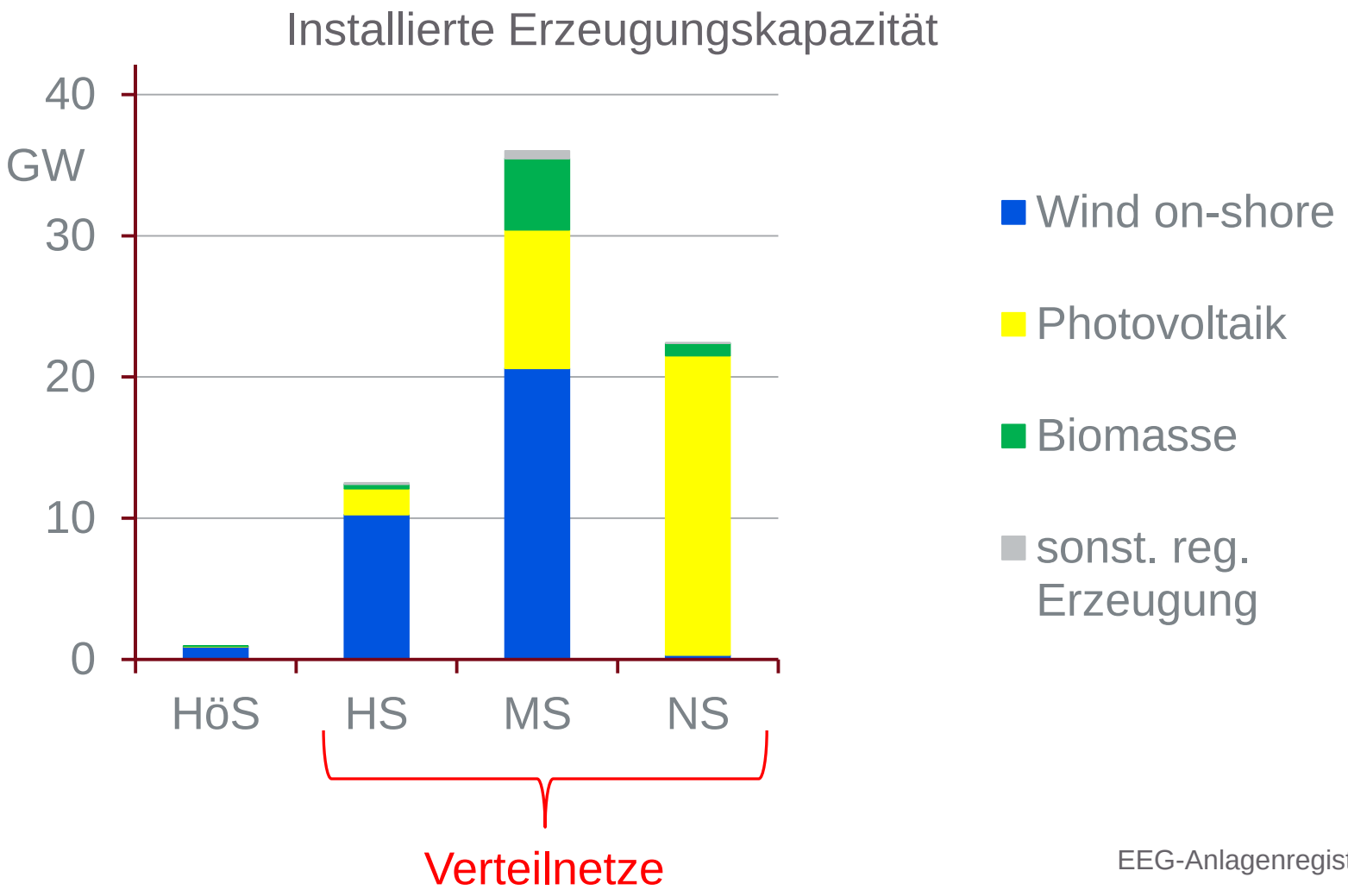


FIG. 12 LOAD AND GENERATION EVOLUTION IN EUROPE (1999-2008)



taken from ENTSO-E ten-year network development plan 2012

DE: Netzanschlussebene der EE-Erzeugung (Stand 2013)



Quelle:
EEG-Anlagenregister Juni 2013

Smart Grids - Topics

Planning and Operation

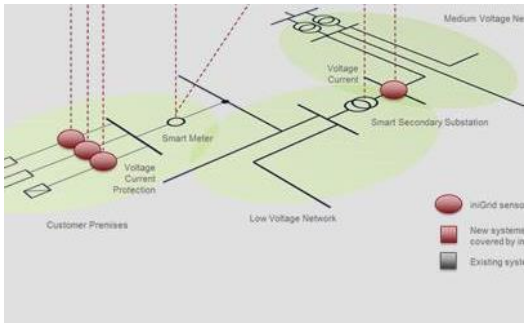
- Integration of Distributed Generation, Flexibility, E-Mobility, etc
- Interaction transmission and distribution system
- Interactions electricity and thermal grids

ICT and Controls

- Robust & scalable control architectures
- Information & communication technologies for monitoring & automation
- Advanced metering infrastructure

Power Electronics & System Components

- Power electronic converters for grid-connected systems
- High current applications & insulation systems
- Grid codes & interconnection requirements



AIT Energy – Laboratories

Smart Grids

- High voltage
- High power
- SmartEST (Smart Grids)
- Power electronics

Power System Analysis

- Cutting-Edge Power System (Co-) Simulation Tools
- Strong background in issues related to Smart Grid Policy & Regulation
- Extensive list of project references both on a National and European Level
- Cooperation reference with main DSOs in Europe

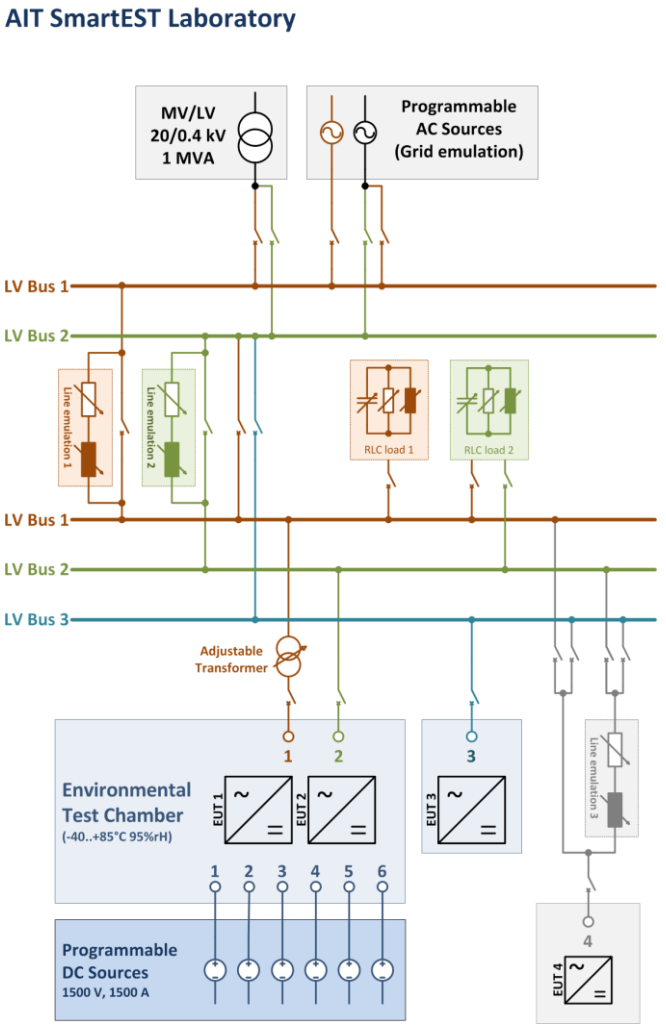
Cutting edge simulation tools & well established references

Smart Grids Forschungsinfrastruktur: smartEST laboratory

The AIT SmartEST Laboratory

Laboratory Hardware Components and Sources:

- 3 independent laboratory grids with variable network impedances for up to 1000 kVA, flexible star point configuration and grounding systems
- 2 independent high bandwidth grid simulators: 0 to 480 V, 3-phase AC, 800 kVA (available from end 2015)
- 3-phase balanced or unbalanced operation
- Facilities for LVRT (low voltage ride-through) and FRT (fault ride-through) tests (available from Q4 2014)
- 5 independent dynamic PV array simulators: 1500 V, 1500 A, 960 kVA



SPONGE - Smart rapid Prototyping Of New applications for Grid Enforcement

Initial situation

Power Systems connected to a Smart Grid need to provide various functionalities depending on the field of use (rural/urban, inverter for PV / storage, FACTS etc.). In order to lower development time and costs new methods for power system development are needed.

Objectives

Provide a rapid prototyping design workflow for Smart Grid Components including high level management functions based on hardware-in-the-loop methods.

Key data

- Start Date: 1.5.2015
- Duration: 30 months

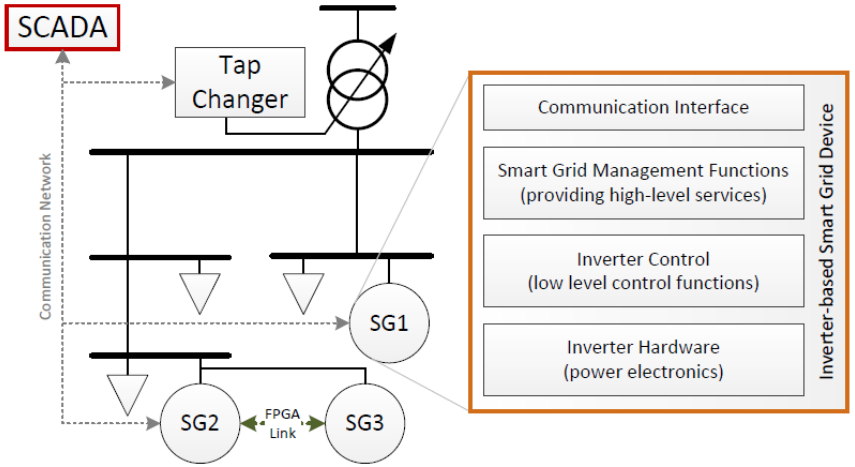
Project partners

Schneider Electric Power Drives

Typhoon-HIL

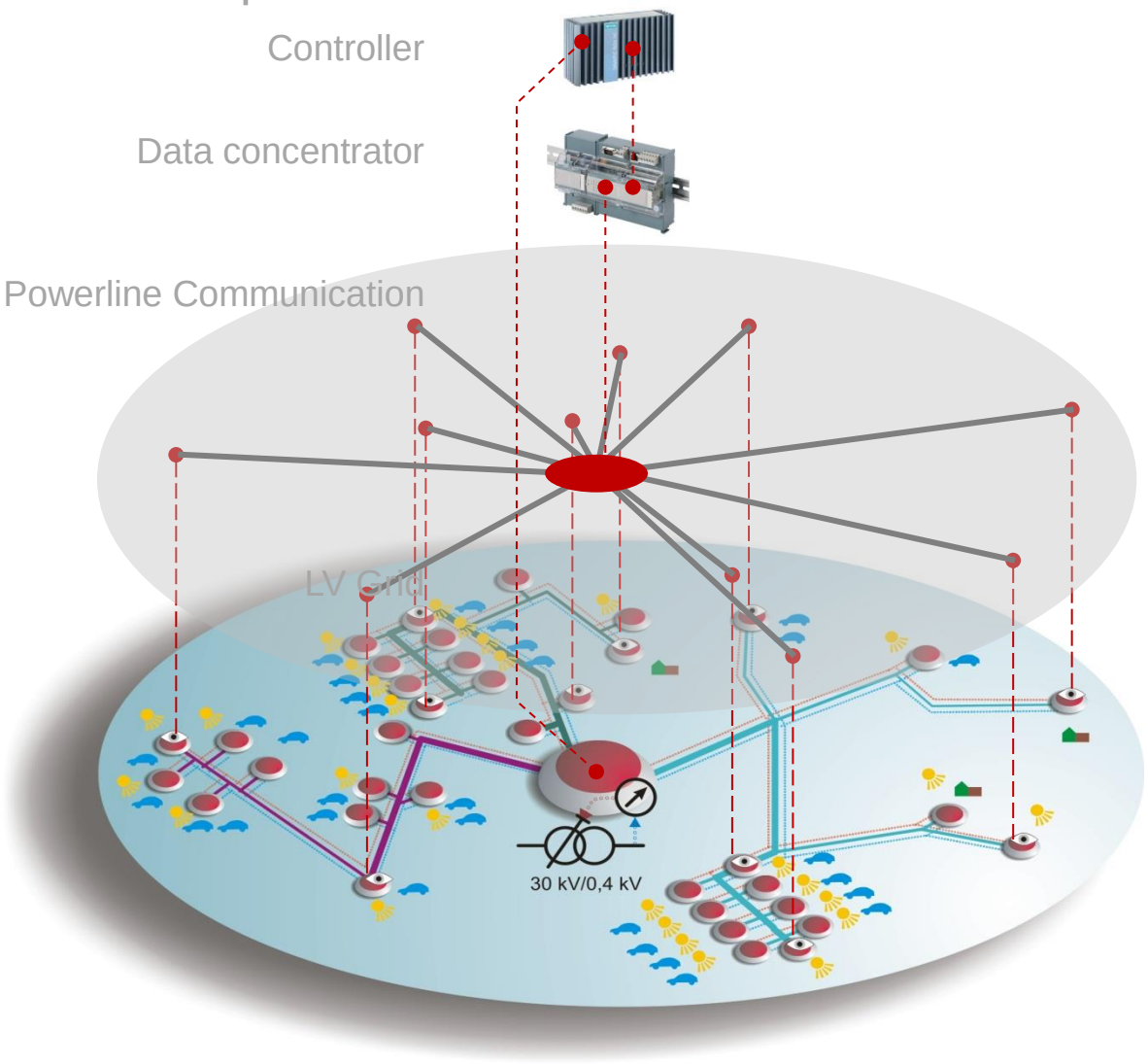
Highlights

- Smart Grid Component Design
  - Rapid Prototyping
  - Integrated Workflow
  - Modular Design
  - Scalable
  - Flexible Functionality

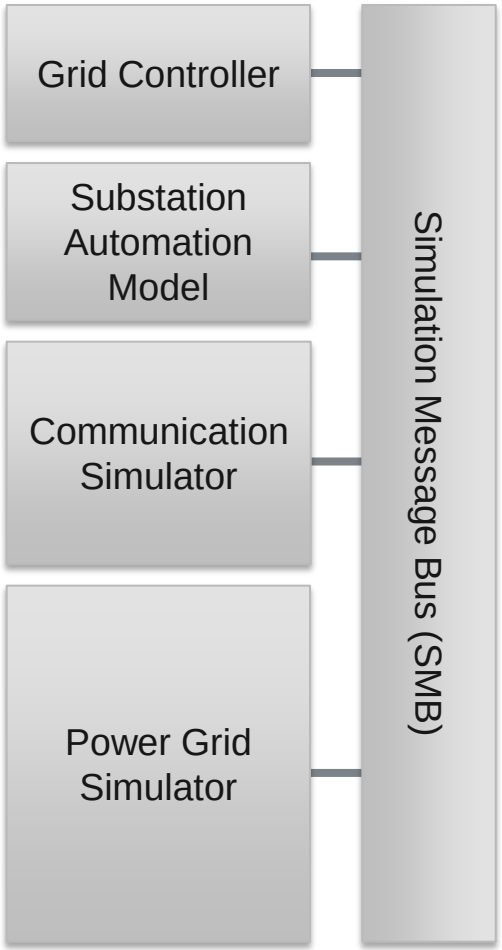


Kosimulationsumgebung

Real Components



Modelling



Framework Conditions for Smart Grids Research in AT

- Active role of Austria in the European Smart Grids research community: e.g. EERA, EEGI, smart grids ERA-Net
- Overall governmental spending in smart grid related research in AT: 35 Mill Eur (2014)

- Strong national program for Smart Grids research based on R&D program of the Austrian Climate & Energy Funds: 84 Mill Eur funding since 2008
- Funding Framework for medium-term research cooperation based on COMET program
- Funding of high-risk product development processes based on the FFG “Basisprogramm”
- Funding based on “Christian-Doppler-Forschungsgesellschaft” at the interface between Science and Industry

- National Strategy Process: SG2.0: Strategic Research Agenda Intelligent Energy Grids – final event: Nov. 6th 2015

Schlussfolgerungen

- Forschungsbedarf aus drei Ebenen:
  - Einzeltechnologien – z.B. SF6 Ersatz, wide-band-gap Halbleiter incl Topologien, Batterien, etc
  - Systemintegration: Planung & Betriebsansätze, Interoperabilität und Systemvalidierung, Marktintegration, etc
  - Entwicklungswerkzeuge: Laborinfrastruktur, (gekoppelte)Simulationsverfahren, rapid prototyping, simulationsbasierte Validierung
- Stabile Rahmenbedingungen für Forschung und Bekenntnis zur grundlagennahen Forschung
- Forschungsstrategie – was wollen wir erreichen? Wer übernimmt welche Aufgaben in der Forschung?
- Forschungsinfrastruktur und Rahmenbedingungen um diese zu betreiben
- Exzellent ausgebildete Forscherinnen und Forscher – Committent zur Qualität und Bedeutung von Schulsystem, Berufsausbildung und universitärer Ausbildung

AUSTRIAN INSTITUTE OF TECHNOLOGY
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Wolfgang Hribernik
wolfgang.hribernik@ait.ac.at