Unleashing the potential of flexibilities in the whole network

ENTSO-E Vision 2030 Webinar, 13 October 2020





Welcome

Laurent Schmitt

ENTSO-E Secretary-General





Webinar rules

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- Speakers or Panellists will be asked to switch video and audio OFF when not talking

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- Chat and raise the hand feature will not be used

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Introduction

Michael Jesberger

Chair of ENTSO-E Steering Group Transmission & Distribution Interface





Agenda

| # | Agenda points | Time | Speakers |
|----|--|--------|--|
| 1. | Welcome & introduction | 10 min | Michael Jesberger, Chair of ENTSO-E Steering Group Transmission & Distribution Interface |
| 2. | An overview of ENTSO-E Vision 2030 | 15 min | Damian Cortinas, Project Leader ENTSO-E Vision 2030 |
| 3. | Future energy systems: Access to distributed flexibility | 15 min | Anne Sofie Risnes, Head of Department, Statnett |
| 4. | The role of innovation: Identify and scale up best practices | 15 min | Christos Dikaiakos, Convenor of ENTSO-E WG Flexibility & Market |
| 5. | A DSO's perspective on the future Transmission & Distribution Interface | 15 min | Paddy Hayes, Co-Chair of the TSO-DSO platform, E.DSO |
| 6. | A consumers' perspective on their role in future electricity grids | 15 min | Jaume Loffredo, Energy Policy Officer, BEUC |
| 7. | Discussion with all participants | 30 min | Moderated by Robert Paprocki, Vice-Chair of ENTSO-E Steering Group Transmission & Distribution Interface |
| 8. | Conclusion | 5 min | Michael Jesberger, Chair of ENTSO-E Steering Group Transmission & Distribution Interface |

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Transition in European Energy System





Transmission and Distribution Interface



An overview of ENTSO-E Vision 2030

Damian Cortinas

Project Leader ENTSO-E Vision 2030 (RTE)





A Vision reconciling political objectives and technical reality



Key drivers and major trends in the power system towards 2030

- Distributed flexibilities with close TSO & DSO cooperation
- **Power Electronics** towards hybrid AC / DC systems
- Markets and Physics seamlessly integrated
- Wind generation and interconnections in the seas, Offshore Grids
- Energy Systems Integration, beyond power
- Mastering operational challenges resilience, forecast, automation, artificial intelligence





A true System of Interconnected Systems

For the benefit of all European consumers





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Building a 'System of Systems'



- Geographical scales
- Multilateral interfaces
- Interoperability
- System operators = key facilitators
- Governance involving stakeholders
- Putting consumers at the heart of the Energy Transition



2030 towards 2050: the rise of renewables

RES share reaches 82% in Distributed Energy by 2050

20.000 100% 20.000 **Distributed Energy** 18.000 90% 18.000 16.000 80% 16.000 14.000 70% 14.000 80% %00 share in %00 2000 N 10.000 M 8.000 60% S12.000 N 10.000 M 8.000 RES 40% 6.000 30% 6.000 4.000 20% 4.000 2.000 10% 2.000 0% 2015 2020 2025 2030 2035 2040 2045 2050 2020 2015 2025 Nuclear energy Solids Nuclear energy Oil (including refinery gas) Natural gas Oil (including refinery gas) Imports for methane demand (decarbonised) Imports for hydrogen demand (decarbonised) Biomass/ BioLiquids/Waste Hydro (pumping excluded) Biomass/ BioLiquids/Waste Wind (Including P2X) Solar (including P2X)

RES share reaches 69 % in Global Ambition by 2050



According to national scenarios, at least 50% of all new RES will be connected to the distribution networks

Increase in distributed resources and unlocking 'distributed flexibilities' to deliver new services: TSO/DSO cooperation is key





- Number of Heat Pumps and Hybrid Heat Pumps
- At least 50% of all new RES will be connected to the distribution networks
- > As well as Storage, Electric Vehicles, Heat-pumps
- > TSO/DSO coordination is more and more relevant

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Evolving flexibility providers over the entire value chain

Figure 2 New flexibility options across the power sector unlocked by innovation



One System of Systems: Access to distributed flexibilities

Distributed resources impact the whole grid and system

- Increasing amount of distributed resources, as well as new actors
- The meaning of cooperation :
 - Transmission and distribution,
 - Coordination between European, National and Local levels

Enhancing and valuing the flexibility potential: new products and services

How to procure these services?

How to maximise value for active customers in the whole system?



Future energy systems: Access to distributed flexibility

Anne Sofie Risnes

Head of Department, Statnett





Changes in our energy system – assumes coordination between voltage levels and markets



Enhancing and valuing the flexibility potential: new products and services

Distributed resources raise challenges to the grid and the system....

...But can also provide new services to the System Operators

Flexibility services should be enhanced and valued

- Needs from system operation and grid management should be defined and shared (like for balancing)
- > Products definition to be established in dialogue with stakeholders
- Rules to access these services should be established and transparent

Cooperation schemes between TSOs and DSOs is key in the process

- > The same resource may be used by both actors
- > Definition and interoperability of market processes, data exchange

How to procure these services: 1) A process for congestion management



How to procure these services: 2) Prequalification

Product pre-qualification: checking whether the unit can (technically) deliver the product it wants to sell/deliver (currently described in SO GL).

Grid pre-qualification: whether the unit(s) connected to the grid can realise the product delivery, considering the technical characteristics of the unit and the capabilities of the grid.

- > **Dynamic:** the pre-qualification can change over time.
- > Conditional: the pre-qualification is depending on certain conditions to be met.

The pre-qualification process should be user friendly, striving to minimise the different steps and standardise them when possible.

How to procure these services: 3) Coordination between market processes



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Active customers: DSR development

> DSR development increasing, from industry to household level, also through aggregation

- > DSR can be used to reduce peak demand and avoid some grid investments
- > DSR can be used for active power:
 - Congestion management for TSO or DSO
 - Balancing for TSO
- > Locational information is key and a minimum granularity is needed for an aggregated pool
 - > To be studied in dialogue with stakeholders (especially aggregators)
- Proper metering is of importance



Conclusion : One System

ENTSO-E vision for 2030:

- > We should look at the energy system at large: integrated system approach
- > We should serve customers and society, in a proactive way: value flexibility

Cooperation with DSOs

- Access to the same resources
- Share data and visibility/observability

What to aim for

- > Common vision, embracing DSOs as well as other actors
- > Different possible models for national implementation (European diversity)
- Integrated system approach, both horizontally (cross-border) and vertically (from homes to cities to regions)
- > Using local scale opportunities, while framing them in the global system

The role of innovation: Identify and scale up best practices

Christos Dikaiakos

Convenor of ENTSO-E WG Flexibility & Markets





Mapping of R&D projects on flexibility

- 66 research projects on flexibility consisting of 105 demonstrations and use cases
- Mapped in the **flexibility framework** and **clustered into flexibility solutions**
- Based on this mapping, WG3 will conduct an analysis of what the R&D needs are, and suggested R&D priorities for TSOs in Europe
- Most of the research mapped address: technical solutions (e.g. battery storage) or market incentives and valorisation of flexibility
- Some research on variable prices and information-based instruments
- Little research mapped on regulation- or agreement-based instruments
 - This may be due to omitted projects in the mapping, a lack of research, etc.



General framework for power system flexibility





Mapping Background statistics



50-200 M

Unknown

10

5

0

0-10 M

10-50 M



Funding



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Distribution of use cases



- Controllable generation
- Variable generation
- Small loads
- EV charging
- Large loads
- Battery storage
- Supercapacitors
- Mechanical storage
- Chemical storage
- Thermal storage



- Instruments
- Market-based
- Price-based
- Information-based
- Agreement-based
- Rule-based



- Adequacy
- Congestion management
- Frequency balancing
- Voltage stability
- Reliability of supply



Mapping research on flexibility solutions – technical



TRL 1 (building competence)

TRL 8-9 (implementation)

Mapping research on flexibility solutions – market



TRL 1 (building competence)

TRL 2-3 (research)

TRL 4-5 (development)

TRL 6-7 (demonstration) TRL 8-9 (implementation)

Focus: Congestion management products (State of research)

Share of Bridge H2020 projects providing services for TSOs/DSOs Source: Bridge report TSO-DSO coordination, 2020





Research intensity: high

Many RDI projects are developing new CM products for both TSOs and DSOs; real life applications also tackle this point.

Lessons learnt:

The level of maturity for technical specifications definition differs from one project to another. There is still a discussion whether

- A) products should be standardized (and how) or
- B) whether flexibility providers should be allowed more freedom in characterizing their offers using a wide range of technical and financial parameters.

The detailed design for products providing congestion management services should take into account the link with products developed for balancing services, the role of both active and reactive power, the implications for the coordination between system operators.

Noticeable projects:

- A) CoordiNet (see next slide), Piclo Flex, Enera, Gopacs, Interflex
- B) Nodes



Focus: Congestion management products (CoordiNet)

Concept

Two products are defined 1) a reserved product (capacitybased) procured at certain availability price and 2) nonreserved product (energy-based) procured at an energy price, most likely close to delivery

| Attribute | Reserved | Non-reserved |
|----------------------|----------------------|----------------------|
| Preparation period | Specific for FSPs* | Specific for FSPs |
| Ramping period | Specific for FSPs | Specific for FSPs |
| Full activation time | Specific for FSPs | Specific for FSPs |
| Min quantity | 0.1 MW or 1MW | 0.1 MW or 1MW |
| Max quantity | N.A. | N.A. |
| Deactivation period | Specific for FSPs | Specific for FSPs |
| Granularity | 0.1 or 0.01MW | 0.1 or 0.01MW |
| Min delivery period | Specific for FSPs | Specific for FSPs |
| Max delivery period | Specific for FSPs | Specific for FSPs |
| Mode of activation | Manual | Manual |
| Availability price | Yes | No |
| Activation price | Possible | Yes |
| Divisibility | Both | Both |
| Location | Included in the bid | Included in the bid |
| Recovery period | Specific for FSPs | Specific for FSPs |
| Aggregation allowed | Yes | Yes |
| Symmetric/Asymmetric | No symmetry required | No symmetry required |

Benefits/relevance

- Development of a separate congestion market for DSO (and TSO)
- Integration with the existing markets (day-ahead, intraday and/or balancing)
- Scalability. General requirements are applicable in different EU countries (specific info need to be specified for each TSO/DSO)



* Specific requirements for each TSO/DSO

RDI analysis: Flexibility resources register (State of research)

The Flexibility Resources Register allows TSOs and DSOs to have visibility on which flexibility resources are connected to their grids, so they know what resources are available to them at all voltage levels. Features can also ensure that the use of flexibility does not jeopardise system stability or doesn't create local challenges through the implementation of a traffic light concept.



Research intensity: moderate

The concept is used in several RDI projects but also implemented in real-life applications

Lessons learnt:

Compatible with implementation of KORRR requirements, different functionalities and organizational models are possible (from basic functionalities for sharing static data to advanced ones tackling real time data, bids activation, settlement etc..), creation of new roles might be necessary (e.g. flexibility data manager to perform quality checks and monitoring control e.g. on baseline calculation)

Noticeable projects:

RecorDER (UK), Synergrid (BE), Elia demo for a blockchain-based solution for residential scale resources (BE), Interrface (Baltic demo), GOPACS (NL), EU-SysflexFlexidao...



RDI analysis: Flexibility resources register (Focus on Interrface)

Concept



Figure 32: Flexibility register concept proposal

 An envisaged service that may serve network reinforcement deferral, network support during construction and planned maintenance, where location specific flexibility assets are being activated for shaving or shifting peak demand and production in order to compensate for the lack of network connections, loads or production

Benefits/relevance

- Develop regional flexibility solutions for power markets
- Develop technical procedures to manage grid and system limitations via the aggregated control of consumption and / or generation
- The platform will provide strong assistance for developing the electricity market and increase market liquidity Implement complete and qualified system
- Coordination on CM and on Balancing as well as coordination on bid grid prequalification
- Scalability and replicability
- Maturity
- Clear design
- Direct activation and coordination mechanisms between TSO-DSO to ensure flexibility bids won't cause congestion in TSO/DSO grid.



A DSO's perspective on the future Transmission & Distribution Interface

Paddy Hayes

Co-Chair of the TSO-DSO platform, E.DSO





A DSO's perspective on the future Transmission & Distribution Interface

Paddy Hayes, Co – Chair of the Transmission-Distribution Platform

ENTSO-E webinar "Unleashing the potential of flexibilities in the whole network"

October 13th 2020









Increasing volumes of distributed energy resources directly connected to distribution systems: potential for whole system flexibility

The changes of the energy system are evident:

- From Fossil to Renewable
- From centralised to distributed and flexible electricity generation
- From Analog to Digital

Changes **enhance the role of DSOs** in EU-system:

- DSOs as integrator of renewables (>90 % DSO-grid)
- DSOs management of increased volatility (grid stability)
- Distribution as the conduit for flexibility
- Increased relevance of **network codes** for DSOs

Holistic DSO-TSO network-planning and



1. "Decarbonisation Pathways," Eurelectric, www.eurelectric.org/decarbonisation-pathways/_accessed 11 January 2018.

2. "Impact assessment support study on: Policies for DSOs, distribution tariffs and data handling," European Commission, ec.europa.eu/energy/sites/ener/files/documents/ce_wa_dso_final_report_vf.pdf, accessed 7 January 2019., accessed 18 January 2018

cooperation increasingly important Distribution and Transmission Systems are central in the energy transition

The role of system operation in the power system - from pipe(s) to platform(s)





- We are responsible for managing the integration of volatile and decentralised renewable generation, increased low carbon demand and flexibility services.
- The large diversity of DSOs and local situations mean that not all need to operate in a " one size fits all" future model.
- However, all DSOs are responsible for connecting more than 90% of customers and ever growing number of local renewable generators in a fast-changing, more decentralised, distributed and digital energy world.
- And all DSOs are evolving to manage the additional complexity and changing power flows in the distribution networks and to ensure that flexibility services can be encouraged and harnessed – for the benefit of the overall system – both distribution and transmission!

DSO and TSO cooperation & collaboration to unleash the potential of flexibility



"DSOs and TSOs shall cooperate with each other in planning and operating their networks. [...] DSOs and TSOs shall cooperate with each other in order to achieve coordinated access to resources such as distributed generation, energy storage or demand response [...]" Article 57 of the Electricity Regulation 2019/943

TSOs and DSOs: compatible systems approach to unveil the flexibility potential



Thoughtful frameworks for Transmission-Distribution interfaces to optimise the potential of distributed flexibility for the whole network

• DSOs acknowledge the importance to enhance the TSO-DSO cooperation and to create a proper framework for data exchange with TSOs to ensure efficient interaction with market parties.



TSO-DSO "Data management report" (2016) ENTSO-E, CEDEC, E.DSO, Eurelectric and GEODE

DSO "Flexibility report " (2018) CEDEC, E.DSO, Eurelectric and GEODE

TSO-DSO "ASM report" (2019) ENTSO-E, CEDEC, E.DSO, Eurelectric and GEODE

EC Task Force EG3

To ensure constructive outcomes when invoking balancing and/or congestion management actions on a system level, TSOs and DSOs have developed three models of interaction (ASM report).

"The different options for market models, coordination and platforms give a European framework, which is recommended to be the basis for the Member States to discuss and implement the best solution.

Irrespective of the options chosen, system operators should always exchange all the relevant information from their grid and the relevant connected assets, from structural data (potential flexibility services and their characteristics) to more dynamic data (forecast and activation of bids): this is needed to allow efficient flexibility procurement without creating issues on the grid." (ASM report)



Increasing volumes of distributed energy resources directly connected to distribution systems: potential for whole system flexibility

Things are changing very quickly at the grid edge.

Distribution system operators are evolving rapidly to optimise this.

There is a strong foundation of cooperative work between transmission and distribution.

Working together on frameworks for distributed flexibilities will optimise the benefit of distribution connected resources for the whole system – both distribution and transmission.

Its critical for the clean energy transition.



1. "Decarbonisation Pathways," Eurelectric, www.eurelectric.org/decarbonisation-pathways/_accessed 11 January 2018.

2. "Impact assessment support study on: Policies for DSOs, distribution tariffs and data handling," European Commission, ec.europa.eu/energy/sites/ener/files/documents/ce_wa_dso_final_report_vf.pdf, accessed 7 January 2019., accessed 18 January 2018

Distribution and Transmission Systems are central in the energy transition

A consumer's perspective on their role in future electricity grids

Jaume Loffredo

Energy Policy Officer, BEUC





BEUC The European Consumer Organisation

The Consumer Voice in Europe

A consumer's perspective on their role in future electricity grids. Enablers for demand-side flexibility and prosumers

Jaume Loffredo, Energy Policy Officer, BEUC



BEUC The European BEUC IS PROUD OF ITS MEMBERS













FLEXIBLE PRODUCTS SHOULD BE FIT FOR CONSUMERS' NEEDS



REMUNERATION

CONTROL

PROTECTION



ACTIVATE FLEXIBILITIES TAKING A CONSUMER CENTRIC APPROACH

| Assess | impact on consumers and energy system |
|------------|---------------------------------------|
| | |
| Remunerate | consumers adequately |
| | |
| Allow | consumers to choose |
| | |
| Design | clear and simple charges |
| | |



INCREASED TRANSPARENCY AND OVERSIGHT ARE NEEDED

| Monitor | impacts on consumers |
|---------|---|
| | |
| Inform | consumers of changes |
| | |
| Ensure | oversight, enforcement, consumer protection |
| | |
| Share | information on grid reinforcement costs with regulators |
| | |
| Involve | consumer organisations in the decision-making process |
| | |

IF YOU ARE NOT SURE WHO TO REACH OUT TO...



Discussion with all participants

Robert Paprocki

Vice-Chair of ENTSO-E Steering Group Transmission & Distribution Interface





Open floor to Questions & Answers

For questions and comments use Sli.do (www.sli.do)
Don't forget to add your name and title to your question





Conclusions

Michael Jesberger

Chair of ENTSO-E Steering Group Transmission & Distribution Interface





Inside the Vision – Join us for the next webinars!



Tomorrow

AC/DC networks & operational challenges (14 October/10-12 CET) Putting all the pieces together: a system of systems for the future (14 October/14-16 CET)