

Exchange-based flexibility markets for grid congestion management

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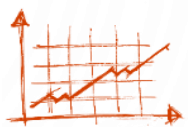
Stylized facts



Energiewende happens in the distribution grid



Flexibility has become increasingly important



Markets increase economic efficiency (static and dynamic)

High-level perspective

Current Market Design

- Large and liquid bidding zones
- No locational/asset information – just price & volume
- Balancing BRPs, welfare optimization, but not reflecting grid physics

Challenges

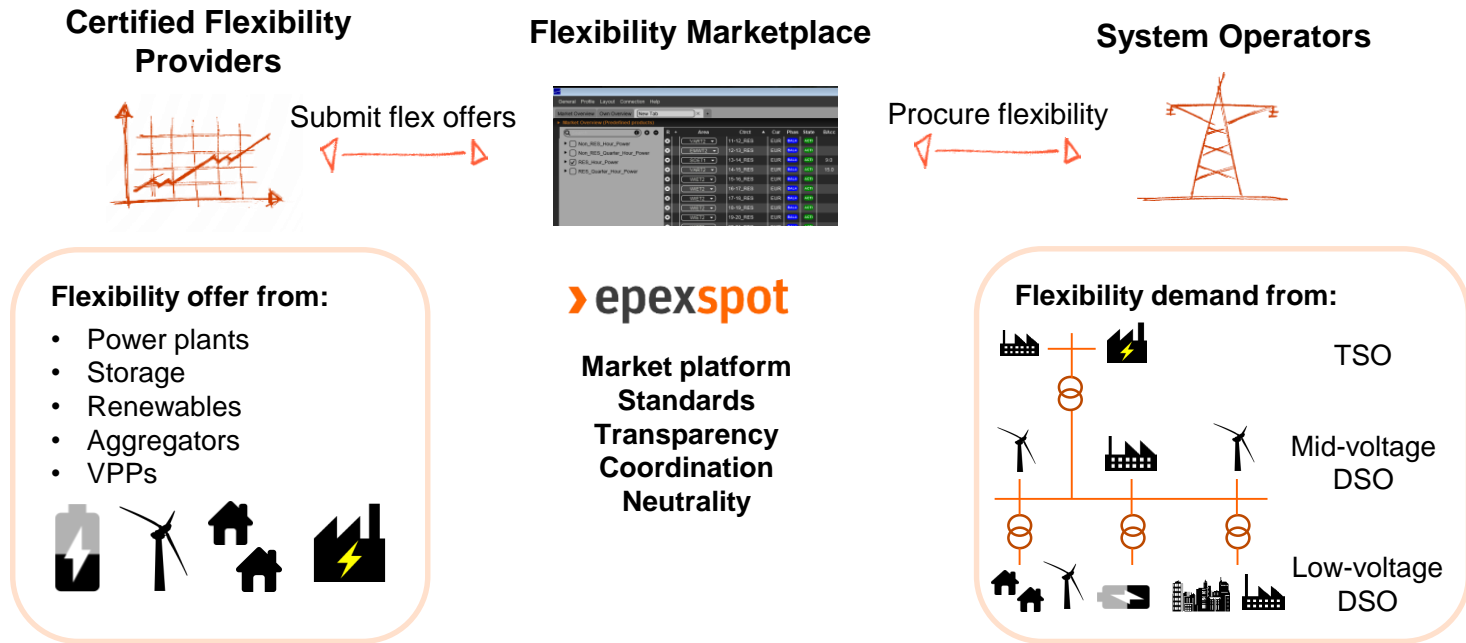
- Temporary relief of congestions in the distribution grid
- Need to know location of assets
- Interaction of grid operators at different voltage levels

A complementary market is required

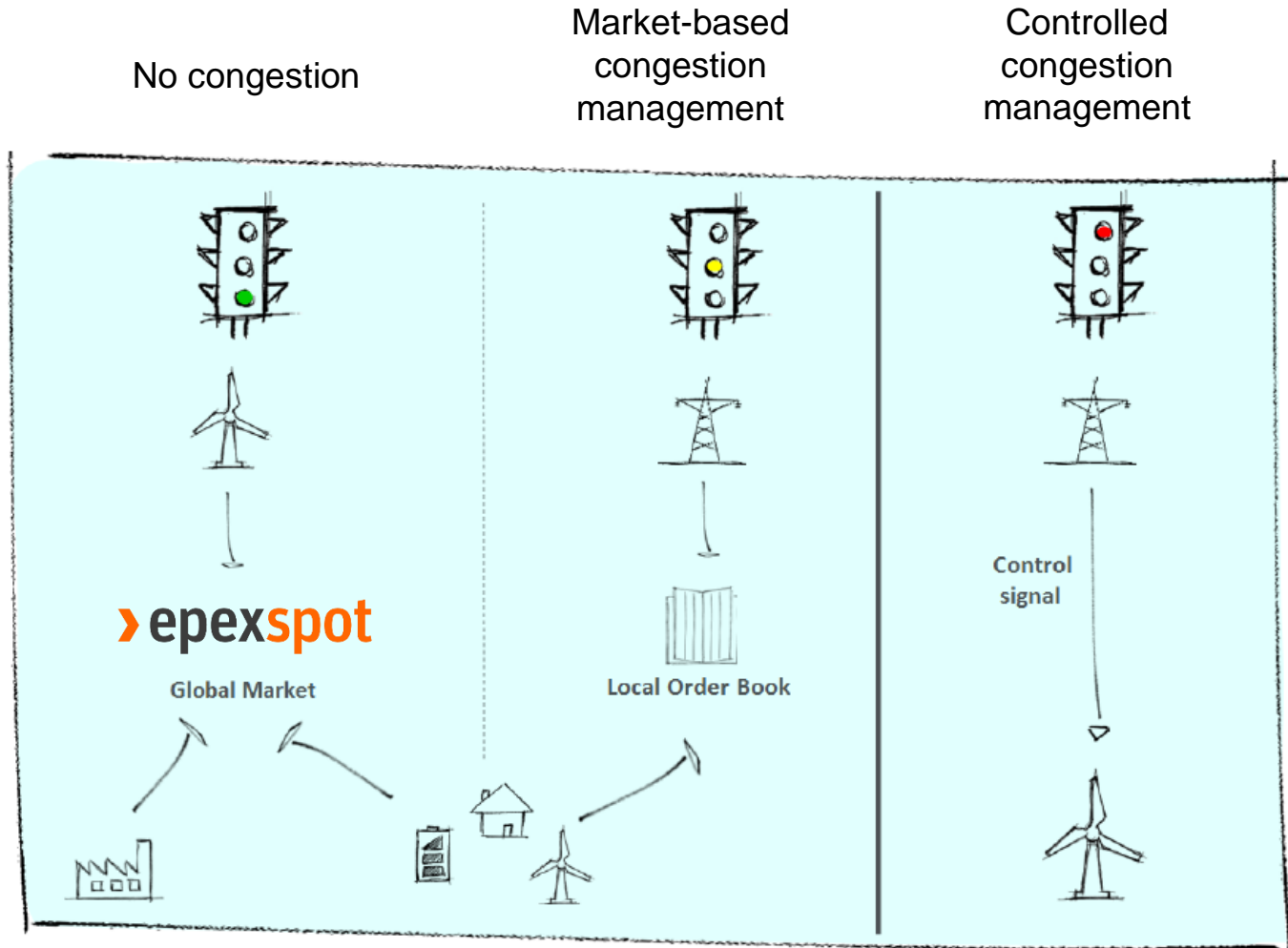
- Locational orderbooks for flexibility
- Market areas defined by sensitivity towards transformer station
- Matches System Operators and Flex-providers

The role of the exchange

- Clear and transparent market rules
- Transparency of prices and volumes
- Standardized admission process
- Experienced market operation and surveillance, well-known trading system
- EPEX SPOT is a neutral and objective third party



The yellow phase



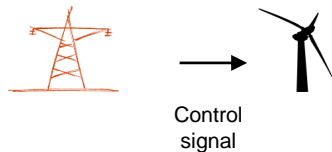
Source: enera

Increase-Decrease Gaming

Increase-Decrease gaming is a serious concern that comes with full market-based congestion management, in a structurally congested network (B. Hobbs, 2000)

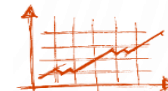
However ...

- Status quo of redispatch is no viable solution for decentralisation and decarbonization: network stability and mounting redispatch costs as nodal/BZ split is not foreseen
- How do you integrate new distributed flex? How do you account for current redispatch inefficiencies and Einsman complexity/risk?
- Purely cost-based redispatch does not create sufficient incentives for development of flexibilities such as batteries, demand-side response or power-to-x,...
- Smart market design and real life experience can help to prevent or severely limit gaming & strategic bidding behavior



The Hybrid solution

Combination of cost-based and market-based mechanisms



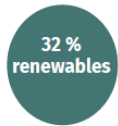
- The hybrid solution is combining cost-based & market based elements
- Several mitigation measures can be implemented in order to:
 - Increase transparency and facilitate monitoring (incl. unit-based monitoring)
 - Surveillance from ALL authorities
 - Bidding/price caps
- New market design that provides local signals, opens up scope for flexibility and offers security of supply in a safe and reliable market that limits gaming behavior while grid is being expanded to remove the structural congestion

enera region: A significant wind production

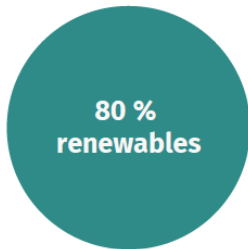


The Region

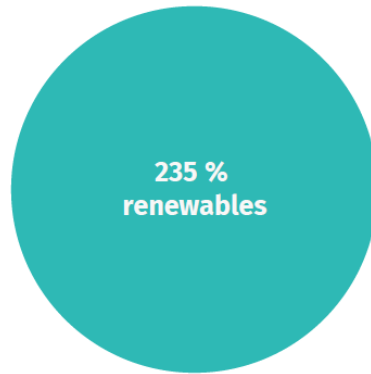
- **Counties of Aurich, Friesland & Wittmund**
- **390.000 inhabitants**
- **200.000 households**



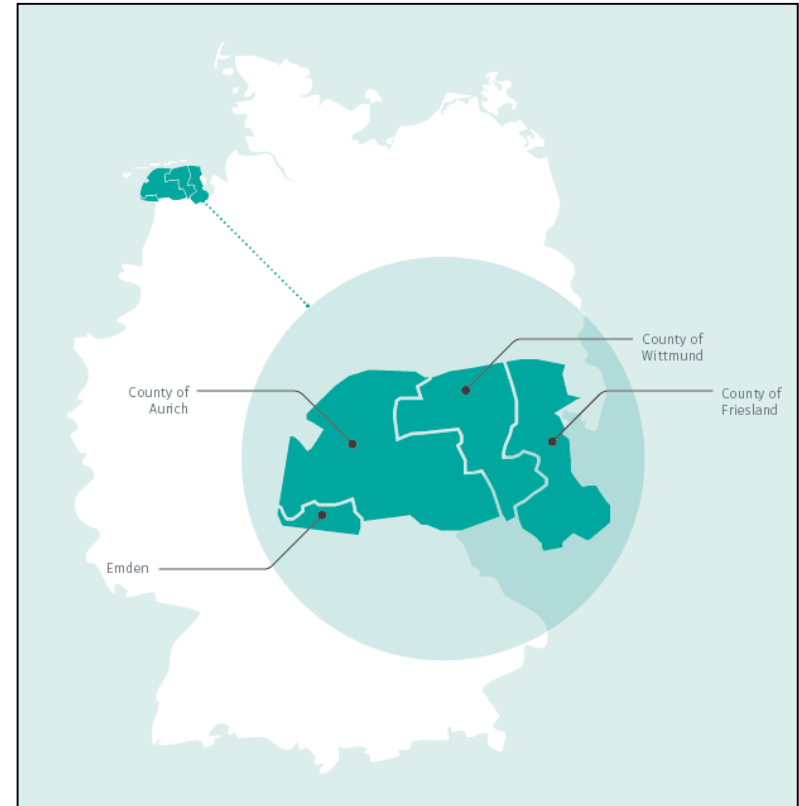
Germany 2016



Germany 2050



enera 2016

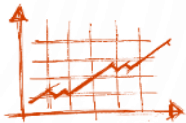


The first local trade in Germany

TradeID	RemoteTradeID	Exe Time	State	Product	Ctrct	TmZ	Qty	Prc	Cur	P/O	Phase	BOrdID	BMbr Id	BMbr Name	BTrdr Id	BTrdr Name	Buy Area	BO/C	E
2		04.02.2019 15:25:34	ACTI	Non_RES_Hour_Pow	17-18_NRES	CET	2.0	-45.50	EUR	O	BALA	6	VWKEX	VW Kraftwerk G	TRD002	JENS MEYERH	SOE_T1		P
3		04.02.2019 15:25:41	ACTI	Non_RES_Hour_Pow	18-19_NRES	CET	2.0	-45.50	EUR	O	BALA	7	VWKEX	VW Kraftwerk G	TRD002	JENS MEYERH	SOE_T1		P

First trade on enera happened on 04/02/2019 at 15h25 with a contract for delivery on the same day at 17h00-18h00 in the market area SOET1 (Sögel)

Certified Flexibility Providers



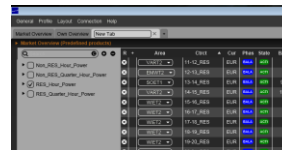
Submit flex offers



Audi

- Disposes of a Power-to-Gas asset whose flexibility is market on this flexibility market
- Sees the flexibility demand at an acceptable price from a system operator in the area where their plant is located
- Submits a matching flexibility offer order via the same interface

Flexibility Marketplace



epexspot

**Market platform
Standards
Transparency
Coordination
Neutrality**



System Operators

Procure flexibility



EWE NETZ

- Forecasts a congestion in a few hours due to high feed-in and therefore needs downwards flexibility to alleviate it
- Sends a flexibility demand order for 2 MW downward flexibility at - 45.50 €/MWh in the market area SOET1 for delivery from 17h00 to 18h00

2 MW have been traded at **-45.50€/MWh**. The orders are matched in the trading system and the transaction is executed. Audi now has the obligation to deliver the flexibility according to the contract specifications. These specifications are part of characteristics of the traded product and have been pre-determined. Based on this trade, Audi will increase their consumption at a given time and at the chosen location. The resulting BRP imbalance has to be closed on the intraday. This localized physical impact allows EWE NETZ to alleviate a congestion before it occurs in a safe and competitive way.

Thank you for your attention!

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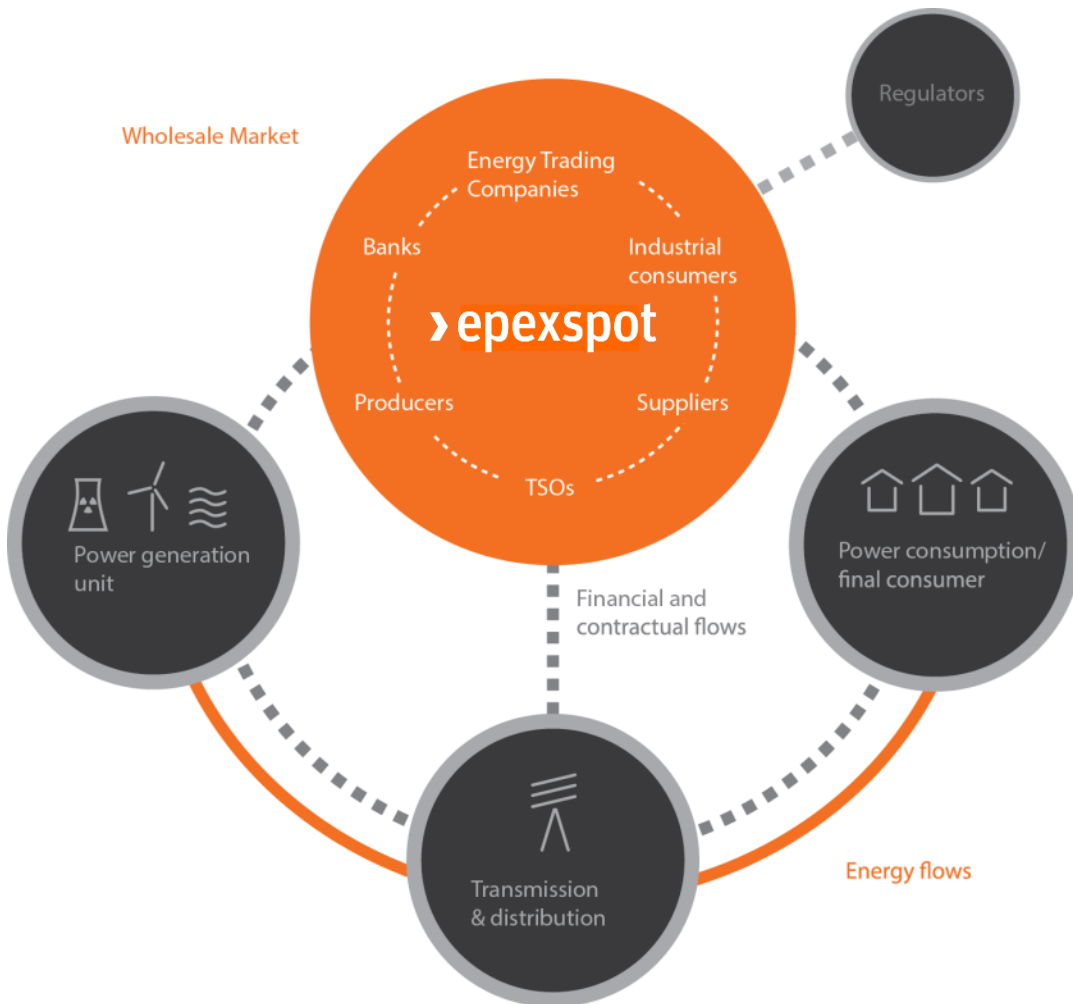
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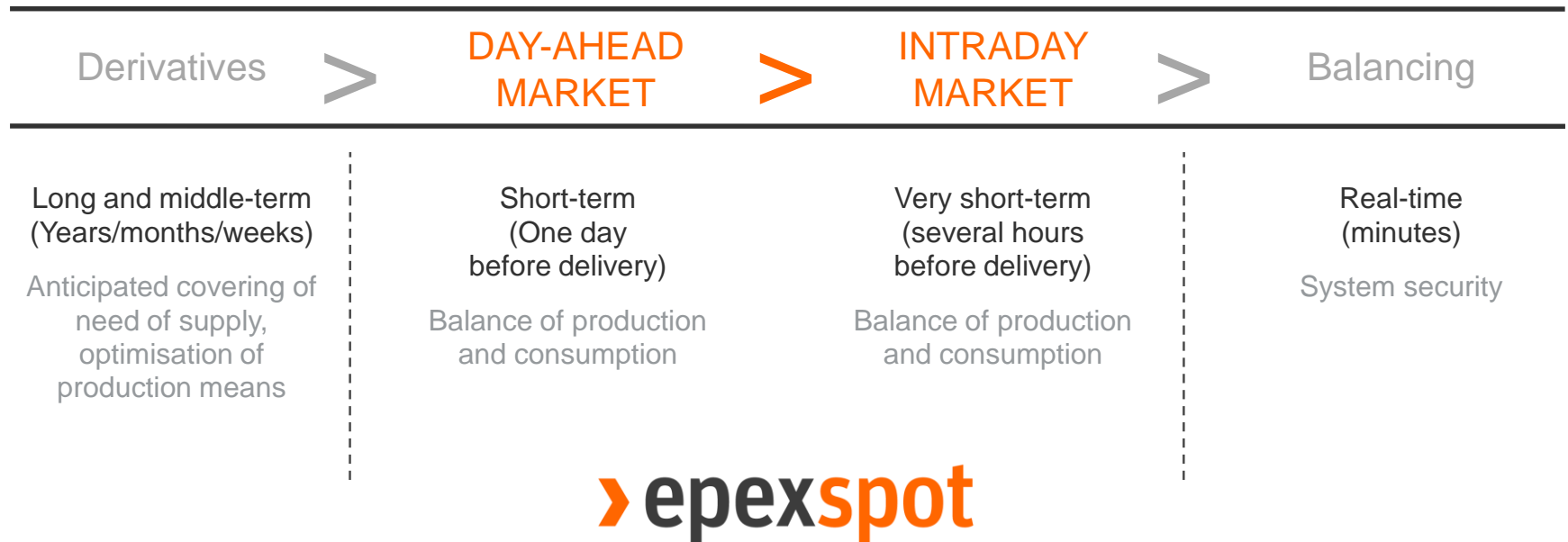
Backup slides

The organised market: principles



- Access to an anonymous market
- Level playing field between members
- Financial guarantees through the Clearing House
- Calculation and publication of transparent and fair price references

The role of the Exchange in the timeline of the market



DAY-AHEAD AUCTION

- Optimisation of liquidity via an auction
- Market areas: Germany/Austria/Luxembourg, France, Great Britain, the Netherlands, Switzerland and Belgium

CONTINUOUS INTRADAY

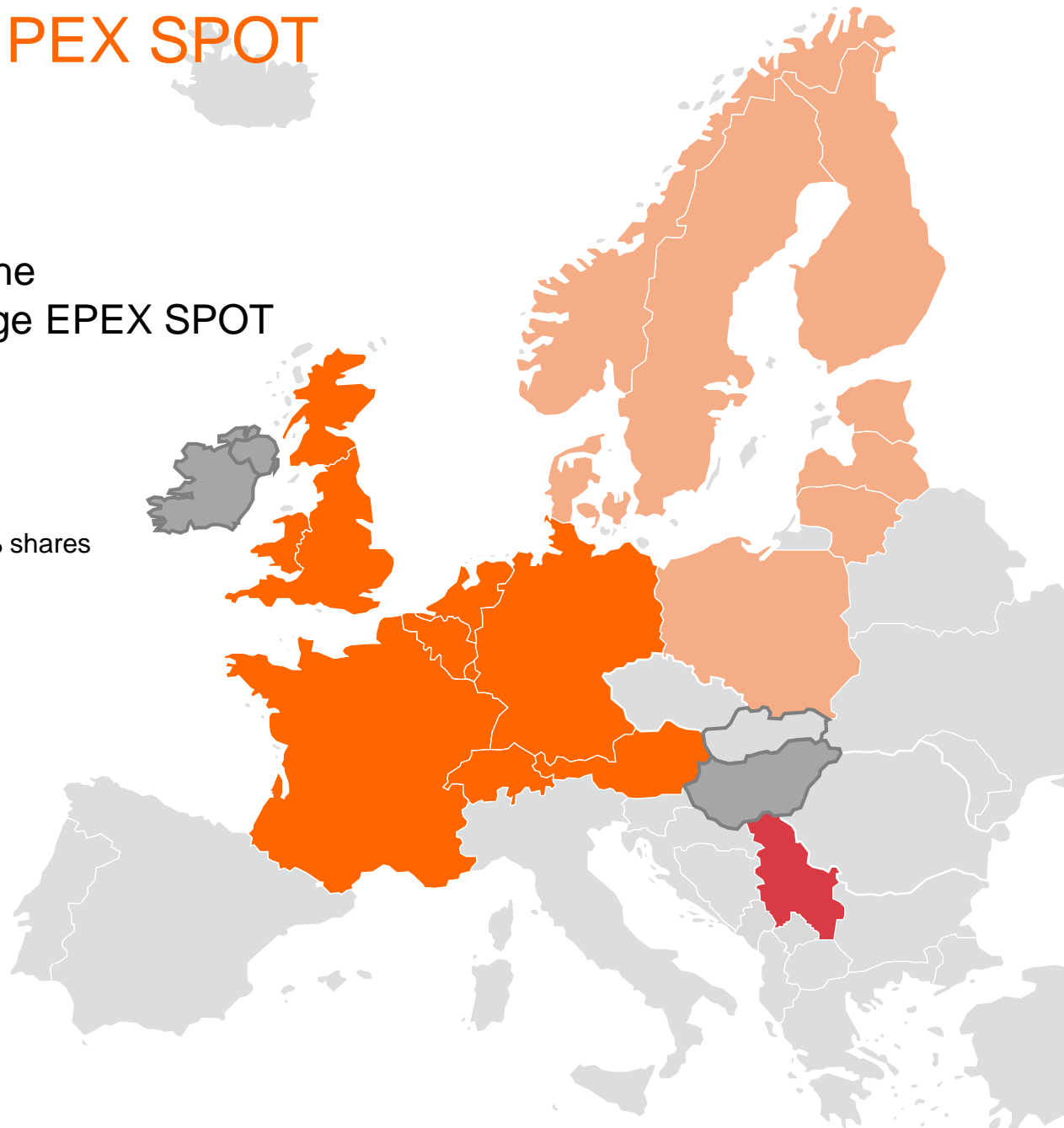
- Flexibility through continuous trading
- Market areas: Germany/Luxemburg, France, Great Britain, the Netherlands, Switzerland, Belgium and Austria

The markets of EPEX SPOT

Markets and services of the European Power Exchange EPEX SPOT

- Current EPEX markets
- Coming soon
- Market operation services and 25% shares
- Market operation services
- Market coupling services

- 21 borders
- Area of 1600 TWh consumption
- Over 285 Exchange Members
- 567 TWh of traded volume in 2018



The main objectives of local flexibility markets

The concept in a few words:

Implementation of a market-based congestion management platform efficiently centralizing local flexibility offers to allow System Operators to reliably and economically relieve physical congestions and bottlenecks from the grid.

A transparent market mechanism

- **Transparent market rules** for actors participating in the market-based congestion management
 - Asset Certification by the SOs, Verification of the physical impact, Strict Compliance
- Definition as an addition to all existing wholesale markets to solve specific local issues.

Development of distributed flexibility

- **Unveil the potential of distributed flexibility**
 - Provide transparent locational flexibility prices and foster the development of distributed flexibility (demand-side management, renewables, aggregators, batteries...).
- The platform can become **the short-term activation mechanism of long-term local flexibility contracts** if there are any, but also **be open to any other flexibility provider**.

Coordination between System Operators

- **Clear guidelines and communication protocols to increase and develop the cooperation between TSOs and DSOs**. It is a key element to reach optimality in the congestion management solution and avoid inefficiencies.
- **EPEX SPOT is a neutral and objective third party** that will be able to efficiently run the platform, adapt to current System Operator processes and Grid management rules, and ensure compatibility with the current European zonal markets

Local order book system

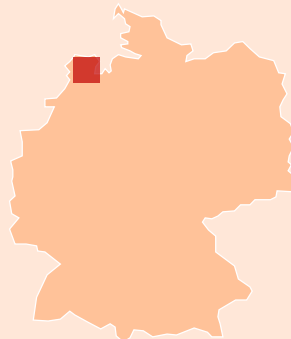
A global market...

EU XBID EPEX	Bid		Ask	
Product	Qty	Price	Price	Qty
DE 03:00	10	32	33	25
DE 03:00	3	31	34	5
DE 03:00	8	30	35	1
DE 03:00	7	29	38	4



In parallel with...

Local Market 4	Bid		Ask	
Product	Qty	Price	Price	Qty
DE 03:00 Local 4	10	32	33	25
DE 03:00 Local 3	3	31	34	5
DE 03:00 Local 2	8	30	35	1
DE 03:00 Local 1	7	29	38	4



complementary local markets

Main principle:

- ➔ Opening of locational order books in the intraday timeframe to solve congestion issues

- Important elements*
- ✓ Local trading certifications delivered by System Operators to market participants
 - ✓ "2 C's rule" ➔ need of Congestion AND Competition to open a locational order book
 - ✓ Strict compliance rules for local trading
 - ✓ Cooperation between transmission and distribution over locational trading