Digitalisation in the Energy Sector

Questionnaire - replies by smartEn

1. Data Access

Data Access refers to the rules ensuring that data should be sourced easily, while its flows should be constrained to the lowest possible extent. Through this area, the Commission should aim at achieving a fair usage of energy data and boost innovative markets and services by ensuring competitiveness, accessibility and consumer engagement.

Questions

1. **How could the access to non-sensitive energy data be improved in order to increase the accessibility and eliminate market barriers?**

Standardized information platforms should ensure free access to up-to-date information on non-sensitive energy data to all participants in the energy sector. They could be provided by the NRA or a fully neutral facilitator.
An EU framework should be defined to set minimum requirements to: 1) adopt rules on ownership, protection, liability and transfer of data; 2) distinguish between sensitive and non-sensitive data; 3) distinguish between dominant and non-dominant position concerning data in the relevant markets; 4) ensure strong cyber-security protection.
Among others, these platforms should include standardized access to household, industrial and network non-sensitive data with adequate real time, reliability performance, to be securely shared with third parties and used to stimulate innovation.
Specifically, lack of visibility on network constraints and spare capacity prevent the introduction of new innovative services and the efficient operation of flexibility markets.
As recently proposed by CEER, "DSOs should consider providing interactive maps and/or network data and models, without endangering security and avoiding any misuse potential".[1]

2. **How could existing initiatives on interoperability standardisation [e.g. for smart appliances] be used to further data access and consumer engagement?**

Consumer engagement will be facilitated due to an improved and automatic communication among smart devices. In this way, smart solutions will not be stand-alone assets, but interactive systems. This will ease their use by end-users and increase their value in view of a pre-defined objective (e.g. self-consumption, flexible interaction with the grid, reduction of energy consumption, improved comfort and wellbeing, etc).

For example, SPINE, a platform-neutral message exchange standard part of the EU driven SAREF 4 ENER, allows one global language for devices to communicate with one another about energy – transcending the boundaries of industries and continents. In this way, home appliances can speak the same language, communicate with energy managers, smart home systems and with each other in an integrated home ecosystem, providing the benefits of smart energy management for consumers and allowing power suppliers

[1] CEER Consultation on Dynamic Regulation to Enable Digitalisation of the Energy System, March 2019

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and grid operators to check their customers' variable loads securely, anonymously and directly, and to control them over time.
Standards currently in development, like EN 50491-12-1 to foster the demand-side flexibility of smart buildings, IEC 15118 and IEC 63110 to ease data communication between charging points, electric vehicles, CPOs in the e-mobility sector, aim to harmonise the automatic interaction between smart devices to provide services to end-users.
Other standards such as EEBUS are being developed to ease integration of distributed energy resources, appliance and smart meters.

Standards shall improve consumer's trust and efficiency remaining a non-mandatory option. An emphasis on interoperability, as the end goal, is a more cost-effective approach to facilitate competition, innovation, and will allow more flexibility by avoiding the premature obsolescence of existing smart technologies.

3. **What data-driven services and related new business models can help the energy transition (e.g. combining health, mobility and energy data to trigger smart home services)?**

At the device level, price signals should allow devices to operate less during on-peak times and more when lower cost power is available. Examples include electric water heating and electric vehicle charging.
At the building level, data-driven services can lead to automation systems to improve maintenance, control and operation. As end results, they will improve comfort and well-being, increase information to occupants, facilitate the flexible interaction with the grid, reduce energy consumption.
At the system level, as demand can adjust to supply thanks to data-driven services, this change in paradigm can improve the revenue profile of renewable producers and financing of investment in renewables can be cheaper, thus reduce the overall cost for society and the need for subsidies or support schemes.
Also, aggregation services can help the energy transition by providing grid flexibility services while engaging consumers through the support of a third party. Key is the creation of mixed pools that can aggregate different smart solutions and combine different sectors (e.g. energy-transport-digital) to exploit their interactions. For example, an aggregator should have the possibility to pool electric vehicles and smart appliances in buildings to have an heterogenous portfolio which can be activated for different system needs.

4. **How can fair access to data contribute to energy efficiency in buildings and consumer engagement in demand response schemes?**

First, there is a need for better communication and educational campaigns to properly inform customers on energy efficiency and demand response potential to lay the foundation for consumer's trust and acceptance.

Fair access to data can lead to direct behavioural changes if end-users have access to such information in easy formats (e.g. through apps, direct collection from smart meter or in-house displays) or if automated devices directly react to data signals.

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It can also lead to innovative business models if data access is granted by consumers to third parties which can identify the potential and automatically manage the energy consumption of buildings and/or provide flexibility services to the grid.

5. **How can open data on meteorological conditions be used to help integration and forecasting of variable renewable energy into the electricity system?**

Accurate data on meteorological forecasts can be provided to renewable energy plants and power grid management systems. Advanced technologies such as Artificial Intelligence and optimization algorithms can be used to make renewable energy generation predictable and profitable by facilitating grid integration and storage system operation and maintenance. High-quality weather forecasting can accurately predict output on a two- to six-hour interval, greatly improving system reliability. With ever improving weather forecasting, operators are getting better at predicting energy output as much as 36 hours in advance[2]. Renewable energy generation forecast can improve from 88% to 94% thanks to Artificial Intelligence[3].

For wind farms, algorithms can also predict when a turbine needs maintenance, and how fast blades will turn at different wind speeds.

Such advanced technologies help reducing costs in operation and maintenance, optimizing energy management and controlling in real time alarms or anomalies related to meteorology.

Even slight improvements in generation forecasting have the potential to result in large operational and economic benefits.

With improved forecast in generation, demand can be dynamically adjusted. Many loads can be shifted to when electricity is abundant and cheap (e.g. EV charging, hot water warming, heating, …).

2. Digital Platforms

Digital platforms are data-driven solutions that have the potential to create new markets and services throughout the whole energy chain. Through this area, the Commission should strive to achieve (1) open markets through fair competition and market access, (2) interoperability to boost technological change and (3) consumer choice to strengthen consumer participation in the energy transition.

Questions

1. **Which digital platforms already exist in the energy sector for (i) flexibility markets (congestion management) and (ii) trading day ahead, intraday and balancing? Can they be used for selling electricity and demand side flexibility products?**

Digital platforms to support local flexibility markets are in their infancy, although examples can be found in Europe to efficiently tackle grid congestion:

- NODES is an independent market operator addressing key trends and challenges in the energy system such as increased share of renewable power production, decentralised generation and the rapid change of the customer behaviour;

[2] www.technologyreview.com/f/613036/deepmind-creates-algorithm-to-squeeze-more-out-of-wind-power/

[3] IRENA, "Innovation landscape for a renewable-powered future: Solutions to integrate variable renewables", 2019 (page 68)

- GOPACS is an innovative platform to contribute to keep the Dutch grid reliable and affordable. It's the result of a cooperation among grid operators TenneT, Stedin, Liander, Enexis Groep and Westland Infra;
- the Enera Project, developed by the energy group EWE AG and the European Power Exchange EPEX SPOT with the system operators Avacon Netz, EWE NETZ and TenneT, is a market platform available to system operators and flexibility providers of the project consortium.
- The Local Energy Market project in Cornwall (UK), supported by the European Regional Development Fund and involving Centrica, the local distribution network operator Western Power Distribution, National Grid and Exeter University, is the first flexibility marketplace in the UK. It is supported by a cloud-based platform which will enable participants to sell flexibility from their energy generation or consumption to the local network and get paid for that flexibility.

Digital platforms to support flexibility marketplaces work on a continuous mode, just as the Intraday market.

Digital platforms for trading Day-Ahead and Intraday are more developed. EPEX SPOT trading systems for Day-Ahead and Intraday auctions are already fit to welcome decentralized market players: EPEX Trading System ETS is the digital platform which fits for this purpose.

2. In order to create fair competition and access to new markets and services, how should the role of existing and new digital platforms be developed? What should be the criteria to harmonise or not those digital platforms?

We already see a mixed setup of projects and new digital platforms in different Member States. Some countries are still sceptical about marked-based solutions, others have first positive experience. At this stage, it's important to ensure a regular exchange of experience and lessons learned across Member States.

Ideally, a harmonization of digital platforms operated by market facilitators, DSOs and TSOs, should be ensured with open and free standards compatible with all kinds of equipment and suitable for the exchange of information between the relevant stakeholders. Transparency of all market transactions is also paramount to establish trust.

In particular, a standardized and harmonized API (Application Programming Interface) would be required to facilitate the use of digital platforms operated by market facilitators, DSOs and TSOs, also by new market players, to integrate and allow automatic exchanges of messages to and from the trading platforms. The API data model could be based on the standard CIM (Common Information Model) from ENTSO-E.

A properly designed baseline methodology is perhaps the most important determinant of the success of any flexibility program - it enables market participants (e.g. grid operators, aggregators retailers …) to measure performance of flexibility resources. During activation of flexibility, actual consumption or RES generation facility curtailment must be compared to "business as usual" energy profile or what the facility profile would have been, but for the implemented curtailment measures. "Business as usual" energy profile is estimated using a baseline methodology. The difference between the baseline and actual flexibility curtailment constitutes that facility's activation performance.

The definition of suitable methodology for baseline calculation is crucial for participation of flexibilities in electricity markets. Currently there is no common procedure in Europe for baseline calculation which could meet all the requirements related to different characteristics of various resources of flexibilities.

3. **How should we ensure that the governance of platforms facilitates data access, exchange, interoperability and ensures data sovereignty (i.e. no lock-in) for those who supply data to the platform?**

Minimum requirements should be set to ensure transparency, use of open communication protocols and ensure end-users can bring their data with them if they want to switch platform.

Platforms should always be subject to oversight by a fully neutral facilitator and all market parties – both traditional and innovative players - should have equal access to information.

4. **What are the data-driven service models of the future? In order to stimulate the creation of new data-driven services, could technological innovations [such as Big Data, AI, Blockchain, Service Platform Architectures] be used to (i) manage how electricity flows, (ii) perform energy forecasting, (iii) create new remuneration/financing mechanisms, and (iv) create new ways of managing transactions (smart contracts, Blockchain)?**

EU regulation should foster the use of future-proof technological innovations for different purposes on the condition that transparency and non-discriminatory access to data are ensured.

For example, through blockchain technology already today both end-users and grid operators have transparency with regards to every kW/h that is traded between participants. At the same time, transactions are transparent, secure and there are no additional costs for electricity trading.

5. **Which digital platforms are being developed to support sharing energy within energy communities, including for allowing them to be open to cross-border participation?**

It is important to differentiate between physical and virtual energy communities.

For example, a company has created the world's first Virtual Power Plan (VPP) consisting entirely of home-storage systems: thousands of batteries generate revenues from stabilizing the electrical grid (a central software links up and monitors all community members while balancing energy supply and demand). Physical energy communities can be also supported by digital platforms to support sharing energy: an example is the Government funded research project Pebbles in the south part of Germany.[4]

3. Asset optimisation, sector coupling and integration

The Commission aims to establish to what extent digitalisation can accelerate to the optimisation of processes and infrastructure to further decarbonise the energy sector and integrate renewables into the energy network. This are will assess whether ICT can be of

[4] https://pebbles-projekt.de/en/

use to link energy carriers, integrate the energy sector with other sectors and/or optimise assets such as buildings and wind turbines.

Questions

1. **How can digitalisation facilitate sector coupling and sector integration? What are the existing use cases? Which digital technologies applicable to sector coupling exist in the market?**

Digitalisation can facilitate sector integration between energy and transport sectors and eliminate barriers to flexibility by fostering their automatic interaction with the grid. For example, behind the meter communication can enable interaction between smart charging (both V1G and V2G) of electric vehicles and smart devices in buildings which can offer their demand-side flexibility to grid operators and participate to (local) electricity markets.

The energy infrastructure needs to be also enhanced and digitalized in order to exploit cross-sector synergies, leveraging on increased decentralization, electrification of end-uses and increasingly active consumers, ensuring at the same time adequacy, security and resilience of the whole system. Interconnecting the energy-using sectors will require the digitalization of numerous processes to better synchronize supply and demand. Intelligent bi-directional communication to allow an efficient flow of information between all stakeholders involved is a fundamental prerequisite for a successful sector integration.

2. **How to speed up the investment in digitalised (remotely monitored and controlled) assets, in particular in areas/sectors where this is not the priority (e.g. buildings, electricity or district heating grids in Southwest and Central Europe)?**

Mandatory and minimum requirements set in EU legislation foster the deployment of digitalised assets. The revision of the Energy Performance of Buildings Directive is a good example as it requires the installation of BACS and individual room temperature controls in specific cases and building types.
The elimination of regulatory barriers is another incentive to investment in digital assets. For example, the Electricity Directive set key principles to foster the business model of aggregators which in certain cases require the installation of remotely monitored and controlled assets, often financed through the participation to electricity markets.
Fostering real-time (or at least time-of-use) prices will also speed up investment in digitalised assets by creating a way to monetize the value of flexibility enabled by digital technology.
The use of EU funds (cohesion and regional funds) could provide a specific support for some regions to finance such investments. The use of ETS revenues should be also encouraged for this purpose.

3. **How can policy instruments support the deployment of a critical mass of energy-smart appliances?**

Mandatory and minimum requirements in EU laws can support the deployment of smart solutions. For example, a lost opportunity for the deployment of smart charging infrastructure for electric vehicles was the revision of the Energy Performance of

Buildings Directive. The specific review clause by January 2023 of the e-mobility provisions is the opportunity to fill this gap.
Ecodesign requirements to boost the demand-side flexibility of smart appliances is also welcomed, although current investigations on horizontal requirements for a broad spectrum of technologies have not proven to lead to any conducive results.
The development of common European initiatives and schemes, like the Smart Readiness Indicator for buildings, have also the potential to raise awareness, stimulate investments and support the uptake of smart solutions.

4. **How can smart buildings and energy-smart appliances contribute to a broader integration of RES, optimise local consumption and improve energy efficiency?**

Digital and decentralised energy solutions (such as distributed generation, energy storage and demand response) in all building types combined with innovative, digital services using real-time monitoring, predictive analytics and automated response enable their demand-side flexibility. This capability will change their interaction with the energy system, from simple energy users to smart and active players which can make their demand more flexible and help to balance the electricity system.
The full integration and interaction of buildings with the energy system is the most cost-effective way to achieve climate neutrality and guarantee system benefits, also by helping to integrate variable renewables. smartEn issued in July a White Paper to further investigate this issue.

5. **What digital solutions are available to allow for differentiation of electricity sources at charging stations for electric vehicles?**

The selection of electricity sources at private charging stations can be achieved similar to the electricity source selection at home, by selecting an energy retailer.
The so-called roaming of electricity supply for public charging stations allows EV drivers to sign up to an electricity supplier at the same time as they subscribe to an e-mobility contract. In order to be operational, metering and transmission of this data to concerned parties is required.
In addition, smart charging can be used to increase or decrease charging rates at different times of day in response to information received from grid operators or power producers about the sources of electricity at those different times, for example high rates of solar power on sunny afternoons. Forecasts as well as real-time data are used by service providers which need to look ahead to the time by which the customer needs charging to be complete[5].

4. Infrastructure for digital solutions

Digital infrastructure enables decarbonisation and further decentralisation, which can lead to more flexibility in the energy sector. Through this area, the EC should assess whether legislative action is needed to support the development of IT infrastructure for digital assets and services in the energy sector.

[5] Real-time information on the mix of the electricity supplying the charging station can be obtained from services such as www.electricitymap.org or «JuiceNet Green» in California.

Questions

1. **What opportunities would a digitalised energy network bring to decentralised and/or energy communities models?**

A digitalised energy network would increase system efficiency due to a cost-effective integration of variable renewables and procurement of flexibility services from the distributed energy resources.

For example, digitalisation would allow system operators to reduce network investments by managing the different decentralised energy resources: in UK only, the application of flexible technologies to electricity grids could reach £8 billion/year savings in 2030 in operating and investment costs in a strong decarbonisation scenario[6].

All consumers will benefit from a widespread deployment of decentralised energy resources that can offer their demand-side flexibility in a digitalised energy system, including the ones that do not participate directly in the flexible management of their loads. The Commission's 2016 Impact Assessment for the Electricity Market Design stated that the increased demand-side flexibility could lead to savings of €5.6bn/year from reduced back-up capacity, network and fuel costs in Europe.

2. **In order to enable the decarbonisation of the energy sector, how would digitalisation contribute to system/grid management assets and services?**

Digitalisation is key for three reasons: 1) system monitoring, which will allow for identification of needs; 2) smart system management to improve efficiencies; 3) the procurement of services via flexibility markets, making use of services from demand response, storage and distributed generation.

3. **Given the development of new technologies such as 5G, IoT, blockchain and AI, how can consumer's connectivity and security be ensured?**

Minimum EU requirements to providers of new technologies should be set in order to guarantee high standards for end-users, also in the energy sector. More specifically, a network code on cybersecurity should target also these innovative developments, based on the recommendations identified by the Expert Group 2 of the Smart Grid Task Force. Also, the Electronic communication code Directive should be properly implemented, with an eye to the contribution to the energy transition.

4. **What digital solutions are available to allow remote management of isolated electricity systems in rural areas and/or islands?**

Micro-grids can fit for the purpose as they are a digitally integrated controllable energy system consisting of interconnected energy producers, storage facilities, and consumers in a specific geographical area. A microgrid can operate as part of the main electricity grid, but is also able to operate autonomously (for example in remote areas or islands).

5. Cybersecurity

Given that energy services are essential to the economy, and that these services are progressively subject to data-driven transformation, their cybersecurity should be ensured. Hence stressing the interaction and interdependence between energy and digital

[6] Imperial Collage/NERA for the UK Climate Change Committee, 2015

infrastructure. Through this area, the Commission should therefore ensure the security of the digitalised energy services and infrastructure, in order for consumers to make digital choices.

Questions

1. **How can digitalised distributed renewable power generation contribute to the resilience of the EU electricity system?**

If distributed RES generation data is made available, system operators will manage the grid better and therefore improve the resilience of the electricity system.
Also, the pooling of digitalised distributed RES generation with other decentralised resources inherently reduces the risk of failure compared with a large single unit.

2. **How can we ensure that digitalised distributed power generation (renewables, flexibility via e-mobility, etc.) is not a liability to the resilience of the EU electricity system?**

While large quantities of highly distributed resources can increase the resilience of the electricity system, distributed resources must also be managed to avoid creating new peaks or operational issues such as over-voltage.

Digitalised distributed power generation as well as flexible loads should be integrated into the digitalised electricity system via secure interfaces. A digitalised grid would increase the level of renewable resources supported by the grid by 62% by 2037.[7] For example, supporting Germany's goal of 80% renewables by 2050 would cost 44% less when using a digitalised grid.[8]

3. **What is the right approach of information sharing at a higher level? (e.g. events, etc.)**

Collection of best practices from innovative stakeholders, recommendations and guidelines from the European Commission to Member States, regular dialogues between stakeholders and Member States, exchanges among Member States through dedicated Concerted Actions.

6. Horizontal actions, communication and awareness

In order to increase its impact on the energy sector, digital solutions must be understood throughout the energy sector including consumers. SMEs and consumers will need support in understanding the processes and seizing the benefits of digitalization. Industry is likely to apply innovative ICT solutions, however, optimizing the consumer interface might remain a challenge. The entire sector should gain awareness about engaging in digital solutions in a legal and secure way.

[7] Sustainable Urban Infrastructure, A smart power supply for Berlin in 2037, Siemens Report No. !19100-F-P181-X-7600

[8] Moderne Vertilernetze fuer Deutschland "Verteilernetzstudie", E-Bridge, IAEW, and OFFIS, 12 September 2014

Questions

1. **How could consumer trust and engagement be fostered when implementing digital solutions in the energy sector?**

Consumer trust and engagement will be fostered if three conditions are met:

- cybersecurity and data privacy are ensured;
- smart energy solutions are easy to manage and are not creating additional hassles. For this we need user-friendly apps, interoperable devices, and a good level of automation that would open these opportunities also to customers that are not active enough to engage directly;
- appropriate price signals are received by end-users to enable them to reduce their energy bills, generate additional revenues from selling self-generated and un-consumed energy on markets.

2. **What are the benefits of digitalisation? Which initiatives already exist in Europe? How can awareness be fostered?**

Digitalisation in the energy sector is needed to manage the increasing complexity of the energy system. Tools are internet-based metering, monitoring and trading solutions in the energy sector that enable industry, businesses and households to generate, store electricity and modify their energy consumption on the basis of external signals (implicit demand-side flexibility) and participate in electricity markets (explicit demand-side flexibility).

The estimated cumulative investments in EU of digitalisation in the energy sector during the period 2016 – 2020 is in the order of €50bn (base-line scenario); it will generate a positive macro-economic impact in the sector, including the creation of additional 280.000 jobs by 2020[9].

[9] Tractebel, December 2017

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