

ISGAN ANNEX 7 SMART GRIDS TRANSITIONS

On Institutional Change

ISGAN Annex 7 & Clean Energy Solution Center Webinar:

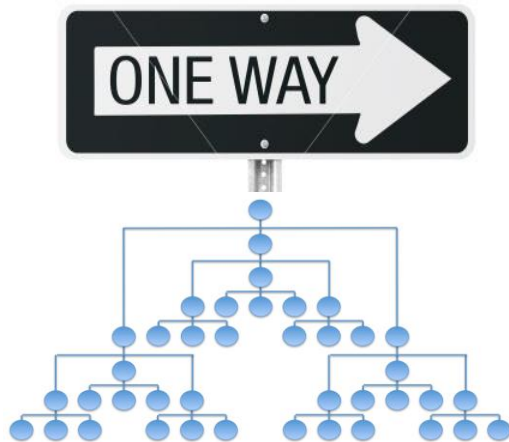
“Research & Innovation Needs for Smart Grid Transition”

29 March 2017

Klaus Kubeczko

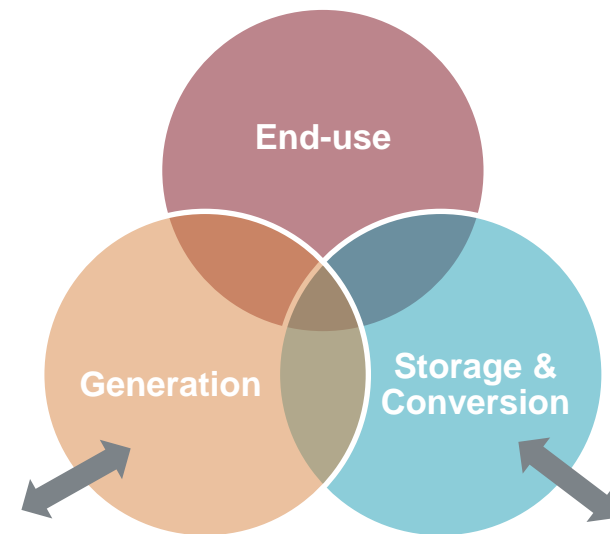
Transition to a decentralized – low-carbon electricity system

Centralized
Hierarchical



Distribution
System

Decentralized
Complex



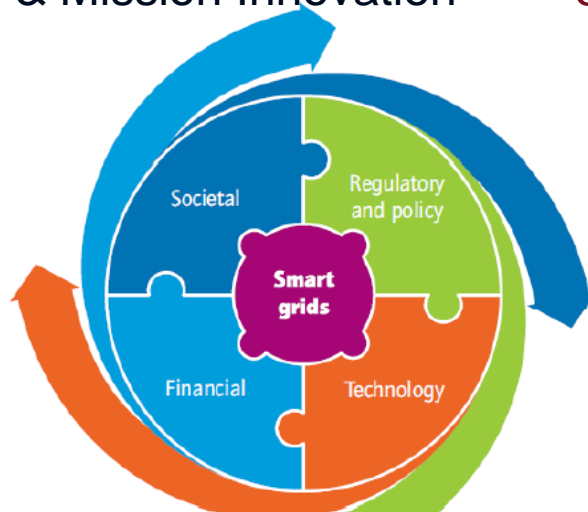
Local System

Aims and scope

- Establish an inter- and trans-disciplinary network of SSH researchers and practitioners
- Support policy development in the field of research, technology and innovation (RTI)
- Bring up-to-date knowledge to the attention of the Clean Energy Ministerial & Mission Innovation

Focus

1. Shaping of local grids taking into account most importantly the socio-economic complexity of energy system and the links between technological and social components
2. Institutional Change and orchestration processes related to Smart Grid Development
3. Strategic long-term thinking in alternative transformative-pathways



Essential SSH Research for Secure, Clean and Efficient Energy

Main authors: Sir Chris Llewellyn Smith and Shearer West (Univ. of Oxford)
League of European Research Universities (2013)

“Meeting the world’s future energy needs in an environmentally responsible but affordable manner is an enormous technical challenge. However, devising the policies, institutions, legislation and economic tools that will enable this to be done in an effective and politically, socially, culturally and ethically acceptable manner is at least as great if not a greater challenge. Research in social sciences and humanities is essential to probe these deeper issues and develop the tools for tackling them.”

Annex 7 - White Paper on Strategic Research Agenda for Smart Grids Transitions

- Aims at promoting socio-economic research on energy systems bringing it to the attention of the
 - Clean Energy Ministerial (Annual CEM Conferences)
 - Mission Innovation (22 countries doubling investment on clean energy R&D within 5 years)

- Steps in formulating this SRA
 - Screening foresights (2013) / survey with national policy makers of ISGAN (2014)/ISGAN Workshop in Shanghai (2014) / Austrian SRA-Process (2013-16) / Annex7 Workshop at Austrian Smart Grid Week (2016) / Screening recent international and national SRAs (e.g. NL) / Webinar /

LinkedIn Discussion Group - Smart Grid Transition
<https://www.linkedin.com/groups/7489503>

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ANNEX 7
SMART GRID TRANSITION – ON INSTITUTIONAL CHANGE



Austrian Strategic Research Agenda (SRA) on Intelligent Energy-Systems.

Participatory Process and New Thematic R&I Focus

ISGAN Annex 7 & Clean Energy Solution Center Webinar
9 March 2017

Overview

- **Goals & Embedding** of SRA-Process
- **Participatory SRA-Process**
 - Foresight Method
 - Stakeholder Involvement
 - Steps towards SRA
- **Content** of the SRA
 - Exploratory Scenarios 2050
 - Vision
 - Research Topics
- **Impact** of the SRA
- **Main Learning Experiences**



Goals of the Intelligent Energy-Systems SRA

- **Energy Policy Goals**

- Security of supply
- Provision of energy infrastructure as public service

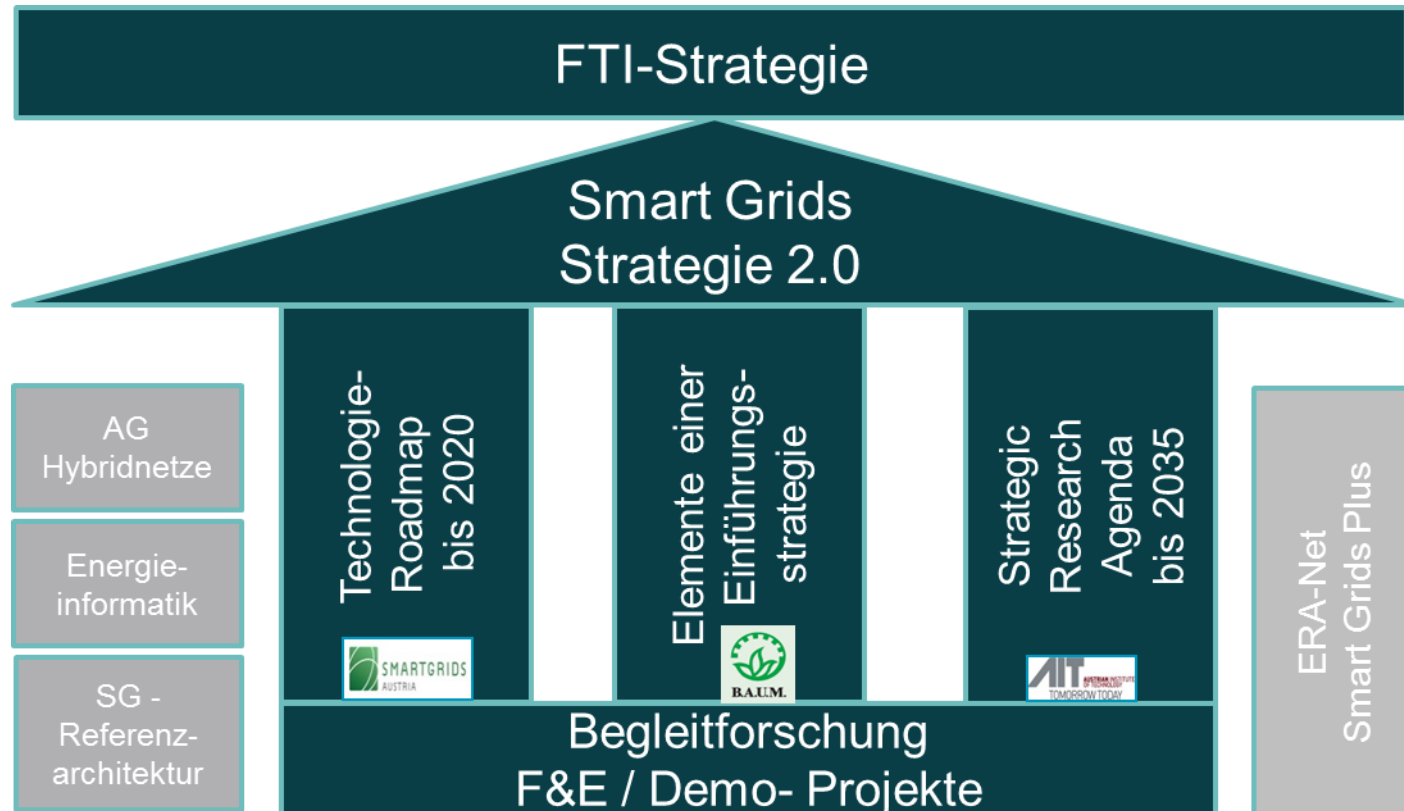
NEW

- Focus on the integration of Renewable Energy Sources (RES)
- Resilience of infrastructure system

- **Energy Research and Innovation Policy**

- Long-term research agenda as part of Smart Grid 2.0 Strategy
- International embedding of research (European Research Area)
- Competitiveness of Austrian industry

SRA as part of Energy RTI-Strategy



Participatory SRA Process - Foresight

- Foresight Method
 - Foresight Scenario building and Visioning
 - Time horizon: 2035 for planning / 2050 to explore scenarios
 - Participation: stakeholder deliberation & networking & coordination

- Involved Stakeholders
 - Research community (research organisations and universities)
 - Innovative industry (Engineering, ICT)
 - Policy makers (funding agencies, city administration)
 - Energy providers (urban/rural, mixed production, renewables)
 - Grid operators (urban/rural, electricity, gas, heat/cold)

Participatory SRA Process – Steps 10/2013 – 4/2016

- **Screening** of energy related foresights and roadmaps (desk research)
 - -> Briefing Paper
- **Stakeholder Workshop 1 – Big Picture** (12/2013, 23 stakeholders)
 - Development of Story-lines for Scenario-building
 - Consolidation of scenarios (desk research)
- **Stakeholder Workshop 2 – Tech-Visioning** (02/2014, 20 stakeholders)
 - Vision 2050 (production / grid / user perspectives)
 - -> Critical success factors
 - Consolidation of research themes, desk research on international embedding
- **Final Stakeholder Consultation Workshop 3** (11/2015, app. 40 stakeholder)
 - Final consultation of scientific community
- **Publication** of Strategic Research Agenda (4/2016)



Download of SRA (in German only):

https://nachhaltigwirtschaften.at/resources/e2050_pdf/reports/1604_strategic_research_agenda_2016.pdf?m=1484317321

Exploratory Scenarios

- Main dimensions:
 - Rural – Urban
 - Centralized - Decentralized
- 1. Sustainability in a decentralized Energy System - Local grids**
 - 2. Sustainability in an internationally integrated Transmission Grid**
 - 3. Laissez-faire – Climate-policy failure**
 - 4. Breakdown - No energy-transition strategy and policy failure**

SRA-Vision for the development of an intelligent energy-system in and from Austria

„The Energy-System 2050 builds on an integrated infrastructure over all domains [renewable electricity, heat/cold, gas] considering social justice in a changing society . Many grid-users take the opportunity to become active energy providers, storage- or flexibility service providers. It is a highly efficient, low-carbon and resilient ICT-supported system . Austria becomes an international frontrunner as incubator of new business models, services and products, after implementation at the national lead-market.“ (own translation)

Research Topics

From disciplinary silos (hypothesis)

- Electricity Grid
- ICT-Infrastructure
- Grids for gas, heating and cooling
- Mobility infrastructure
- Societal aspects
- Urban regions

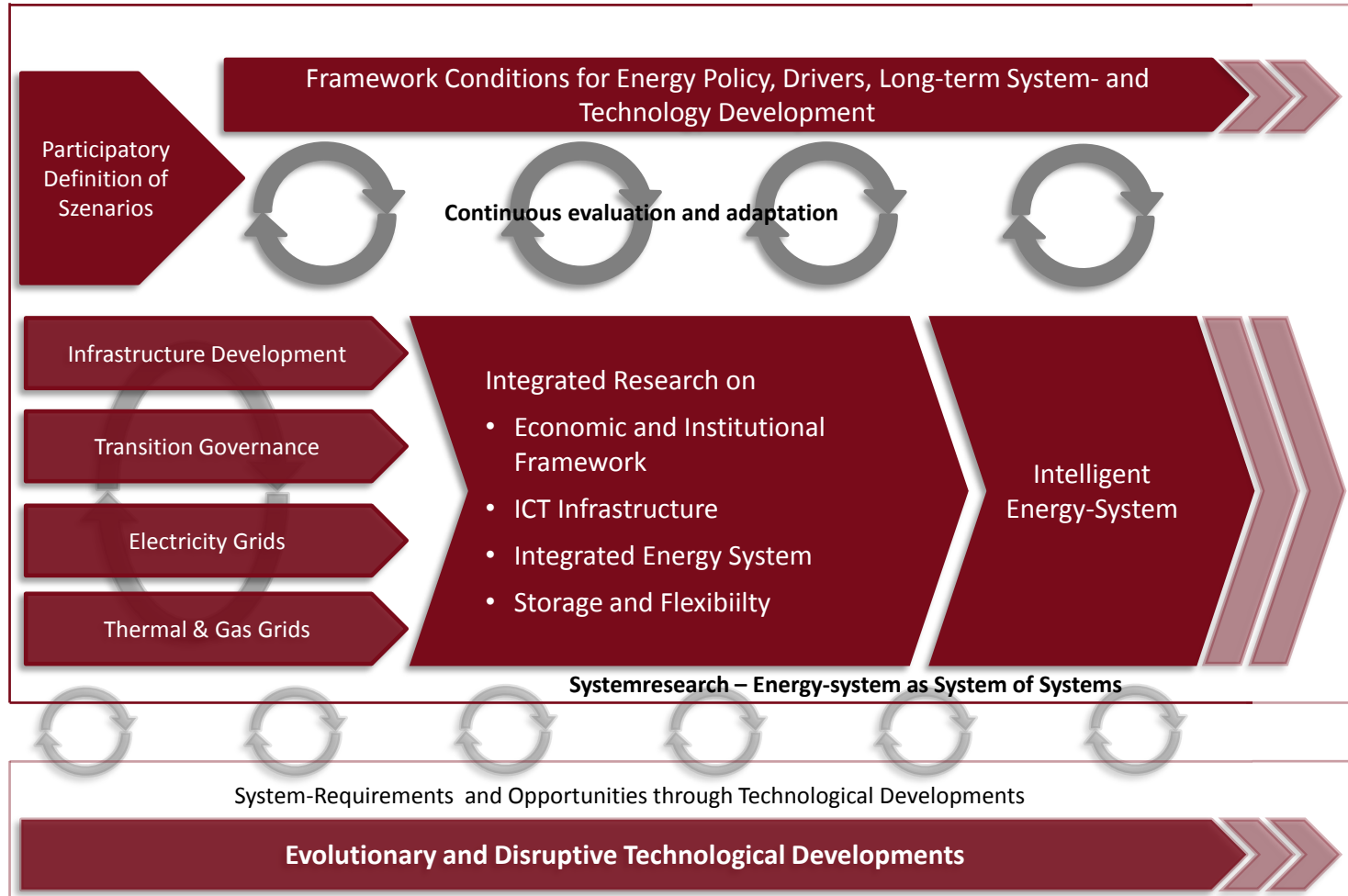
-> to transdisciplinary approach for critical success factors

- **Infrastructure Development**
 - Region specific
 - Integrating infrastructures – power to ...
- **Governance of Energy Transition**
 - Socio-economic and socio-technical aspects of the transition from the old to the future energy system
- **Electricity Grids**
- **District Heating and Cooling Grids & Micro-Grids & Gas-Grid**
- Integrated research areas:
 - **Economic and institutional framework**
 - **ICT-infrastructure**
 - **Storage and Flexibility**

Transition-pathways towards a highly efficient cross-domain Energy-System

2016

2035



Electricity Grid

Research Topics

- Definition and Clarification of the Strategic Framework-Conditions for the Electricity Grid of the Future
- Energy-Efficient Transformation-Chains in Power-Supply
- Development of the Electricity System Towards a Synergetically Optimised Energy System
- Security and Quality of Supply
- Interaction of Power-Grids with Other Infrastructures

District-Heating/Cooling & Micro-Grids & Gas-Grids

Research Topics

- Security and Quality of Supply
- Interaction of Grids with other infrastructures (Electricity, Water)
- Definition and clarification of the strategic framework for the future of Heating&Cooling Grids and the Gas-Grid
- Energy-efficient chains of transformation in the provision of gas, heating and cooling.
- New grid-architectures and control-strategies

Cross-Domain Infrastructure Development

Research Topics

- Further development of particular Hybrid-Grid Technologies
- Estimation of Demand for Hybrid-Grids
- Systemic Integration and Optimization of Hybrid-Grids
- Safe & Secure ICT Infrastructure
- Economic and Organisational Framework
- Identification of Types of Energy-Space
- Space-related Infrastructure-Development & Planning
- Cross-regional/national Infrastructure-Development

Transition Governance I

Research Topics

- **Governance of the Energy-Sector**
 - Changing Actor-networks
 - New business models and market-rules
 - Behaviour and social practice of Users and Consumers
 - Safety / Security for industry and end-users

- **Multi-Level Governance**
 - Complexity of Reconciliation of Interests between levels and between incumbent and new actors
 - Legal-Framework of the Energy Transition
 - New Processes for the integration of societal groups
 - Data-Protection – Privacy

Transition Governance II

Research Topics

- **Developing Transition-Pathways towards intelligent Energy-Grids**
 - Orchestrating collective vision of the future Energy System
 - Generate and provide open access to strategic knowledge
 - Generate and understand societal acceptance of SGT
 - Adaptation of visions as means of orchestration
- **Re-orientation of RTI-Policy towards Energy-Transition**
 - Mission oriented RTI-policy
 - Technology Assessment
 - Horizon Scanning and Foresight
 - Developing new instruments
 - New weight to non-technological Research

Cross-cutting Issues

Research Topics

- **Information and Communication**
 - ICT-safety and security concepts, security by design,
 - Data protection, privacy, consumer-rights
- **Energy Storage & Power-to-X**
 - Integrated analysis and modelling
- **Energy Efficiency**
 - Local use
 - High efficient transmission infrastructures
- **Governance of the Integration of the Energy-Systems**
 - Coordination of the energy sector and beyond
 - New markt-designs und markt-rules
 - Understanding decision making and energy-related social practices

Impact of the SRA

On Strategies of Ministries, Innovation Platforms, Research Alliances

- Part of Smart Grid 2.0 (2013-2016). bmvit, Smart Grid Technology Platform
- Main input to bmvit – Energy R&I Strategy (2016-2017). Bmvit, KliEn
 - Austrian Energy R&I funding-programs / ERA-Net Smart Grid Plus
 - National consultation -> EC: Horizon 2020 – Program calls and FP9
- Input to ETIP-SNET R&I Roadmap Local Workshop (2015-2016)
- Input to SRA process of the Economic, environmental and social impacts – Joint Programm (JP e3s) of the European Energy Research Alliance (EERA)

On other processes and organisations

- Likely input to strategies of research-organizations and other stakeholders
- Components of ISGAN Annex7 – White Paper on Strategic Research Agenda for Smart Grids Transitions

Austrian Energy Research and Innovation Agenda 2017

Influence of SRA on new Research Fields

- **Energy-Systems and –Grids**
 - Buildings and Urban Systems
 - Industrial Energy-Systems
 - Transport- and Mobility-Systems
- **Conversion- and Storage-Technologies**
- **Transition-Processes and Social Innovation**

Main Learning Experiences from SRA-Process

- **From disciplinary research -> inter- and transdisciplinary research**
- **Research needs regarding Governance besides Government**
 - Need for long-term orientation – stakeholder deliberation
 - Changing role of government as DRIVER of transition processes
- **End of Technology Push Policy Making**
- **Focus on user-side of local grids**
 - Consumers' energy management, integration of local RES, providers of storage/conversion
- **Lack of Social Science and Humanities research (economics, social sciences, history, marketing, law, political science...)**
 - Change towards transdisciplinarity – capacity building
 - Lack of funding of basic, applied and transdisciplinary research

Thank You!

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