cerre Centre on Regulation in Europe

SMART CONSUMERS IN THE INTERNET OF ENERGY

FLEXIBILITY MARKETS & SERVICES FROM DISTRIBUTED ENERGY RESOURCES

EXECUTIVE SEMINAR
19 NOVEMBER 2019, BRUSSELS

cerre.eu

Improving network and digital industries regulation

INTRODUCTION

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PRESENTATION

Part 1: Opportunities

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The report

Main question:

In the Internet of Energy (IoE), can smart consumers, with access to distributed energy resources (DER) assets, contribute to the *value chain of the system flexibility?*

3 key objectives:

- Investigate the design of existing local energy markets and trading platforms, including incentives for consumers;
- Assess the role of TSOs and DSOs to develop efficient markets;
- Identify regulatory challenges that emerge from the transition.

Our approach:

- Analyse several case studies of innovative business models and regulatory arrangements where DER are actively involved.

1. The context

Legal framework:

The **Clean Energy Package** creates legal conditions for IoE development with consumers, producers and system operators trading DER.

Market trends:

- An increased amount of weather-dependent power supply
- Growing number of distributed energy resources

➡ *Which role for smart consumers?*

2. Determinants of “smart” demand

Empirical evidence from the literature and pilot experiments

Consumers adjust their demand:

- according to prices (*monetary incentives*);
- if/when receiving real-time information (*search costs*);
- and due to growing awareness and environmental concerns (*social norms*).

Current issue

- Uncertainty about monetary value of flexibility services to the consumers and role of non-monetary drivers.

➡ *Will smart consumers with access to DER be more responsive to market signals?*

3. New players & services

A **well-functioning market** with smart consumers:

- Correct compensation for value provided to the system, direct and indirect effects on other players;
- Technology support and simpler processes to go beyond implicit demand response (by traditional retailers);
- Fair charging for vulnerable consumers embedded in centralised system.

Key trading models:

- Prosumers;
- peer-to-peer;
- community energy.

Microgrids & trading platforms

- **Lack of regulatory guidance** limits development of local markets (participation in markets, ownership and partnerships, licensing).
- Should they be considered as **'utilities'** and subject to regulation?
- They adopt **a variety of business models** and target different revenue streams.
- Traditional utilities in the US see microgrids as **a way of offering new services**.
- Concerns about **limitations of blockchain technology** in energy context.


CNN BUSINESS

Clean energy trading through blockchain

Since bitcoin, the concept of blockchain has taken the world by storm. A New York start-up is now leveraging this technology in the energy sector.

Source: CNN Business

Community energy

- At local level it can have tasks of DSO and retailer/aggregator. It can create **synergies** between local systems.
- Defined, supported, monitored and regulated in different ways reflecting the **variety of emerging projects. Difficult to compare.**

- Driven by **financial motives** but also **preference for green/local, autonomy and democratisation, social capital creation.**
- **Main challenges:** market access, financial viability (including eligibility for govt. support schemes and cost of connection), achieving efficient size of assets and complex legal processes.

Issues emerging from case studies

- **BMG microgrid (US):** regulatory challenges re: authorisation for marketplace to go live and seeking new business model for services to the grid.
- **De Ceuvel microgrid (NL):** circular, resource-based economy project, tokens to reflect 'utilitarian value' of electricity → requires adherence to community value system.
- **Bannister House (UK):** based on innovative technology (VHH), limited number of buildings involved and communal ownership of batteries (replicable or scalable?)

Lessons learned (1/2)

- Existing projects (microgrids and energy communities) reveal different levels of success and **different success factors**, but comparisons are problematic due to **limited data**.
- Not clear whether the new systems can offer **sufficient financial benefits** to consumers. If not, non-price factors (localism, environmental preferences, altruism) will drive participation.
- Energy communities might benefit from **private sector participation** to achieve efficient scale but this may require changes in regulation and may conflict with democratisation and independence objectives.

Lessons learned (2/2)

- Need for regulatory guidance on role of new actors and nature of interactions with DSOs/TSOs (potential barrier to market development). **Externalities** at local and national level arising from new actors/activities need to be addressed to ensure fair competitive conditions and efficiency.

- **Distributional/welfare issues** require consideration but might be addressed through reform of the tariff regime.

REACTION FROM THE EUROPEAN COMMISSION

Manuel Sánchez-Jiménez

Team Leader, 'Smart Grids'

DG ENER, European Commission

OPPORTUNITIES OF THE INTERNET OF ENERGY: SMART CONSUMERS & BUSINESS MODELS

Panel Discussion

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PRESENTATION

Part 2: Challenges

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Organising localised market
3 questions

1. Who should take the role of market facilitator at the local level?

2. How should network tariffs be set?

3. How should DSOs be regulated?

1. The role of DSOs

New tasks at localised distribution level:

- **Running the wires**: investment and maintenance of network;
- Providing **market access:** enable DER to participate in all energy markets / dispatch of DER;
- Managing **local congestion;**
- **(Local) balancing** of markets;
- Forecasting **DER** production/consumption;
- Owning and operating **energy storage** facilities (with some exceptions).

Current DSO task

New tasks

In the EU, left to market players

➢ **Need for a neutral market facilitator**

Looking at different proposals

Who will be the neutral market facilitator?

- The DSO or the TSO? Both? Others (third party)?

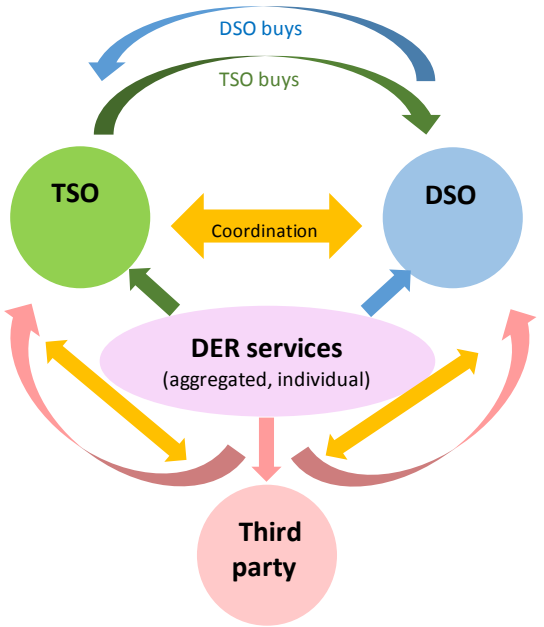
Country/state level proposals for DSO-TSO interactions are emerging (2018):

- UK (5 Worlds), Australia (4 options);
- In New York: DSP (already ruled for 6 larger IOUs, 2014).

Others evaluate to split tasks at different levels:

- EU (3 TSO-DSO options for congestion management & system balancing).

Fig. 1: Example of different arrangements



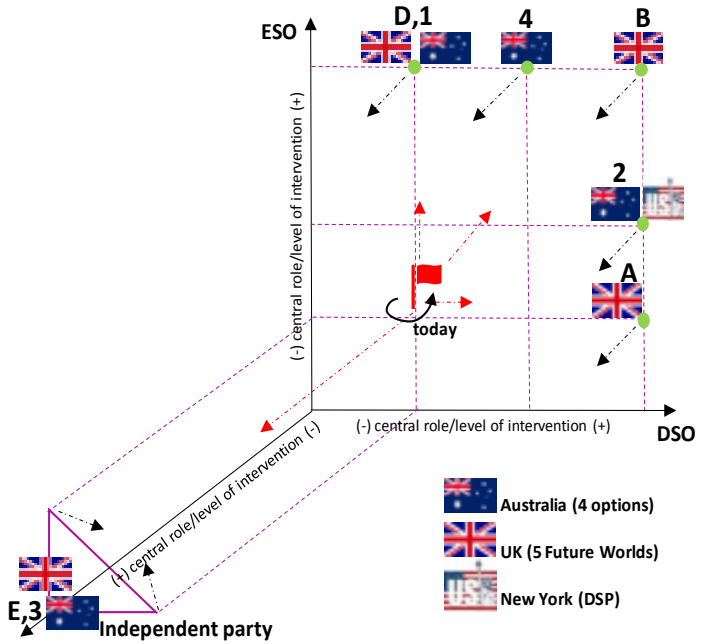
Note: this is a simplified approach. Flexibility services can be also provided by (1) customers (load) with or without aggregation and (2) local energy systems (LES).

The DSO as a neutral market facilitator? (1/2)

Looking for the best option

- Some similarities among the case studies, but without a preferred approach yet (except in NY):
  - DSO (buys), TSO (buys), DSO-TSO (buy), independent party: iDSO (buys);
  - Single or double-entry to the market.
- Level of coordination, intervention and complexity depends on the option:
  - World E/option 3 the most decentralised but the most expensive with complex interfaces.
- CBA may help to identify the best option(s) but uncertainty remains large:
  - UK (Baringa, 2019), Australia (forthcoming).

Fig. 2: Summary of DSO-TSO coordination/interaction initiatives (Australia, UK, New York)



The DSO as a neutral market facilitator? (2/2)

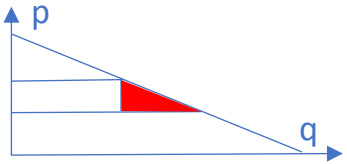
Looking for the best option (cont.):

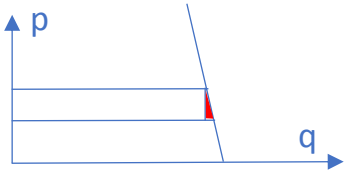
- Depends on the **regulatory environment, market structure and needs;**
- A **common framework for all DSOs may not be the most appropriate option (initially),** i.e. Germany with +800 DSOs;
- The option of a **regional independent party** (i.e. iDSO) **may work in places with a large number of DSOs** (grouping the smaller ones);
- **Conflict of interest may occur** if DSOs are not subject to unbundling rules (some restrictions are observed: NY, CA);
- **Level of DSO/TSO intervention** (regardless of the World/Option) **to decrease over time** (more sophisticated technologies and markets);
- **Hybrid model (DSO/TSO) might be workable in the short run:**
  - does not require market structure intervention;
  - but higher level of DSO/TSO coordination is needed;
  - and also harmonisation of services/products.

2. Tariff structure (1/2)

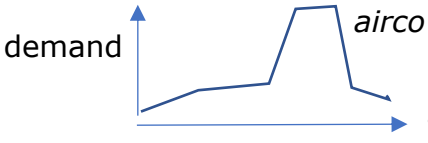
Observations

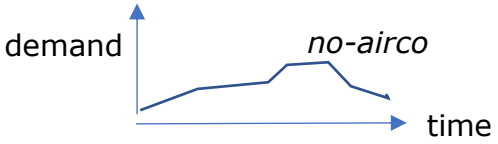
- Demand becomes more elastic → more important to set correct tariffs





- Consumers differ more → not possible price on a "profile"





- Current regulation shifts costs from rich households to poor households

Current tariff structure is not viable in the long run!

2. Tariff structure (2/2)

Align tariffs to network costs

Short run:

- Increase capacity tariff and reduce energy component
- Abolish net metering

Long run:

Smart meters will provide opportunities

- Time-of-use pricing
- Tariff for demand during system peak hour
- Localised Marginal Prices (depending on local congestion)

3. Regulation of DSOs (1/3)

Challenges

- Many new tasks for DSOs (see above)
- Not all tasks are well described
  (e.g. providing market access, creating a competitive DER market)
- Market is continuously changing (innovation both within network and on the edges)
- Trade-off between grid investments and operation (buying ancillary services)
- Collaboration with TSOs is needed
- DSOs need to acquire new skills

3. Regulation of DSOs (2/3)

Regulatory options

1. **Strong incentive regulation of DSO**

   Steer on output, not input:

   - Allows for flexibility and innovation;
   - Regulate on total costs (trade-off between Capex and Opex);
   - Explicitly reward for cooperation with TSO;

3. Regulation of DSOs (3/3)

Regulatory options (cont.)

2. More comprehensive cost plus regulation of DSO:

- regulator defines standardised products and markets;
- innovation on the edges;
- less innovation within the DSO, so create regulatory sandboxes to allow for innovation.

3. Shift tasks of DSO to TSO and keep regulation unchanged:

- local synergies between network investment and operation disappear;
- DSO might have to be better informed about local conditions.

But:

- coordination between low and high voltage level is improved;
- and TSO might already have know-how.

Remaining challenges at local level

Need for neutral market facilitator

- **Task allocation and coordination** between DSO and TSO
- **Cost recovery, tariffs:**
  - Incentives for business and consumers
  - Distributional concerns: allocation of costs and benefits
- **Smart regulation**
  - Providing incentives for innovation and cooperation
  - Learning from other member states: Best practice

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Challenges of the Internet of Energy: regulation & market structure

Panel Discussion

CONCLUSIONS

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