



**THEMA**  
CONSULTING GROUP

EXECUTIVE SUMMARY

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# DATA EXCHANGE IN ELECTRIC POWER SYSTEMS: European State of Play and Perspectives

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THEMA Report 2017-03

# EXECUTIVE SUMMARY

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## **Smart grids and innovative markets require extensive data exchange**

The European electricity sector is currently undergoing a major transformation via the growth of distributed generation, renewables and storage, which makes its operation more complex to optimise. Digitalisation is a key driver for allowing active system management in the electricity grid, enabling Transmission System Operators and Distribution System Operators (TSOs and DSOs) to optimise the use of distributed resources for ensuring a cost-effective and secure supply of electricity for all customers. Digitalisation is also making it possible for end-users to become active market participants with their self-generation and demand flexibility. It will create a drive for innovation with respect to new services, technical solutions, products and markets. The electricity grid, together with an efficient data exchange infrastructure, is a major factor underlying European energy transition and the European economy.

While the transformation offers many new opportunities for all stakeholders, the operation of the electricity system becomes more complicated both at the transmission and distribution levels. The amount of available information is growing exponentially, and cooperation and coordination between TSOs and DSOs will be critical for meeting the requirements of all stakeholders. Consequently, the need for coordination between TSOs and DSOs with respect to the grid increases, and this is also the case across national borders. The traditional divide between wholesale and retail markets becomes largely obsolete as even smaller customers can

participate not only in the spot markets, but also in the balancing markets to provide ancillary services to the European electricity system, either directly or via aggregators. As the overall system is increasingly necessitating distributed flexibility, it grants the retail market a new cross-border dimension. The draft legislation on Clean Energy for All Europeans takes into account this change. Indeed, it seeks to further enhance the role of the customer, and acknowledges the increasing part played by TSOs and DSOs. In short, TSO and DSO coordination will be a cornerstone of energy transition and the active customer paradigm.

# Data exchange platforms are a tool for improving coordination and market functionality

In the building of an efficient integrated European electricity market, information exchange and data management are becoming more connected. Increased information access and exchange not only leads to substantial efficiency gains in grid operation and planning, but also lowers market access barriers, ensures transparency in consumers' usage and creates new market opportunities (e.g., energy services companies). Efficient data exchange is also necessary for achieving a seamless integration between wholesale and retail markets.

Data exchange platforms (DEPs), also called data hubs, seek to improve data exchange processes between the different parties connected to the electricity system and market. The upcoming

use of DEPs and their functionalities are subject to different regimes and practices throughout Europe. Furthermore, several recent studies and reports have covered the development of DEPs primarily from a retail market perspective. This has also been the focus of several of the DEP projects that have been implemented or planned to date, however, there are certain examples serving both retail and wholesale markets, such as in Denmark and Estonia. The range of possible benefits from DEPs clearly goes beyond the retail market and the DSO level. DEPs that take a wider system perspective and facilitate innovation through stimulating the development of third-party applications (for example, in the Estonian DEP) can be said to constitute the state-of-the-art with regards to data exchange in the European context.

## Data exchange rising on the policy agenda

In parallel with the development of DEPs, regulatory agencies, TSOs, DSOs and utilities are placing data exchange at the top of their agendas. Reports that highlight the role of data exchange in a broader context are **“The power sector goes digital – Next generation data management for energy consumers”** by Eurelectric, **“My Energy Data”** by the European Smart Grids Task Force and the **“TSO-DSO Data Management Report”** by CEDEC, EDSO, ENTSO-E, Eurelectric and Geode. The Eurelectric report **“The power sector goes digital”** contains a classification of data which is also the basis for our report. The latter offers a common ground for high-level principles of data management. Furthermore, the Council of European Energy Regulators (CEER) has recently published **“A Review of Current and Future Data Management Models”**, which includes recommendations on good data management and a status report from eight countries. The International

Energy Agency (IEA) is also taking on a role by establishing an Implementing Agreement for a Co-operative Programme on Smart Grids (ISGAN), designed to advance the development and deployment of smarter electric grid technologies, practices and systems.

In this context, one should also note the recent Communication by the European Commission on the Data Economy. The Communication notes the benefits of the free flow of data and data access to the economy, citing that already, today, the data economy accounts for 1.87% of EU GDP. At the same time, the need for strong privacy protection is underscored. The relevance of big data for promoting competition and efficiency is also recognised in recent reports, for instance by CERRE in **“Big Data and Competition Policy”**. It is important to link data exchange in power system issues to the broader data economy discussion at the European level.

# Objectives of the report: Data needs, state of play and development potential for Data Exchange Platforms

The present report's objective is to provide an overview of the state-of-the-art in terms of how EU Member States are currently organising their data exchange as well as perspectives and solutions for their data exchange. Using the TSO-DSO Data Management Report as a starting point, ENTSO-E has requested THEMA to answer the following questions:

1. What are the data requirements of different stakeholders in the electricity sector, both in the transmission and distribution grid and in various markets for energy and other services?
2. What is the status regarding the development of DEPs in European electricity markets?
3. How can DEPs be developed in the short- and long-term to meet the needs of the different stakeholders and EU energy policy objectives?

The stakeholders addressed by this analysis include customers in the grid, TSOs, DSOs, retailers, regulators and various third parties in order to supply a broad perspective on DEPs and explore possibilities surrounding the role played by such platforms. The analysis is concentrated on the functionalities and contents of DEPs. Regulatory drivers for data requirements are also covered.

## All stakeholders face an increased need for high-quality data in large volumes and with minimal delay

The shift from conventional to distributed renewable generation, the liberalisation of energy markets and the digitalisation of the system are paradigm shifts that entail significant changes in processes at all stages of the electricity value chain, from generation and operation of the grid to market functioning and consumption. All business processes are generating an increasing amount of data, which are becoming critical to efficient system functioning and a smart electricity market. Data exchange is also a prerequisite for a closer integration of retail and wholesale markets, especially with new actors, for demand-side response and aggregation, who need a sustainable business model to develop.

For the **consumers**, access to and control over metering data is necessary for understanding their own electricity demand, be active in the market and choose between suppliers and contracts. Data access will also enable consumer participation in demand response and the use of home automation services. In addition, it will be vital for the development of new entrants providing flexibility services, such as aggregators.

On the **retail** side, the advent of independent suppliers has significantly increased the interfaces for retail processes, such as exchange of metering values, supplier switching or contract cancellations. Each supplier must interact with each DSO, and establishing these communication links presents a market entry barrier

for new actors. Data quality and reliability of processes tend to vary widely between different metering responsible parties. This situation has motivated an increasing number of countries to introduce central DEPs.

For **TSOs**, the balancing of the system can be more efficient, but also more complex, with access to flexible resources at all grid levels. The new role of flexibility also impacts short- and long-term grid planning. Similar challenges are faced by DSOs regarding congestion management within their respective grids.

**Balance-responsible** parties face rising data requirements related to scheduling and imbalance settlement with market liberalisation, more active consumers and small-scale producers.

Last but not least, new actors, such as **aggregators** and **Energy Service Companies** (ESCOs) will require extensive access to data and data exchange with other actors (including TSOs and DSOs) to be able to offer flexibility on behalf of customers in various markets and help customers optimise their energy consumption and generation.



## State of play: Towards centralised data exchange involving TSOs, DSOs and third parties

While today, decentralised data exchange is still the most common model across Europe, there has been a noteworthy trend towards central platforms. Several countries are in the process of implementing central solutions, like, for example, Norway, Sweden and Finland, or they are further centralising the existing data exchange, as in the cases of Belgium, Spain and the Netherlands. Others have just recently implemented a central DEP, including Denmark, Estonia or the United Kingdom, or have long-established central data exchange, such as Ireland and Iceland.

The establishment of central DEPs has been promoted by three main objectives:

- Improved efficiency in data management, which involves greater and more consistent data quality, transparency and exploitation of economies of scale for all involved stakeholders;
- Removal of barriers for new market entrants, including the facilitation of supplier switching and fostering of new services; and
- Empowerment of customers, which involves strengthening the opportunities for market participation, granting access to data for customers and authorised third parties, realising the potential of smart meters and facilitating demand response.

Decentralised solutions, like in Germany, Austria or Portugal, can reduce, but not fully eliminate, market barriers if the processes, data types and communication interfaces are legally binding and if the regulator has enough authority to enforce compliance. Variations in data quality and availability, even with standardised formats, can be a drawback of such models.

While the focus of the central DEPs established so far has been the retail market, we have observed that the perimeter extends to TSO-connected units on a number of the platforms. A variety of DEPs also seek to go beyond retail markets by supplying additional data and information to customers and by allowing customers to grant access to their data to third parties, such as energy service companies or aggregators, active in the wholesale market. This allows these new market players to develop and offer innovative services – from information products that may support energy efficiency measures to demand response that can elevate the flexibility potential that lies hidden on the demand side and with distributed generation.

A final observation on the state of play is that the governance model of central exchange platforms can vary. Governance of such DEPs implies TSOs, DSOs and third parties. The key feature of the party or parties responsible for a DEP should be full neutrality in order to avoid any discrimination in data access and delivery.



## Central data exchange could be developed further

Customers, especially small consumers and prosumers in the distribution system, will start to take on a more active role in energy and reserve markets, directly or via aggregators. This necessitates and creates data exchange, for example, between TSOs, DSOs and aggregators to communicate grid congestions, between aggregators and suppliers to settle deviations from schedules and between TSOs and DSOs to exchange information on available and activated flexibility sources. All these topics are recognised by the proposed new EU legislation, and it will be a challenging task for the whole industry to find non-discriminatory, transparent and secure means of efficiently handling all the data needs across all stakeholders.

As they allow an extensive sharing of data, central exchange platforms can enhance the efficiency of processes, reduce market barriers and enable customers to make informed decisions pertaining to their demand, choose suppliers or actively participate in markets. For these purposes, the platforms must meet certain criteria:

- The platform must guarantee full neutrality. This does not mean that all actors should have access to the same data, but that any actor with a legitimate need and authorisation by the customer should have access without any form of discrimination;
- Stakeholders must have trust in the platform regarding data quality, data access and governance;
- The platforms should focus on exchange of data where several parties require access to the same type of data and a very high level of data quality is required. Given this, the platform can exchange many types of data and distribute information to the stakeholders with a legitimate need for access; and
- The platform should facilitate interoperability between national solutions. Besides, the geographical scope of a central platform can vary. A country-by-country approach can be a starting point.

## Integration of wholesale and retail markets and customer empowerment could be main benefits with further development of central Data Exchange Platforms

Given the aforementioned criteria and development possibilities, we see several areas as interesting options for the further development of central DEPs. In general, the main benefit from a central platform is the opportunity to bring together data sources and potential applications and services, making data and new functionalities accessible. For instance, central platforms may provide communication between flexibility providers, aggregators, market operators and system operators surrounding activation of flexibility resources, prices and volumes (according to stakeholder needs). The function of a DEP in this respect could include making accessible standardised market data on wholesale prices, prices in balancing markets, load profiles and installed equipment for demand response. Other types of supporting data, like weather forecasts, can also be included. A central platform could also assist in promoting participation of distributed generation in the wholesale market through increased availability of data on generation capacities, historical generation and continuously updated

daily generation. The same benefits could apply to demand-side flexibility and storage.

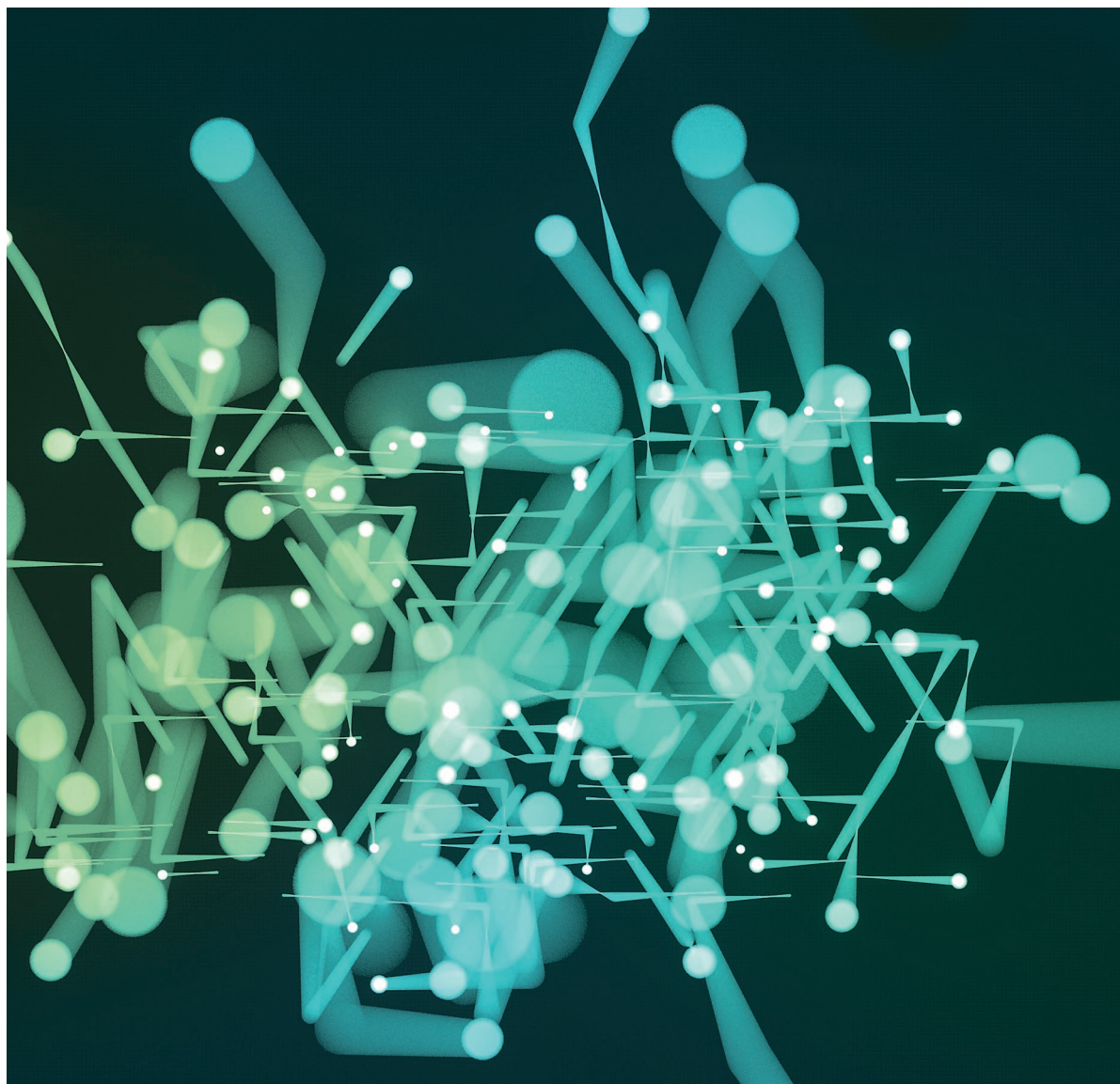
DEPs might also serve to inform suppliers, generators and aggregators of grid congestions, and the effect such conditions may have on their ability to participate in energy or reserve markets. Such locational data could be essential for utilising distributed flexibilities.

Again, the platforms could have different functionalities and governance structures between areas. The important criterion for efficiency in this respect is that the solutions are interoperable.

Real-time data on grid operations are, on the other hand, less suitable for such central DEPs. Currently, SCADA systems efficiently handle the operational data exchange between TSOs and DSOs.

## **There is no ‘one-size-fits-all model’, but Data Exchange Platforms can offer benefits surrounding big data treatment and the creation of new energy services**

DEPs can be the tool of choice for many of the new processes and data exchange needs in a more consumer-centric power system. Data stored and exchanged will grow beyond mere metering values to include market data, like weather forecasts or spot prices, grid congestions, unavailability of assets or possibly even grid-planning data where this is relevant for other stakeholders besides system operators. DEPs may mature from being focused on a fixed set of processes around the retail market to a more flexible architecture that allows third parties to offer services and functionalities. Finally, an increasing harmonisation of standards and formats across Europe may make it easier for companies to provide services across several countries.



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