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Digitalisation in the energy sector – Questionnaire by DG Ener, European Commission

Eurelectric response

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Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent the electricity industry in over 30 European countries.

We cover the entire industry from electricity generation and markets to distribution networks and customer issues. We also have affiliates active on several other continents and business associates from a wide variety of sectors with a direct interest in the electricity industry.

We stand for

The vision of the European power sector is to enable and sustain:
- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

We are committed to lead a cost-effective energy transition by:

investing in clean power generation and transition-enabling solutions, to reduce emissions and actively pursue efforts to become carbon-neutral well before mid-century, taking into account different starting points and commercial availability of key transition technologies;

transforming the energy system to make it more responsive, resilient and efficient. This includes increased use of renewable energy, digitalisation, demand side response and reinforcement of grids so they can function as platforms and enablers for customers, cities and communities;

accelerating the energy transition in other economic sectors by offering competitive electricity as a transformation tool for transport, heating and industry;

embedding sustainability in all parts of our value chain and take measures to support the transformation of existing assets towards a zero carbon society;

innovating to discover the cutting-edge business models and develop the breakthrough technologies that are indispensable to allow our industry to lead this transition.

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Distribution & Market Facilitation Committee
Customers & Retail Services Committee
Markets & Investments Committee
Generation & Environment Committee
Electrification & Sustainability Committee

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Digitalisation in the Energy Sector - Questionnaire

Context

Within the Energy Union, three key targets and policy objectives have been established in light of the 2030 climate and energy framework of the EC: 40% cut in greenhouse gas emissions, 32% share for renewable energy and 32.5% improvement in energy efficiency.

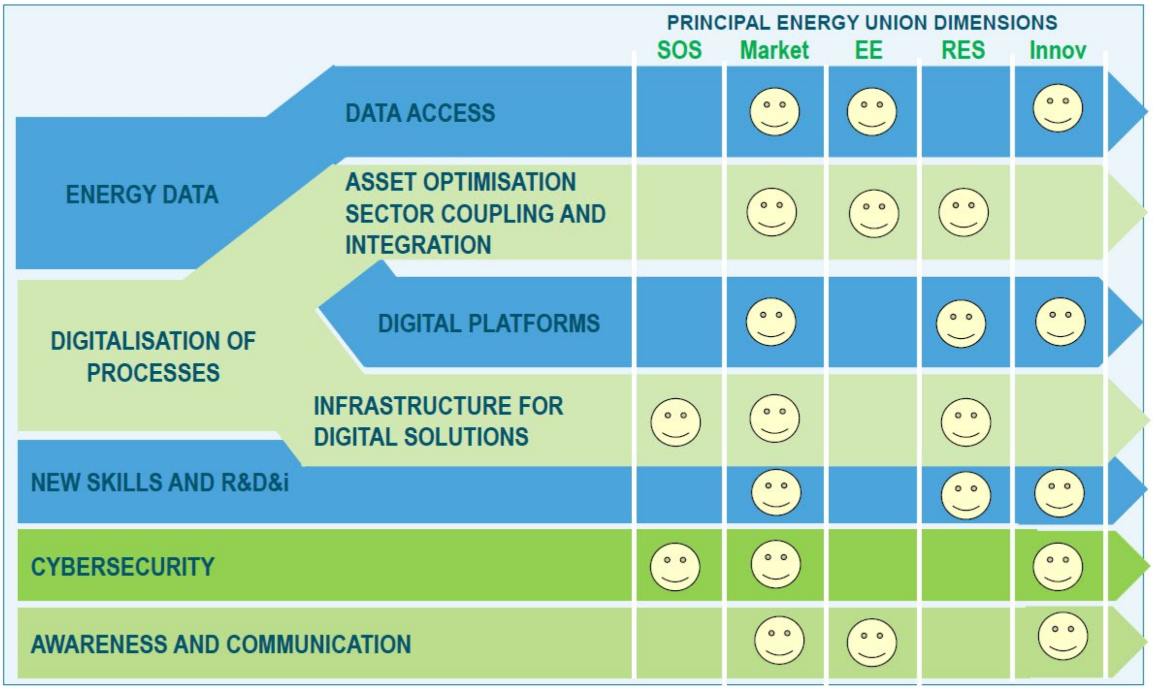
To achieve these objectives, five mutually reinforcing dimensions work together to balance the overarching energy triangle (energy security, sustainability, competitiveness) and enable the achievement of the **2030 climate and energy framework**. These dimensions are: (1) Energy security; (2) Internal energy market; (3) Energy efficiency, (4) Decarbonisation, (5) Research, innovation and competitiveness**.** The Energy Union Strategy also recognises that an innovation-driven transition to a low-carbon economy offers great opportunities for growth and jobs. This would lead to the increasing flexibility in the electricity sector, emergence of new business sectors, new business models and new job profiles. Nevertheless, the transition will also imply adjustments in some sectors, business models or job profiles.

On the other hand, the data-driven nature of the transformation of the energy sector requires understanding the interdependence with the **Digital Single Market**, to ensure access to online activities for individuals and businesses under conditions of fair competition. The relevant areas include: (1) Interoperability and related standards; (2) Horizontal legislation on data: the General Data Protection Regulation (GDPR), free flow of non-personal data (FFD), e-Privacy Regulation; and (3) Cybersecurity.

The legal basis for bridging the objectives of the Energy Union and the digital transformation of the energy sector is already present in the **Clean Energy for All Europeans package**. The Market Design Initiative introduces new provisions closely related to the digitalisation of the electricity sector. In particular, the provisions within the newly adopted Electricity Directive on demand response, dynamic prices, flexibility procurement, access to data, interoperability and data management. The Energy Performance of Buildings Directive promotes digitalisation of buildings through the establishment of a smart readiness indicator for buildings and through the introduction of requirements for the deployment of recharging infrastructure for electric vehicles. For heating and cooling, the revised Energy Efficiency Directive requires a transition to remote readable metering devices in district heat and cooling networks and in sub-metering systems within multi-apartment and multi-purpose buildings.

Questionnaire

The figure below summarises a possible mapping of the different clusters on the digitalisation of the energy sector and the impact into the principal Energy Union dimensions.



The paragraphs below describe each of these clusters and propose relevant questions to understand better their status and impacts. Please, insert your answers under each question in the boxes below and send your contribution back to ENER-DIGITALISATION-TASK-FORCE@ec.europa.eu **before 15 September**. Please indicate whether you reply as individual expert or as an organisation/association; in the last case, please provide the full name and coordinates of the organisation as well as your position in such organisation.

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?**

First of all, the notion of "non-sensitive energy data" should be defined. This exercise should mark a starting point for further discussion on accessibility of such data. Non-sensitive energy data must not include any publication of documents and data that could jeopardise the security of critical infrastructures.

From a commercial perspective, it would be relevant to make sure that all market players have non-discriminatory access to energy system data and consumption data when customers consent. At the same time the recent Electricity Directive contains a number of new provisions which should improve the situation, such as Art 24 and Art 34. In addition, data hubs and platforms for decentralised data exchange are evolving from the existing ones or being set up in a number of European countries and will make data access smoother for all players.

Data privacy and it data security remain paramount. The protection of natural persons with regard to the processing of personal data and rules relating to the free movement of personal data is subject to the General Data Protection Regulation (GDPR). For the time being, publishing data which show precisely the consumption of customers, being a natural persons, to enhance energy efficient consumption to any third parties risks infringing the GDPR. Therefore, further analysis is needed in order to assess the overall effects of the GDPR before taking additional action. Besides, should further steps in terms of regulations need to be taken, it should be done in a transversal way rather than at sectorial level.

Transparency is central to the future power market design and to consumers. Consumer empowerment should come with easier access to transparent and reliable price signals, to ensure optimal consumption decisions. Data transparency with respect to power system and market data is a prerequisite for fair and efficient competition between market participants and is the only way to ensure that market participants are able to make informed decisions. Sufficient transparency can and already is suitably ensured through publication of market data, e.g. on the ENTSO-E Transparency Platform[1].

Although a central issue, it should be acknowledged that, enhancing transparency should not be accomplished at the expense of excessive reporting obligations for market participants, particularly if that data is already available to system operators, market operators, regulators and other market agents.

This concern has been partly acknowledged through the public consultation on fitness check on the EU supervisory reporting last year but overlapping of same data reporting coexist under different legal packages as well as quasi-overlaps between national and European reporting frameworks. Digitalisation should contribute to mitigate such market barriers and to maximise data access.

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

Standardisation can be understood as a process by which specifications are set (e.g. IEC 61850 vs IEC 61870, IEC 870-5-104 protocol and others). The majority of specifications helps ensure that devices, systems and services retain the ability to connect and interoperate with each other, boosting innovation, and keeping the respective markets open and competitive. Smart systems in electricity entail a mix of technologies. The final goal of fostering interoperability at European level is to have a « language » which makes

[1] See also the Data Management report published in 2016 by the 4 DSO associations and ENTSO-E

it possible for any home appliance to talk to any energy management system thus enabling the smart home and beyond (e.g. smart charging).

Intelligent energy management is necessary to use energy efficiently and sustainably. Open source initiatives enable the further development of various systems and ensure their mutual compatibility. This leads to rising efficiency potentials in different areas. For example, through the AI-based interaction of different devices a maximum load that cannot be exceeded can be defined. Current efforts in this area should generate a higher customer benefit and increase the acceptance of smart applications.

Interoperability and standards will be needed in particular to enable the delivery of electric vehicle charging services along the pan-European charging network. Consumers will need to be able to charge their vehicles anywhere regardless of the ownership of the charging station and their actual mobility service provider, in order to enjoy a seamless consumer experience that does not hinder the adoption of electric mobility.

Moreover, at system level, 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 take advantage of their interactions and stack services. For example, an aggregator should have the possibility to pool electric vehicles and smart appliances in buildings to have a diverse portfolio which can be activated for different system needs.

In general, there is a further need to work on the interoperability between system, market and consumers. Standardised, open and enabling interfaces, play a fundamental role in empowering consumers' participation in the electricity market, namely through better access to data and the possibility of making their flexibility available to system operators in a much more complex and multiparty environment. Standardised, open and enabling interfaces play a fundamental role in empowering consumers' participation in the electricity market, namely through better access to data and the possibility of making their flexibility available to system operators in a much more complex and multiparty environment.

With regards to smart meters specifically, their optimal level of functionality should be the result of a thorough cost-benefit analysis, bearing the following factors in mind:

- It could be very expensive if smart meters are forced to be a hub for all electric appliances downstream. Not all customers would benefit from such a complex device.
- Cybersecurity issues could arise if smart meters are forced to connect to the customer's home area network.
- Most customer´s data needs can be obtained from a range of sources, including smart meters, IoT as well as the central database where readings are stored.

- It is, however, possible to fit smart meters with a cyber-secure port to provide real-time readings to be used by appliances. To allow the use of that port and to increase security, logging into the central data server should be mandatory.
- Forcing customers to use smart meters as the smart home hub could be interpreted as a monopoly situation in favour of electricity companies.

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)?**

Smart Solutions based on digitalization such as mobility, self-consumption, home devices, green energy certificates or efficiency will help not only for economical savings and carbon emissions reductions, but also for a better customer experience through digitalisation.

Some of the new products and services which will facilitate the electrification and decarbonization of the economy through digitalisation are:

- Hosting capacity: making any capacity available to users that they need to generate or consume.
- Electric vehicle: the EV battery is a flexible demand element that allows multiple possibilities.
- Flexible use of heat pumps
- Storage
- Demand response
- Building automation
- Aggregation services
- Elderly care assistance (e.g. monitor habits and provide warning messages based on routine changes).

Moreover, building energy management with user feedback (e.g. visualisation of energy flows) can lead to behavioural key changes and supports the energy transition. In addition, the smart meter rollout can create interfaces to new services and technologies. Apart from the technologies mentioned above, a small unit such as a building can contribute to the stability of the grid by using consumption and generation data as incentives that drive user behaviour towards a stable grid. New digital tools can facilitate the distribution of energy resources such as household PV panels and storage, by creating better incentives and making it easier for producers to store and sell surplus electricity to the grid. New tools such as blockchain could also help to facilitate peer-to-peer electricity trade within local energy communities/prosumers.

Moreover, combining multiple offerings in one solution that goes beyond the traditional utilities business (such as energy consumption information with a mobility service) enlarge consumer options and thus opportunities to engage in the flexibility market, considering transparency as a key principle in terms of prices, terms and conditions. We strongly support this idea under the precondition, that these offerings reap benefits for customers, the energy transition and all players involved in developing and marketing them.

But most importantly, a digital energy transition needs both rules and technologies. Regulators will need to consider how to regulate appropriately new platforms and players with impartial rules that guarantee equity and a fair competition

As already highlighted under the Q1 answer, one of the key issues when combining data from various sources is the importance to comply with all the requirements regarding privacy. Interestingly enough, anonymizing the dataset might not be enough to ensure that privacy of consumers is actually guaranteed at the required level. This triggers the need to investigate further solutions for storing and processing datasets. The security of the critical infrastructure data and the customers' private data is a vital concern that has to be ensured.

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

Users of a technical system need to know the status and "reaction" of this/their system (building, car, smart home, etc.) to be able to react to signals and triggers. Therefore, all users should have a fair access to the systems data.

In buildings with decentralised energy generation and storage, the visualisation and processing of the data on energy flows in buildings can help users to adopt an energy efficient behaviour (e.g. through apps or in-house displays). In addition, this data can be processed in the technical building automation system to adapt the operation of the building to the needs of the occupants as well as to the constraints of the grid. This can also improve the energy efficiency and overall performance of the building. Innovative business models can be developed if data access is granted to third parties which can identify the potential and automatically manage the energy consumption of buildings and/or provide flexibility services to the grid.

In general, the "digital revolution" is facilitating the deployment of tailored solutions for different types of customers making possible a great progress in energy efficiency in buildings.

As a clear example, the use of smart heat pumps will not only bring the benefit of heat decarbonization through the use of electricity, but, thanks to the remarkable energy efficiency of this technology, global energy efficiency objectives will be more easily achieved.

Specifically, in demand response schemes, price signals are needed to create the potential for increasing efficiency. Typically, such new products may require consumers to have smart meters. To stimulate demand-side flexibility potential and allow consumers reap the benefits, smart metering systems should be interoperable with connected Energy Management Systems that enable also demand-side flexibility of buildings, where the adjustment to energy consumption is valued by the markets.

As most buildings are not stand-alone entities and their interaction with the system will bring economic efficiency, technical building systems do not necessarily have to use a common protocol, as long as one gateway (e.g. the building (energy) management system) is able to interact with other technical building systems.

Fair access to data enables more agents and competitors to step in and bring more and improved services, at cost-efficient levels through natural, and more diverse, competition, thus benefiting consumers with market solutions designed to their needs and preferences. Provided that these agents prove to be reliable, given the essential nature of these services, there should be a definition of the agents/roles eligible to access data, as for instance energy retailers.

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

Performance of variable renewables is highly dependent on suitable weather conditions, actors in the renewables sector are in much need of reliable data on meteorological forecasts. Thus, the availability of open data on meteorological conditions will definitively help the integration of renewable energy system into the electricity system. Meteorological data is especially very relevant for day-ahead and intra-day forecasting.
Accurate models and algorithms for RES production forecast will provide DSO more possibilities to prevent and manage potential grid outages, giving the chance to harness on customer's and utility-based flexibility aimed to better control and optimise the grid conditions and operations, suppling better quality of service and maximizing the RES grid hosting capacity.
The issue should be however handled carefully, as collection and retail of this type of data is a business model for certain companies. Furthermore, needed investments into the development of new and better survey methods might be hindered if financial incentives are lost.
Although data availability might be generally positive, one of the main issues remains more about improving forecast methodologies for the stand-alone RES generation but also for joint management of generation/demand and for joint technologies as well (eg. hybrid powerplants).

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?**

With the electricity power exchange and the balancing markets there are already "digital platforms" in place, where the participants can sell electricity as well as "demand side flexibility". Power exchanges provide trading platforms for intraday very close to delivery, day ahead and long-term derivative trading. Gas exchanges may even provide platforms for balancing. Some power exchanges also provide more granular short-term trading on flexibility markets. In fact, the usual existing trading platforms are all already digital per default.

Digital platforms to support local flexibility markets explicitly with the focus to tackle grid congestion are in their infancy in most EU Member States. They all work on a continuous mode, such as the Intraday market. Participants in these projects include TSOs, DSOs, BRPs and power exchanges. In Europe, the following platforms are active, among others, to give a few examples:

- Enera offers a local flexibility platform for market-based congestion management that will efficiently centralise flexibility offers that system operators can activate to alleviate grid congestions.
- 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.
- DA/RE project: The main objectives of the project are to develop and implement common processes for TSO-DSO data exchange, to coordinate grid stabilisation measures with flexibilities across all network levels on a digital platform, and to then enable redispatch actions within the distribution grid.
- GOPACS is an innovative platform to contribute to keep the Dutch grid reliable and affordable. All players can use it for selling electricity and demand side flexibility products.
- Coordinet: aims at showing in Spain how DSOs and TSOs shall act in a coordinated manner to procure and activate grid services in the most reliable and efficient way through the implementation of three “TSO-DSO-market participants” demonstrations at large scale.

Furthermore, digital platforms for grid operator coordination for congestion management are in place and in further development by TSOs and DSOs[2]. The Portuguese mainland DSO is experimenting, together with other parties, in the framework of European projects, a cloud-based solution to support the provision of flexibility services to system operators.
For the electronic data exchange between market parties for e.g. supplier change and clearing/settlement EDA (Elektronischer EnergieDatenAustausch; electronic energy data exchange) is used in the case of Austria. This is a decentralized platform based on encrypted data exchange between the parties. The TSO (Austrian Power Grid APG) is operating another platform for market (day ahead, intraday) and frequency services. The Austrian EDA is already used as platform for “Communal Generation Facilities” which are a local limited (to an apartment-building) form of a CEC. CEC’s and REC’s are planned to be implemented as well as a flexibility platform.

Furthermore, it is important to note that several solutions might coexist in the near future and will need to cooperate to provide system operators with flexibility needs,

[2] For examples in the UK see here : http://www.energynetworks.org/electricity/futures/flexibility-in-great-britain.html

particularly by complying with a uniform set of principles and guidelines as the ones stated by system operators in their very recent report on Active System Management[3].

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?**

The criteria should be the usability for customers. Easy to use, easy to understand, not time consuming and comfortable operation for prosumers who deal with their flexibilities is requested.

Although different digital platforms could coexist, one should of course make sure that the interoperability of these platforms is ensured so as to minimize the transaction costs. The creation of market platforms, e.g. for flexibility, is overall a necessary step to support the energy transition by ensuring grid stability and efficiency in grid operation. For any of these platforms, non-discriminatory access is a key success factor. We already see a mixed setup of projects and new digital platforms in different member states (MS). Some MS are still sceptical about market-based solutions, others have first positive experiences. A good next step should be setting up a regular exchange of experiences and lessons learned across MS borders with the further aim to establish some standards or best practices that could also be applicable to upcoming pilot projects.

Looking towards new (data) platforms, these also will be vital to the DSOs' digital transformation. These platforms should contain elements of open data where security regulation allows but can go beyond this for internal use such as data-insights for asset management. The extent to which such platforms can be used across market players or should even be harmonised should be left to the market itself. As the relevant data for such platforms is proprietary knowledge of each DSO, it is a question of trust and/or commercial terms, if DSOs are willing to share them.

Fair competition already exists on power and balancing markets in the case of for example Germany. Small and decentral units as well as demand side flexibility are active on those markets. Not the market access but the transaction costs are a limiting factor for further increase of "prosumer" participation. With the decided smart meter rollout in Germany these transaction costs could lower due to the then existing technical infrastructure. The existing platforms are open for new participants. Further harmonisation needs to be weighed up carefully with technical requirements in the respective MS.

DSOs should be recognised as one of the key stakeholders to ensure that customers and distributed resources develop their full economic potential by participating in energy and flexibility markets. To achieve this goal, DSOs are currently working on building and operating new platforms on which new markets are developed and access to information required by different players is managed, following the privacy and security practices that are established by regulation.

[3] See also: TSO DSO report on Active System management, 2019: https://cdn.eurelectric.org/media/3797/tso-dso_report_-_an_integrated_approach_to_active_system_management-2019-030-0255-01-e-h-B31641F6.pdf

For DSOs in particular, the need for flexibility warrants not only digitalisation but also greater interaction with network customers. Preconditions to achieve this are an optimised relationship between investments in conventional grid reinforcements and better interplay with local flexibility resources. However, this step will require a radical change in business processes, pricing and tariff-setting for network services. This can only happen if the right regulatory frameworks for digitalisation are developed.

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?**

Market operators have an incentive to make these platforms comfortable and safe to use in order to attract the prospective market participants. The Commission should set a minimum set of rules to allow for a range of implementation options. .

For instance, one of the key issues regarding the governance of platforms is the way these platforms ensure the rights around consumer privacy according to European standards.

Consequently, 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 platforms. Platforms should always be managed by a fully neutral facilitator and all market parties should have equal access to information in these.

Any such new (data) platforms should follow market principles. Therefore, the governance should lie with the provider of the platform with those deciding to utilise them making the decision based on the attractiveness of the offering.

For the optimal-functioning of platforms, we consider paramount to encourage the free flow of data, being compliant with data porting, interoperability and markets reciprocity principles. In order to reduce 'lock-in' risks, promotion of industry-driven codes of conduct will drive competitiveness, sustainability and productivity of the platform.

A genuine single market coherent with the legal framework applicable to the connected world, is of prime importance. Among other things, Europe should work to address and eliminate divergent Member State interpretation and application of data retention and other e-communications rules.

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)?**

Many of these digital market places and enabling technologies such as blockchain are still in their early stages but likely to play an increasing role in the medium and long term.

As shown in recent Eurelectric white papers papers on “Blockchain in electricity”[4], the development of local market places (e.g. through blockchain or equivalent platforms) could, with the right conditions in place[5], contribute to system operation - and thereby reduce network costs, improve the economics of small-scale renewables and DER, and give customers greater choice and transparency regarding energy supply. However, the deployment of new blockchain (or equivalent) implementations remain for now burdened by high costs, slow transaction indicators, and other technological limitations and risks, particularly regarding market regulation and user-friendliness. The use of peer to peer technologies in the energy sector should therefore be carefully monitored.
Examples of data-driven service models include:

- Managing energy exchanges within local energy communities combining producers, consumers, storage, microgrids, etc based on the use of blockchain and IoT technologies
- Services around e-mobility: such as EV charging with renewable energy (produced onsite or offsite), smart charging, vehicle-to-grid services etc.

More generally, digital solutions will allow links to energy production with consumption and evidence e.g. the renewable characteristics of the energy consumed in real time.

Thanks to advances in technologies, we can gather and secure data (IoT, blockchain, cloud), interpret information (Analytics, AR/VR), automate actions and generate innovative contents (RPA, AI) tailored to internal and external customers.
In this regard, Digital Hubs play a pivotal role as they are ultimately responsible for enacting the value embedded into data, by implementing effective data driven solutions for energy customers such as:
Flexibility services:
To achieve the Paris’ decarbonisation goal the electricity sector needs to invest heavily in variable renewable energy sources and correspondingly new flexibility services are needed to preserve system stability such as storage and demand response. Directly or through aggregators, consumers should be able to generate, store, share, consume or resell energy to the markets, empowering them to manage their consumption *(corresponds to aim i) and* income with new revenue streams *(corresponds to aim iii).*
Smart homes and buildings: With smart meters rollout and increased usage of BMS, there is a huge increase of building energy data. As an example, DELFI is a new solution **to identify consumption / production of customers** *(corresponds to aim ii)*, so to improve the quality of load profiles, reducing manual intervention, using machine learning and predictive modelling.
Adaptive Lighting and City Analytics
For a data driven urban planning, utilities may apply Big Data Analysis to anonymized geo-localized data streams, open data and pre-existing sensors/solutions data to produce output relevant for PAs and Private Customers *(corresponds to aim ii).*
Guarantee of origin of renewable energy

[4] See “Blockchain in Electricity: a Critical Review of Progress to date” and “Blockchain in Electricity: A Call for Policy and Regulatory Foresight”, Eurelectric, May 2018
[5] These include ensuring sufficient liquidity, accounting for the risk of gaming and having the right coordination and market mechanisms in place.

New renewable energy certification tool could be created for customers, which connects in real time suppliers and clients using **blockchain technology** *(corresponds to aim iv).* The chain doesn't allow changes and third parties in the network ensure integrity of the data, (no double-counting). It can be an alternative to official certification schemes and also a relevant lever to enable energy sharing & trading among members of CECs / RECs in a cost-efficient way.

Transactive energy

For example, a 'Smart Trading project' conducted by ENEL **applies AI** to improve trading activities and support decision making (*corresponds to aim i)*

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)?**

There are specific regulations in place designed to support energy communities. Digital platforms are being developed and tested for example within the 'SINTEG' projects. Cross-border projects have, to our knowledge, not yet been started. In our view, several questions concerning regulation, taxation, subsidisation etc. would need to be addressed in order for them to work.

Further national examples include the Electronic Energy Data Exchange (elektronischer Energiedatenaustausch, EDA) in Austria. In Portugal there are also other examples in the scope of H2020 projects, such as Sensible, UPGrid, InteGrid, and some sandbox initiatives regarding the design of new grid tariffs, conducted in coordination with the NRA.

When „sharing energy" means electricity trading, there are already good working solutions (power exchange, balancing markets, etc) in place and they also allow cross-border participation.

In order to manage this complexity, DSO should count on new tools and resources to better control and manage the grid edge transformation, another example being DERMS (Distributed Energy Resources Management Systems) which can be integrated on the tradition legacy distribution systems. This will enable the possibility to count on DERs for the grid operation, as flexibility sources, also with market players such as aggregators in order to prevent in advance grid violations (at primary/secondary substation level, feeders etc.). New use cases for congestion relief, peak shaving, shifting or deferral of T&D investment will be possible, based on platforms integration. On the other hand, this new ecosystem will ensure the possibility to monetize some distributed resources for different stakeholders (grid and behind-the-meter assets), thanks to the connectivity with almost real time with 5G and the data management tools with artificial intelligence and analytics.

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 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 is a prerequisite of sector coupling and integration. Energy related sectors such as power, heat, mobility and industry may be connected, e.g. through central real-time price signals from energy exchanges, allowing for a rationale and system friendly use of energy in different sectors. For this to happen, technologies transferring price signals, incentivising operations and connecting sectors are necessary.

Digitalisation can also optimise the efficient operation of sector coupling technologies such as PtG-plants depending on RES generation, load and network situation, so that these technologies are able to unfold their positive impact on the system operation and the decrease of carbon emissions. An energy system with coupled sectors and without distortive sector specific tariffs and charges can reduce the need for RES curtailment. Digitalisation also enables new revenue opportunities for these technologies and eliminates barriers to flexibility by fostering their automatic interaction with the grid. For example, behind the meter communication can enable interaction between smart charging of electric vehicles and smart devices in buildings which can offer their demand-side flexibility to grid operators and participate to (local) electricity markets.

One aspect must not be neglected: Digitalisation is already today one of the main contributors to the decarbonisation of the energy system. Without digitalisation it would have been impossible to integrate the large amounts of wind energy and PV generation already feeding into the electricity system. The same technology which enables renewable energy integration (sensors, actors, remote access) is already available to sector coupling as well. The main barrier to sector coupling is the missing business case, not insufficient digitalisation nor other technological issues besides a lack of systems thinking and a historical preference towards siloes.

Digitalization can connect and integrate different sectors to provide solutions to the final users with a clear added value. An example of such cooperation is Alastria, a non-profit association that promotes the digital economy through the development of decentralised ledger technologies/Blockchain.

Thanks to the cooperation of these different sectors, joint solutions could be developed as the following example:

Electric vehicle rentals: A single contract could be offered to customers including a broad spectrum of services such as the rental services itself, insurances, tolls, charging services, parking, energy sharing and much more.
A customer could save money and time, performing micro-payments with a minimum transaction costs, executing insurance coverage automatically, becoming prosumers by selling battery energy or even sharing mobility services and costs.

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)?**

To speed up the investment in digitalised assets, thoroughly designed incentive schemes and/or regulatory schemes are needed. With today's regulatory system in many Member States, such as Germany, it does not pay out for grid operators to invest in digitalisation in some cases. The regulatory rules have to set incentives for the installation and usage of digitalised assets.

But even if regulation is adapted to incentivise the use of digital technology, there will be areas where operation without ubiquitous digitalisation is maintained. Given the long lifetime of grid assets (20 to 40 years) compared to the short lifecycle of digital technologies (around 8 years), there are many use cases in traditional grid operation where investing in digital technologies does not make sense from an asset manager's point of view.

For market actors, investing in digitalised assets only pays out if the money saved by using these assets (e.g. by making use of demand side flexibility) outweighs the costs incurred by these assets in terms of initial investment and operation and maintenance costs.

In this context, it is also important:

- To improve levels of standardisation, reducing uncertainty and improving thereby the environment for private investment;
- To consider TOTEX based regulation approaches for DSOs where appropriate, which reflect the shift from CAPEX to OPEX resulting from digital solutions to provide advanced monitoring and control of the distribution network. This would ultimately also help take into account that potentially deferring or avoiding network reinforcements cost can come with increased operational cost.

More specifically, an owner or tenant of apartments or buildings has to clearly see the economic and ecological advantage of these solutions. Without these advantages, no investment will be done.
As mentioned in Chapter 1, the Energy Transition needs primarily a change of behaviour and coupling of different energy sectors. In order to achieve this, information shall be made available to all these relevant stakeholders. The application of internet-based digital technologies to the production and trade of electricity and related services is becoming an even more important part of the European electricity market. The transition to a digital electricity can contribute to competitiveness across all economic sectors, new opportunities for business and entrepreneurial activity and participate in e-value chains. It also provides new tools to tackle persistent economic development and social problems. Moreover, new financial models are needed, e.g. easily accessible low-interest loans provided by national authorities including more information on availability of these solutions.

Further key developments that could be carried out in this regard is the complete secondary substation automation (up to each low voltage feeder) to get the most out of:

- Distributed solar connected to low voltage in order to minimize curtailments
- Charging of electric vehicles to apply smart charging measures when needed. (EV charging only produces issues at distribution grid level if at all, never in transmission)
- Maximize access to the grid up to the actual maximum capacity.
- Flexibility provided by customers

3. What are the socio-economic and regulatory preconditions for enhancing the use of digital technologies that facilitate sector coupling? For example, how could digitalisation facilitate the deployment of power-to-gas?

Power to gas has a huge potential as a seasonal storage, which is important for the success of the energy-transition. But as mentioned before it is not a lack of digitalization but a lack of a positive business-case that prevents this technology for now. As long as an electrolyser or a storage facility is treated both as a normal load on the one hand and as a normal generator when unloading the storage there will never be a positive business-case.

Digital tools can help to trace the carbon-content and/or renewable characteristics of hydrogen and synthetic gas, in particular where there is no common location of wind or solar farms and electrolysers. The deployment of digital technologies should primarily be a market-driven process, supported by the correct implementation of the existing legislation at a national level. Digitalisation can support the efficient deployment of power-to-gas, e.g. by facilitation of an efficient operation depending on RES generation, load and network situation.

Competitive markets and market-based price formation enable these changes. They benefit consumers and aim to maximise social welfare. To reach the goal of barrier-free sector coupling, a clear and stable regulatory framework is needed as well as more regulatory coordination and harmonization between the different sectors.

4. In order to integrate renewable and low-carbon gas into the gas network, how would connectivity and data analytics contribute to measuring and metering?

In general, due to the increasing diversity of renewable gas sources, we expect an increased necessity to monitor and control gas composition and specific gas features. Hence, data analytics make sense at certain important interconnection points in the gas grid in order to measure gas quality when there are various proximate producers of renewable gas feeding in the grid. Measuring gas quality is also useful at connection points of special users such as industry sensitive to variation of gas components.

For now, very large variations in gas composition at end consumers' are not expected. Gas applications usually need a certain range of gas composition to operate reliably and safely. Also, gas distribution system operators might be capable to allow a higher variation of gas infeed if equipped with monitoring capabilities in combination with installation to gas treatment to supply end consumers with a certain sort of gas.

RES generation and demand for electricity must be measured or forecasted accurately to integrate power-to-gas efficiently.
The key issue is the availability of smart meters that facilitate the exchange of information regarding the state of the network and also the active participation of the prosumers in the electricity market, which is why it is considered the basis for the development of future smart grids as well as potentially contributing to the improvement of efficiency energy.

5. **In order to improve consumer's energy consumption awareness, how would smart meters measuring calorific value, in addition to gas volume, contribute to more accurate billing?**

Accurate billing is already mandatory and will not change the behaviour of customers. If in a future environment, gas composition at end consumers remain stable, there is no need to measure gas as calorific value, as there is a constant factor to transform a volumetric value to a calorific one. If future applications allow for higher variation of gas composition at end consumers, metering service companies would need to exchange metering devices. Using this switch to new metering systems to change to calorific value in one and the same step would only cause minor costs. Then, it could contribute to a more exact tariff system for renewable gas products.
Unlike other solutions aimed at decarbonising heat (renewable gases), heat pump technology is mature, efficient, and risk free. Therefore, energy policy must target the wider rollout of heat pumps.
The use of the same electricity network (and also the same electrical smart meters) for mobility and heat makes the investment necessary to meet the demand twice as beneficial.
Therefore, a tariff system, which incorporates temporary variation and excludes costs outside the provision of the service, is essential for consumers to take full advantage of heat pumps and also for EVs.

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

Smart appliances will be critical to switch towards a new digital paradigm, where customers will be able to control and manage in real-time all different equipment, with much more data and according advice on energy efficiency measures.
Awareness-raising in society should on be the agenda, as many MS state that customers lack basic knowledge with regard to energy-smart appliances and climate protection, and the impact of the former on the latter. Customers are not always aware that they can bring a change through their own actions as for example changes in behavioral patterns related to energy consumption. Moreover, the ongoing debates on the ePrivacy Regulation are decisive for the deployment of a critical mass of energy-smart appliances and of the benefits linked to it.

The Commission's proposal on ePrivacy goes far beyond the requirements of the GDPR, requiring the consumers consent at every new transfer of data. However, the collection and increasingly automated evaluation of metering data are indispensable for the operation of both smart meters and related services in the energy system. This includes the digitised and automated control of energy grids, including for the integration of decentralised generation from renewable energies, intelligent load control as well as demand-side management. The European specifications for smart meters lay the foundations for the introduction of smart metering systems. They form the basis for energy efficiency measures and the participation of consumers in the energy market, driven forward by the European Commission, including as 'prosumers.' Requiring consent for every use of intelligent metering systems would mean that end-users could endanger the security of the system and of supply by refusing the required electronic communication which is needed for running smart grids, particularly when an extremely large number of decentralised generation plants and consumption sites need to be controlled and managed automatically.

Therefore, "activities in the context of the supply of electricity, gas, water or heat with regard to terminal equipment where it is necessary for compliance with a legal obligation deriving from the law of the Union or the Member States, or necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the entitled bodies" should be exempted from the scope of the ePrivacy Regulation (Art. 2), as currently put forward in the debates of the Council Working Party Telecommunications and Information Society.

Moreover, a clear regulatory framework should be established giving a boost to the deployment of a critical mass of energy-smart appliances.
Many draft Integrated National Energy and Climate Plans submitted by Member States to the Commission, omit to investigate the potential of demand response and the contribution of all decentralized energy resources to increase system flexibility. We encourage EC to track effective deployment of flexibility resources in MS such as Demand response (which implies a promotion of efficient connected devices) for an effective integration of energy-smart appliances and variable renewables.

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

Smart appliances can provide customers with a detailed report about their consumption and support them in making informed decision about when, how long and which electric appliances to turn on and off. Furthermore, the smart appliances facilitate the use of small–scale renewables by residential and office-buildings and many customer can turn into prosumers. Therefore, smart building and energy smart appliances give an opportunity of higher control of the efficient consumption in the hands of the customers and stimulate customers' interest and appetite to participate in energy markets.
Once the building or appliance reacts automatically to RES generation, or efficient consumption without the need of human interaction the contribution can be maximized. Starting from the premise that energy-management systems are line-commutated and grid-supportive, smart buildings and energy smart appliances offer the opportunity to efficiently integrate RES. The further integration of a battery or thermal storage allow the use of RES more independent from the point of time when the power was generated.

Moreover, by the interconnection of sensors and actuators, smart technologies can predict weather, user behavior and environmental conditions to adapt the operation of components such as photovoltaic systems, storages and energy appliances. Through weather forecasts and technologies such as geofencing, the operation of heating systems can be controlled efficiently. Modern heating systems can also increase the self-consumption of locally generated energy.
A full integration and interaction of buildings with the energy system is a very cost-effective way to achieve climate neutrality and guarantee system benefits. This is the reason why buildings should not just be digitalised, but also active systems, enabled by the smart solutions present in buildings which have flexible consumption patterns and make them compatible with grid operation.

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

There are already solutions available and deployed that allow for a differentiation of electricity sources at EV charging stations, in particular if a EV user wishes to charge with a contract that ensures RES-based electricity. Moreover, these software solutions allow unlock additional revenue streams by enabling implicit and explicit demand response valorisation and/or grid related services towards the DSO. Typical digital solutions for energy sources traceability have up to now been based on blockchain technology as it allows to accommodate information from different parties in a decentralised way.

In general, EV charging infrastructure should be equipped with smart technology that enables flexible pricing in real time, smart charging (the precondition for successful and cost-effective EV grid integration) and by extension, the requisite of GO's tracking or another technique (as a charging station PPA) that reveals the energy source used.
Where the market has not been yet facilitated, DSOs can contribute to the deployment of sufficient public recharge infrastructures in those situations where market solutions are not feasible. For this reason, DSOs should collaborate in designing and managing the smart recharging systems of electric vehicles, together with other market agents.

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.

Questions

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

The development of new innovative structures (e.g. virtual power plants, virtual storage and smart charging infrastructure) could contribute to a better integration of RES at local scale, by allowing household consumers to sell their energy as one virtual power plant on the market.
In this context distribution System Operators, besides ensuring the digital means to integrate all new requirements to ensure a reliable and cost-effective grid operation, can play their role as market facilitator and offer information and billing data based on SM-Data to customers and with customer consent to energy service provider.
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 (e. g. virtual power plants, virtual storage and other forms of aggregation).
All consumers will benefit from a widespread deployment of decentralised energy resources that can offer their flexibility in a digitalised energy system, also 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?

Grid management (system operation with a SCADA and EMS system) is already completely digitalised. Enlargement to medium and low voltage levels might help individual customers to apply at flexibility/DMS/DR markets.
Due to the increase in decentralised generation and the associated volatility, higher demands are placed on grid monitoring and grid control in order to operate the power grids in a safe state at all times.
Also, the operation of the processes to keep the power grids stable require additional information in order to take the correct measures in critical grid situations.
Digitalisation can make a significant contribution to providing grid operators with the information and data necessary for intelligent and efficient system and grid management in the following four key aspects: 1) system monitoring, which will allow for identification of needs; 2) smart system management to improve efficiencies (e.g. dynamic line rating etc.); 3) the interfaces between system, market consumers; and 4) the procurement of services via flexibility markets, making use of services from demand response, storage and distributed generation.
Demand response services allow not only a better integration of RES but also a proper sizing and use of the network infrastructure. These services can be offered thanks to the digitalization of energy.

Thus, the availability of more and better data can be used by regulators and TSOs/DSOs to make better informed decisions which improve the efficiency and productivity of the grid assets and procedures and, at the same time, reduce risks. Some of the key factors include:

- Sensorisation: the intelligent network now can provide more data to optimize the operation and reduce risks.
- Reduction of losses (technical and non-technical) with the deployment of Smart grids, where data on network flows and voltage can be analysed.
- Resilience and system reliability with the help of real-time information.
- Optimal planning and operation (demand forecast).
- Resilience against cyber-attacks.

However, more digitalisation in the network will require an additional investment effort, as well as maintenance, so it must be considered appropriately in regulatory framework and incentive schemes, considering the long-term benefits resulting from this required digitalisation.

3. **How to ensure that the future telecommunication infrastructure provides the type and quality of services (at a competitive/reasonable cost) that the energy transition requires?**

Due to the increasing decentralisation of energy supply and the progressing digitalisation, the energy and water industries are facing new challenges related to their communication systems. Since the majority of the industry provides essential services, companies are in need of secure, universal coverage, highly available and cost-efficient communication systems in order to ensure consumer's connectivity and security. Without such a communication system, it will not be possible in the future to permanently sustain a secure energy and water supply as central elements of general public provisions.

An example of what the industry is doing to try and overcome this challenge is Germany's case where the industry is seeking out the instalment of an exclusive radio network using the 450 MHz frequency. Such a network is necessary for the network monitoring and control, the connection of generation and consumption plants, the voice communication with maintenance and repair work teams and the reading of smart meters. The radio network has to be securely available in everyday business, but also in case of major emergencies, natural catastrophes or largescale electricity outages and it has to be protected against cyber risks.

Furthermore, it is necessary to consider the energy and water industries application scenarios in research and development of new technologies such as 5G, IoT, blockchain and AI. Industry should also be involved in standardisation processes at European and international level in order to ensure these technologies will meet their needs for innovation and customer connectivity.
The deployment of smart meters in the case of Spain was a successful example of improvement of the operation and the quality of supply, where PLC (Power Line Carrier) was partly use for accessing smart meters.

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

Member States via their respective regulatory authorities must ensure that the price charged by service providers (especially big telco companies) is corresponding to real expenses.
Satisfying and secure connectivity to digital solutions requires the existence of high-speed, reliable and affordable digital infrastructures in the first place. Since transformation is not possible without reliable and secure communication, the foundation of secure electronic communication needs to be supported by easier and quicker access to secure communication solutions – not only on a single European level or market but rather on a global scale. Certificates-based solutions are an excellent example for that, but even these comfortable solutions might be improved in the near future. For operators of Critical Infrastructure (CI) this often means expensive and time-consuming tests, very long approval times for digital & secure solutions. Often there are company-threatening business risk – especially if the operator is a privately owned company – when solutions are not secure or sufficient the first time and need to be fixed later in the on-site or at the consumers' places.

Connectivity requires infrastructure (or in other words; a reliable connection) and security requires continuous trust (and testing). Thus, connectivity of consumers can be provided by supporting the future rise of more digital infrastructures (especially in areas that are currently benefiting only partially from digitalisation, e.g. rural or island areas). Security and trust – of course – can only be built over time, they require a more general but still dynamic approach, since vulnerabilities or other threats challenge security and therefore also resilience on a daily basis (see e.g. CERT-EU news https://cert.europa.eu/cert/filteredition/en/CERT-LatestNews.html). Providing cheaper and easier ways for future, secure communication solutions (e.g. by using certificated-based or other PKI-based methods) might be a step in the right direction, strengthening resilience and trust in this critical sector (of energy supply for all).

Furthermore, the technologies mentioned (5G, IoT, blockchain and AI) have different characteristics which must be taken into account in a final assessment. For example:

- **Security for IoT:** introduce Security criteria for IoT devices participating in energy market/distribution systems. State of the art principles (security by design processes, code review, pentest, mandatory support, patchability) before market approval.
- **5G**: If EU backdoors for prosecution purposes are implemented, the standard will be broken mid-term which in turn is a major risk for enterprises and consumers.
- **Blockchain:** Type of blockchain (central/decentral, public/ private/consortium/mixed) must match the purpose of application to avoid being exploitable by distributed system takeovers.
- **AI:** Data protection must be ensured to ensure privacy rights and hinder market misuse of meta-information. Some of the current AI models are fragile – long term reliability and stability/safety is not always guaranteed with state of the art approaches (distributional shift, adversary examples).

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

Digitalisation has been changing the way isolated electricity systems as well as specific plants in remote areas are planned, operated and maintained. First, digital tools can help to optimise the necessary storage size of an isolated system, taking into account the specific system demand. Second, digitalisation can provide both historic and real-time information, supporting operation and maintenance. Who monitors a system or a plant could be thousands of kilometres away but skilled local teams will still be necessary on site. Especially on islands, a capable local workforce should be kept that is well trained in the new energy technologies, able to install, to maintain, and to operate innovative energy technologies, such as storage, micro-grids, smart-grids or new digital services. Usually, utilities employ skilled workers on islands and prevent at the same time further brain drain. Solutions based on the latest communications techs and protocols, namely the ones that can guarantee real QoS (>= LTE), in order to provide visibility and controllability close to real time. One of the pillars of 5G, with URLL (Ultra Reliable Low Latency), is targeting this critical infrastructure space.

Microgrids integrate renewable energy generation and electricity storage systems (such as batteries) being able to operate both connected to the public grid and autonomously (in so-called "island" mode).
Micrograds are increasingly widespread in isolated areas thanks to its sustainable character, the falling costs of both energy storage and renewable technologies and its remote energy management capability.
An appropriate example of a microgrid solution is for example on La Graciosa Island, consisting of a LV microgrid which enables testing different flexibility services to the distribution network such as interaction between DSO and prosumers for active demand-side management, storage system and generation control; all supported by a microgrid EMS in which a PV generation forecast is also taken into consideration.

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 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. **To what extent is the Commission Recommendation on Cybersecurity[6] implemented? What needs to be further considered to address the particularities of the energy sector in terms of cybersecurity, namely real-time requirements, cascading effects and the mix of technologies?**

The level of implementation depends on the member states laws, which were settled after the EU NIS directive. Usually, these laws explicitly name the measures the energy sectors has to take and implement.
In this context, we welcome the publication of the Commission Recommendation on Cybersecurity for mapping out basic requirements for the security of networks and IT systems in the energy sector especially with consideration of proven international standards.

Regarding the implementation of the Commission Recommendation into national legislation and regulation, the implementation in the case of Germany is well-advanced in terms of cybersecurity in the energy sector. Several laws and directives define and specify requirements for the secure operation of IT, OT and SCADA systems of energy grids and power plants, e.g. IT-Security Law (Act to Strengthen the Security of Federal Information Technology), BSI Law (Act on the Federal Office for Information Security), BSI-Kritis-Verordnung (Ordinance on the Identification of Critical Infrastructures) and IT-Security Catalogues by the national Regulator. All these legislative and regulative acts have been introduced since 2015 after the IT Security Law added security relevant points to multiple already existing laws in Germany (articles act).
The correct and up-to-date implementation of these acts and ordinances is audited regularly (at least on an annual base) by accredited, external ISMS-auditors. Constantly performed risk analysis ensure that the current implementation is sufficient, also considering often and fast changing threats or new technologies. The comparable security level is ensured by a uniform certification based on the international information security standards ISO/IEC 27001 and ISO/IEC 27019.

Nevertheless, ISMS Certifications are no ultimate guarantee for security. Auditors are sometimes unable to detect actual risks beyond processes and asset documentation due to missing technical knowledge.

While cybersecurity is essential for a digitalised energy grid and a decentralised system of renewable energy production, the macro economical cost of providing the security consider revising. A higher rate of digitalisation also invokes higher interdependence and therefore increases a systems vulnerability to external interventions. A real-time or near-real-time transfer of smart meter data that include data for coordinated control of renewable energy plants require high quality levels of data transfer infrastructure together with highly secure communication channels on a national scale. Therefore, a cost-benefit analysis for secure digital infrastructure adapted to the actual

[6] Commission Recommendation of 3.4.2019 on cybersecurity in the energy sector, C(2019) 2400 final, https://ec.europa.eu/energy/sites/ener/files/commission_recommendation_on_cybersecurity_in_the_energy_sector_c2019_2400_final.pdf

circumstances in the individual countries needs to be taken into account when implementing recommendations in the supranational realm.

2. **How would you estimate the costs of addressing the particularities? Can you provide examples?**

A cost estimation for the implementation of measures in line with the Commission Recommendation depends highly on the individual context of respective companies and, therefore, is hardly comparable. However, it can be noted that costs for the certification in line with international standards such as ISO/IEC 27001 and ISO/IEC 27019 itself are not the largest expenditure. Although, for example, larger DSOs in Germany must spend several weeks of on-site audit alone which cause enormous expenditures for the certification and personnel costs. The necessary adjustments that have to be made in the day-to-day business, in the business processes and in the operational phases are even higher.

To fulfil the strict requirements the Commission Recommendation EU-wide, most energy providers would have to hire additional employees (often highly specialised), reconfigure existing processes EU-wide, implement new, more secure technologies and raise the security awareness of all employees and major service providers significantly. Structured security management approaches such as the Information Security Management System are not static in nature. The ISMS is always an ongoing process, so that it´s optimisation will be ongoing as well – security is not a one-off cost but a continuous investment. In addition to the internal cost, often a high six- or even a seven-digit investment is spent for external certifications on an annual basis.

For the case of Austria, the implementation of an ISMS and operation triggers a fixed resources team of about 5 FTE for a medium sized DSO, as an example.

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

Investments into the digitalisation of the energy sector that lead to a reduction of forecast errors and a better integration of renewable energies into the energy system are positive. To foster those investments, the implementation of an appropriate regulatory framework might be necessary. Furthermore, it is of utmost importance that assets in the energy sector that are considered critical infrastructures are, if digitally connected, highly protected from cyberattacks.

In terms of security the pooling of numerous decentralised resources inherently reduces the risk of failure compared with a large single unit. Distributed small systems can be more resilient if they are built with a solid separated architecture. Consequently, they can reduce or detect individual defects or attacks and reduce outages.

DSOs activities are altered by the integration of new energy resources in their networks (mainly renewable generation and storage). This great complexity enables DSOs - as a provider of new modalities of access to the network - to achieve a more efficient use of the network more adapted to the new needs of network users.

The availability of more and better data from these distributed renewable power generators (forecast and real-time) can be used by DSOs to make better informed decisions which improve the resilience of the electricity system.
Moreover, active network management using digital solutions for advanced monitoring and control of the distribution network will mean:

- Automation of network configuration and utilisation of the available flexibilities connected to the distribution network (e.g. flexible generation, active demand, storage, etc.), potentially avoiding or deferring the need to reinforce the network to provide the required levels of security of supply, power quality, reliability and resilience.
- Reduction of the impact and likelihood of disturbances caused by extreme events such as weather-induced outages.
- Solutions for meeting challenges related to RES integration and potentially reduce the cost of maintaining high levels of network resilience.

4. 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?

It is of utmost importance that assets in the energy sector that are considered critical infrastructure are, if digitally connected, highly protected from cyberattacks. Digitalised distributed power generation as well as flexible loads should be integrated into the electricity system via secure interfaces. System complexity can be reduced by IT and communication standards.
Also, good demand side management strategies contribute significantly to the resilience of an electricity system. New data that will be available e.g. through smart meters will allow DSOs to improve their grid control and supervision, demand and generation forecast, outage management and grid optimisation.
Notwithstanding the above, given the goal to reach a 100% emission-free generation, the role of storage will be essential to maintain security of supply. Storage, and more specifically batteries connected to the network, maximize their value to society when they are connected to the electricity distribution network. It is also critical to ensure the operation under a disturbed environment, by implementing some mechanisms to ensure the resilience of the systems in case of incidents, to minimize the risk of blackout.

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

Information sharing and collaboration is a key factor for overall success in protecting the European energy sector and power grid in particular. Multi-stakeholder trust based cooperation assures that all parties add complementary value to the general objective, facilitating a common understanding of the challenges, threats, best practices, incidents and preparedness. In this context, sectorial collaboration as well as ICS-CERT collaboration seem to be the most beneficial models.

Public Private Partnership collaboration is deemed to be useful as well and would mean the energy sector cooperates to found a CSIRT, which then communicates with the authority according to the NIS directive in each Member State.

Information sharing and collaboration is a key factor for success in protecting the European energy sector and power grid particularly. Multi-stakeholder trust-based cooperation assures that all parties add value to the general objective, facilitating a common understanding of the challenges, threats, best practices, incidents and preparedness. In this context, sectorial collaboration as well as ICS-CERT collaboration seem to be beneficial models.

Public Private Partnership collaboration is deemed to be useful as well. For example, in the German case, the so-called UP KRITIS has been founded several years ago as a Public-Private Cooperation between Critical Infrastructure Operators (KRITIS), their associations and relevant public authorities. The UP KRITIS addresses eight of the nine critical infrastructure sectors in Germany. The aim of the UP KRITIS cooperation is to maintain the supply of critical infrastructure services in Germany by continuous analysis and information sharing. Furthermore, also national and international industry associations function as aggregators of information in order to facilitate industry-wide cooperation. Vital cooperation within such associations is a significant step towards the protection of critical infrastructures and Best-Practices cross-border amongst all KRITIS sectors.

Also, cooperation with security research, scientists or ethical hackers to get Pre-CVE knowledge could be beneficial. Moreover, an European Pentester team specialised at energy grid systems at the disposal for the EU members would be beneficial.

6. New skills and capabilities, Research and Development

The digitalisation of the energy transition must be supported by new technological developments and upgrade of skills of energy companies and public administration.

Question

1. **How can we promote digitalisation in energy Research & Innovation as part of the next framework programme, ensuring a close link with energy policies and full consistency with EU energy and climate objectives.**

The upcoming European funding program „Horizon Europe“ will have to give support to the efforts of science, entrepreneurs and politics in developing and implementing new technologies for a clean and sustainable energy future and will, of course, have to be in line with the European climate and energy policy. National programs for R&D-supports in member states will complement European level promotion.

In order to prepare appropriate conditions it could be useful for some R&D projects to have exemptions of current legislative and regulatory frameworks.

We believe that the best approach is the roll-out of different energy sandboxes with a high involvement of market parties, allowing clean innovative business models to be tested, such as flexibility platforms, GOs tracking tools and decentralized smart energy systems, needed to open up new ways to increase easiness and allowing consumers to engage with green services.
New digital technologies need to be tested in a real world conditions, close to the market situation, at sufficient significant scale. R&D projects could more easily benefit from flexible frameworks to ease the further scale up and develop new ways for consumers to engage with green services. One solution would be to deploy R&D projects within regulatory sandboxes, allowing innovative business models (flexibility platforms, GOs tracking tools) to be tested with high involvement of market parties and customers. Regulatory sandboxes which are currently deployed in the United Kingdom to test new concepts of energy communities and P2P trading are good examples that could be replicated. In Germany, so-called "sandboxes of the energy transition" ("Reallabore der Energiewende") deal with sector integration and neighbourhood concepts.

Digitalisation can be seen as a general term and the basis for developments in Information and Communication Technologies- ICT and their impacts on the energy system. ICT uses do not directly contribute to climate goals, but they are substantial instruments and tools to easier and quicker fulfil the future climate goals than without using ICT. ICT uses are required for example for integration of decentralised energies and for controlling production, transport and use of energy. Therefore, digitalisation should be an obligatory part of the next framework program. Furthermore, digitalisation is a cross-sectional subject what is implying strong relations to general developments in ICT and ICT applications in different sectors.

R&D funding should focus on two main activities: a) security and resilience and b) methods and techniques related to data handling and processing.

Therefore, promising funding areas with special focus of their application in the energy sector could be the following: Making given data utilisable, Internet of Things, Big Data Analytics, AI, Human-Machine-Interoperation, Robotics, digital solutions for the improvement of sector coupling.

7. 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.

Questions

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

The recently adopted GDPR together with the Cyber Security Package provide a very extensive framework to ensure data privacy and security of the networks and information systems. Digitalisation of services triggers service providers to process constantly increasing amounts of data. Many of today's benefits such as access to more competitive energy services or comparison tools hinge on a stable internet connection. Equally important, the overall system must be kept fair, accessible and adequate to all customers, including those who do not want to take an active part in the market and those who cannot afford to invest in distributed generation, and technologies and equipment's for smart-homes.

Moreover, smart products like self-consumption or home devices will help customers with the adoption of digital channels and engagement with their energy usage. Last but not least, the private sector should be encouraged on initiatives on best practices, certifications and codes of conduct.

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

Digitalisation in the energy sector helps managing the increasing complexity of the energy system leading to smarter and more cost-effective solutions. 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).

However, the digital age provides new opportunities and also affects how power plants are designed, operated and maintained. The progressive digitalisation in the energy sector involves both new and existing plants and is key to meeting the challenges on the path towards a decarbonised power system. Many utilities across Europe have already launched their own initiatives to digitalise systems and processes, such digital applications (used especially at hydropower plants) include:

- buckling visualisation systems (video analysis with artificial intelligence for the inspection of generators or stator core damages);
- advanced data analysis (insights and predictions by machine learning; advanced statistics and anomaly detection);
- intelligent operation and maintenance optimisation system (OPEX reduction, CAPEX forecast);
- interactive trouble shooting (using mobile devices and smart glasses);
- virtual 3D model of the plant (to plan maintenance work, documentation, safety instructions, training tutorials);
- digital work force management (mobile devices used in maintenance and repair work);
- acoustic monitoring (of machine sounds to detect anomalies, self-learning systems);
- digital twin (life-time forecasts of equipment based on real time simulation models);
- brush monitoring (data collection of the running behaviour of carbon brushes in the generator);

- remotely operated vehicles (for the inspection of the concrete structure, machinery and steel hydraulic equipment);
- echoscope (real-time 3D sonar for underwater inspections and visualisation of complex structures);
- fish monitoring systems (software-based fish detection).

The benefits of digitalisation are in this regard numerous and span from lower cost of energy supply to new customer offerings, higher security of supply, better work safety and many more. Looking at public perception of digitalisation, there is a substantial amount of negativity, e.g. due to projected effects on job markets or larger-scale data privacy breaches from tech giants. Given this circumstance, it is important that the public is made aware of the benefits of digitalisation mentioned above and that there is a joint commitment to this topic both in politics and in the energy industry itself.

Awareness can be fostered with the promotion of inclusive growth and sustainable development by enhancing connectivity, building capacity, and developing digital skills Initiatives such as the EC Digitising European Industry initiative (DEI) launched in April 2016 will be key to reinforce the EU's and SMEs' competitiveness in digital technologies. In particular:

- Implementation of Digital Innovation Hubs where SMEs, startups and mid-caps– can get help to improve their business, production processes, products/services by means of digital technology
- A strong network of DIHs to enable every company to take advantage of digital opportunities
- Development of digital industrial platforms, large-scale pilots and PPPs
- Ensuring a level playing field of regulations and obligations to all players (incumbents and newcomers) operating in the new enlarged energy sector which includes distributed generation, intelligent mobility, smart houses & buildings and new appliances, and others.

Eurelectric pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

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