

CEER

**Council of European
Energy Regulators**



EU – US Roundtable

**THE IMPACT OF DISTRIBUTED GENERATION ON
ELECTRICITY INFRASTRUCTURE**

**Regulatory Dilemmas in Promoting the Future
Role of DSOs**

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**AEEGSI Commissioner
CEER DSO WG - Co-Chair**

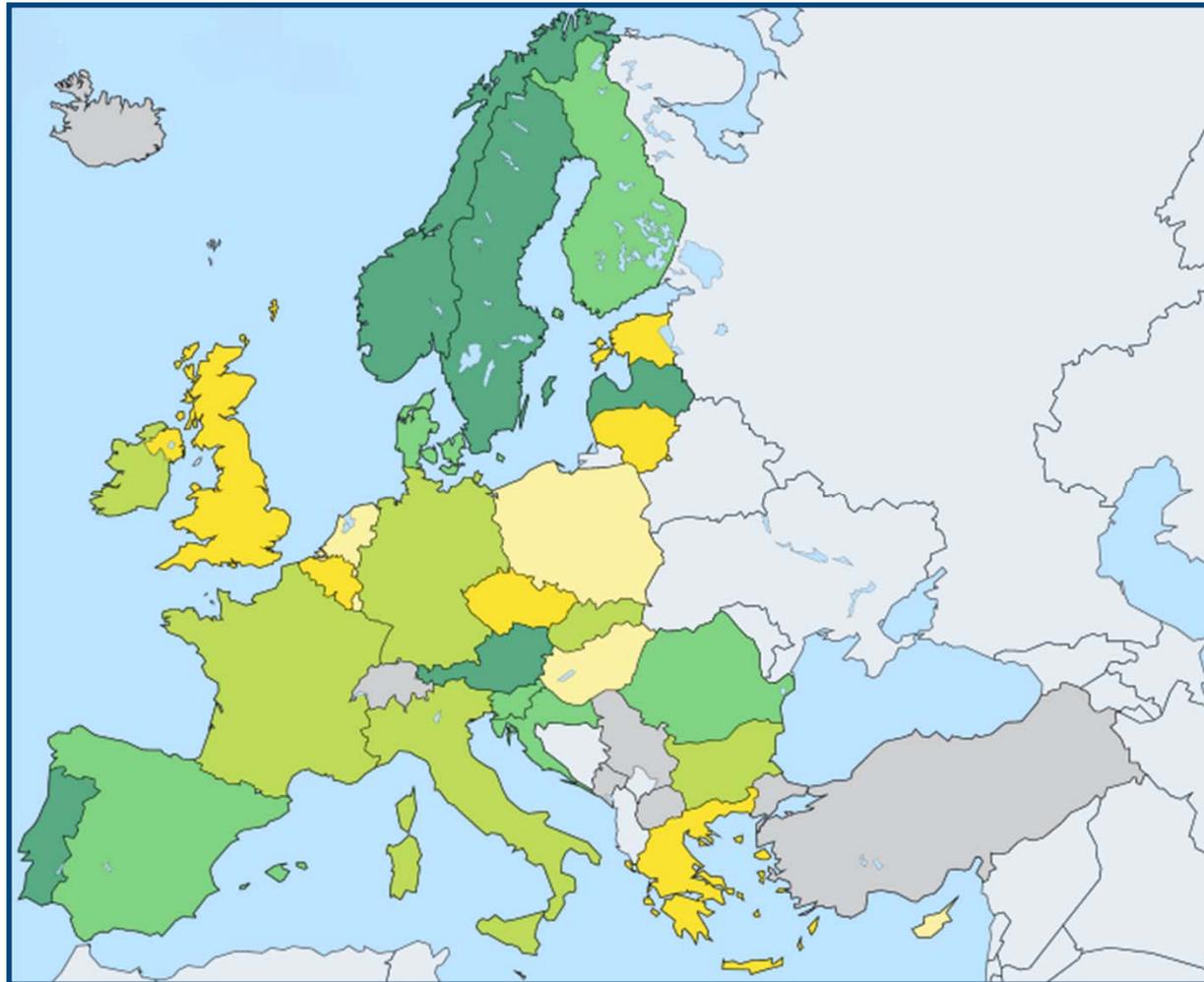
Boston, May 13th 2014

Fostering energy markets,
empowering **consumers**.

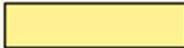
- I. Overview of DSOs in Europe
- II. Regulatory challenges for DSOs' new roles:
 1. Incentives & regulation for investment (smart) + infrastructure development
 2. Tariff structures: price signals + decouple DSO profits from el volumes
 3. Framework to ensure DSO neutrality and non discrimination in providing resources for ancillary services
- III. EU Green Paper: a bridge to 2025



Differences across Europe: electricity generated from RES



Data for 2012

Legend	Cases
 1.1 - 10.7	6
 10.7 - 16.5	6
 16.5 - 27.6	6
 27.6 - 38.7	6
 38.7 - 104.3	5
 Data not available	2

Minimum value: 1.1
Maximum value: 104.3

(% of gross electricity
consumption)

Source: Eurostat, 2013



Overview of DSOs in Europe

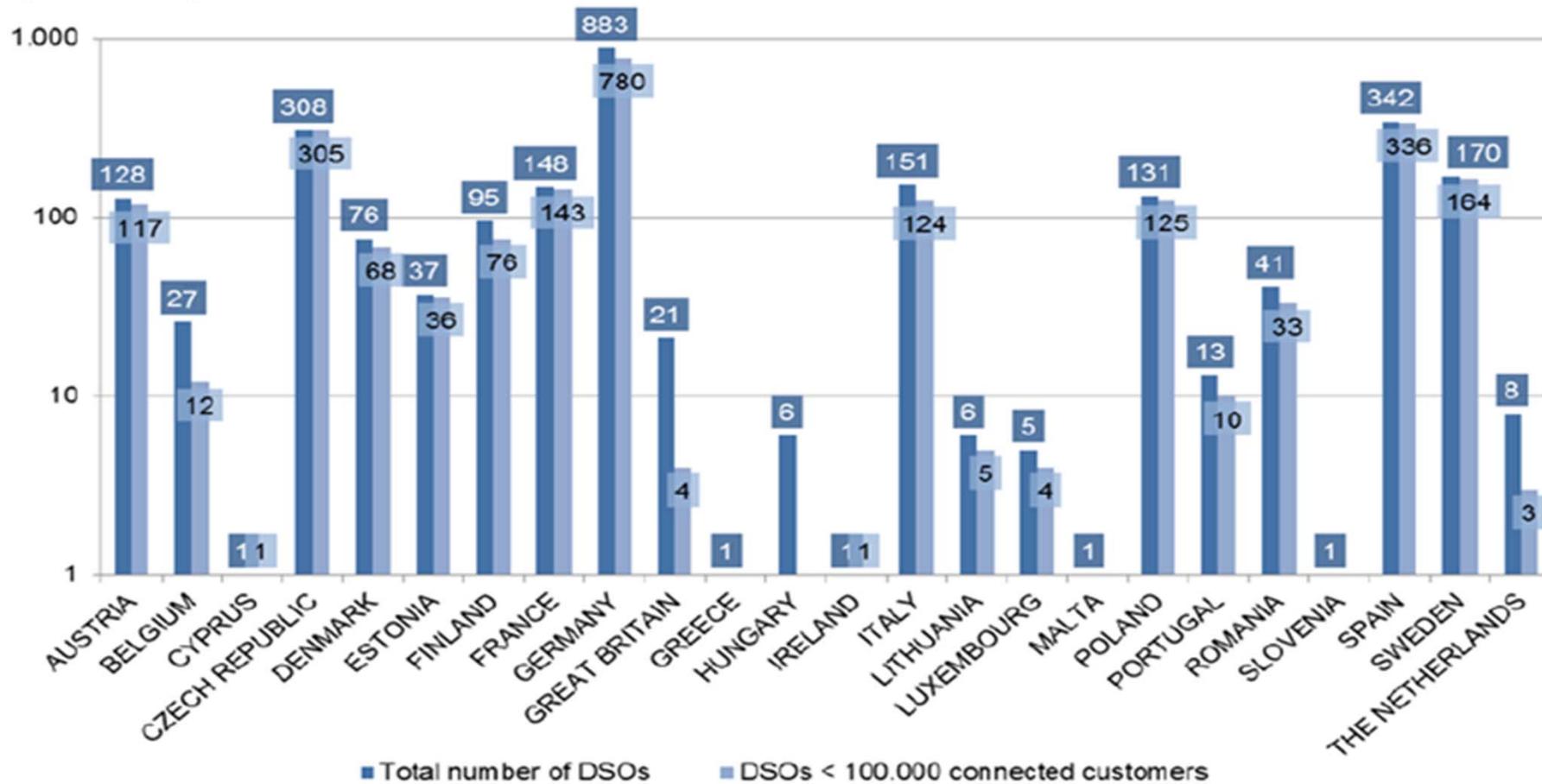
- ▶ Large differences in size and number of DSOs per country – due to historical reasons
- ▶ In some countries small DSOs are very fragmented
- ▶ Unbundling between distribution and supply: mandatory only above 100,000 customers*
- ▶ Metering activities mostly carried out by DSOs (*but* very relevant exceptions: DE, GB)
- ▶ Important differences in technical issues: voltage levels of distribution networks, network automation, etc.

* Art. 26 of Dir. 2009/72/EC of III Package



EU DSOs: different numbers & sizes

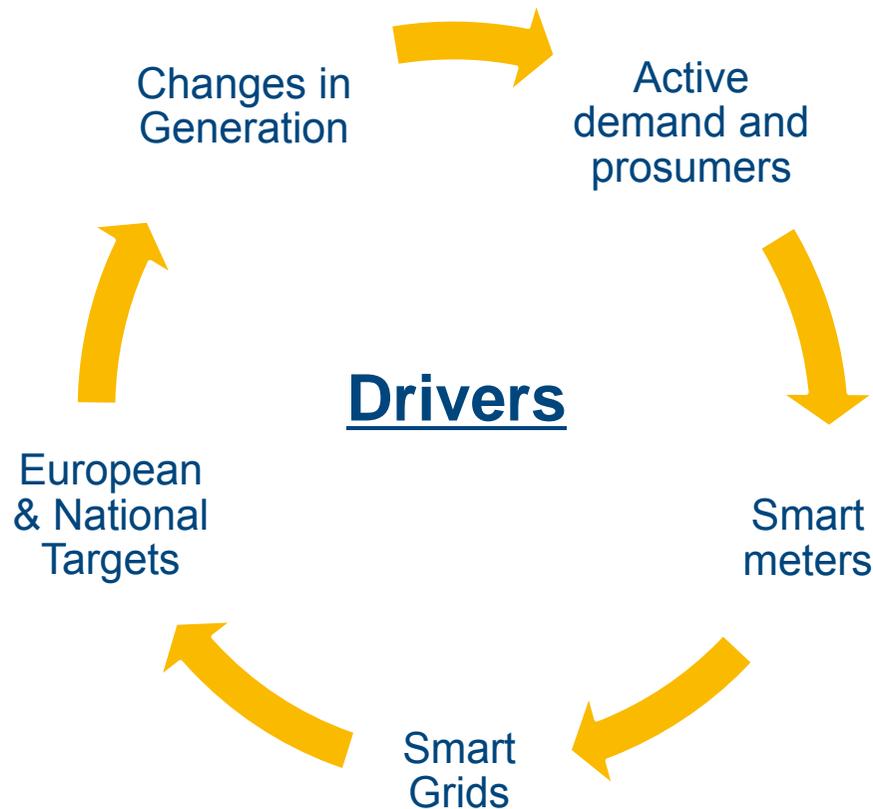
No. of Electricity DSOs
(logarithmic scale)



Source: Status Review on the Transposition of Unbundling Requirements for DSOs and Closed Distribution System Operators.
Ref.:C12-UR-47-03



Drivers of Change in DSO Regulation and Challenges



Developments and Challenges

1. List of DSO new activities
2. DSO perimeter
3. Data Management
4. TSO-DSO coordination
5. Role for flexibility
6. Distribution Tariffs
7. Incentives for investments



Evolution of DSO role in EU

- ▶ **Traditional role:**
 - *Grid development, operation and maintenance*
 - *Connections*
 - *Metering (in most EU Member States)*

- ▶ Role related to **retail liberalization** (“supply-centric” model)
 - *Non discriminatory relationship with suppliers*
 - *Enabling supply competition (switching processes)*
 - *No commercial activities for final customers*

- ▶ New role required by **Distributed Generation**
 - *Change in network management (bidirectional flows, congestions, balancing, etc.)*
 - *Local dispatching / ancillary services*



Impacts on Regulatory framework

Although DSOs will continue to pursue their traditional mission, ensuring system security while operating, maintaining and developing efficient distribution networks, they will be asked to perform a series of new activities.

This greatly impacts the regulatory framework



1. Smart network investments

Ten recommendations for regulators

- **Ensure** stable regulatory framework and long-term return on Investments
 - **Decouple** profits and volume for grid operators
 - **Incentivise** innovative solutions (demonstration)
 - **Introduce** output-based regulation: value for money of users
 - **Improve** consumer awareness for energy use and market opportunities
- **Perform** societal cost-benefit assessment
 - **Disseminate** the results and lessons from the demonstration projects
 - **Adopt** open protocols and standards for interoperability
 - **Distinguish** grid-related vs market-related activities
 - **Learn** from best regulatory practices

Source: ERGEG Smart Grids Position Paper (2010)

Many of these recommendations are very close to the **EPRI "Integrated Grid" approach!**



2. New distribution tariff structures

- ▶ Transparent and cost-reflective network tariffs also facilitate appropriate network investments
- ▶ Regulation drives cost reductions, but must also take innovation into account (e.g. *more ICT – less copper*)

Dilemmas:

- ▶ Complexity issues for retail competition: ToU pricing can be used to reflect the value of energy consumed at different times more accurately: ToU only for energy prices or also for distribution tariffs?
- ▶ How to recover DSOs costs with energy-based tariffs in a world with less distributed energy (*prosumers, net metering, energy efficiency*)?



3. Ancillary services

Local dispatching: a role for DSOs?

TSO-DSO Coordination is required in any case.

Dilemmas:

- TSO should not act on **DER connected to distribution grid** (THINK suggestions)
- What role for DSOs in dispatching?

Service	Type of DER able to offer the service	System operator procuring such services
System balancing services	All types of DER	TSO
Frequency control	All types of DER	TSO
Voltage control	All types of DER	DSO
Blackstart	Larger-scale DS and DG	TSO and DSO
Short-term security congestion management	DG, DS, DR, (EV)	TSO and DSO

DG distributed generation

DS distributed storage

DR demand response

EV electric vehicles

DER distributed energy resources (DG+DS+DR+EV)



The CEER/ACER 2025 Bridge: Trends and Technological Innovation for DSOs



- To meet new demand and generation patterns, DSOs will be required to implement more active and intelligent management, monitoring and control of their networks
- To allow for well functioning customer-centric retail markets, commercial data management will increase in weight as well as in relevance and the role of DSOs in this respect will have to be clarified
- The TSO-DSO interface must be designed to ensure efficient information exchange for security of supply, coordinated congestion management and integrated planning
- DSOs shall remain neutral facilitator for competitive market. It has to be investigated which services could be better provided within competitive markets and which additional safeguards (or boundaries) are required to ensure that competitive market can develop.



The CEER/ACER 2025 Bridge: Impacts on Regulatory framework for DSOs

- ▶ The regulatory framework must adapt to this new role of DSOs in order to:
 - Enable DSOs to take on the role of a neutral market facilitator;
 - Accompany the development of new markets to the benefit of consumers, including load control and energy usage monitoring;
 - Review distribution network tariff structure in order to ensure cost recovery and focused incentives for smarter networks;
 - Assist DSOs and TSOs in clearly defining their roles, allowing the respect of coordination requirements.



The 2025 Bridge: Regulatory actions on the future role of DSOs

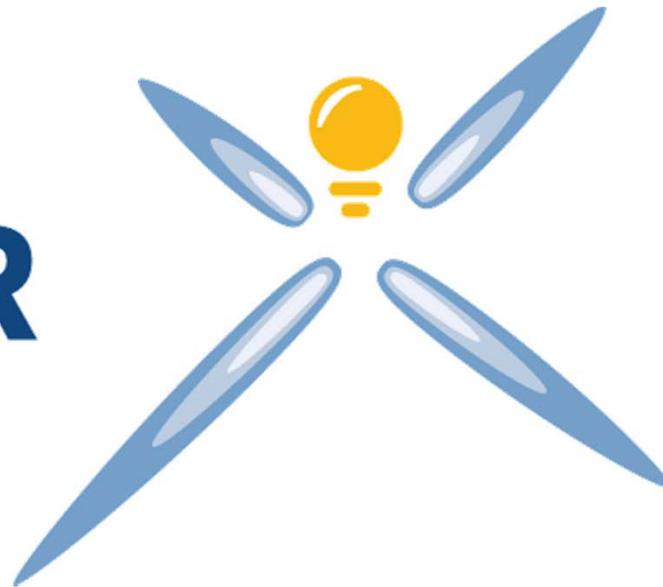
- ▶ Consult on the future role of DSOs
- ▶ Work with DSOs and TSOs in order to more clearly define their respective roles and responsibilities
- ▶ Assess innovative regulatory mechanisms to promote necessary but higher risk investments with significant social benefits.
- ▶ Consider output-based incentive mechanisms to encourage efficient operations and investments by DSOs in order to have smarter networks (*more IT-based control, less copper*).



Thank you for your attention!

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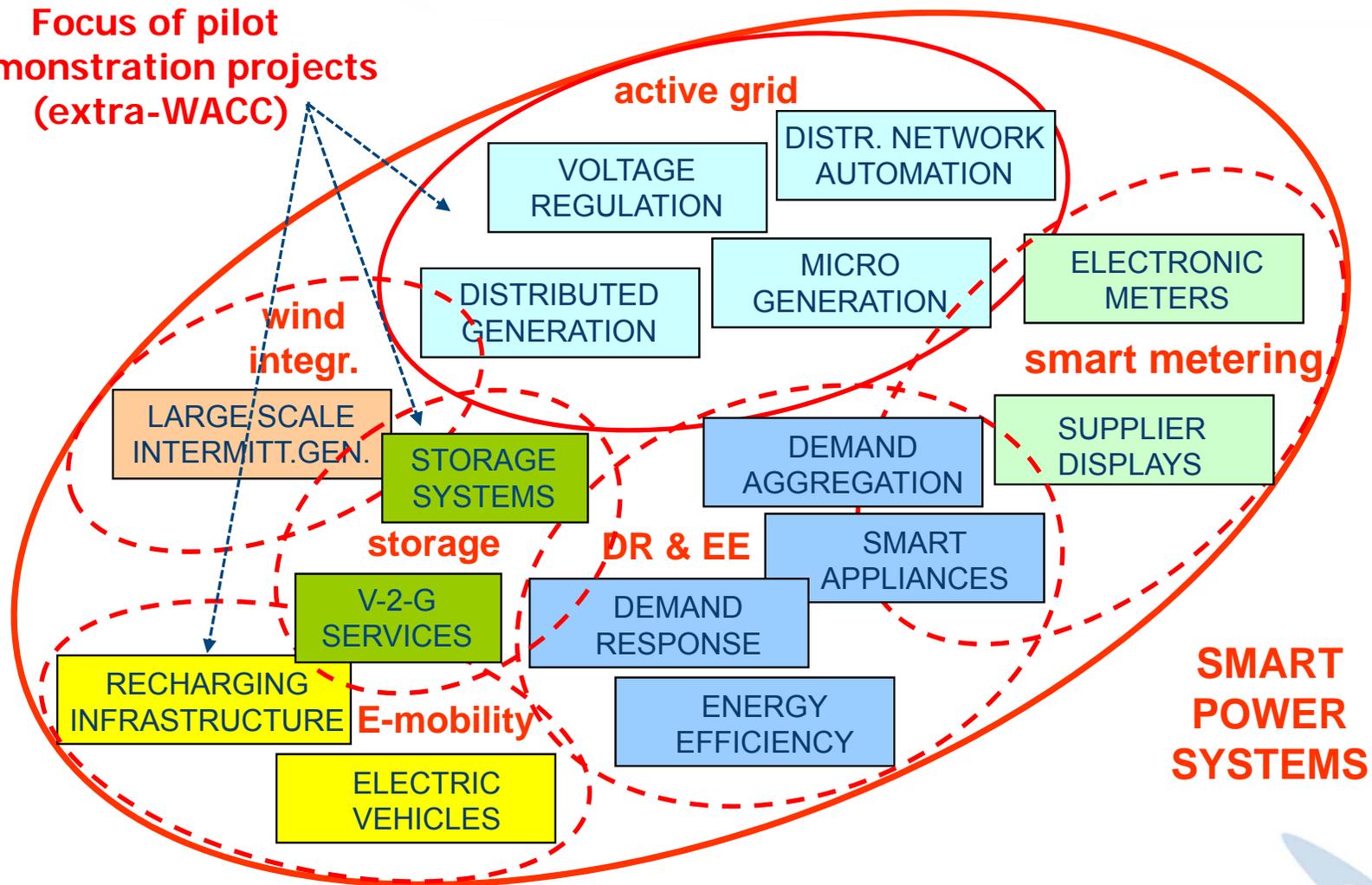


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Back-up slides

From input-based to output-based regulation (the Italian approach 1/3)

Focus of pilot demonstration projects (extra-WACC)



From input-based to output-based regulation (the Italian approach 2/3)

AEEG decision n. 39/10:

- supervising 7 smart grid pilot projects led by DSOs
- projects selected with quantitative and qualitative criteria
- investment included in distribution RAB (focus: Medium Voltage)
- input based regulation with extra-WACC: +2% (12 years)
- evaluation and selection process (with help of Academics)
- monitoring and dissemination of results.

Main concepts developed through regulatory involvement in demonstration:

- **RPT indicator** (Reverse Power-flow Time): selective index for smartening
- **Psmart concept**: upgrade of hosting capacity due to “smartenisation”: useful for output-based regulation as output measurement, given some technical requirements (voltage control, frequency tolerance, power regulation)



From input-based to output-based regulation (the Italian approach 3/3)

INPUT-BASED

- *e.g.* Innovation
- **Metrics not yet fully available**
however, regulator's need for simple cost/benefit ratios, in order to avoid "lengthy proceedings"
- **Demonstration projects**
"real networks, real voltages, real currents, real bills"; selection indexes for identifying critical network areas
- **Incentive as extra-WACC**
+2% for 12 years on top of ordinary WACC for demonstration projects
- **Learning process**
monitoring performance and dissemination of results; evolution in output-based regul.

OUTPUT-BASED

- *e.g.* Quality of Supply
- **Reliable and fair metrics:**
key performance indicators that must be cleansed from out-of-control effects; enforceable guidance for data recording and auditing
- **Baseline**
(natural improvement trend): output based incentive related to additional improvements on top of natural improvement trend – 2-step approach
- **Output valuation**
value of outcome should be assessed taking into consideration both customers view and societal welfare (CEER 2011 report compares VoLL values)

The 2025 Bridge and its pillars

Green Paper: “Energy Regulation: A bridge to 2025”

Encompasses a broad range of issues

Gas
Wholesale
Markets

Electricity
Wholesale
Markets

Infra-
structure
Investment

Demand
Side &
DSOs

Retail
Markets

Launch on 29 April; Responses by 16 June; Conclusions September



EPRI Integrated Grid - Action Plan

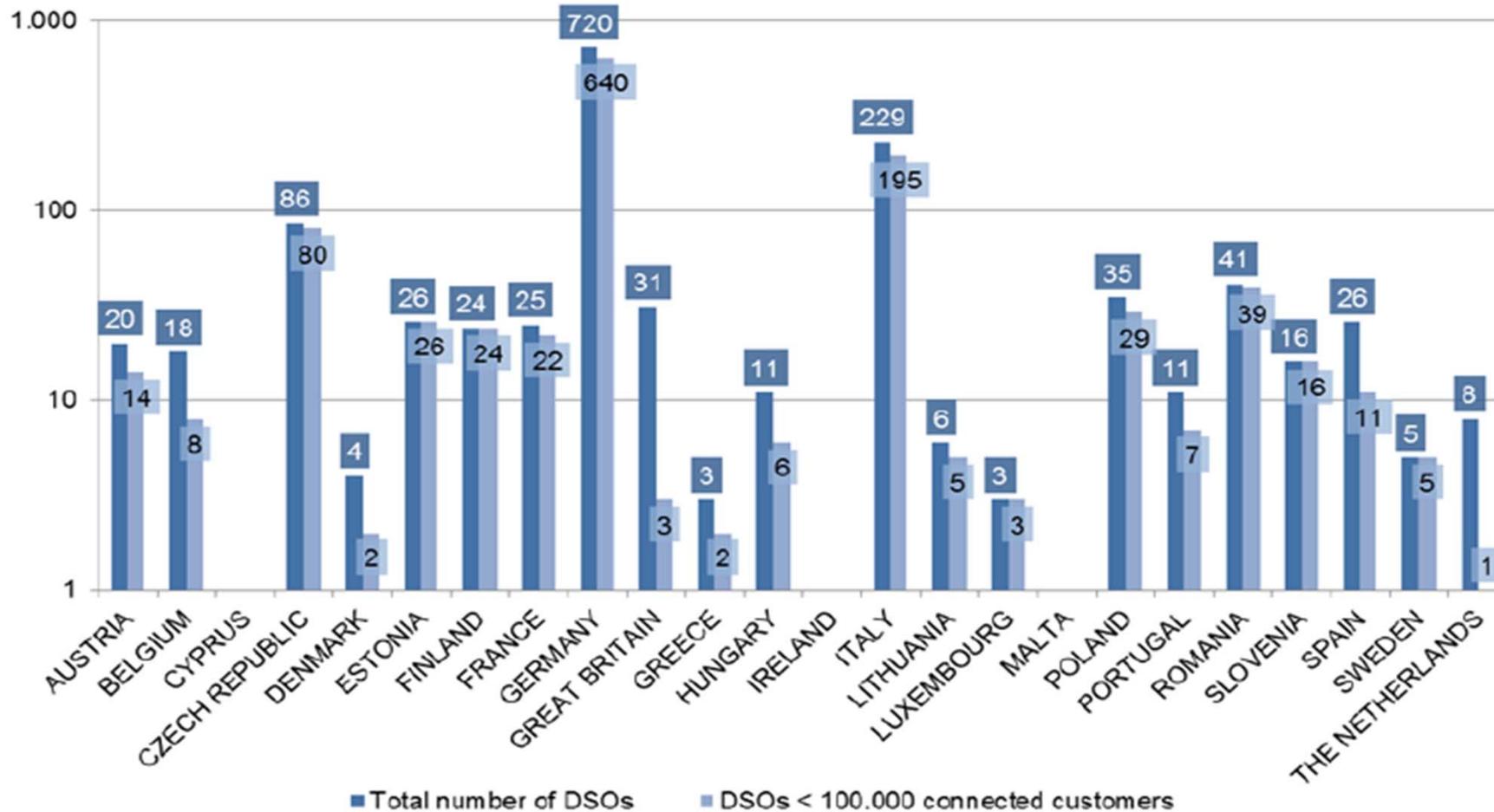
1. Interconnection Rules and Communications Technologies and Standards
2. Assessment and Deployment of Advanced Distribution and Reliability Technologies
3. Enabling Policy and Regulation
 - ▶ Capacity-related costs must become a distinct element of the cost of grid supplied electricity to ensure long-term system reliability
 - ▶ Power market rules that ensure long-term adequacy of both energy and capacity
 - ▶ Policy and regulatory framework to ensure costs incurred to transform to an integrated grid are allocated and recovered responsibly, efficiently, and equitably
 - ▶ New market frameworks using economics and engineering to equip investors and other stakeholders in assessing potential contributions of distributed resources to system capacity and energy costs





Gas DSOs in 24 EU Member States: size variations

No. of Gas DSOs (logarithmic scale)



Source: Status Review on the Transposition of Unbundling Requirements for DSOs and Closed Distribution System Operators. Ref.:C12-UR-47-03

