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

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Operating Agent Annex II

Workshop Demand Side Management and Energy Efficiency

April 1st, Gartenhotel Altmannsdorf

Contents

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- DG System Integration into Distribution Networks
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Distributed Generation

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- Different drivers for increasing share of renewable energy resources
  - Climate Change
  - Energy Import Dependency
- The penetration of Distributed Generation (DG) **increases** continuously
- **new challenges** for distribution network operation
- **energy- and load management** is becoming increasingly important

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Integration of DG in distribution networks (1)

The voltage rise effect is the main influence of DER on power quality in rural networks

Effect can be limited by arrangement during planning of the connection:

- **power limitation**
- **enhancement of the short circuit power in the PCC**
- **Active integration of DER with power control dependent on the voltage level is not common**

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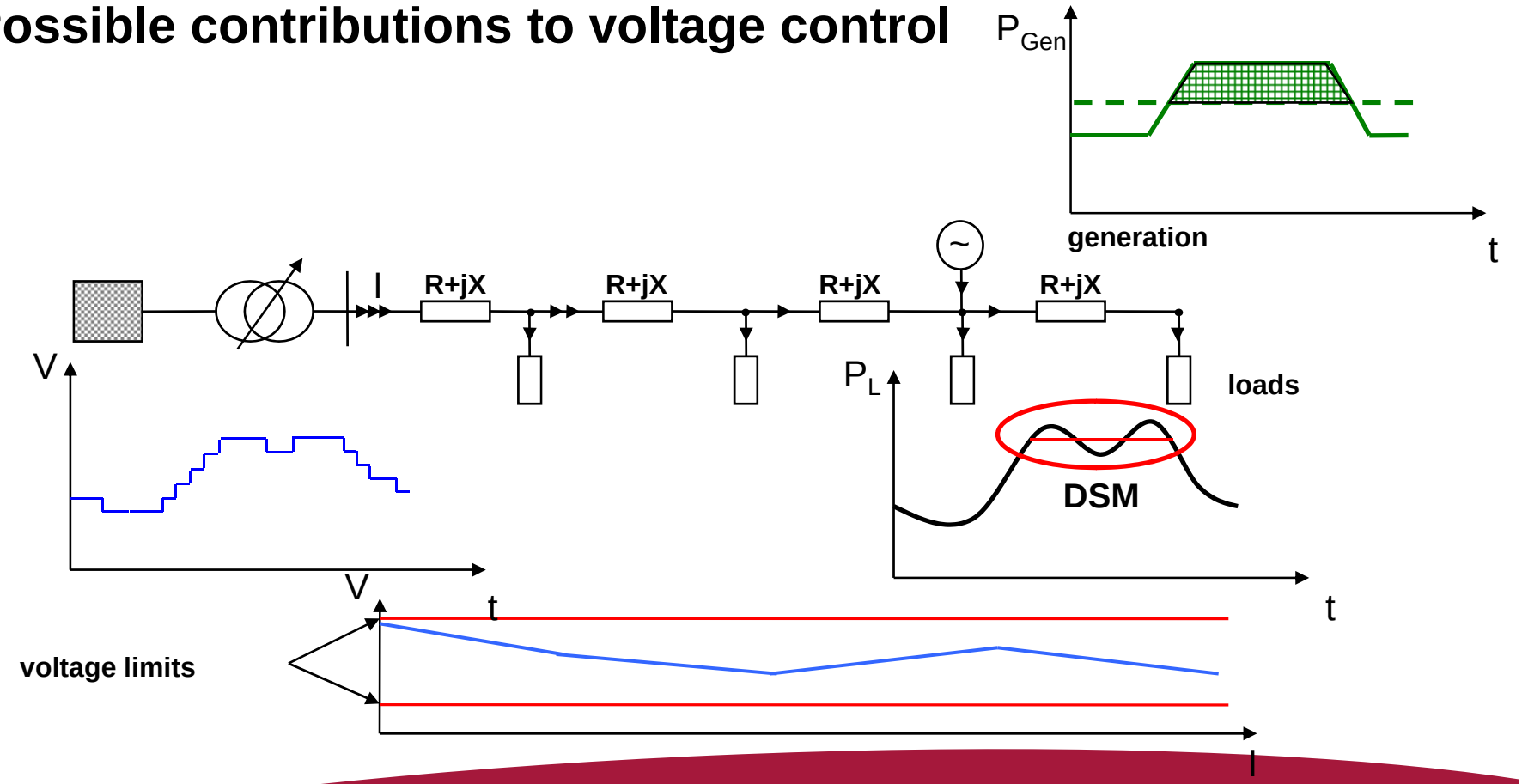
Integration of DG in distribution networks (2)

Possible contributions to voltage control



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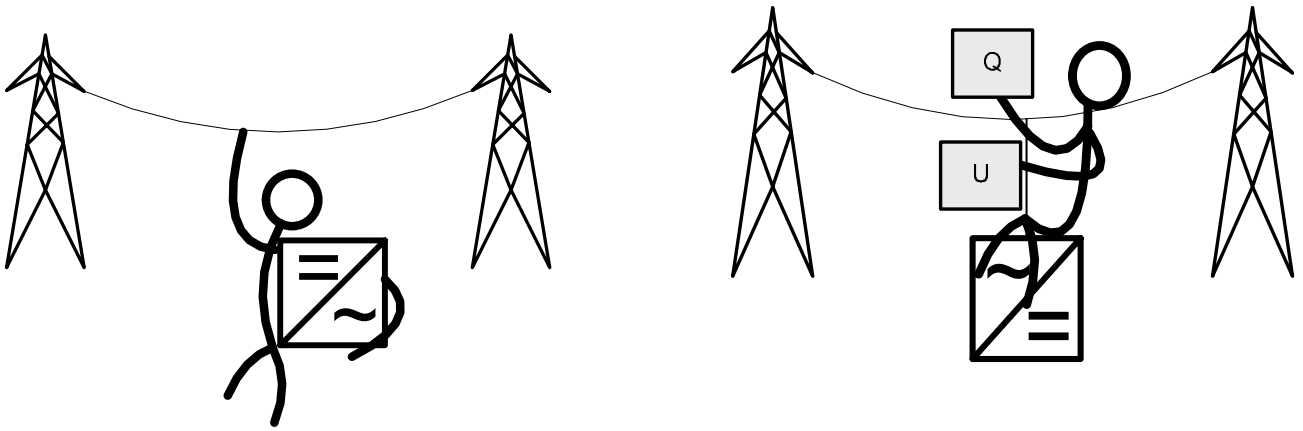
Integration of DG in distribution networks (3)

Current Status

„fit and forget“
„Connection" of distributed generators to the network, no active role by DER

Future

„Active network services by DER“
Active role of DG - **„Integration“** - means to take over ancillary services



Smart Grids

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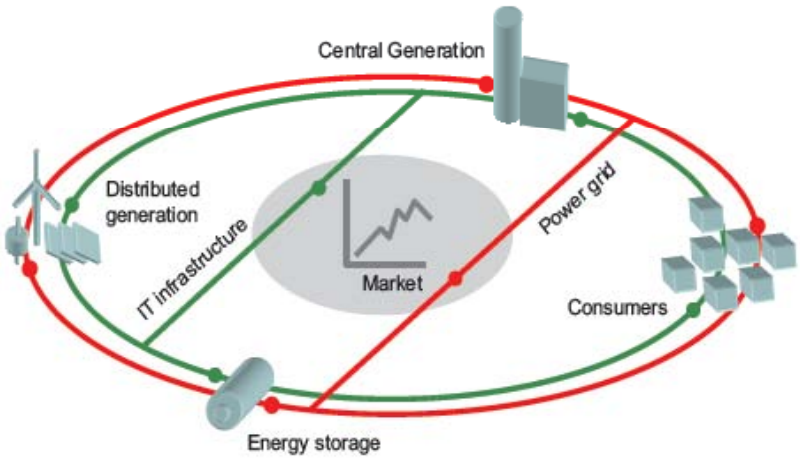
A possible Solution for DG System Integration is a Smart Grid

Smart Grids are power grids with a **coordinated management** based on bi-directional communication between **grid components, generators, energy storages and consumers** to enable an energy-efficient and cost-effective system operation that is ready for future challenges of the energy system

SMARTGRIDS AUSTRIA



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Smart Grids and Distributed Generation

- **Possible ancillary services provided by DG**
  - **voltage control**
  - **reactive power compensation**
  - **loss compensation**
  - **harmonic filtering**

  when the share of PV is high maybe additionally:
  - **frequency control**
  - **network stability**
- **The stochastic characteristic of some DG must be taken into account**
- **In general the opportunities for DG to provide ancillary services may increase with increasing DG penetration**

Relationship between Technical, Economcal and Regulatory Issues

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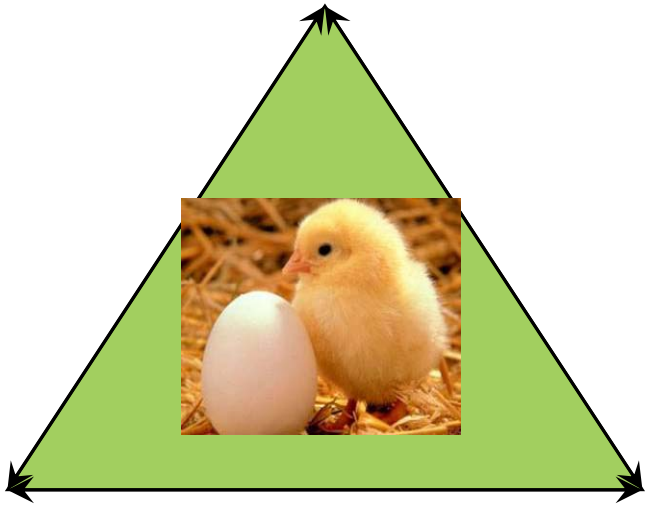

- **The chicken or the egg causality**

Ancillary Services Markets

- **Currently only limited markets for small units are existing**
  - **i.e. revenues for reactive power in Spain**
- **No market for voltage control at distribution network level**
- **No market for harmonic compensation**
- **Limited access for small units to balance energy markets**

Regulatory framework

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- **Incentives for DG interconnection and DSM**
  - **technical, economical and regulatory**
- **Participation of DG in balance energy markets**
- **In a first step ancillary service markets combined with feed in tariffs**
  - **until DG is competitive without subsidies (only a question of time)**
- **Development of ancillary service markets**
  - **voltage control**
  - **reactive power supply**
  - **harmonic filtering**

IEA ENARD Annex II

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ENARD
Electricity Networks Analysis, Research and Development

ENARD Vision

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- ENARD – Electricity Networks Analysis, Research and Development

- Vision: “To facilitate the uptake of new operating procedures, architectures, methodologies and technologies in electricity T&D networks, such as to enhance their overall performance in relation to the developing challenges of network renewal, renewables integration and network resilience”

ENARD
Electricity Networks Analysis, Research and Development

Status Participating Countries

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Austria

Switzerland

Italy

Denmark

Belgium

Finland

Sweden

Spain

United Kingdom

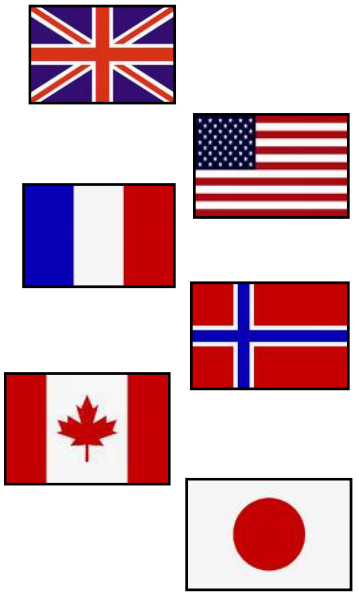
United States (t.b.c)

France

Norway

Canada (t.b.c.)

Japan (t.b.c.)



ENRD
Electricity Networks Analysis, Research and Development

ENARD Overview

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Annex I - Information Collation and Dissemination (U.K)

- Central control & coordination (Ex-Co Meetings)
- Essential definition platform

Annex II – DG System Integration in Distribution Networks (Austria, arsenal research)

Annex III - Infrastructure Asset Management (U.K)

- Asses ageing, degradation, failure and EoL (End-of-Life) characteristics
- Case study of examples on how asset information is used
- Cross reference with available information transmission system

Annex IV - Transmission (Norway)

- Long term vision for developments in transmission systems

ENARD Annex II

Status

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- Annex II is officially approved by the IEA ENARD ExCo
- Draft working program was worked out within Annex I Workshop “DG System Integration and New Business Models” in Vienna, March 20th-21st, 2007
- Operational since September 24th, 2008 (ExCo Meeting in Trondheim, Norway)
- Kick-off Meeting in Vienna, May 13th-14th, 2008 :
- 1st Working Meeting December 8th and 9th in London
- Next Meeting May 27th and 28th in Billund, Denmark

Objectives of Annex II

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- to build up and **exchange knowledge** on DG system integration aspects and existing active network approaches **amongst the global players** in distribution networks
- to **promote implementation possibilities** for active distribution networks as an overall goal of this Annex II.
- to develop **guideline(s)** for network operators and political decision makers on how to manage and implement the **transition from a passive to an active distribution network**

ENARD Annex II - Tasks

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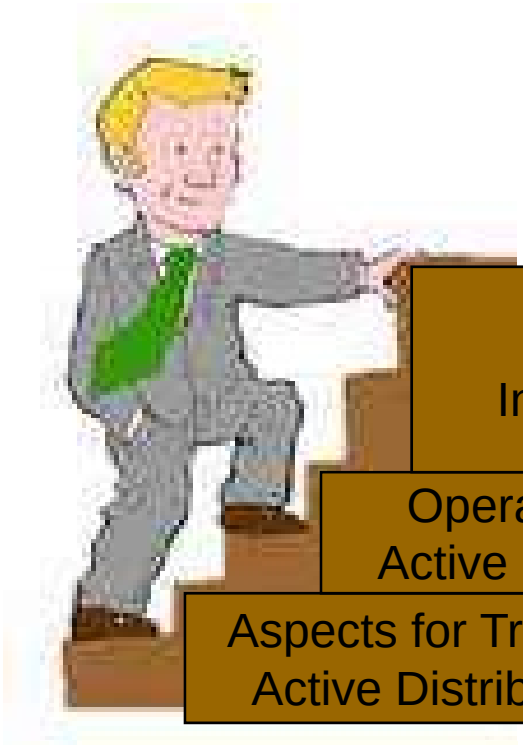
DG System Integration in Distribution Networks



Cross Cutting Issues,
Interrelation and Dissemination

Operation and Control of
Active Distribution Networks

Aspects for Transition towards
Active Distribution Networks

24 Months + optional extension

Scope and Tasks

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Task 1: **Aspects for the transition towards active distribution networks**

- To review, analyze and document existing architectures and planning approaches of active distribution networks including barriers and models
  - survey of existing active networks
  - benchmarking and identification of needs
- Output: State of the art, trends, barriers and recommendations for active distribution networks **architectures and planning approaches**

Scope and Tasks

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Task 2: **Management of Active Distribution Networks**

- To foster the development of control and operational strategies that can be utilised to improve the reliability, operation and performance of active distribution grids
  - Surveying technical, economical and organisational Operation and Control Approaches
  - Organisational Framework and Business Models
  - Guideline and Recommendations
- Output: Current state of the art, trends, barriers and recommendations for **control and operation** of active distribution networks.

Scope and Tasks

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Task 3: **Cross Cutting Issues, Interrelation and Dissemination**

- To develop a clear vision of active distribution networks and evaluate the micro and macroeconomic benefit; to perform dissemination activities for active distribution
  - Workshops and dissemination
  - Vision and value analysis
- Output: Reports on interrelation and dissemination activities, guidelines for stakeholders to assist DNO´s to progress from passive to active approach, vision and value report.

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Thank You

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