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Preparing a future EU strategy on energy sector integration / EPEX SPOT contribution to the public consultation of the European Commission

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Introduction

EPEX SPOT welcomes the opportunity to express its opinion on the future EU strategy on smart sector integration. EPEX SPOT strongly supports the EU Commission's approach that **an integrated energy system shall be at the heart of Europe's economic recovery post-COVID-19**. Sector integration is the most cost-efficient pathway to a real decarbonisation of the energy system, allowing to optimise the energy system as a whole, instead of each sector independently. Especially in the post-COVID-19 period, it is crucial to maintain the European path of ambitious decarbonisation targets as set out in the Clean Energy Package and the European Green Deal. The expansion of renewable energies across all sectors and deployment of low carbon technologies will create new crisis- and future-proof jobs, strengthen European industry and improve the quality of life for Europeans.

Competitive markets deliver reliable price signals for electricity, flexibility, gas and CO_2 emissions to enable these changes. They benefit consumers and aim to maximize social welfare. Even low or negative electricity prices, as can currently be observed due to the reduced demand for electricity in the wake of the COVID-19 pandemic, provide necessary price signals.[1] To reach the goal of barrier-free sector integration, the full potential of demand-side flexibility needs to be unlocked in all energy sectors. Besides, a clear and stable regulatory framework is needed as well as more regulatory coordination and harmonization between the different sectors.

EPEX SPOT's contribution to the preparation of a European strategy for energy sector integration focusses on the following key aspects:

- **Competitive, non-discriminatory and liquid energy markets** deliver reliable price signals and are thus the cornerstone to achieve smart sector integration.
- The full potential of **demand-side flexibility** needs to be unlocked in all energy sectors to make smart sector integration a success. **Exchange-based flexibility markets** are a promising solution for this.

1. What would be the main features of a truly integrated energy system to enable a climate neutral future? Where do you see benefits or synergies? Where do you see the biggest energy efficiency and cost-efficiency potential through system integration?

Competitive energy markets with reliable price signals: Competitive, non-discriminatory and liquid energy markets with free price formation are the cornerstone to achieve smart sector integration. A price signal reveals diverse and dynamic information to market participants which cannot be revealed by a regulated determination of asset remuneration or fixed prices. Power Exchanges play a crucial role in the free price formation on European wholesale markets. Every day, EPEX SPOT generates and publishes the reference price for electricity. Under the roof of EEX Group, a cross-commodity power exchange group EPEX SPOT is part of, further price signals for gas, coal, and CO_2 emissions are delivered. This price is determined by matching of European demand and supply. It is decisive for an efficient electricity market: it leads short-term generation and consumption decisions as well as long-term decisions in investments in new generation capacities. Well-functioning power markets are the most efficient basis for the market integration of continuously growing share of renewables, by enabling market parties to trade highly granular products very close to delivery, thus enabling aggregators to accurately balance forecast errors and to properly handle generation ramps. A strong and reliable price signal will set the right incentives to run power-to-x plants to produce for example hydrogen from electricity when it is most efficient.

[1] Negative prices are a price signal on the power wholesale market that occurs when a high inflexible power generation meets low demand. Current low or negative prices illustrate the urgent need for more flexible production capacities. Negative prices signal generators to reduce output to avoid overloading the grid and thus help to maintain the required balance.

Also, the dissemination of price signals to decentralized assets and loads, such as (un-)charging electric vehicles, supports the whole energy system.

European-wide interconnected wholesale electricity markets: Security of supply, affordability and decarbonisation are core objectives of the European Energy system. Between the countries of the European Union, balancing effects arise in load and the feed-in of renewable energies as well as in the event of unplanned unavailability of power plants – provided that the electricity markets and grids are sufficiently integrated. A concrete example is the European Market Coupling. As an independent initiative of Power Exchanges and Transmission System Operators it is now an integral part of the European Internal Energy Market. Market coupling optimises the allocation process of cross-border capacities at the interconnectors thanks to a coordinated pricing mechanism and thus enables the efficient exchange of electricity between countries. The price signal from the exchange not only determines the direction of flow of electricity from a low-price area to a high-price area. Rather, it makes an important contribution to the efficient use of the network infrastructure, for the safe operation of the network and for security of supply. **Market Coupling is the clearest expression of the fact that security of supply is no longer a purely national issue** but can only be meaningfully grasped in its European dimension. A study for DG ENERGY estimates the benefit of market coupling at EUR 2.5 to 4 billion per year.[2]

Enhanced demand-side flexibility of all different energy sectors: The expansion of renewable energies poses a major challenge for the European energy industry: decarbonisation and decentralisation lead to a greater need for flexibility to guarantee an electricity system that is cost-effective and at the same time guarantees security of supply. As already calculated by the European Commission, **increased demand-side flexibility could lead to savings of EUR 5.6 billion per year from reduced back-up capacity**, network and fuel costs in Europe.[3] To achieve all benefits a truly integrated market can provide, it is key that all actors have fair and equal access to the markets. This is especially true for the demand side. Market-based flexibility options are urgently needed to unlock the full potential of demand-side flexibility. Cost-based and regulated mechanisms do not create incentives for the development of load-side flexibilities such as batteries, demand-side-response and power-to-x. This is because the definition of the cost of load is purely based on the value of the electricity to the consumer. These opportunity costs vary between individual consumers as well as with time and location. Since it is not possible to define costs for these load-side flexibilities, they can only unfold their potential through a transparent market with free and anonymous bids and not through a cost-based mechanism. However, **flexibility on the load side is urgently needed to make the energy transition cost-efficient and thus contribute to acceptance by the public through low costs for end consumers.** Finally, the integration of load flexibility, which can only be achieved by a market, is also a step towards the democratic participation of consumers in the revenues of the electricity market and the energy system transformation. One example is the marketing of the flexibility potential of batteries and electric vehicles. The Clean Energy Package, which defines local energy communities that participate in the energy market as new decentralized actors, has recently strengthened the role of citizens within the energy transition.

Flexibility markets as one promising flexibility option developed by EPEX SPOT: Flexibility markets implement a marketplace for congestion management that efficiently centralizes local flexibility offerings. This enables network operators to resolve physical congestions reliably and economically. The flexibility providers, on the other hand, benefit from an additional revenue opportunity for the flexibility they can provide. Flexibility markets will become key for the successful integration of renewables into the electricity system. Competitive and liquid short-term markets offer already today many ways to value flexibility, in particular with smaller product

[2] Booz & Company, University of Cambridge, Imperial College London, IISS, LeighFisher (2013): Benefits of an Integrated European Energy Market

[3] European Commission (2016): Impact assessment of the revised rules for the electricity market, ACER and risk preparedness

granularity and short lead times, but they do not solve grid congestions which are likely to increase in some EU countries in the coming years. New innovative markets and products will further increase flexibility trading and will allow the market to solve congestions in a cost-efficient way. They will also create the right conditions in the short term to use the embedded flexibility but also going forward to develop new flexibility sources. An energy system with coupled sectors and without distorting sector-specific tariffs and charges can greatly facilitate the integration of renewables and the achievement of climate targets. The technologies for this, such as power-to-x are already available, but currently do not have enough remuneration opportunities. A flexibility market will create revenue opportunities for sector-coupling technologies that can also be used for congestion management.

With the enera project[4], the first exchange-based flexibility market has been successfully launched. The project has shown that a flexibility market is not only technically feasible, but also offers real added value by eliminating local physical congestions through use of a market. The curtailment of renewables could be avoided and new flexibility potentials were opened up. Since the opening of the market in February 2019, trading activity has developed steadily. New ways of remunerating flexibility have been found, coordination between System Operators has been enhanced and procedures put in place. The project allowed to create blueprints[5] for the implementation of market-based flexibility mechanisms, which will be looked at from other EU countries going in that direction according to the Clean Energy Package provisions.

2. What are the main barriers to energy system integration that would require to be addressed in your view?

A deeper energy system integration is currently hindered by the following barriers:

- **Regulatory interference in market price formation**: The end-consumer electricity price does not reflect the wholesale market price but is blunted through fixed components (such as taxes, charges, levies), thus failing to reflect the value of flexibility that could drive sector integration.
- **Barriers to market access and participation**, e.g. barriers to demand-side flexibility (often from transport, heating and industry) to participate in electricity markets, also complexity of the electric system often not designed for small players (such as balancing responsible party scheme or participation to ancillary services)
- **Regulated mechanisms for end-consumer flexibility** (such as § 14a EnWG in Germany), because it locks assets and flexibility in a monocausal and regulated mechanism, excludes its participation from aggregations and other smart business models that foster further system integration and it prevents the free choice of the end-consumer in marketing his flexibility at a fair and transparent price
- **Inconsistent incentives for system operators when procuring flexibility**, such as purely CAPEX-based cost recovery that distorts the choice between grid extension and non-wire alternatives.
- **Inconsistent regulatory framework**, lack of clear roles for different market actors and clear targets.

Lack of harmonization of taxes, charges and levies across different sectors: the current system of taxes and duties has grown historically for each sector individually. Despite the existence of mature sector coupling technologies, this non-harmonised regulatory framework does not set enough incentives for flexible transition of energy from one sector to the other. Charges such as network tariffs shall be raised where the final transition

[4] https://projekt-enera.de/

[5] An official evaluation of the enera project is made by the project consortium and will be available end of 2020. Additionally, external consultants work on an overall assessment of the SINTEG projects that enera is part of.

from end energy to utilised energy takes place (at the “real” end-consumer) and not at the border of each energy sector.

3. **More specifically:**
   a. **How could electricity drive increased decarbonisation in other sectors? In which other sectors do you se a key role for electricity use? What role should electrification play in the integrated energy system?**

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   b. **What role should renewable gases play in the integrated energy system?**

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   c. **What measures should be taken to promote decarbonised gases?**

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   d. **What role should hydrogen play and how its development and deployment could be supported by the EU?**

Hydrogen and power-to-x technologies in general can contribute to tackle current congestion problems in the electricity networks. If intermittent renewable energy is consumed on-site during generation peaks to produce gas, it alleviates the very costly congestions in the electricity grid, which happen often for example in Germany and become an increasing problem in Austria. This makes it a very promising technology especially for electric network operators. Another role of hydrogen and power-to-x technologies can be to efficiently integrate intermittent renewable energies by storing surplus energy for a decarbonized future. The principle is to combine different energy uses and linking different sectors, like electricity, transport, heat and gas. Coupling the gas and electricity sectors via electrolyzers (as a power-to-gas plant) is a great opportunity to store electricity in the form of hydrogen that can be used in many ways, e.g. as normal gas in the gas market (heating etc.), in the chemical industry or for re-electrification. A price signal is needed to set the right incentives for the most efficient use of electricity and production of hydrogen. In this context, **a flexibility market can provide the right signals, but also provide profit opportunities for sector coupling technologies.**

   e. **How could circular economy and the use of waste heat and other waste resources play a greater role in the integrated energy system? What concrete actions would you suggest to achieve this?**

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   f. **How can energy markets contribute to a more integrated energy system?**

Energy markets already contributed in the past to foster system integration and will continue to do so in the future, in particular through **reliable prices setting the right signals for investment, generation, consumption and support of the grid**. This applies both to the electricity and the gas price signals, but also to the price of CO_2

emission certificates. **Sector integration is already taking place today in various forms, especially on markets.** Organised trading on the exchange, for example, brings together a wide range of market participants from different sectors and with different business models. The market participants trade a wide range of different goods, such as electricity, gas and emission allowances. These are the basic ingredients for sector integration. The market is used to reacting to developments on different market segments and to optimizing its behavior based on price signals. For example, better linkage between the electricity and gas sectors can open up new trading opportunities in the future, such as long-term trading opportunities through spreads between the electricity and gas sectors. Automation and new trading system technologies can facilitate sector integration through smooth trading of spreads between products.

It is its natural role for power exchanges to support the coupling across sectors. The European Power Exchange EPEX SPOT is the pioneer of one form of coupling: the coupling between markets. Market Coupling has proved to be instrumental for the integration of the Internal Energy Market. In the same way EPEX SPOT has a natural role to support the coupling across sectors, even more considering its belonging to cross-commodity EEX Group. The legitimacy to do so notably comes from our market participants gathering actors from all relevant sectors (utilities, municipalities, industrials, etc.) as well as from our integrated one-stop-shop model having under the same roof power and gas markets within EEX Group.

Energy markets allow to provide meaningful price signals for different products and thereby to reveal their value at a certain point in time. This allows to value all different characteristics of electricity, such as flexibility or green property, but also to give a value to the very process of sector coupling (for example through spread products between the price of electricity and gas). In this way, flexibility providers can market their asset where it provides the biggest value, which in the end increases social welfare. Markets provide a crucial coordination function in this regard.

g. How can cost-efficient use and development of energy infrastructure and digitalisation enable an integration of the energy system?

Digitalisation already has an impact on the energy system. Increasing computing power and larger amount of data available to analyse enable to better predict behaviours along the value chain, improve efficiency and energy usages, optimise investments, adapt production to customer behaviour, empower customers to follow and act on their consumption patterns and to become “prosumers”. In particular, the foreseen widespread smart meter roll-out is an important game changer towards a digitalized energy system. Smart meter, but also artificial intelligence and machine-learning enable real-time information from grid-edge assets and enable them to become full and active participants to the energy market.

Digitalisation is a catalyst for the integration of the energy system contributing to a deep decarbonisation of the different energy sectors. Digitalisation provides the necessary connections for these trends to complement and reinforce each other. Digitalisation allows to provide fairer grounds to the evolving electricity trading community, enabling new players to benefit from participation to the market on a level playing field with “traditional” market participants: **digitalisation opens energy trading to a greatest number of marker players.**

From EPEX SPOT’s perspective, one of the most important impacts of digitalisation is the **emergence of new business models and markets on a decentralised and more “local” level.** New digital tools can facilitate distributed energy resources such as household solar PV panels and storage, by creating better incentives and making it easier for producers to store and sell surplus electricity to the grid. Digitalisation has been ongoing for

quite a few years for the traditional market players, and EPEX SPOT's markets already welcome new digital trading solutions, such as automated trading.

In the context of a widening of the electricity trading community, EPEX SPOT sees an increasing role for power exchanges to provide a reliable and transparent price for all trading members. Capitalising on the experience gained over the past decade as the liberalisation of the electricity system has triggered an increase in the number of market participants, EPEX SPOT will keep on playing its innovative role by accompanying the next steps of liberalisation through extending the trading community.

Besides, **digitalisation is already a reality on EPEX SPOT' day-ahead and intraday markets**. To take the example of algorithmic trading, on our markets, the average number of orders a day has increased by 300% over the last two years. The share of API (Application Programming Interface) generated trades for 15min Intraday products reached 60%. Algorithmic trading has become a key trading advantage on continuous intraday markets and our robust trading systems are capable to accommodate this high load of orders and trades. Indeed, this trend towards more automated trading needs robust trading solutions to unfold its potential. EPEX SPOT is a key expert in providing reliable systems that are fit for future developments of digitalisation.

4. Are there any best practices or concrete projects for an integrated energy system you would like to highlight?

In the enera project the first power exchange-based flexibility market was successfully implemented in Europe. The project has shown that a flexibility market is not only technically possible, but also offers real added value by eliminating local physical congestion in the grid. The curtailment of renewables could be avoided and new flexibility potentials were opened up. New innovative markets and products can further strengthen trading of flexibility and allow the market to resolve congestion in a cost-effective manner. In this way, the right incentives can be created to use existing flexibility on the one hand and to develop new flexibility options on the other. The first trade took place in February 2019 between a power-to-gas facility of Audi and EWE Netz. 2 MW were traded at a price of -45.50 €/MWh. The power-to-x asset was paid 45.50 EUR/MWh to increase its consumption, thereby avoiding the curtailment of RES. In fact, the power-to-gas station provided flexibility by increasing their consumption and sold this service on the market. The additional power was transformed into gas, hence presenting a textbook illustration of energy sector integration. Furthermore, this creates a real market price signal that cannot be provided by cost-based redispatch. In other words, the buyer, in this case Audi, was reimbursed the corresponding amount. For a network operator, this means that in the event of congestion, no producer (e.g. a wind farm) has to be curtailed in this way and the produced electricity can be used for gas production instead. Since the opening of the enera market, trading activity has increased steadily. Nine participants are active on the enera market, including three grid operators and six flexibility providers. A total of 360 MW of flexibility is certified and tradable. This includes wind farms, biomass plants, batteries, power-to-gas plants and industrial loads.

Another project to highlight is a concept **EPEX SPOT develops together with Siemens to achieve market-based sector integration** through the connection of Siemens Building Energy Management Systems with EPEX SPOT markets.[6] The approach is to further **open up EPEX SPOT's markets to decentralized market players, down to the level of a single building.** This will be possible using Building Energy Management Systems and optimization algorithms and connecting them to the flexibility and wholesale markets operated by EPEX SPOT. The project considers four levels of the electric system:

- Level 1: within a building or site

[6] https://www.epexspot.com/en/news/taking-markets-all-levels-valuing-flexibility-achieve-market-based-sector-integration

- Level 2: within a local distribution area, such as a village, smaller city or a city district
- Level 3: within a region encompassing larger cities
- Level 4: national or even transnational areas

By enabling the market participants to value their flexibility across these levels, the objective is to unlock the full flexibility potential of decentralized assets to the benefit of the whole electric system. With the evolution of the energy landscape, the power system is moving from centralized assets to smaller and distributed energy sources. Buildings are more and more equipped to monitor and self-supply their electricity needs and even store power for future use. Energy Management Systems for buildings combine these assets with data on forecast and energy use, at a building level. The Building Energy Management System developed by Siemens can interact with other such equipped buildings to achieve a local optimization at the level of a village or a city district. Aggregating individual offers through peer-to-peer transactions, the optimization algorithm enables the offering of remaining flexibility on the regional (local flexibly) or wholesale market. On a regional distribution area, flexibility can be valued on flexibility markets operated by EPEX SPOT. They are complementary to wholesale market and to ancillary services. If there are no grid constraints, participants can also value their flexibility directly on the wholesale market, which covers national and trans-national areas. The connection of Siemens' Building Energy Management System via the local optimization algorithm, with EPEX SPOT's regional and wholesale markets allows market participants to value their flexibility across all market levels. This renders peer-to-peer trading at a local level compatible with the wholesale market. Decentralized market players benefit both from the marketing of their surplus and from a reliable, transparent price signal as provided by the wholesale market. The interaction between individual buildings and upper market levels also widens the scope of the price formation process, covering all market levels, also to the benefit of the end-consumer.

5. What policy actions and legislative measures could the Commission take to foster an integration of the energy system?

Local flexibility markets can create new revenue opportunities for sector coupling technologies. Also, sector coupling constitutes an additional flexibility provision source for market-based congestion management. In a local flexibility market, sector coupling technologies, such as power-to-gas, located in relevant grid areas, can be used for congestion management and the reduction of wind curtailment by using the electricity from wind power plants to produce gas. An energy system with coupled sectors and without distortive sector specific tariffs and charges can reduce the need for RES curtailment. Local flexibility markets are a possible way forward to efficiently relieve grid congestions and to value flexibility. We welcome the recognition of market-based redispatch and market-based flexibility procurement for DSOs in the Clean Energy Package. Yet, **current regulation on feed-in management, cost recovery and self-consumption impede an efficient congestion management**. Exemptions from the target model of market-based flexibility options, as i.e. implemented in Germany through cost-based redispatch, are no long-term solution for the energy transition and hinder the integration of demand-side flexibility.

Policy actions shall be in line with other regulatory projects, such as the Clean Energy Package, renewed State Aid Guidelines for Energy and Environment, Recovery Strategy, Green Deal, etc.

Furthermore, **the principles of market-based congestion management, local energy communities and non-wire alternatives to grid extension set ambitious targets for the inclusion of new actors to the markets**. The study by the European Commission "Assessment and roadmap for the digital transformation of the energy

sector towards an innovative internal energy market" (2020)[7] includes a roadmap towards an innovative internal energy market until 2030, that summarizes the existing regulations to be implemented with regard to TSO-DSO coordination, specifications of the products for flexibility services, the more active role of DSOs in the procurement of flexibility services and the role of aggregators in procuring flexibility services. Key steps in our view include:

- Full implementation of the Regulation on the Internal Energy market (IEM) to promote the obligation for TSOs and DSOs to adopt market-based mechanisms for redispatch;
- Full implementation of the Regulation on the IEM to promote the implementation of incentive- and output-based regulatory frameworks for electricity distribution networks;
- Full implementation of the Regulation on the internal market for electricity with respect to: the monitoring of implementation of the network codes and guidelines; the network planning and operation.
- Consultation processes and creation of expert panels at the EU level to develop guidelines for the promotion of the provision of flexibility services at the distribution level by means of coordination between TSOs and DSOs and flexibility platforms.

About EPEX SPOT

The European Power Exchange EPEX SPOT SE and its affiliates operate physical short-term electricity markets in Central Western Europe and the United Kingdom. As part of EEX Group, a group of companies serving international commodity markets, EPEX SPOT is committed to the creation of a pan-European power market. In 2019, its 302 members traded 593 TWh – a third of the domestic consumption in the eight countries covered. 49% of its equity is held by HGRT, a holding of transmission system operators.

Finally, we would like to refer to the response to this consultation by the European Energy Exchange EEX with a focus on carbon pricing and the gas market.

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