3rd International Conference on Integration of Renewable and Distributed Energy Resources

SOLID-DER: RTD results on benefits & solutions for more Integration of DER in EU

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The Netherlands

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eu-deep

GDF SUEZ

ADEME French Environment & Energy Management Agency

European Commission Research Directorate-General

ISET

IRED

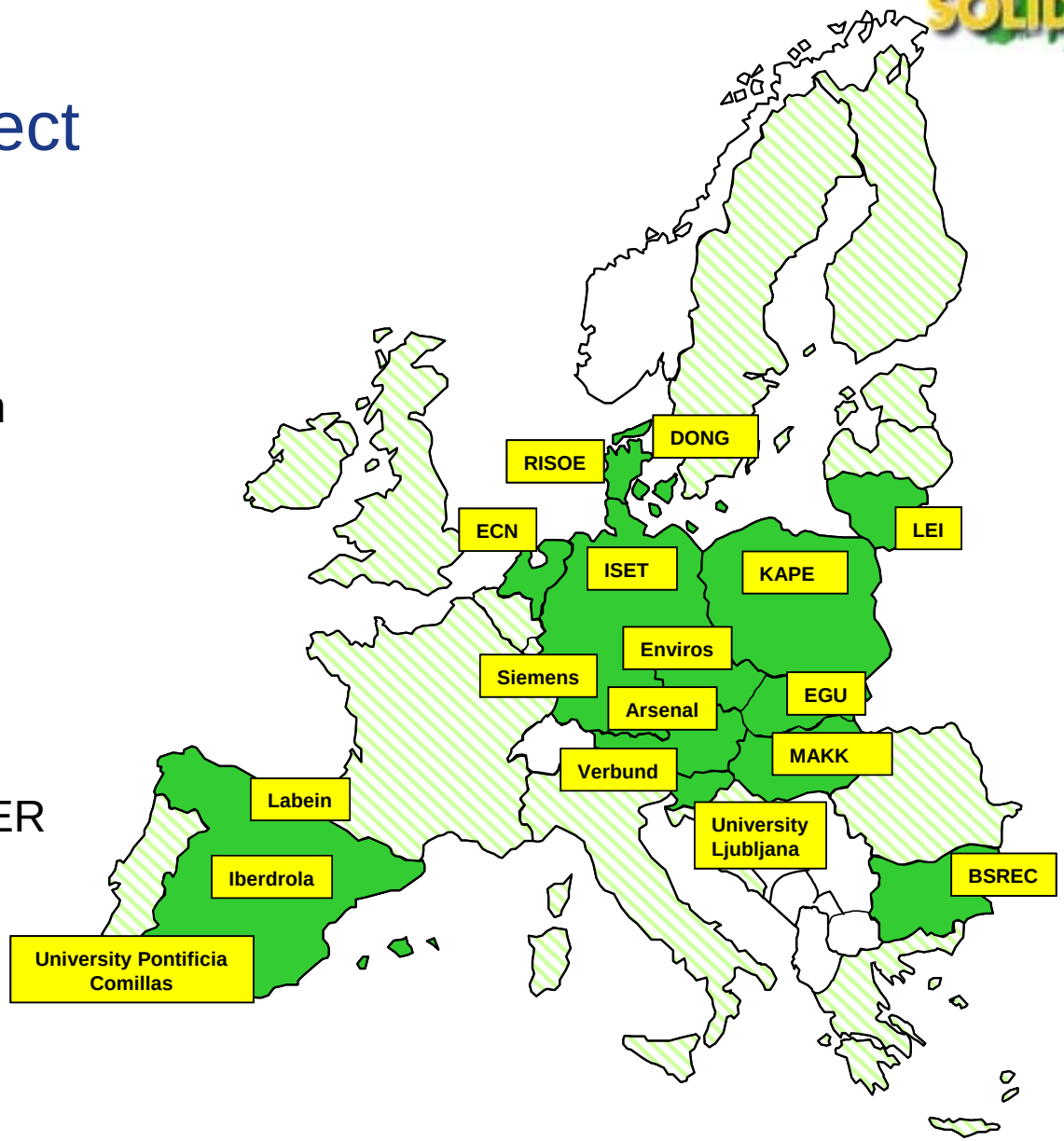
SOLID-DER project

FP6 Coordination Action
(2005 – 2008)

17 partners from research community, consultancy and energy industry

Main objective:

Unite R&D forces within the EU-27, aiming at large-scale integration of DER into the European electricity market



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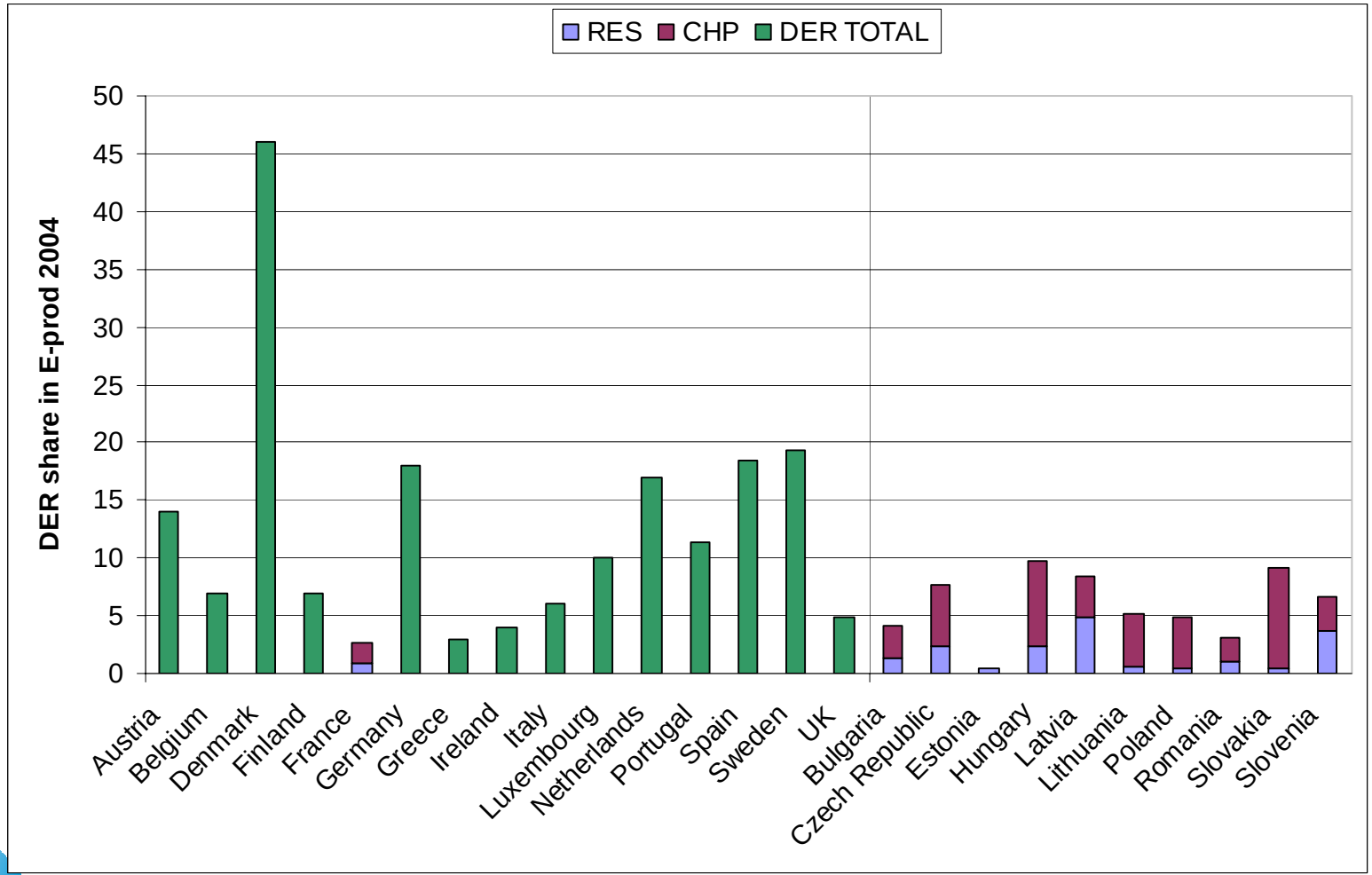
ECN Energy research Centre of the Netherlands

Content

- Development of DER integration
  - Achievements
  - Drivers
- Barriers and Solutions for take-off DER
  - Technical & Economic barriers
  - Solutions for more DER
- Recommendations for Large-scale RES & DG integration
- Pending RTD issues

DER share in total electricity production



Drivers for more RES-E and DG in the system

- **Greenhouse gas emission reduction**

•**EU Kyoto target** : -8% reduction in 2008-2012 compared to 1990 emissions

•CO2 emission reduction in 2020: **20%** (or even 30% pending post-Kyoto outcome)

- **Renewable electricity**

•2010 target: 21% electricity demand in EU from RES.

•**2020** target: **RES 30-50% in electricity** and **20%** in total primary energy supply

- **Energy efficiency**

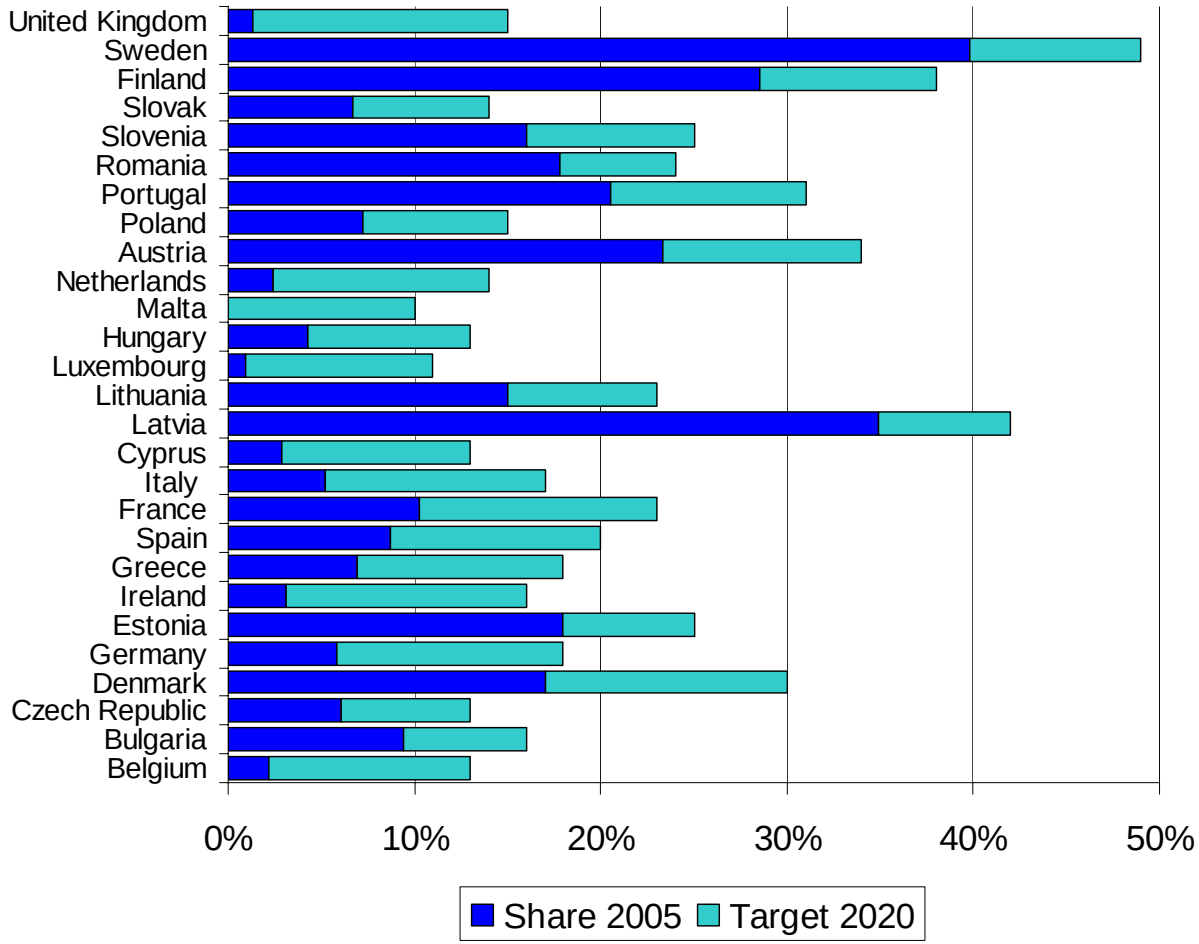
•EU directive for **Combined Heat and Power** (CHP)

•EU Action Plan for Energy efficiency: **20%** energy saving 2020

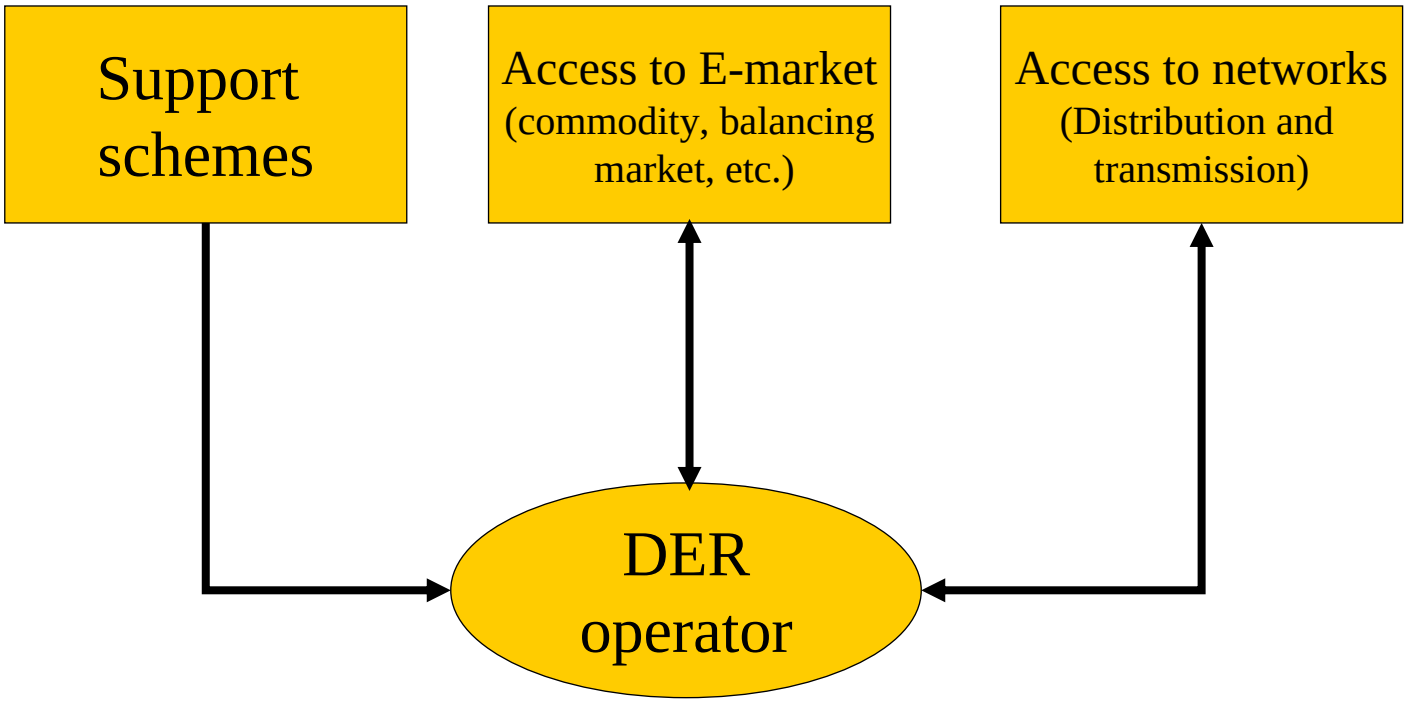
- **Enhancing supply security by reducing fossil fuel import**

→Support Schemes in all Member States to meet these 2020 targets

National RES Targets 2020 in EU



Key relationships with DER operator



Barriers for take-off of DER

- **Policy and regulatory barriers**
  - Frequently changing policies and priorities
  - Long administrative procedures for spatial planning, construction permissions etc
  - Long & complicated (non-standardised) connection procedures
  - Network access/use charges often discriminatory to small (DER) generators
  - DSOs often refuse DER access (some new MS) or DSOs lack sufficient remuneration for investments to connect them
  - Generally in EU, no use of DER for balancing, system security

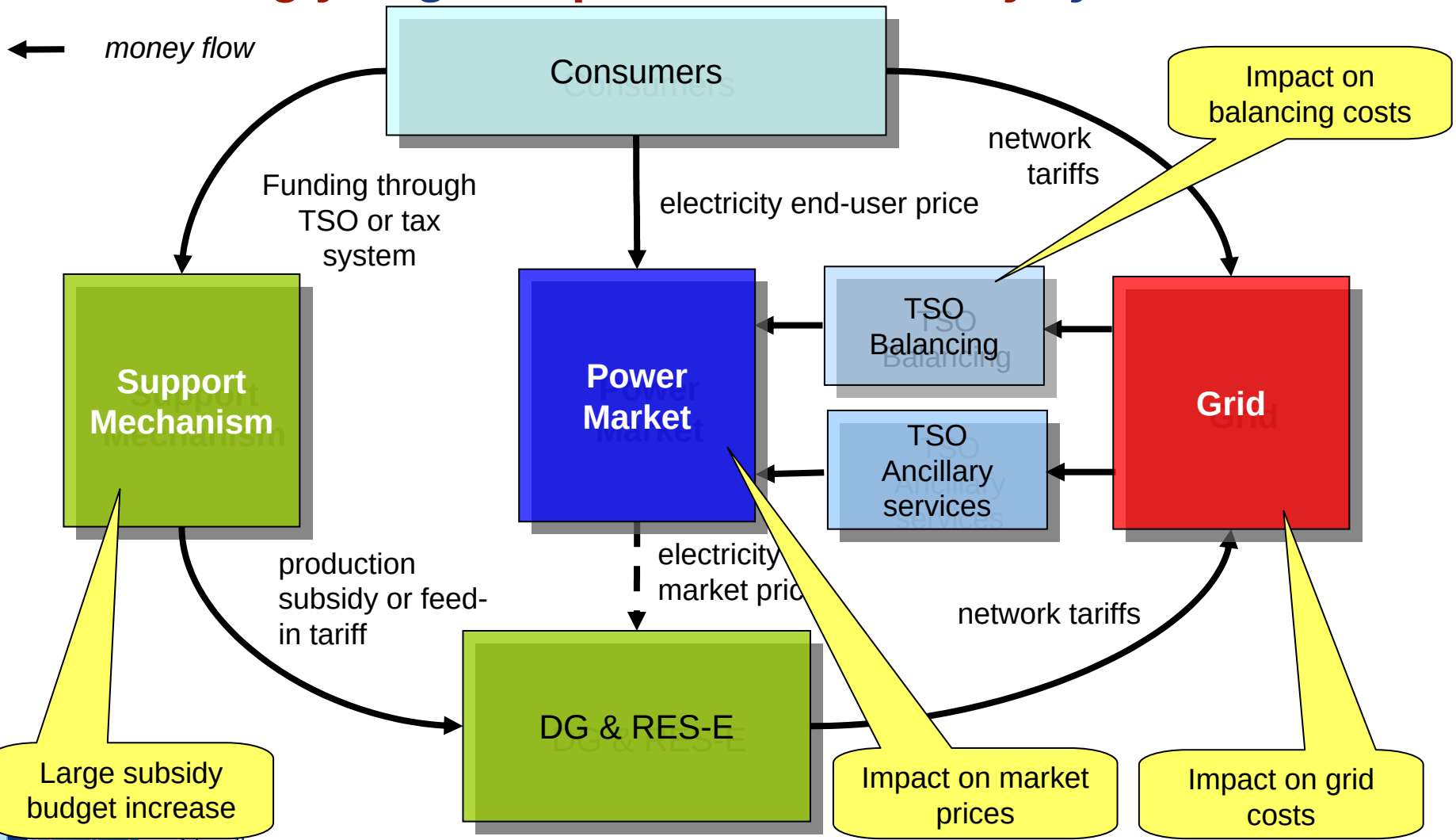
- **Financial barriers**
  - Large upfront investments: but limited access to credits/loans
  - Current support schemes: often unstable, cost inefficient etc

Solutions for take-off of DER

- **Institutional Solutions:**
  - Create “one-stop shop system” for project authorization
  - Secure stable, transparent support policies
  - Standardise connection procedures for DSOs to connect DER
  - More fair allocation of costs and benefits of DER connection

- **Technical Solutions:**
  - Small generators should be excluded from some rules applying to large generators
  - European interconnection standard with focus on connection

If DER really takes off:
increasingly large amounts DG & RES-E (will) have increasingly *larger* impacts on electricity *system costs*



Increasing distribution network costs if intermittent DG & RES shares exceed 15%-20%

- **Technical problems DG or reduction of power quality**
  - DG &RES in rural distribution networks causes voltage rise problems.
  - DG & RES in urban distribution networks causes fault level increase.

- **Network reinforcement costs**
  - At low DG & RES penetration (or overcapacity) levels of reinforcement costs are zero, but increase progressively with higher DER penetration.
  - Also “high DER-density” causes additional reinforcement costs.

- **Energy losses**
  - DG may initially reduce energy losses, but with higher DG penetration losses will again increase steeply.

- **Distribution asset replacement value**
  - DG reduces power flows through high voltage T&D network assets and postpone network reinforcements, but not if larger shares of DG & RES penetrate and “DG-density” increases.

Recommendations for more efficient DER integration in next decade in EU (1)

- **Improvements in RES & DG support policy & instruments by:**
  - Introducing market based elements in **feed-in tariff schemes**, i.e. premium feed-in schemes
  - Implementation **RPS & TGC** is economic efficient but need liquid markets
  - Support scheme **harmonization in EU** & cross-border trade of RES certificates to facilitate max & efficient exploitation DER

- **Improvements in Distribution Network Regulation & Management by:**
  - Functional **unbundling of generation & distribution networks**, create transparent grid connection rules etc
  - Innovate passive DSO business with **Active network management**

    → improving its performance
  - Standardize network **codes**
  - Implement shallow **connection charges** & socialization of DER-integration costs (consumers & DER operators)

Recommendations for more efficient DER integration in next decade in EU (2)

- Create more **generation market flexibility** in system through:
  - Harmonisation of support schemes → better dispersion of renewables over countries
  - Better coordination between TSOs for capacity calculation of interconnections
  - Market based auctions for cross-border trading
  - More peak load generation capacity through one-stop shop approach for flexible conventional plants

- Create more **balancing market flexibility** in system through:
  - Make market parties balancing responsible through BRP system
  - Promoting interruptible contracts between TSO and consumers
  - Enabling DER provision of balancing through VPP
  - Reduction of gate closure time day-ahead market

Recommendations for more efficient DER integration in next decade in EU (3)

- More **Distribution network controllability** through:
  - Implementation of Active Network Management by:
    - » Improving network planning
    - » Incentive regulation allowing for CAPEX & OPEX
    - » Unbundling network & generation
  - Discourage priority access and dispatch DER
  - Time-of-use and locational network tariffs for generators and load

- More **Transmission network controllability** through:
  - Facilitate cross-border markets (day-ahead, intraday and other trade frames) through policy and regulation
    - » Enable better capacity calculation of interconnections through coordination of national markets, for instance European load flow model
    - » Enable better congestion management through harmonisation of cross-border trading approaches
  - Time-of-use and locational network tariffs for generators and load

Pending RTD issues for more efficient large scale integration of (intermittent) RES & DG in EU (1)

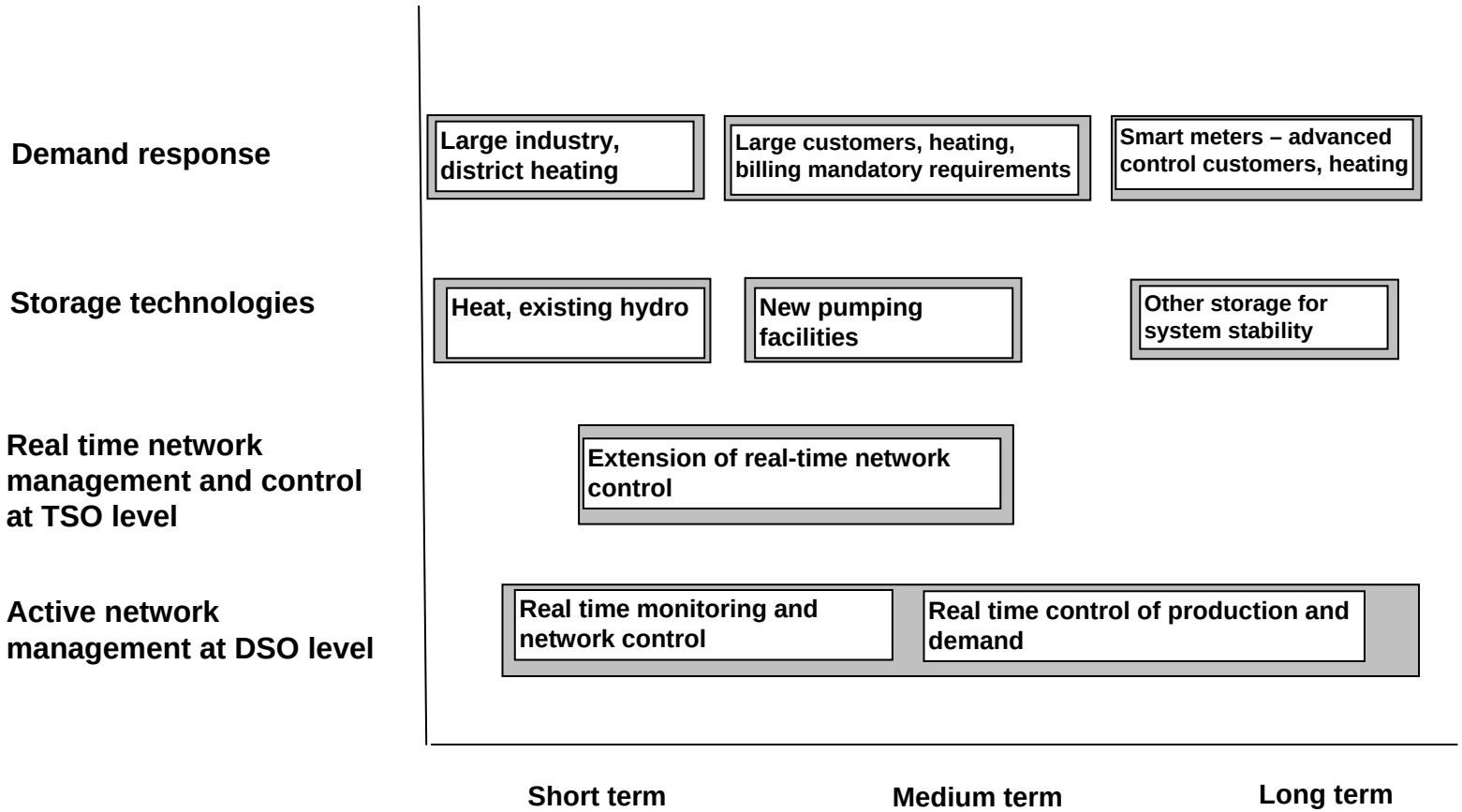
- **RTD for Distribution Networks:**
  - Developing Smart grids concepts, i.e. **active network management** by applying ICT etc
    - » Developing real-time *monitoring* of condition of cables and overhead lines at lower voltage levels
    - » Developing real-time *control* possibilities like switching between circuits, fast responding protection schemes, automated network reconfiguration
    - » Extending real-time *control* of DSO to DER and load through developing new communication & metering devices and automated systems at household level (demand response)
  - Demo projects and testing of **business models**
    - » For feasibility of operating new active network management possibilities by DSO
    - » For demonstrating costs/benefits of innovations for whole system to regulators

Pending RTD issues for more efficient large scale integration of (intermittent) RES & DG in EU (2)

- **RTD for Transmission networks**
  - Further development of **advanced technologies** to steer and control network flows (HVDC, FACTS)
  - Enable transmission networks for short-term interactions **between countries** with a lot of intermittent production

- **RTD for both network controllability and market flexibility**
  - Develop **demand response** options: smart metering & rates, communication devices, ICT data handling, automated load control devices
  - Improve (lower costs of) different (minutes, hours) **storage** options
    - Heat storage (heat boilers, pumps, micro-CHPs)
    - Electricity storage (fuel cells, batteries, CAES)
  - Develop more accurate wind power output prediction tools

Time Frame of application of solutions in different RTD areas



Thank you for your attention

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Project references

- SOLID-DER website for all reports http://www.solid-der.org
- RESPOND, website for reports http://www.project-respond.eu
- IMPROGRES, website http://www.improgres.org
- DG-GRID
- FENIX