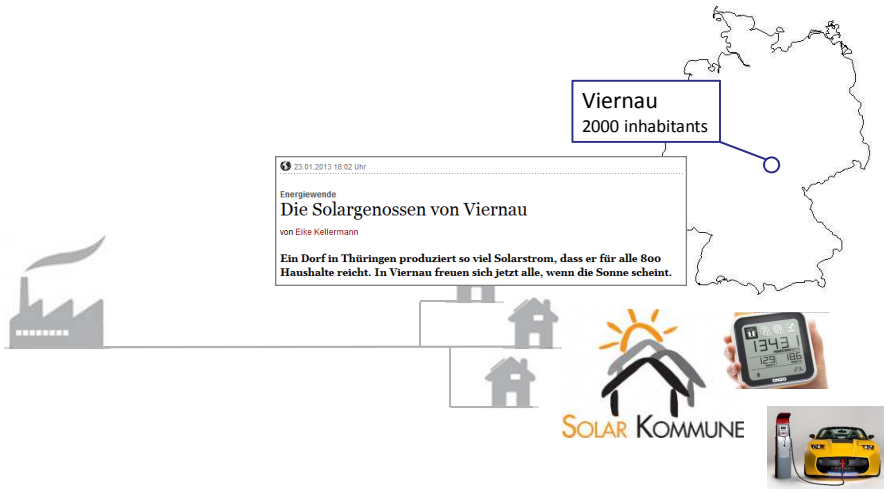
From distribution networks to smart distribution systems: Rethinking the regulation of European electricity DSOs

- Results of the THINK study -

Sophia Ruester
CEDEC Workshop on Smart Grids
Brussels, 6 November 2013



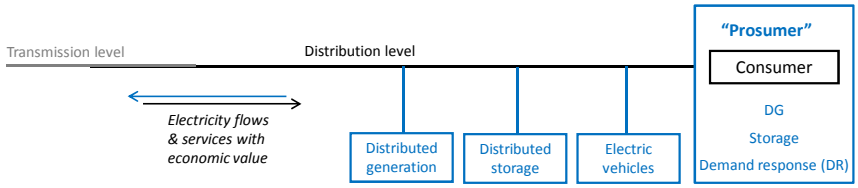
With smart distribution systems

- DSOs cannot continue to do “business-as-usual”
- Data volumes and the value of data will increase drastically

Background

Technological advances are reshaping today's electricity market

Advent of "distributed energy resources" (DER):



Challenges:

- Increased volatility of net demand
- Much variation and uncertainty of flows in D grid and at T interface (even reverse flows)
- Network architecture becoming more complex & expensive

Potentials:

- Diversity of services with economic value in local electricity markets
- DER may successfully compete with centralized generation
- New tools for system control by the DSO

3

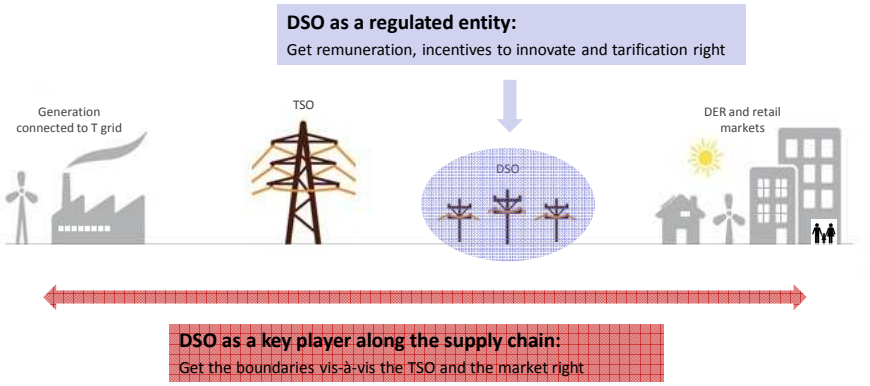
Background

Why this THINK report?

- In the light of these market developments and resulting challenges & potentials …
- … and to contribute to the current debate on DSO regulation (e.g. Smart Grid Task Force, London Forum, Eurelectric, EDSO, etc.)
- … we ask

1. **Why & where do we need to rethink the current regulation of DSOs?**
2. **How can the regulatory compact be adjusted to incentivize DSOs**
   - **… to effectively integrate DER into electricity markets?**
   - **… to effectively employ DER for their own purposes?**

Background
Whole spectrum of regulation to be reviewed



#1 – Adequate remuneration of DSOs
Revisit regulation

- Increasing amounts of DER require **substantial investments** to
  - Properly connect all new resources
  - Set up ICT infrastructure that empowers DSOs to employ DER for their daily grid operations
- Therefore, two **regulatory mandates**:
  - Account for increasing total costs of distribution (losses, grid reinforcement, etc.),
  - But at the same time also incentivize investments in active system management to cushion those costs

➢ A **sound regulation** that efficiently incentivizes DSOs to engage in active system management has to take account of:

a) Changing OPEX and CAPEX structures
b) The optimal choice among both
c) How to incentivize DSOs to deploy innovative solutions

#2 – Adequate distribution network tariffs
Revisit tariff design

- **No sound methodology** to design network charges for the different agents that may connect to the grid
- Moreover,
  - Business models might exploit existing ill-designed network tariffs
  - Absence of economic signals
  - Hidden subsidies
    (e.g. volumetric network charges combined with net metering; exemptions from grid tariffs)
- Grid users become complex, **sophisticated agents**
  - With very diverse consumption and/or production patterns
  - Able (and willing) to react to price signals

➢ A **sound grid tariff design** should be able to convey efficient economic signals
  - Any hidden subsidies should be removed and replaced by sufficient but direct subsidies that do not turn into inefficient signals
  - Tariffs should reflect the true costs (or benefits) of different types of load and generation for the system

#3 – DSO boundary vis-à-vis the TSO
DSOs become active system operators

- General responsibilities of network operators with respect to grid management do not change
  … but the set of tools available to perform the tasks is enriched by DER
- Some of the services DER can provide are relevant for either the TSO or the DSO
  … whereas others might be of interest for both types of network operators

➢ Regulation needs to guide DSO-TSO interactions, in particular in:

a) … TSO-DSO **coordination**
   - Hierarchy of decisions for system balancing
   - Protocol of DER committed for which operations, to whom, for which time-frame

b) … TSO-DSO **differentiation**
   - Via a careful product definition
     (Time of delivery, geographic scope, technical features)

#4 – DSO boundary vis-à-vis the market

Challenges

Basic DSO/DNO tasks

"Get basic **regulation of DSOs** right"

Commercial business models

"Get **markets & enabling regulation** right"

?

Different areas where there is no consensus about who should be responsible

DSO?

Third regulated party?

Commercial actors?

"Get **DSOs' roles, boundaries & responsibilities** right"

#4 – DSO boundary vis-à-vis the market

Three areas investigated in the report

Different models – regulated as well as liberalized – have been proposed:

Ownership/management of metering equipment

UK vs. DE vs. IT

Data handling

DSO vs. Central Data Hub vs. Data Access-Point Manager

Smart Grid Task Force EG3 (2013)

EV charging infrastructure

DSO vs. Charging Infrastructure Operator vs. Independent e-Mobility Provider

Eurelectric (2010)

All models have their **pros and cons:**

Doubts about non-discriminatory neutral market facilitation

Solving 'chicken-and-egg' problem // Possibility to socialize cost

Higher incentives to innovate

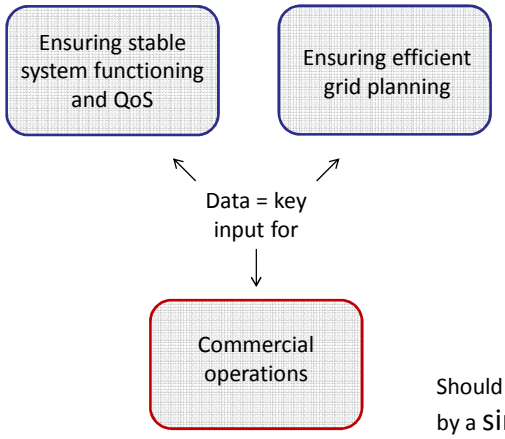
Higher trust from consumers

Difficulties related to implementation // extra regulatory efforts

Economies of scope/scale

#4 – DSO boundary vis-à-vis the market

Volumes – and value of – data increase



Aggregated data vs.
Personal data

While aggregated data is **enabling** the market…

… personal data is **driving** it!

Should data be managed and provided by a **single regulated entity**?

If yes, should this be the **DSO**?

#4 – DSO boundary vis-à-vis the market

Should new tasks become DSO activities?

[More detailed conclusions on the three individual areas in our report]

In general:

- Tasks may – or may not – be offered at lowest cost and in a more qualitative way by DSOs as compared to other third regulated or commercial agents
- Suitability of a certain model will depend on system-specific conditions
  [e.g. potential scale/scope economies, degree of uncertainty regarding best technological solutions, concerns with respect to possible market entry barriers, etc.]

➢ As system complexity increases, an insufficiently unbundled DSO could either stay with a restricted set of tasks…
  … or the DSO could expand its portfolio of activities, but accompanied with an increasing **level of unbundling**

➢ Mandate **minimum set of requirements on data handling**
  [How data are obtained, stored, made available and privacy is preserved – as far as possible independently of from data model]

Synergies between DSOs and ICT
Some thoughts

How to achieve cooperation and synergies between DSOs and ICT companies – while maintaining level-playing field in the market?

- "Joint venture" model?
  - Communication infrastructure for smart grids becoming part of smart grid infrastructure

    i.e. falling into regulated domain
  - ICT companies providing their expertise in building and operating this new infrastructure

    i.e. generating revenue outside the regulated domain
- Tasks of DSOs could be disaggregated into a set of services
  - Business approach shifting from "managing assets"

    to "managing a portfolio of services"?

Looking forward to your thoughts!

Contact: sophia.ruester@eui.eu