

Market Designers



ANNUAL REPORT 2018

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> Designer /di'zaine(r)/ noun A person who imagines the look or workings of something prior to it being made.

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Our markets are a result of design and innovation

The year 2018 has been an exceptional one for the European Power Exchange. Yes, it is true that every year of our company history has been marked by a steadily growing number of product launches, market integrations, coupling initiatives and corporate partnerships; all to further the efficiency of power markets in Europe.

> Ralph Danielski Chief Executive Officer of EPEX SPOT



2018,

however, stands out in terms of scope, impact, significance and in terms of diversity of the projects and products we have implemented.

EPEX SPOT is a driving force in the realisation of projects of European scale. We are a trusted service provider who shares expertise across the continent, while continuously developing new products and services for our trading members.

All the solutions we develop, and every single market with its corresponding product portfolio, is a result of innovation and design. This design must be well thought, as the following dimensions play a central role in the setup of power markets.

THE FUNCTIONAL

Our members make our markets, and therefore all our products and improvements have to cater to the needs of our trading members. A product has to be functional to bring the desired benefit for the market, be it in terms of liquidity, in terms of processes or in terms of systems. In 2018, we introduced a variety of new products and product features, migrated trading in Great Britain to new and more performant systems and implemented lead-time reductions. All solutions provide our members with more effective tools to enhance and refine their trading activity.

THE PHYSICAL

The power spot market is a physical market. It is designed according to the characteristics of electricity, of the grid and it functions in line with the physical equipment of the borders between countries. Every new product or measure must follow this logic. In 2018, we laid the foundation of the enera initiative, a new market model called Local Flexibility market. It follows the logic of the physical grid at its smallest entity, offering a market-based and local solution to handle grid congestions before they occur.

THE POLITICAL

As a physical market with direct benefits for the European consumer, the electricity market unfolds within a complex set of regulations. In 2015, the Guideline on Capacity Allocation and Congestion Management has set a regulatory framework for Market Coupling, an activity previously carried out by Power Exchanges and System Operators on their own initiative. On an Intraday level, this has been put in place within the cross-border Intraday initiative XBID, which went live on 12 June 2018. XBID is the result of a close cooperation of over 20 parties and was launched across 14 countries.

THE BENEFICIAL

The main goal of a well-thought power market design remains to increase the efficiency of the power system, and thus to create a benefit for the European consumer. We are proud to be able to share this expertise within the setup and launch of the Irish power market I-SEM in October 2018. It brings key elements of the European design to the Single Integrated Electricity Market in Ireland, and therefore to the Irish consumer.

However, market design doesn't start and end at our doorstep, or with our link in the overall electricity value chain. As part of EEX Group, our spot markets bring a constitutive element to a large set of global commodity markets.

2018 has been an outstanding year in both achievements and traded volumes. We trust that it has laid the foundation for many more developments to come, and I am looking forward to every single one of them.

A product has to be functional to bring the desired benefit for the market.

10 YEARS OF POWER

Throughout 2019, EPEX SPOT will be celebrating its 10 year anniversary. So much has been achieved in a decade, and I would like to warmly thank our customers for their support and their trust, our stakeholders for our fruitful cooperation and last but not least our teams for their passion and dedication.

Annual report 20'

02

VISION

Only very few industrial sectors have seen changes as rapid and evolutions as profound as those of the energy sector. Within this constant transformation, the role of Power Exchanges evolves, and so do the markets we operate and the benefits they bring to the consumer.

Market Designers for Europe



s the European Power Exchange, we operate short-term electricity markets in Central Western Europe and Great Britain. We grant access to reliable trading platforms, ensure that rules and regulations are respected on our markets and publish a reference price for electricity in a transparent manner.

Thanks to our markets, which are integrated in the European Market Coupling, electricity flows are optimised, cross-border transmission capacities are used more efficiently and social welfare is increased. This is the classic setup of the power market as we have known it. With digitalisation, decentralisation and decarbonisation EPEX SPOT has evolved within this role and beyond.

Products designed for and with our market participants

The energy transition and the growing need for environment friendly solutions have given a new role to power markets, and thus to EPEX SPOT. What good does renewable energy do, if the generated electricity doesn't reach the end consumer? Renewables have to be integrated into the market, and the spot market is key here. From lead time reductions to more flexible continuous trades. In 2018, we have launched products to help market participants to manage their renewable portfolios more efficiently.

Services designed for our customers

With our long-standing expertise in the field of power markets, our curiosity to share our knowledge, to help set up new markets and to accompany our clients has grown constantly. In 2018, as a service provider, we have supported the Irish Power Exchange SEMOpx in setting up the Integrated Irish Power Market I-SEM. We have accompanied our members in the go-live of the European Cross-Border Intraday Initiative XBID and have laid the foundation for the launch of a Frequency Response Auction Trial in Great Britain, with our partner National Grid.

Markets designed for Europeans

With a changing energy mix, evolving use cases, a growing energy consciousness and more autonomous end users grows the number of opportunities to find market-based solutions for the challenges in the energy sector. As experts in markets, it is our vocation to design these solutions. In 2018 we developed the detailed set up of Local Flexibility Markets, tailored to alleviate grid congestions that are inherent to areas with high renewable share. We also further explored the potential of blockchain and use cases for us as Power Exchange, and how we can efficiently use the technology for the benefit of our customers.

The range of our activity has grown significantly, and while keeping the operation of reliable and efficient markets at the heart of what we do, it is our pursuit to design products, services and markets that anticipate the evolving needs of the energy sector.



Flexible / adj.

Vision

an hourly interval, meaning electricity is traded by the hour. To increase flexibility EPEX SPOT has introduced 15 and 30 minute products over the past years, through which quarter and half hours are tradeable.



MIX

ENERGY



07



08

MICRO LOCAL MARKE

THE TRENDS OF DECENTRALISATION AND DIGITALISATION HAVE MADE RENEWABLE ENERGIES ACCESSIBLE TO EVERYONE. ENERGY COMMUNITIES HAVE EMERGED IN NEIGHBOURHOODS, WITH CONSUMERS INSTALLING SOLAR PANELS ON THEIR **ROOFS TO THEN CONSUME** ELECTRICITY THEY PRODUCE. CONNECTING THESE MICROGRIDS TO THE WHOLESALE MARKET ALLOWS PROSUMERS TO VALUE THEIR ELECTRICITY AND TO ADJUST THEIR PRODUCTION AND CONSUMPTION IN RELATION TO THE MARKET PRICE.

LOCAL MARKET

IN AREAS WITH HIGH **RENEWABLE INPUT, GRID** CONGESTIONS INCREASE. THIS MEANS THAT TOO MUCH ELECTRICITY IS FED INTO THE GRID, CREATING BOTTLENECKS ON THE GRID THAT HAVE TO BE AJUSTED BY SYSTEM OPERATORS. THESE REDISPATCH MEASURES ARE COSTLY. LOCAL FLEXIBILITY MARKETS ALLOW TO EFFICIENTLY HANDLE CONGESTIONS BEFORE THEY OCCUR, BY INCENTIVIZING ACTORS TO BUY OR SELL FLEXIBILITY THAT IS THEN ADDED TO

OR TAKEN FROM THE GRID.

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WHOLESALE MARKET

THE WHOLESALE MARKET RELIES ON LARGE BIDDING ZONES. BY POOLING A MAXIMUM OF LIQUIDITY PER-BIDDING ZONE, A RELIABLE REFERENCE PRICE FOR ELECTRICITY IS DETERMINED FOR EVERY HOUR OF EVERY DAY. IN ADDITION TO THIS. THE WHOLESALE MARKETS ARE COUPLED. PRICES ARE CALCULATED WHILE TAKING INTO ACCOUNT THE AVAILABLE TRANSMISSION CAPACITY AT THE BORDERS. THIS OPTIMISES CROSS-BORDER FLOWS AND MINIMISES PRICE DIFFERENCES BETWEEN MARKET AREAS.

Vision

With the development of Local Flexibility Markets, EPEX SPOT designed three complementary types of market models over the past years, all fulfilling a different purpose along the electricity value chain. All three models benefit from our expertise in operating markets and from our robust systems.

Beneath the layers of the market



The wholesale market An ideal starting point

Power markets have the goal to achieve security of supply and competitive electricity prices while offering sustainable services for European citizens. The European spot market is a main driver towards this goal: it optimises price calculation as well as electricity flows across borders.

The European Day-Ahead and Intraday markets are the foundation of our expertise. On the Day-Ahead markets, electricity is traded via a daily auction for delivery on the next day. By aggregating supply and demand, EPEX SPOT calculates a reference price. As our markets are coupled, this calculation takes into account the available transmission capacity at the borders. This minimises price differences between market areas and optimises cross-border flows. On the Intraday markets, electricity is traded continuously for delivery on the same day, and until five minutes before delivery. This allows for a high level of flexibility. These markets are therefore used to make last minute adjustments in case of changes in electricity production or consumption. Short-term adjustments are of growing importance with an increased share of renewables in the system, whose generation capacities depend on wind and the sun. The Intraday markets are coupled as well, and participants therefore dispose of a large number of trading opportunities across borders.



Local Flexibility Markets and the Energy Transition

Think global, trade local

With the increasing share of renewable energies in the electricity grid, the structure of electricity production is changing. It fluctuates depending on weather conditions, while conventional producers continue to produce electricity in parallel. If too much electricity is then fed into the grid, congestions arise. To solve these congestions, System Operators have to recourse to redispatch measures that are costly.

Our solution: Local Flexibility Markets, a new kind of market to solve grid congestions. Flexibility providers offer their flexibility on a local marketplace provided by EPEX SPOT, and System Operators with short-term flexibility demand in the same geographical area purchase the flexibility when they need it, thus avoiding congestions before they occur. This clear and transparent market mechanism allows to attribute a price to flexibility. It also helps to foster the development of flexibility sources and to simplify the coordination between the different System Operators. Flexibility markets have a local scope, but their potential to facilitate the Energy Transition gives them a global impact.

Microgrids and the wholesale market Power to the prosumer

Digitalisation and decentralisation give end-consumers the tools they need to regain control over their personal energy footprint, and the ability to achieve a new level of energy autonomy. Consumers become prosumers by installing solar panels on the roofs of their houses, forming small energy communities among their neighborhoods, referred to as microgrids. These microgrids form a peer-to-peer market, on which electricity can be traded through a secure blockchain technology provided by our partner LO3 Energy.

If a prosumer wants to determine the real value of the electricity he is producing and consuming, the wholesale market comes into play. By plugging microgrids into wholesale markets, prosumers can resell excess electricity, purchase energy in case of shortfall or low prices, and they can adapt their consumption according to the wholesale price, such as recharging an electric vehicle during hours when the wholesale price is low.

This market setup is revolutionary in a sense that it gives individual end-consumers access to the wholesale market and its price signal – powered by LO3 Energy and EPEX SPOT.

SEPARATE BUT COMPLEMENTARY

The key benefit of the three market types is their complementarity. Each of them caters to a different need along the value chain, from reliable price formation to valuing flexibility and empowering the end-consumer. But they all share the same foundation: our unique expertise in the operation of markets and our robust and reliable systems. Market Design is not only about innovation and creativity, but first and foremost about functionality. For a power market to work, members must trade on it.

Our members make the market

MISSIONS

THE EXCHANGE COUNCIL ADOPTS THE EXCHANGE **RULES AND THE CODE OF** CONDUCT OF FPFX SPOT AND THEIR AMENDMENTS

rading members need the operational tools and services to access markets through our systems, but the products also have to give a concrete added value and use in relation to their power assets, their trading portfolio,

and so on.

IT APPROVES NEW TRADING SYSTEMS AS WELL AS NEW PRODUCTS OR MARKET AREAS AND APPROVES THE APPOINTMENT OF THE HEAD OF THE MARKET SURVEILLANCE OFFICE

THE BODY MAKES SURE THAT THE SERVICES AND PRODUCTS OF THE EXCHANGE COBBESPOND TO THE NEEDS OF THE MARKET AND THAT THEY CAN BE IMPLEMENTED IN LEGAL

AND OPERATIONAL TERMS.

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The EPEX SPOT **Exchange Council**

The best way to reveal the concrete needs of trading members is to ask them.

By establishing an Exchange Council, EPEX SPOT has opened a permanent two-way street of interacting with our customers. The Exchange Council of EPEX SPOT is an official body of the Exchange. It meets up quarterly and discusses market news and new products.

The Exchange Council consist of 26 members and 7 permanent guests. They adequately represent the diversity of economic and corporate profiles that exists among the Exchange Members: Utilities and aggregators, power trading companies, regional suppliers, brokers and financial service providers, commercial consumers, transmission system operators and academics.



Members of the EPEX SPOT Exchange Council

The group of Utilities and Aggregators is represented by:

• Alpiq SA: Pierre Guesry, Project Manager Strategy & Participation • Compagnie Nationale du Rhône: Rémi Perrin, Head of Trading • Direct Energie SA: Antoine Bourdon, Head of Trading . EDF Trading Limited: Julien Haure, Head of Paris Trading • Edison S.p.A.: Andrea Siri, Head of Power Origination • EnBW AG: Dr. Bernhard Walter. Head of Market Design and Regulatory Affairs • Eneco Energy Trade B.V.: Lucien J.W. Wiegers, Commercial Director, Head of Trading, Asset & Portfolio Management • Enel Trade S.p.A: Dr. Nigel Hawkins, Head of Power and Fuel Portfolio Management . Engie SA: Vincent Verbeke, Head of Energy Transition Services and Short Term Power • RWE Supply & Trading GmbH: Paul Dawson, Head of Regulatory Affairs • Statkraft Markets GmbH: Andreas Bader, Vice President Sales & New Products • Uniper Global Commodities SE: Michael Bonde, Lead Trader • Vattenfall Energy Trading GmbH: Marcus Bokermann, Director Prompt Power Trading Markets • VERBUND Trading GmbH: Dr. Stephan Sharma. Member of the Managing Board

The group of Trading Companies is represented by:

• Danske Commodities A/S: Anders Kring Jensen, Director. Head of Intraday Power Trading . Energi Danmark A/S: Thomas Bjorn Houlind, Director Markets • In Commodities A/S: Jesper Severin Johanson, CEO • MFT Energy P/S: Cağdas Ozan Ates, CEO • TrailStone GmbH: Cédric Le Tallec, Head of Short Term Power Trading

The group of Local Suppliers and Consumers is represented by:

• Enercity (former Stadtwerke Hannover AG): Dr. Jan Sierig, Head of Markets • EWE Trading GmbH: Dr. Michael Redanz, Managing Director • MVV Trading GmbH: Stefan Sewckow. Managing Director

The group of TSOs is represented by:

• Amprion GmbH: Ralf Lonsdorfer, Head of Frontoffice and System Planning • Austrian Power Grid: Prof. Mag. Manfred Pils, Senior Advisor • RTE: Emanuele Colombo, Director Power System Economics

The group of Banks, Financial Service Providers and Clearing Banks is represented by:

• ABN AMRO Clearing Bank N.V.: Vincent van Lith, European Head of Energy

Permanent quests:

• 50Hertz Transmission GmbH: Dr. Dirk Biermann, Managing Director, Chief Markets and System Operation Officer • Elia: James Matthys-Donnadieu, Head of Market Development • Enedis: Sandrine Chevalier, Head of Flexibility Mechanism Department • European University Institute: Leonardo Meeus, Professor • Swissgrid AG: Dr. Jörg Spicker, Senior Strategic Advisor • Tennet TSO GmbH: Thorsten Dietz, Head of Trade • TransnetBW GmbH: Andreas Semmig, Head of Trading

Vision

The Exchange needs a sounding board

As a long standing member of the Exchange Council and its Chairman, Bernhard Walter gives insights on the EPEX SPOT Exchange Council and its function.



ernhard Walter has been Chairman of the EPEX SPOT Exchange Council since June 2016. He is Head of Market Design and Regulatory Affairs (Trading) at EnBW Energie Baden-Württemberg AG and has been a member of the Exchange Council since 2012. In his pivotal role, Bernhard Walter chairs every Exchange Council meeting. He steers the discussion and assembles the position of the trading members of EPEX SPOT in terms of Rules, Regulations and Market Design, and ensures a seamless two-way communication between the Power Exchange and its members on these topics.

Why does EPEX SPOT need an Exchange Council and what makes its role so important?

Power spot markets are a very special type of market and the traded commodity electricity is not like any other commodity. It is traded on a physical market but you cannot touch it, nor is it possible to store it in large scale.

Bernhard Walter

Head of Market Design and Regulatory Affairs (Trading) at EnBW Energie Baden-Württemberg AG, Chairman of the EPEX SPOT Exchange Council

This means that the efficiency of these markets has a measurable positive impact on the electricity system, on cross-border flows and on price formation. In turn this has an important impact on economic welfare, as power is a key element of the industrial value chain.

A core aspect of an efficient market is liquidity; this is also very true for power markets. This liquidity is provided and ensured by trading members, who trade on those markets that provide the "right" products and services that they need for their trading and portfolio strategy. Organising and operating these markets is therefore a mutual give and take between the Power Exchange and its trading members. The Exchange Council plays a significant role and is an excellent forum for this.

We want to make EPEX SPOT's markets better.

From a practical point of view, what does the work of the Exchange Council look like?

The Exchange Council helps to make the best of the markets, according to the principles of representation. Comparable to a parliamentary setup in a democracy, the membership of the Exchange Council reflects the diversity of the actors that trade on the Exchange. The Exchange Council meets up quarterly and discusses new products and general projects, decides on product launches as well as rules and regulations. We also provide advice for the EPEX management and support them in further developing the Exchange following the members' needs.

We want to secure the company's position as Europe's preferred Power Exchange. Vision

Annual report 20'

The communication is very open and we have highly constructive and fruitful debates where all views are brought to the table. This can sometimes even be heated. But in the end, we all strive for the same goals: We want to further improve EPEX SPOT's markets and we want to secure the company's position as Europe's preferred Power Spot Exchange.

What are the upcoming topics and challenges for EPEX SPOT and the Exchange Council?

Power markets are in transition and are changing significantly. So is the environment for Power Exchanges with growing competition. Our experience has taught us that operating a successful Power Exchange with liquid markets is a complex issue where the product needs of market participants play a key role. Of course platform access and fee structure are also relevant, but should not overshadow the entire picture. The Exchange Council members are looking forward to market launches in new geographical areas, to new Intraday products and to new flexibility solutions, be it on the local or on the wholesale level.

A successful Power Exchange has to provide cuttingedge trading products, propose innovative solutions to companies with increasingly diversified trading desks, expectations and needs. In order to provide state-of-the art services and products, the most important skills are to listen and to learn. Both those values are lived through the Exchange Council and they also paved the way for EPEX SPOT's success, and I am convinced that we will continue to do so in the future. The energ project is the first implementation of a Local Flexibility Market in the windy North-West of Germany. Buckle up for this pilot project, a market-based solution to tackle grid congestions, one of the main challenges of the energy transition.

Flexing for the Energy Transition

n February 2018, EPEX SPOT and EWE signed a cooperation agreement within the scope of the enera project. Both companies committed to the launch of a local market platform for system operators and flexibility providers, together with Avacon Netz, EWE NETZ and TenneT.



The project partners announce the successful go-live of the enera market in February 2019 at a press conference.

From left to right: Torsten Maus. Chairman of the Management Board EWE NETZ GmbH; Dr. Philippe Vassilopoulos, Director Product Development EPEX SPOT SE; Dr. Urban Keussen, CTO EWE AG; Ralph Danielski, CEO EPEX SPOT SE; Dr. Hermann Pengg, Managing Director Audi Industriegas GmbH; Thorsten Dietz, Senior Manager Customers & Markets TenneT TSO GmbH

With this market platform, the initiators want to tackle the widespread issue of grid congestions. One year later, the pilot project was ready for launch.

Grid congestions: Traffic jams on the grid

With the increasing share of renewable energies, the patterns of electricity production are changing. It fluctuates according to weather conditions, while conventional generators continue to produce electricity in parallel. If too much electricity is then fed into the grid, congestions arise, comparable to a traffic jam on the freeway. For the System Operator, there are two ways to guarantee grid stability: The electricity grid can be expanded further, by building new lines, or renewable generation can be curtailed. Shutting down renewable generation eases the situation in the short-term: in the long run, however, the share of renewables in consumption is supposed to increase to reach the targets of the energy transition - the dilemma remains. In order to extend the use of renewable energies further, generation and consumption must be aligned and made more flevible

Along with our partners, we are addressing this problem by providing a market-based solution to solve local congestions: Local Flexibility Markets. In the framework of enera, we offer a marketplace for trading flexibility in order to avoid congestions before they occur. Flexibility providers submit sell orders for flexibility in a certain geographical area, which system operators can purchase when a congestion is forecast in that same area. The whole transaction is completed on an exchange platform developed by EPEX SPOT. The model thus offers all the advantages of exchange trading: an anonymous matching mechanism with a transparent and reliable price formation. System-related issues such as congestions are mitigated or even eliminated in order to integrate renewable energies more efficiently into the grid.

2018

February

Signature

cooperation

agreement

One year later: Ready for takeoff

2019

February

Launch of

the first

demonstrator

After the signature of the cooperation agreement, all project partners worked to develop the market platform, which was launched exactly one year later, in February 2019.

Demonstration phase

2021

February

Evaluation

A first trade of flexibility was completed on 04 February 2019 between EWE NETZ and Audi for delivery on the same day, in the market area SOET 1 (Sögel). 2 MW were traded at -45.50 €/MWh. EWE NETZ forecast a congestion on its grid and hence submitted an order for downward flexibility which Audi, having a power-to-gas asset in the area, accepted. Via this transaction, the partners were able to avoid a congestion before it occurred.

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17

MISSION: FAIR PRICE

Trading flexibility on an exchange-based platform offers all the advantages of exchange trading: supply and demand are determined anonymously and a transparent market price is calculated.

/ision

16



Market Coupling in Europe has come a long way. Starting off as a private initiative between Power Exchanges and Transmission System Operators, the underlying principles of Market Coupling have been put into law in 2015, with the EU Guideline on Capacity Allocation and Congestion Management.

The European energy community

GOING WITH THE FLOW

Market Coupling uses the price signals of national markets and network constraints to determine the most efficient electricity flows between the countries. As a result, existing grid is used to full capacity, liquidity rises and competition increases. The price calculation method takes into account the network constraints in the region of Central Western Europe. With flow-based Market Coupling, prices between market areas tend to converge and the use of cross-border capacities are optimised.



Explicit benefits trough implicit allocation

arket Coupling was initially conceived on the continent by the former French Power Exchange Powernext and its Dutch counterpart at the time, APX. The former became one of the founders of EPEX SPOT, the latter joined forces with EPEX SPOT in 2015. The initial idea, established in 2003 and implemented in 2006, was to use the price signals of national markets to determine the most efficient electricity flows between the countries. As a result, existing grid is used to full capacity, liquidity rises and competition increases.

Electricity and capacity, all in one trade

Before the European markets were coupled, in order to complete a trade between two countries, market participants had to purchase transmission capacity separately from the electricity. This is referred to as explicit allocation.

In coupled markets, cross-border capacities are allocated implicitly. This means that electricity and cross-border capacities are sold at the same time through the same trade. Network constraints are taken into account during the price calculation. This levels out price peaks, minimises price differences between countries and optimises cross-border flows so the available capacities are used to a maximum.

Power markets, a European matter

What started off in 2006 as Trilateral Market Coupling between France, Belgium and the Netherlands was soon extended across Europe. Power Exchanges cooperated closely with TSOs and other stakeholders to widen the scope of this solution. Today the Multi-Regional Coupling covers 20 countries stretching from Portugal to Finland and from Ireland to Italy, representing 85% of the European electricity consumption. With the publication of the first EU Network Code in 2015 and with the aforementioned CACM Guideline, Market Coupling has become EU law, and the benefits of this model have been recognised. Target models for Day-Ahead and Intraday markets are implemented across the continent.

As one of the pioneers of Market Coupling, EPEX SPOT has exceptional expertise in this matter, and the principles of Market Coupling, as well as the truly European idea behind it, are part of our DNA. In 2018, the topic has kept us busy and in will continue to do so. Challenges are behind us and also lie ahead, but we remain convinced that an Integrated European Electricity Market is the best possible setup for the European consumer. On the Intraday level, Market Coupling plays just as big a role as on the Day-Ahead markets.

XBJC The target model for Intraday markets in Europe

A LARGER TRADING COMMUNITY

XBID brings the benefits of Market Coupling to all countries covered, meaning market participants benefit not only from the liquidity in their country, but also in their neighbouring countries. This means more trading opportunities to balance out positions at better prices. specially in an ecosystem with a growing share of intermittent renewable production, continuous Intraday trading is an

important tool for market participants to keep their positions balanced.

Consequently, via the CACM Guideline, the European Commission has established a Target Model for Intraday, based on continuous energy trading where cross-zonal transmission capacity is attributed through implicit continuous allocation. This solution has been implemented in 2018 through the European Cross-Border Intraday Market Project XBID.

Cross-border trades, an essential part of the EPEX SPOT Intraday market

EPEX SPOT coupled its French and German continuous Intraday markets in 2010, with all other Intraday markets joining soon after. This had an uplifting impact on the volumes traded on these markets, they reached 71 TWh in 2017 and surged to 82 TWh in 2018, a new record. About 20% of all Intraday trades were cross-border. Coupled Intraday markets offer more trading opportunities, more occasions to make last minute adjustments at better prices, because they benefit from the liquidity of neighbouring countries.

of all Intraday trades were cross-border ğ

%

82

in 2018

EPEX SPOT YEARLY INTRADAY VOLUMES (TWh)





XBID, Intraday Market Coupling institutionalised

The European Cross-Border Intraday Market Project XBID went live in June 2018. XBID connects the Intraday markets of 14 countries, the so-called first wave. More countries are to join in 2019, in the second wave, as well as in the upcoming years.

The XBID solution is based on a common IT system forming the backbone of XBID, linking the local trading systems operated by the Power Exchanges, as well as the available cross-zonal transmission capacity provided by the TSOs. Orders entered by market participants in one country can be matched by orders similarly submitted by market participants in any other country within the IT systems' reach, provided there is cross-zonal capacity available.

The teams of EPEX SPOT and European Commodity Clearing ECC have been working on this project since 2012, together with over 20 project partners. The implementation of Market Coupling across so many market areas and at one single go-live date is unprecedented, and the go-live of XBID was eagerly awaited.

The market opened on 12 June 2018 at 12:00 and only a few seconds later, the first trade was recorded. The first successful cross-border XBID trade for EPEX SPOT was operated between Germany and France at 12:03.

The most rewarding part was the teamwork



A flawless operational go-live was the only option to secure the trust of our customers and to not harm the market.

What was most challenging and most rewarding during your work on XBID?

The biggest challenge was without a doubt the technical aspect of the project. Coupling so many markets all at once was unparalleled in the history of Market Coupling, and for EPEX SPOT a lot was at stake: in 2017, the year before XBID go-live, we reached a traded volume of 71 TWh on our Intraday markets, our clients rely on these markets and their price signal.

A flawless operational go-live was the only option to secure the trust of our customers and to not harm the market and its dynamics. In 2018, we reached 82 TWh of traded volumes on our Intraday markets, so it's safe to say that the go-live was a success.

The most rewarding part of the work was the teamwork behind it all. It was a true human adventure to work with over 20 partners over so many years.

What are the benefits for our clients?

With the implementation of XBID we took the opportunity to enhance our systems and processes in order offer even higher reliability, performance and scalability to our customers. In addition to this, general benefits of Market Coupling remain: XBID significantly improves the opportunities for market participants to trade out their imbalances, as they do not only benefit from the national available Intraday liquidity, but also from the available liquidity in other areas.

COUNTRY COUPLED IN 1^{ET} WAVE IN JUNE 2018

COUNTRY COUPLED IN 2ND WAVE >20

project partners

since 2012

Nodel

In 2018, 567 TWh of electricity were traded on EPEX SPOT's markets - more than ever before in one year. Further record volumes were reached on the Intraday market and on the French spot markets.

Traded volumes 2018



Bidding-zone split of the common DE-AT price zone

In autumn, EPEX SPOT implemented the so-called split of the German-Austrian bidding zone, following a request of the regulators of these two countries. Up until that day, the Day-Ahead markets of Austria, Germany and Luxembourg formed one common market area (DE-AT-LU) with one shared market price. Since 30 September 2018, EPEX SPOT has been publishing two separate sets of prices and volumes: one for the market area DE-LU and another for the market area AT. The implementation was a success and traded volumes remained stable in both market areas.



members were active on our markets in 2018, with 21 new members registered.

EPEX SPOT – Yearly Figures Report 2018

VOLUMES 2018 volume 2017 volume – previous year **Power Spot Volumes** MWh MWh Total 567,332,323 534.671.647 Day-Ahead 484,987,351 463,660,924 Day-Ahead DE-AT-LU total* 234,547,987 233.156.072 9,918,105 - Day-Ahead AT* - Day-Ahead DE-LU* 55,498,741 - Day-Ahead DE-AT-LU* 169,131,141 25.930.653 Day-Ahead BE **Day-Ahead CH** 23,590,331 23,328,690 Day-Ahead FR 113,757,856 105,693,244 Day-Ahead GB 50,494,272 49,783,175 **Day-Ahead NL** 37,377,349 33.105.026 82,344,972 71,010,723 Intraday Intraday AT 2,387,301 2,396,832 Intraday BE 1,130,361 1,079,652 Intraday CH 1,245,021 2,074,146 Intraday DE 50,392,591 44,481,867 Intraday FR 5,912,905 4,151,911 Intraday GB 19,027,907 15,190,834 Intraday NL 2,100,913 1,483,123 **OTC Registration** 147,973 152,358

* The bidding zone DE-AT-LU was split into two zones, DE-LU and AT on 1 October 2018.

Model

Annual

A lot happened on our British markets in 2018. Contrary to political trends and debates, we worked hard to bring together what belongs together. New products and new systems for the GB market have been major milestones to improve the market design and trading experience for our customers, eventually bringing the whole of Europe closer together.

Focus on GB

H jump across the Channel

EIGHT COUNTRIES, ONE TRADING SCREEN

New product and systems for Great Britain

New trading systems

Since April 2018, Day-Ahead trading in Great Britain happens on the EPEX Trading system (ETS), the robust and reliable trading solution that was already implemented on all other EPEX Day-Ahead markets. Intraday trading followed in November, with a transfer of continuous trading to the M7 system. All markets operated by EPEX SPOT now share one respective trading screen. This brings numerous benefits to the trading members, from internal operations such as reporting and back-office processes to costsavings for participants active in several market areas. The change to M7 also opens the door to API trading to our members in Great Britain, allowing

them to plug in trading robots to increase performance and to customise their trading strategies.

New coupled Intraday auctions

Since October 2018, two new Intraday auctions complete the product suite in GB. Both auctions are coupled with the Integrated Single Electricity Market in Ireland, which launched on the same day.

The auctions are 30 minute auctions, meaning not hours but half-hours are traded. The first auction takes place every day of the year at 17:30 local time. The 48 half hours of the following day are traded. The second auction takes place at 8:00 local time, and the 24 half hours of the afternoon of the same day are traded.

With the launch of these two products, the auction portfolio on the GB market has become four-fold. They complete the already existing hourly Day-Ahead auction at 11:00, as well as the half-hourly Day-Ahead auction that takes place at 15:30 local time. On the hourly auction, members trade the bulk of their production and consumption; the half-hourly Day-Ahead auction then allows them to rebalance their portfolio on a local level. The new coupled Intraday auctions complement these two existing auctions and allow members to benefit from further arbitrage and cross-border trading opportunities with Ireland, closer to delivery time.

I-SEM: the Integrated Single Electricity Market in Ireland

The design of this market is brand new. In the context of a broad power market reform in Ireland, EPEX SPOT and Clearing House ECC supported SEMOpx in setting up and operating the I-SEM market, having jointly won a tender launched by Transmission System Operators EirGrid and SONI in 2017.

The new I-SEM Day-Ahead market is coupled within the Multi-Regional Coupling and offers hourly contracts as well as complex orders. Furthermore, three Intraday auctions have been set up. Two of these are coupled with Great Britain, while one remains local within I-SEM. The offer is further complemented by local continuous trading. All auctions are accessible via the EPEX Trading System ETS, a robust solution used on all EPEX SPOT markets across Europe, Continuous Intraday trading runs on the M7 system, which is already used on all continental continuous markets of EPEX SPOT. All transactions are cleared and settled by ECC.

> ONE SET OF SYSTEMS

MISSION ACCOMPLISHED

THESE TRADING MIGRATIONS MARK THE FINAL STEP IN THE SYSTEM MIGRATION PROCESS, WHICH IS HEREBY COMPLETED, AND WHICH HAS BEEN ONGOING SINCE THE MERGER OF EPEX SPOT WITH FORMER APX GROUP IN 2015.



ONE CLEARING

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ONE RULEBOOK

ONE MEMBERSHI



Our business initiatives must be led by our customers

John Farthing has been dealing with commodity markets throughout his entire career. He joined former APX Group in 2006 and has been a first-hand observer and expert of the developments of the power market since then.

When you look back on 2018, what has made the year special for EPEX SPOT, and for the clients in Great Britain in particular?

The last year was an extraordinary year in many ways, especially when you look at the broader context, and at what has been happening on our markets for the past ten years. XBID brought competition to our Intraday markets on the continent, and the highly complex go-live of the project went extremely well for our clients and the Exchange.

For our GB clients, the developments were positive as well. Even with political insecurities coming along with the preparations of Brexit, we decided to further invest in the GB market in 2018. We completed two trading migrations, one on Day-Ahead and one on Intraday level. This brought new levels of system robustness and user friendliness. The new M7 system for continuous trading also allows for new trading opportunities on the continent and for our clients in the UK.



Director of Sales

What is the key to managing all this successfully?

All these achievements are a result of teamwork. Trading migrations and launches like XBID require a high amount of coordination and effort on EPEX SPOT side. The key account managers continuously are in touch with the market participants, building and strengthening relationships. This was key in keeping our members' belief that we can deliver. But this would not have been achievable without the strong support we had and continue to get from all the other departments in EPEX SPOT. Every department plays a key role in our success. Everyone is committed to deliver the best service. We listen closely to all our members across all membership categories in order to constantly improve our services and our offer. This is one of the reasons why we have become the market leader in customer service and the innovation of contracts.

What are the priorities of our customers in terms of trading experience, and do they find what they need on our markets?

Our customers have two main priorities: System robustness and performance. This is what we have invested in, it is what we have delivered and will continue to deliver. Of course, the aforementioned diversity of products is important, but system robustness and user friendliness are still key in order to give real added value to traders in their day-today business. And this is what it comes down to in the end: Our business initiatives must be led by our members, and the high level of customer service must be led by us.

EPEX SPOT has partnered up with National Grid Electricity System Operator in November 2018 to develop and operate a platform which will host a brand-new firm frequency response auction trial in Great Britain. The launch of the platform is scheduled for the second half of 2019.

Frequency response auctions

A brand new market design for the reform of

Great Britain's balancing services and markets

Frequency response is an essential service provided by National Grid ESO. ensuring that in cases of interruption of supply, the frequency of the electricity system is kept stable at all times. Within the previous procurement setup, market participants offer frequency response on a long-term basis. The new auction trial will be run every week for service delivery on the same day, rendering the whole mechanism more flexible. This will unlock

the potential of new technologies to provide frequency response, enabling more players than ever before to join this market segment. With the new market platform. renewable generation as well as industrial and commercial sites are encouraged to participate in the market, along with traditional providers.

For EPEX SPOT, this is a new phase in our long-standing company history in Great Britain, where we have been operating markets for over 15 years.

The last September weekend in 2018 was decisive for EPEX SPOT, as three projects were delivered in two days.

Preparation is everything

n Monday the 1st of October 2018, three major projects went live, all with an exceptional impact for our markets and our business. The split of the German-Austrian bidding zone was implemented on 30 September, with first deliveries on 1 October. The same went for the launch of I-SEM, the Integrated Single Electricity Market in Ireland: Day-Ahead and Intraday Trading were launched on 29 September. Last but not least, we also launched our brand new Intraday auctions for the British market on the same day, coupled with the Irish I-SEM.

Keeping track of the steps

Product launches and implementations require a very detailed preparation on the Exchange side, but market participants are also concerned:

Trading members must be well informed about new products and the new specifications that might come along, from potential changes to the trading interface, to amended membership schemes. Many factors must be considered, a lot has to be thought of, and forgetting one small point in the list could put a whole launch process at risk.

These complex and essential tasks are driven and overseen by our project team. The project department involves all further teams that are concerned by a product launch or that could contribute to its success.

In September, during the two weeks leading up to these go-lives, our teams worked their way through a checklist with 346 items. On the weekend in question, a checklist with 100 items was used. Not only the different action points are crucial, but their order is decisive as well.

What was at stake?

Every project and product implemented during this weekend was complex in itself, but very diverse factors were at stake:

- In the implementation of the split of the German-Austrian bidding zone, it was essential to secure the continuity of the market. The German market is the most liquid power spot market in Europe, so the highest priority of the teams was to keep the market stable during the change of its setup.
- The new Intraday auctions represented an entirely new product with a new price signal. And the auctions are coupled to a brand new Irish market, so the cross-border processes were to be set up. Clearing activities are ensured by ECC. EPEX SPOT's clearing house since our inception.

Over 40 members of staff present over the weekend

• The launch of I-SEM meant the creation of an entirely new market, with products on Day-Ahead and Intraday level, EPEX SPOT's customer in this process weren't Irish market participants directly, but the Irish power exchange SEMOpx.

The launch process was flawless for all three projects, thanks to the dedication of the teams and, of course, their impeccable preparation.

Our teams were following the different go-lives from the Market Operations room. Over 40 staff members were present at our offices during that weekend, a part of them is pictured here. Not shown in the photo: the pizza and sushi ordered to our offices over the two days.



GETTING READY FOR LAUNCH

All product launches have a two-fold preparation process: Internally, on the exchange side, with impact on systems and internal processes, and externally, on the member side. Our project department steers these processes and involves all concerned departments of EPEX SPOT. Our knowledge of our customers and the way they work helps us to accompany them through

Model

INNOVATION



Innovative Market Design requires functionality and creativity. Functionality is mainly driven by the needs of our customers, their processes and their portfolio strategies.

Purpose and imagination, the ingredients to Market Design

reativity can be driven by many things, and we endorse the challenge of thinking beyond the traditional boundaries of a Power Exchange and its activity.

A growing amount of renewables poses new challenges to power markets. They must be more flexible, with shorter delays between trades and deliveries, giving traders the possibility to make last minute adjustments. Flexibility products have seen a great success on our markets, and lead-time reductions allow for adjustments in real-time.

Decentralisation, digitalisation and new technologies open the door for a new kind of actor on the power market: The prosumer. Especially the rise of the blockchain technology gives prosumers new tools to become a proactive link of the energy value chain. Digitalisation accompanies this trend: Consumption behaviours can be tracked, saved and even predicted. The internet of things allows household items such as fridges, electric vehicles and so on to become receptive to signals from the market. In an energy world where all generation and consumption levels are able to communicate with each other, data becomes a cornerstone of the system.

As an innovative Power Exchange, exploring these possibilities, seizing opportunities to contribute to their development and creating concrete use cases is a cornerstone of our strategy.

Annual

Block orders have an important function in Day-Ahead trading and they have been an essential asset in the EPEX SPOT product portfolio for years.

A walk around the block

n 2018, we introduced block orders within our very popular 15-minute auction in Germany, and we launched two entirely new types of blocks across all Day-Ahead markets: Loop and curtailable blocks.

Single hours become blocks

On the EPEX SPOT Day-Ahead markets, 24 hourly contracts are available on the auction, corresponding to the 24 hours of the following day. These hours can be traded individually, or combined in a block order. Block orders allow traders to combine a certain number of hours in one order. They encompass several hours, and all hours covered in a block order are submitted at the same price.

The volumes in a block order can vary from hour to hour. This is called a **profiled block order**.



EPEX SPOT has been offering smart and big blocks since 2014. They have additional functionalities, each corresponding to the needs of certain production plants, generation patterns and consumption profiles.

Big blocks can host a larger amount of Megawatt hours in one same order. They allow to cover larger production capacities, for instance of a large utility.

Linked blocks are a set of blocks that are linked together through a particular execution constraint. This means that the execution of the entire block order depends on the conditions set for one "father block". They allow to take into account the financial and technical constraints of power plants with regard to the market price.

Exclusive blocks are a group of blocks within which a maximum of one block can be executed. This is how traders can be sure that the electricity is traded at the most profitable moment.

A new generation of block orders

Block orders are either entirely executed or entirely rejected, after which the hours that have once been tied up in a block order can't be separated anymore. In 2018, one exception to this was added.

In December, we introduced curtailable blocks. They are executed only above a minimum acceptance ratio defined by the traders.

Curtailable blocks were launched along with loop blocks, offering the entirely new functionality of combining two block orders. By tying together two block orders in a loop, traders can ensure that these two blocks are accepted or rejected together. They allow to bundle buy and sell blocks to reflect storage activities.



Block orders are essential in auction trading, where the largest part of electricity is traded. They allow to combine a certain set of hours within one order, and the order is executed on all these hours when certain conditions are fulfilled. Traders have the opportunity to tailor their orders to particular generation or consumption profiles.

More combinations for the 15 minute auction

As block orders allow to tailor the trading activity more precisely to the portfolio of a market participant, EPEX SPOT introduced block orders within the German 15 minute auction in July 2018. This means that traders can now combine several guarter hours in one order, instead of trading all quarter hours of the day separately. The execution condition in these orders is "All or none", meaning all preselected quarter hours are executed together or rejected. As 96 guarter-hours are tradable in a day, this allows for a high number of combinations and a high degree of flexibility. The introduction of this functionality follows the strong wish of our trading members, as it gives them additional arbitrage opportunities between the coupled Day-Ahead auction of 12:00 o'clock and the local 15 minute auction at 15:00 o'clock.

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With a growing share of renewables in the electricity system, power markets increase their pace: Renewable energy is intermittent, meaning patterns of production change rapidly, as they depend on wind and the sun.

Increasing the pace

ime is key for traders, and the highly flexible Intraday markets allow them to efficiently balance their portfolios, even at the last minute. Two factors are crucial to render the Intraday markets more flexible, and therefore more receptive for renewable generation: product granularity and lead-time.

of 15 minute contracts traded within the last half hour before delivery

The clock is set to 15 minutes

In addition to the hourly products that are traded in the Day-Ahead auction and on the Intraday continuous markets, market participants can trade 15 or 30 minute products on our markets. We run 15 minute continuous trading in Austria, France, Germany and Switzerland, 30 minute continuous trading in France, Germany and Switzerland and a very successful 15 minute Intraday auction in Germany.

In 2018, this offer was extended to Belgium and the Netherlands, where we launched 15 minute continuous trading in July, in partnership with our clearing house ECC. The new contracts are designed to manage the emerging flexibility challenges on these markets more efficiently.

Last minute trades for Austria, France and Switzerland

In early 2018, EPEX SPOT and ECC reduced the lead-time on the Austrian and French Intraday markets to five minutes before delivery, while lead-time on the Swiss Intraday market was newly set to 30 minutes before delivery.

In Intraday trading, lead-time refers to the time lapse between the execution of a trade and the delivery of the traded electricity. The shorter the lead-time, the more precise the last-minute adjustments done by traders, as generation, consumption and even weather forecasts are most reliable when they are closest to real time.

Before this reduction, the lead-time amounted to 30 minutes for Austria and France, and to 60 minutes before delivery in Switzerland.

Automated trading

This increase of speed on the Intraday market clears the stage for the digitalisation of the trading experience : via Automated Programming Interfaces (APIs), our market participants can automatise their trading by connecting robots to our trading system, and even using algorithms to support their trading strategies.

Our members can connect to our open API with their own technical solution, developed in-house, or via a solution offered by a certified Independent Software Vendor (ISV). Every ISV offering a solution to connect to our API has been certified by EPEX SPOT. We currently count about 20 ISVs with certified solutions to connect to our API, which constitute a unique ecosystem, providing more choice to our customers and contributing to make our technology an industry standard.

About a third of all volumes on EPEX SPOT continuous Intraday markets are today traded via an API solution. Automation of trading also means higher frequency of trading : we have invested in our trading system so it is scalable and we maintain a very high level of performance in these new market conditions. During 2018, the number of orders submitted to our M7 trading system was multiplied by two, reaching more than 700 000 orders counted per day.

REAL-TIME TRADING FOR MORE FLEXIBILITY

In order to efficiently integrate renewables, Intraday markets must be highly flexible and allow traders to make last-minute adjustments. Offering sub-hourly contracts in market areas with growing flexibility challenges has been a successful way to make markets more flexible. In addition to this, EPEX SPOT has shortened the lead-time across all markets over the last years. Lead-time reductions extend the trading window and allow for more trading opportunities closer to real time.



Blockchain has become a buzzword in the energy sector over the past years with new potential use cases popping up every day. Having always been technology neutral, EPEX SPOT follows this evolution closely and is actively involved in several blockchain initiatives. In our partnership with LO3 Energy, we aim at connecting microgrids to the wholesale market. In the Exergy initiative, we explore, along with other project partners, the potential of blockchain in the world of energy data.

Blockchain

Opening the energy community to new actors and new use cases

ven though the impact of the blockchain technology on exchange trading has been rather limited, it takes part in opening the energy sector to new actors and new use cases. It also allows for new levels of transparency and security at a micro level, enabling prosumers to get active on the way their energy procurement is handled.

As a generally public and digital ledger of transactions, a blockchain is decentral and held by all participants. Each transaction is automatically registered, secured, checked and approved by the network -to which extend depends on the or the type of the network. This high level of decentralisation leads to increased security of the data saved in the blockchain, therefore becoming virtually unhackable. The disclosed information of a transaction passing through the blockchain can be seen by anyone connected to the network. This ensures full transparency without requiring a middle man checking the accuracy of the data. The system verifies itself, as every block and the information it contains is traceable and immutable.

The microgrid is built on data

As a neutral market operator, EPEX SPOT is able and willing to connect our markets with any kind of decentralised market player, as the access to market mechanisms and transparent price signals brings benefits on all levels of the energy value chain. The blockchain technology has its highest potential coupled with other



Blockchain is a technology with high potential at the micro-level, where it can enable peer-to-peer transactions and, in combination with other technologies, can allow for efficiency gains thanks to insights on generation and consumption behaviours. In addition to microgrids, the biggest potential of blockchain lies in managing and securing data and in the improvement of post-trading processes. EPEX SPOT works on unlocking more potential uses of the technology.

A lot of potential still needs to be unlocked

Senior Business Developer

Delphine works as a Senior Business Developer at EPEX SPOT. She closely follows the newest trends around innovation and blockchain in the energy sector, analysing the business potential for EPEX SPOT and our activity.

What is so special about blockchain?

The blockchain technology really is a whole new way of processing data and of encrypting transactions. There is a very democratising factor to it, as it doesn't depend on one central middle man or institution to oversee the whole process.

Will blockchain change the energy world?

Yes and no, and not alone. Blockchain itself will not replace the cornerstones of the electricity system, such as the electric grid and wholesale power trading. But in combination with other technologies (smart meters, Internet of Things, Artificial Intelligence, etc.), there are great possibilities for the technology, particularly when it comes to data security and management. Used together with other digital solutions, we believe that blockchain can be an enabler to a wider involvement of decentralised assets to the energy chain. At the wholesale level, we see a potential for improving post-trading processes, due to the ledger nature of blockchain. A lot of potential still needs to be challenged and unlocked, and that's what makes the work on blockchain so interesting.

What are the next steps in the field of blockchain for EPEX SPOT?

The next steps are to keep on investigating blockchain potential for our business with our two existing partnerships with LO3 Energy as well as with other partners. We have laid a solid foundation that will allow us to play a central role in two central use cases: The connection of decentalised market players, such as microgrids, to the wholesale market as well as blockchain based processing of energy data. We have two projects in the starting blocks and expect great insight on the added value, application and use of blockchain.

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technologies such as smart meters, Internet of Things and smart devices. It is already tested on a microlevel, connecting prosumers of a neighbourhood to a microgrid, exchanging generated electricity according to consumption and production patterns through a secured peer-to-peer blockchain transaction. These transactions are specific in a way that they aren't necessarily based on economic logics only, and they can even include personal preferences like consuming local and green energy rather than grey and possibly cheaper energy. For this to happen, the overall system needs information in the form of data: real-time data on electricity consumption, provisional data on recurring consumption patterns, as well as generation data for every unit participating in the microgrid. Data plays an essential role here, and blockchain, with its benefits of security and transparency, can again be used to bundle the information. And why not make it available on further levels of the value chain?

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Exergy - The data network

In October 2018, EPEX SPOT committed to support Exergy, an innovative global data exchange and network entirely based on blockchain. The project was initiated by LO3 Energy and aims at standardising and monetising energy data.

Data related to electricity production, use and transmission is valued, as it is turned into a digital asset. This digital asset can then be accessed by other actors connected to the Exergy platform. A company producing electrical vehicles, for instance, can then buy data on use preferences of electrical cars on the platform.

When are they used and for how long, when are they charged? This can give them valuable insights for product development and industrial production, and even grid usage. Various actors on the demand and supply side have a real benefit from the data they can access on Exergy.

Exergy manifests the shared vision of LO3 and EPEX SPOT of a transactive energy world, i.e. a market-based approach for every type of energy flow, from the prosumer to the supplier and utility level, improving the efficiency and reliability of the overall electricity system, toward a more interactive energy future.





THE EXERGY NETWORK



Permissioning **Energy Data** Marketplace



Annual report 2018

Innovation



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Supply side

Behind EPEX SPOT are 192 people of 27 nationalities, working from seven offices across Europe. Here are some electrifying facts about the cities we're located in.

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The Emmental is a valley in the eastern part of the canton Bern. The region is very hilly and mostly devoted to farming – dairy farming in particular - as the famous Emmental cheese is produced there. A study has found that around 8% of the energy consumed in the area could be produced from animal manure such as cow dung, a resource that exists in great plenty in the area. The region is now working on reaching this target, as biomass could help to achieve the region's climate goals.



To celebrate the opening of the Paris Universal Exposition in 1878, the first electric street lights were installed on the Avenue de l'Opéra and around Arc de Triomphe, using so-called arc lightning developed by Pavel Yablochkov. The lamps were also referred to as "electric candle"



Numerous boats roam the canals of Amsterdam, catering to the city's many tourists. The municipality of Amsterdam decided that all boats would have to switch from diesel engine to electric power by 2025, supporting the effort to reduce emissions and pollution in the Dutch capital.



In 2012, Brussels Airport was the first airport in the world to receive the ISO 50001 certification for its energy management. The airport also generates its own solar energy, with 7,200 panels on the roof of a freight building and 5,760 panels on the ground, close to the runway. Per year these solar parks are generating what equals the average annual consumption of 800 families.

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Near the capital of Austria, in the west of the city the Steinriegel wind park was installed in 2014, producing electricity for 24,00 households.
21 wind turbines with a total installed capacity of 38.3 MW produce 79,000 MWh of electricity per year. Located at Rattener Alm at a height of 1,600 m above sea level, it is Europe's biggest high-alpine wind farm.

The Savoy theatre in London was the first public building in the world entirely lit by electricity. This was the achievement of English chemist, physicist and inventor Sir Joseph Wilson Swan, the first person to illuminate homes and public buildings with incandescent light bulbs. He supplied about 1,200 lamps powered by an 88.3 KW generator which was installed on open land not far from the theatre.



Just a few years after its commissioning in 1838, the first power plant of Leipzig reached its maximum capacity of providing electricity for 30,000 lamps in the city. The plant and copper cable network had to be expanded rapidly, and in 1910 the second power station, the "Südwerk" on Bornaische Strasse, went into operation. The largest customers were the Leipzig tram companies, which had begun electrification in 1896.



EPEX SPOT offers a wide range of training programs available to members and non-members alike. Our E-learning modules are designed to transmit knowledge in an innovative and interactive way, and by using a variety of digital tools.

Learn more about the functioning of European power markets and energy trading by entering a course that fits your needs – whether you are a trader or an energy professional.

For the complete E-Learning offer and registration please visit **www.epexspot.com/en/elearning** or contact **elearning@epexspot.com**.

HERE IS A SELECTION OF OUR E-LEARNING OFFER:

| SPECIFICITIES OF THE POWER MARKET IN COOPERATION WITH RTE | MARKET COUPLING IN EUROPE | PARTICIPATING IN THE ELECTRICITY WHOLESALE MARKET |
|---|---|--|
| A pack of courses on the Capacity Mechanism, the dynamics of power generation and consumption, market balancing and much more. | Which are the main principles and advantages? From cross-border interconnections to the evolution and objectives of market coupling initiatives in Europe, there is a lot to learn about the process of market integration. | Introduction to the electricity wholesale market: opportunities and risks, players and ro les, including case studies. |

MARKET DATA OFFERS

Data means knowledge, and knowledge means understanding. The in depth analysis of EPEX SPOT market data can give you the insights you need for your business. Our Market Data offers grant access to real-time, delayed or end-of-day market data of EPEX SPOT market areas: DE, AT, FR, UK, NL, BE and CH.

For more information on Market Data offers, terms of use and prices please visit **www.epexspot.com** or contact **marketdata.sales@epexspot.com**.

HERE IS A SELECTION OF OUR MARKET DATA OFFER:

End of Trading Session (EOD) market data for internal use: DE, AT, FR, CH via Website and FTP server Real-time access to M7 Intraday continuous trading system and/or ETS auction trading system via an API Historical anonymous order book data: Orders on the Intraday continuous market available from 2013 to 2018

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