



IEA ENARD – Annex II: DG System Integration into Distribution Networks

Helfried Brunner
Operating Agent Annex II

IEA ENARD Grid Policy Workshop
“Electricity Grids – a key enabler in the delivery of a sustainable energy policy”, Paris,
Wednesday 28th April 2010

Content

- Context
- Aims & Objectives
- Targets for Future Electricity Systems
- Emerging Conclusions and Recommendations
- Outlook

Context



- Most of the electricity consumption is in the distribution system
- Increasing share of distributed generation due to energy related framework conditions. There is a need to:
 - Reduce CO₂ emissions
 - Increase energy efficiency
 - Increased use of renewable energy sources
- In future also more consumption in distribution systems (e.g. heat pumps)
- Idea is to bring together consumption and generation on distribution level

Content

- Context
- Aims & Objectives
- Targets for Future Electricity Systems
- Emerging Conclusions and Recommendations
- Outlook

Aims and Objectives



- The scope of Annex II is to address DG system integration into low and medium voltage networks including technical, economical, organizational and regulatory aspects. Annex II aims to:
 - Build up and exchange knowledge on DG system integration and existing approaches to active network management;
 - Promote the possibilities for the implementation of active distribution networks; and
 - develop an authoritative set of guidelines to facilitate the transition from today's passive distribution networks to the active distribution that will be increasingly required in the future

Approach



- Step 1: Documentation and analyses of the current status of DG system integration in the participating countries
- Step 2: Target formulation for future grid operation
- Step 3: Technical, Organizational and Economical Barriers for DG System Integration
- Step 4: Recommendations for future DG System Integration

Content

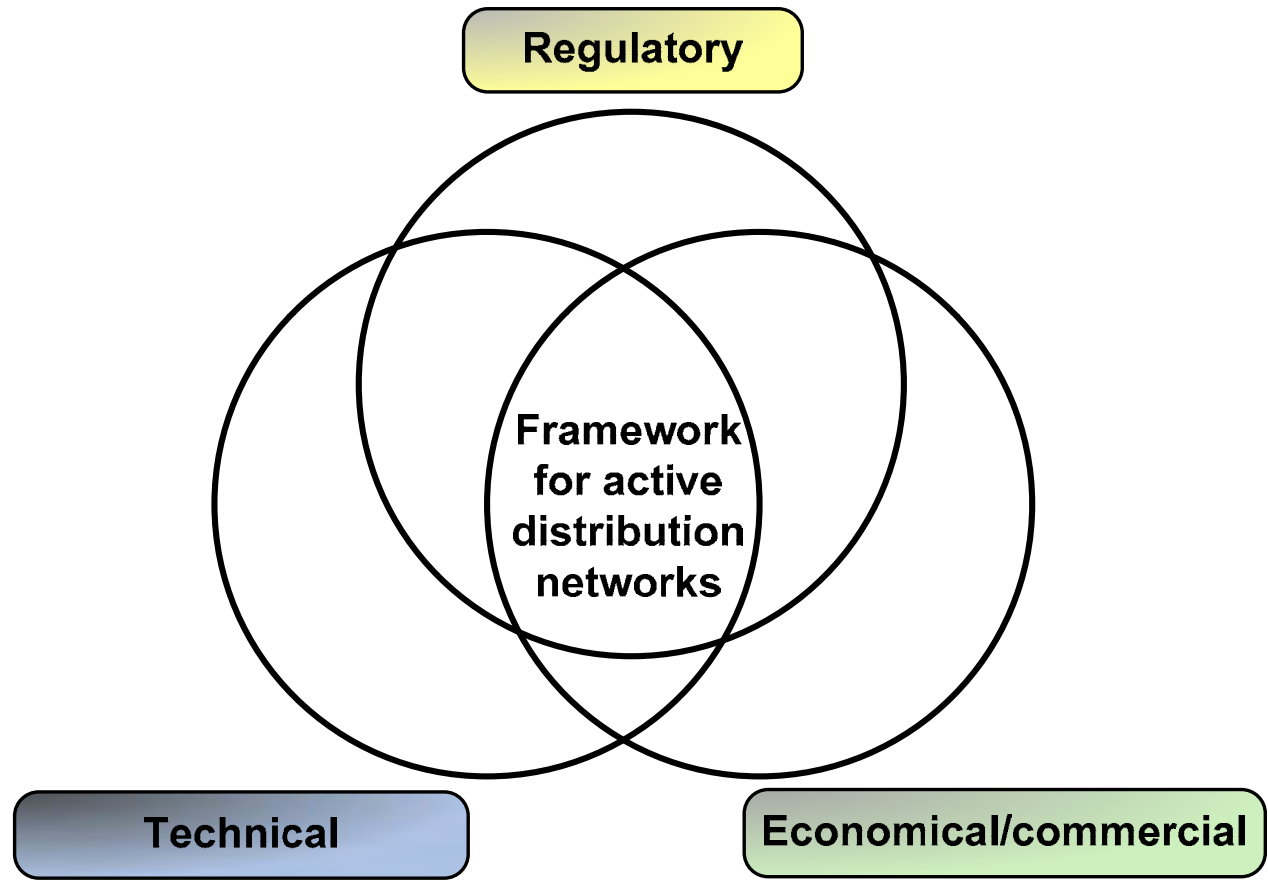
- Context
- Aims & Objectives
- **Targets for Future Electricity Systems**
- Emerging Conclusions and Recommendations
- Outlook

Targets



- Integrate a higher share of distributed generation (mainly based on renewals) into the existing power system.
- Cost efficient DG network integration and optimized utilization of network assets
- Network as a platform for efficient energy use, better utilisation of available energy and new services and markets (e.g. flexible tariffs, new business models consumer and generators)
- Participation of consumers to demand response (via advanced smart metering infrastructure)
- Incentives for the optimization of the entire energy system
- Integration of a high share of electric vehicles

Framework



Content

- Context
- Aims & Objectives
- Targets for Future Electricity Systems
- Emerging Conclusions and Recommendations
- Outlook

Recommendations (1/6)



- **Clear national and international energy strategies are required** A clear commitment and vision for future electricity mix (what amount of different energy resources and should a country be self-sufficient (per year or per second)) is needed.
- Many different regulation models are used, thus a **clear structure and continuity of regulation models is required**, that is fair for DER - changing regulatory framework is a critical uncertainty for long term investments in electricity networks
- **clear handling of R&D and demonstration costs** by DNOs and related legal security and exceptions for demonstration/trial projects is required (e.g. benchmarking of DNOs without considering R&D efforts)

Recommendations (2/6)



- Fixed feed in tariffs are a clear incentive for DG but in many cases act as barrier for active network integration. The **different DG support measures and level of support** (regional, national and international) **need to be harmonized.**
- **Markets must follow the dynamics in the power systems** as much as possible and need to be designed for active integration of DER into distribution networks. Following actors and aspects need to be considered
 - Aggregator in the market needs to be clearly defined (Balancing Responsible Parties (BRP), Aggregators, certain ESCO types...)
 - New services on distribution network level like ancillary services - in future are also market and business models on distribution network required
 - Harmonisation of different connection regimes (deep, shallow...) is required – Who is going to pay the connection costs?

Recommendations (3/6)



- **New contract models and business models**, due to different technical and economical interests of DNO and DG (quality and security of supply versus maximizing power feed in) need to be introduced.
- Efficient use of electricity networks will be essential in the future. Networks will be operated more **efficient if DNOs are able to take more system operation responsibility for active network and active use of DG resources and demand response**

Recommendations (4/6)



- **The smart meter is a possible enabler for DG system integration.** A flexible smart meter with bidirectional communication can be sensor and actor in future networks. Open questions are:
 - the cost for smart meters and who is going to pay – goal should be multi use of infrastructure
 - business models for metering (liberalized metering)
 - Network operators, DG unit operators and consumers should benefit
- **Harmonized technical requirements and standards** (for DG, communication and smart metering equipment) **are needed** in order to ensure quality and safety of future active networks

Recommendations (5/6)



- **Good procedures for grid connection need to be established**, for instance information flow between DG unit operator and DNO
- More focus should be laid on the **interface between distribution and transmission networks**
- The use of storage and controllable loads, for instance electric vehicles must be increased. **New applications such as electric vehicle should not be seen only as a new load type but also as a possibility for active operation.**

Recommendations (6/6)



- **Reactive power management will be more and more important** and can be relatively easy implemented.
- **New and enhanced protection strategies and equipment is required** for networks with high share of DG
- Due to the increasing system complexity, in general for future network operation DNOs as well as education institutions **need to build up new knowledge**
- **More active network demonstration projects are necessary** to gather more practical knowledge and best practice examples for future network operation

Content

- Context
- Aims & Objectives
- Targets for Future Electricity Systems
- Emerging Conclusions and Recommendations
- Outlook

Outlook



- There is a lack of practical implemented solutions for active DER network integration.
 - A lot of theoretical research projects and some pilot projects are currently ongoing.
 - It is not possible to identify general best practice examples at present
 - Ongoing knowledge exchange as well as intensified dissemination activities are required.
- Grid policy and regulatory aspects were identified as the most challenging issues concerning massive DER integration in distribution systems. Therefore in future activities dealing with DER and network related grid policy issues should be intensified.

Contact



DI HELFRIED BRUNNER, MSc.

Operating Agent IEA IA ENARD Annex II
Deputy Head of Business Unit Electric Energy Systems
Energy Department

AIT Austrian Institute of Technology

Österreichisches Forschungs- und Prüfzentrum Arsenal Ges.m.b.H.

Giefinggasse 2 | 1210 Vienna | Austria

T +43(0) 50550-6382 | M +43(0) 664 620 78 75 | F +43(0) 50550-6390

helfried.brunner@ait.ac.at | <http://www.ait.ac.at>