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Florence School of Regulation

EU Electricity Markets & Regulation in a sea of changes

EU & China Cooperation Meeting
Beijing, 28 October 2019

Jean-Michel Glachant
Director Florence School of Regulation
European University Institute (Florence, Italy)

Changes from 60 years ago…

Changes for 30 years to come…

3 views on … EU regulation & markets changes

- (I) ***Overview***: Electricity Regulation from 1880 monopolies to 2050 energy transition & deep digitalization
- (II) ***First case***: Opening existing EU Markets to Flexibility procurement
- (III) ***Second case***: Opening EU national markets to cross-border Balancing

(I) Regulation over centuries

- **1880-1990 Old challenges: Monopolies Access**

a) From framing infrastructure monopolies to…

b) Guaranteeing Universal Access and Affordability

- **1990-Today First wave of new challenges: Opening Markets**

a) Opening markets with "incentive regulation"…

b) and aligning Market Design(s) with Grid Operation & Tariffs

- **2015-2050 Latest wave : Energy Transition & Deep Digitalization**

a) Aligning Grids & Market design(s) with Massive (variable) Renewables

b) Redefining Regulation for "Disruptions" of *Energy Transition* & *Deep Digitalization*

Redesigning Electricity Regulation for Energy Transition & Deep Digitalization

1) Aligning Grids & Markets with Massive Renewables

EU going from 15% Renewable electricity (RES) in 2015 to 50% in 2030… All the "slack" of power system is gone

**Distribution Grids hosting RES*: Become first level of power systems > System operation (Congestion, Balancing) from Distribution <#> Coordination with TSO

***Wholesale Sequence of Markets*: with massive variable generation > shifting equilibrium closer to real time >> Higher need of Flexibility - Flexibility products – Flex Incentives – Flex Markets: centralized or decentralized?

Redesigning Electricity Regulation for Energy Transition & Deep Digitalization

2) Redefining Regulation for "Takeoff" of Energy Transition & Deep Digitalization

Paris Agreement 2015: Energy Transition(s) with multiple dimensions

*EU *Grid investments for massive RES*

Grid for Wind Offshore? Extension of onshore grid monopoly? Or innovation open to Offshore park developers? Germany 50 % more expensive than UK

Distribution Grid Expansion? Extension of "Fit&Forget"? Or creation of FLEX mechanisms or LT FLEX contracts? Germany: 3% RES peak erasure can lower grid reinforcement costs up to 40%

**Generalisation with new regulatory regimes*

Discovery & Innovation <call for> Tests, Pilots >> "Sandboxes"

Delivery of Multiple Outputs <calls for> more than Incentive Regulation for Single Output >> "Performance-Based Regulation" can be better than "Price Cap" (but much more demanding for the Regulator)

Redesigning Electricity Regulation for Energy Transition & Deep Digitalization

***Digitalization permits activating "Retail-size" units

Uber, AirB&B: digital platforms creating trade relations between "Retail-size" units [Akerlof 1970: direct Peer2Peer is impossible when quality is unknown]

#*Aggregators*: activate "Retail-size" unit consumptions, pack them for Wholesale trade

#Distributed Generation create "*Prosumers*" (Retail-size producers) > *Peer2Peer* permit them to trade with Retail-size buyers; *Blockchains* too can help

#"*Communities*" can be Aggregators, and/or Prosumers, and go to Peer2Peer

** **Generalisation with new regulatory regimes

(New York) Distribution Grids becoming *Open Platforms* (neutral Amazons)

Peer2Peer "Two Tier" Regulatory Frame:

Empowerment of Individuals <*On Top of*> Universal Mass Regime

Redesigning Electricity Regulation for Energy Transition & Deep Digitalization

3) Regulation for "Higher Regimes" of Energy Transition & Digitgalization

"Entry Regime" is "Greening Power Mix" + "Agregators & Prosumers"

"Higher Regimes" are:

**Electrification of most of energy usages*

Transportation (with electrical mobility) # *Heating & Cooling* (hence all buildings) # *Heavy Industrial processes*: ciment, steel, chemistry, etc.

***Digitalization of most of energy usages*

#Smart Homes #Smart Devices >> *Internet of Things, Big Data, Artificial Intelligence*

** ***Generalisation with new regulatory regime*s

Activation Behind-the-Meter: smart consumers, communities, asset-fleet managers

Multi-level power systems (Transactive Energy: from smart buildings & minigrids)

Sector Coupling: Power &Heat; Power &Gases; Power &Hydrogen; Power-to-X

So many Regulatory Challenges…

Daniel Schmerler (Peru) President of ICER… International Confederation of Energy Regulators

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FSR ENERGY & CLIMATE

(II) *First case*: Opening existing EU Markets to Flexibility procurement

1
2

Outline

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- Topic - EU target model and Clean Energy Package for electricity

- New kid on the block – Flexibility markets
  - Context
  - Clearing the fog: illustration of four projects

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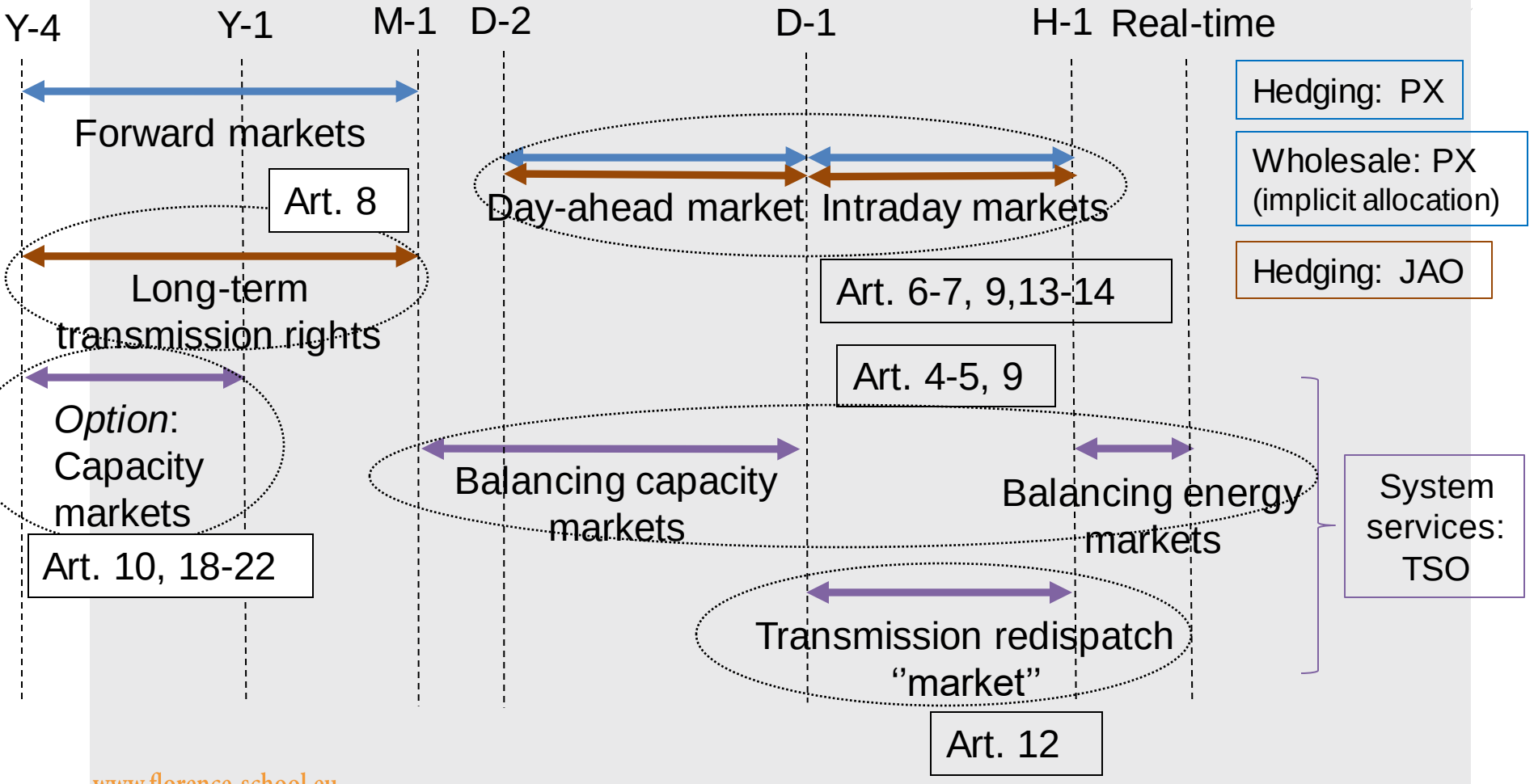
Current landscape- Typical sequence of EU markets



Recent past, most discussion about:

1/ Updating **existing markets** to better value flexibility:

- E.g. fixing wholesale markets: finer granularity (time and space)

2/ Lowering entry barriers **existing markets** to get cheaper flexibility

- E.g. opening up balancing markets and redispatch markets

Today and in the near future?

3/ Creation **new markets** to match **new flexibility needs** with **new providers**:

- E.g. flexibility procurement for distribution grids

but also markets for non-frequency ancillary services

FLEXIBILITY FOR GRIDS OPERATION

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New players in new markets

2.3.2. Measure to incentivize DSOs to procure flexibility services

The CEP aims to define the conditions under which DSOs may acquire flexibility services[47] without distorting the markets for such services. It includes clear provisions that will enable DSOs to manage local grid issues and enhance the security of supply (SoS) through flexibility procurement.

DSOs flexibility services procurement process

Regarding the regulatory framework for the procurement of flexibility by distribution system operators, **art 32(1)** of the E-Directive requires MSs to define the exact regulatory framework including incentives for DSOs and adequate remuneration. It states that *'Member States shall provide the necessary regulatory framework to allow and incentivise distribution system operators to procure flexibility services services, including congestion management in their service area, in order to improve efficiencies in the operation and development of the distribution system.'*

This procurement shall be transparent, non-discriminatory and market-based. In this context, market-based flexibility procurement refers to a process whereby flexibility is obtained and priced through a (separate) market mechanism from all stakeholders that are a source of flexibility, benefit from it, or have a controlling role, i.e. consumers, producers, BRP, system operators and regulators. In addition, the non-discriminatory aspect refers to the *'participation of all market participants including renewable energy sources, demand response, energy storage facilities and market participants engaged in aggregation,'* as stated in **art 32(1a)**. A derogation could be given by NRAs, if they establish that this kind of procurement is not economically efficient or if it may cause severe market distortions or higher congestions.

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Current landscape- Sequence of EU markets

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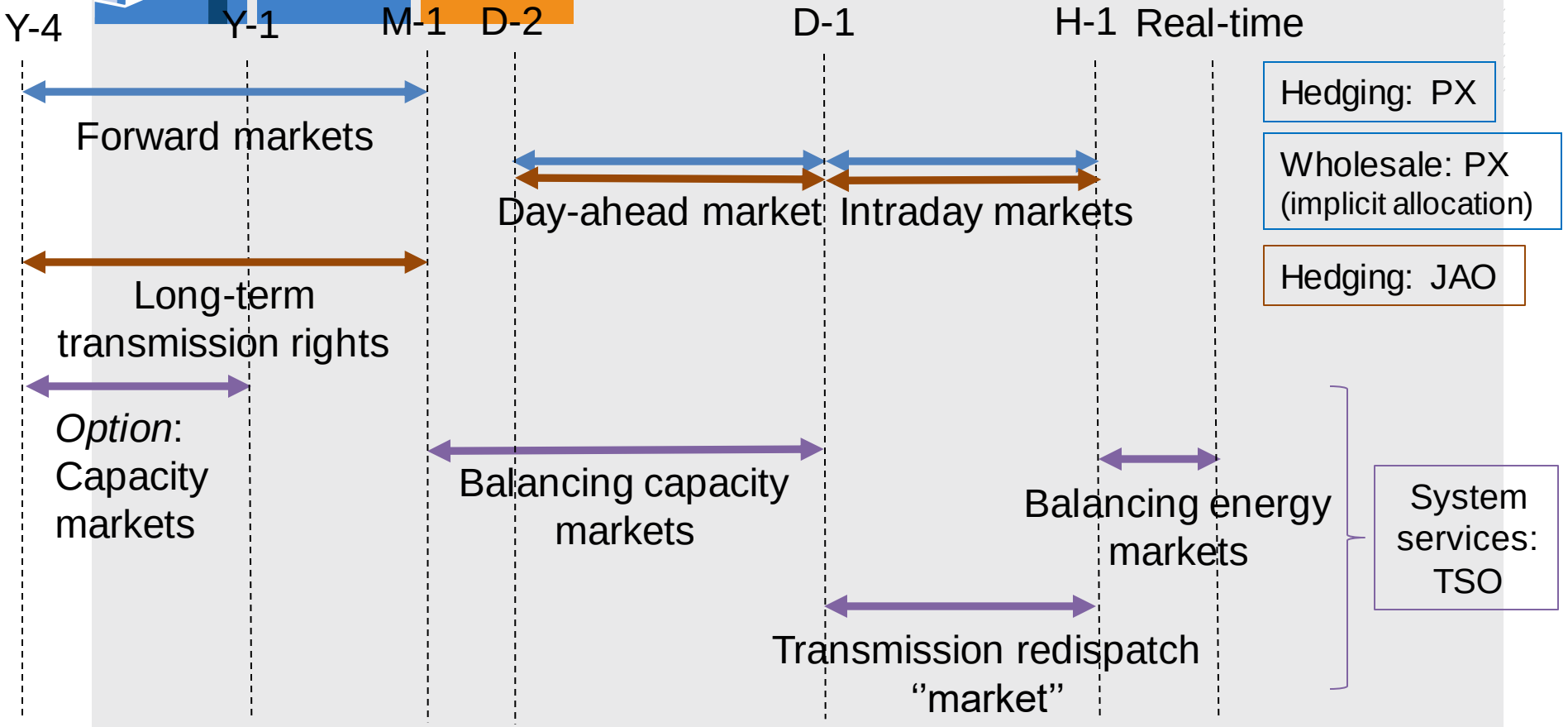

Where to "plug in" a DSO redispatch market?

Remark 1: markets are not the only way for DSOs to access flexibility

Distribution Systems Working Group

Flexibility Use at Distribution Level

A CEER Conclusions Paper

- **Rules-Based Approach** – codes and rules, which impose detailed flexibility requirements.
- **Network Tariffs** – tariff structures may be designed to encourage network users to alter their behaviour for a more efficient use of the distribution network.
- **Connection Agreements** – DSOs could reach arrangements with customers for the provision of flexibility where a Member State considers this an appropriate measure.
- **Market-Based Procurement** – DSOs can explicitly procure flexibility that benefits the grid services from the market(s). The flexibility could be procured via (bilateral) contracts or in a short-term market, e.g. via a platform or other forms of interfaces, given there is enough liquidity and arrangements for the market-based procurement do not unduly distort markets and comply with unbundling rules.

In examining these different models, CEER agrees with many respondents that market-based procurement is the preferred option because the procurement of flexibility on a competitive basis would be efficient as long as markets for the provision of flexibility that benefit the network are liquid and comply with unbundling rules. Clear requirements for the bilateral contracts need

Remark 2: Redispatching is not first best

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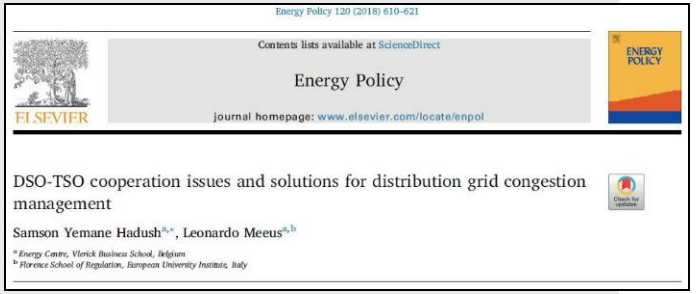
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journal homepage: www.elsevier.com/locate/enpol

DSO-TSO cooperation issues and solutions for distribution grid congestion management

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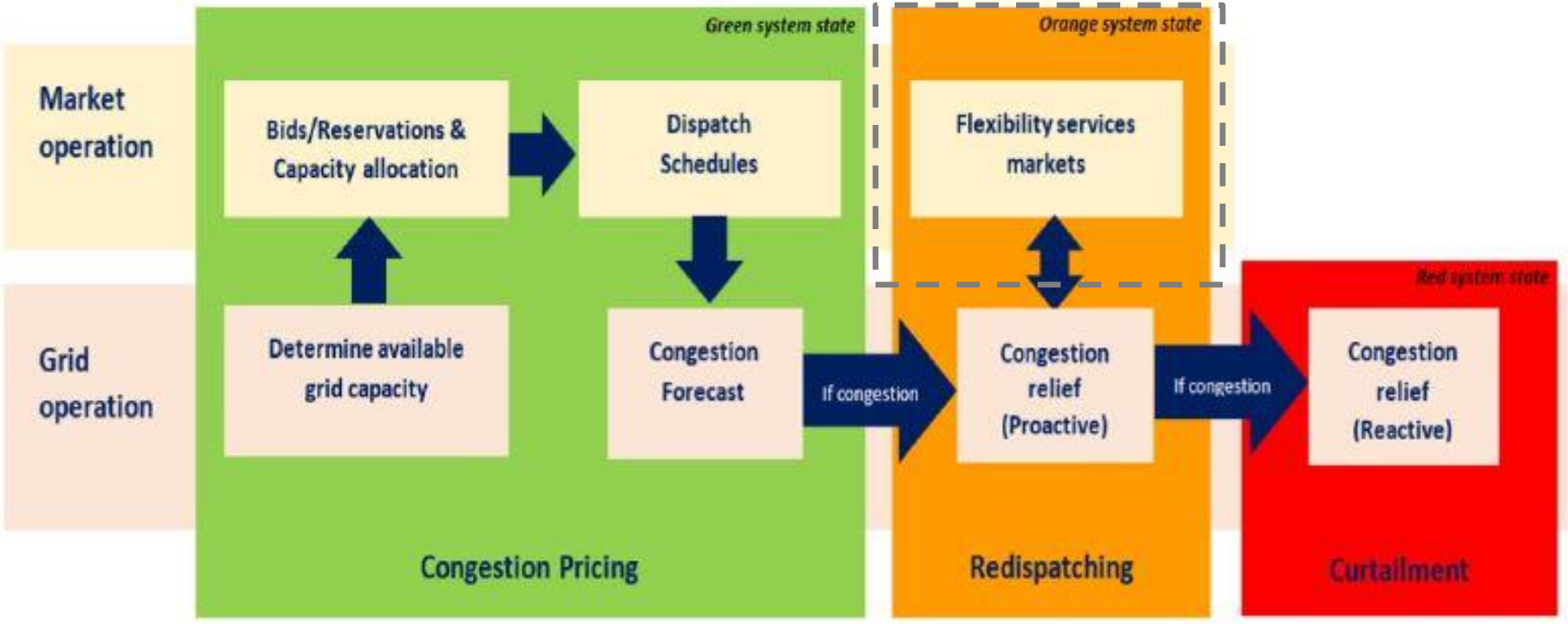
[b] Florence School of Regulation, European University Institute, Italy



Best — 2nd best — Last resort

: ILLUSTRATION OF 4 PROJECTS ALREADY IMPLEMENTING 'FLEXIBILITY MARKETS'

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1

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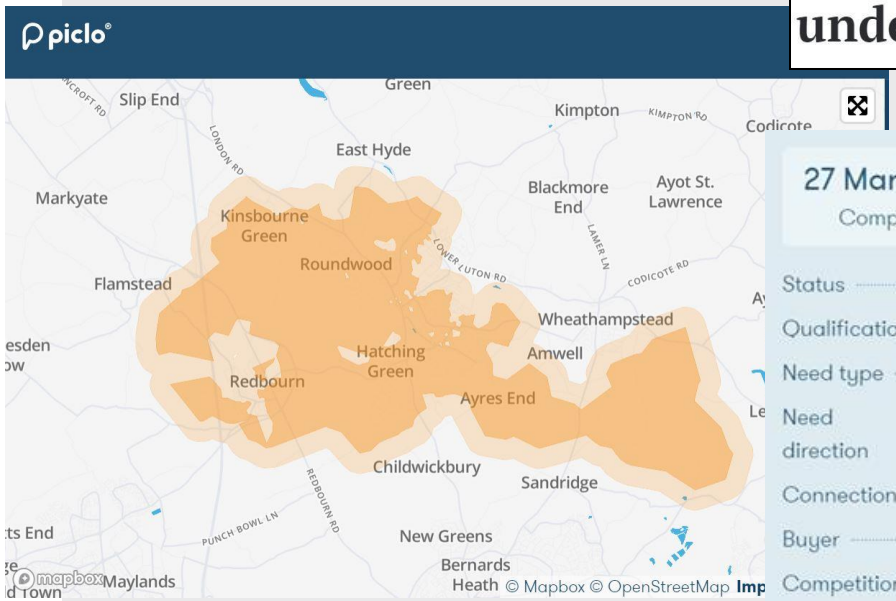
Option 1: Separate service – Contracting: long term flexibility tender + activation

NEWS TECH NETWORKS

UKPN's second flexibility tender to launch under 'online dating' Piclo Flex platform



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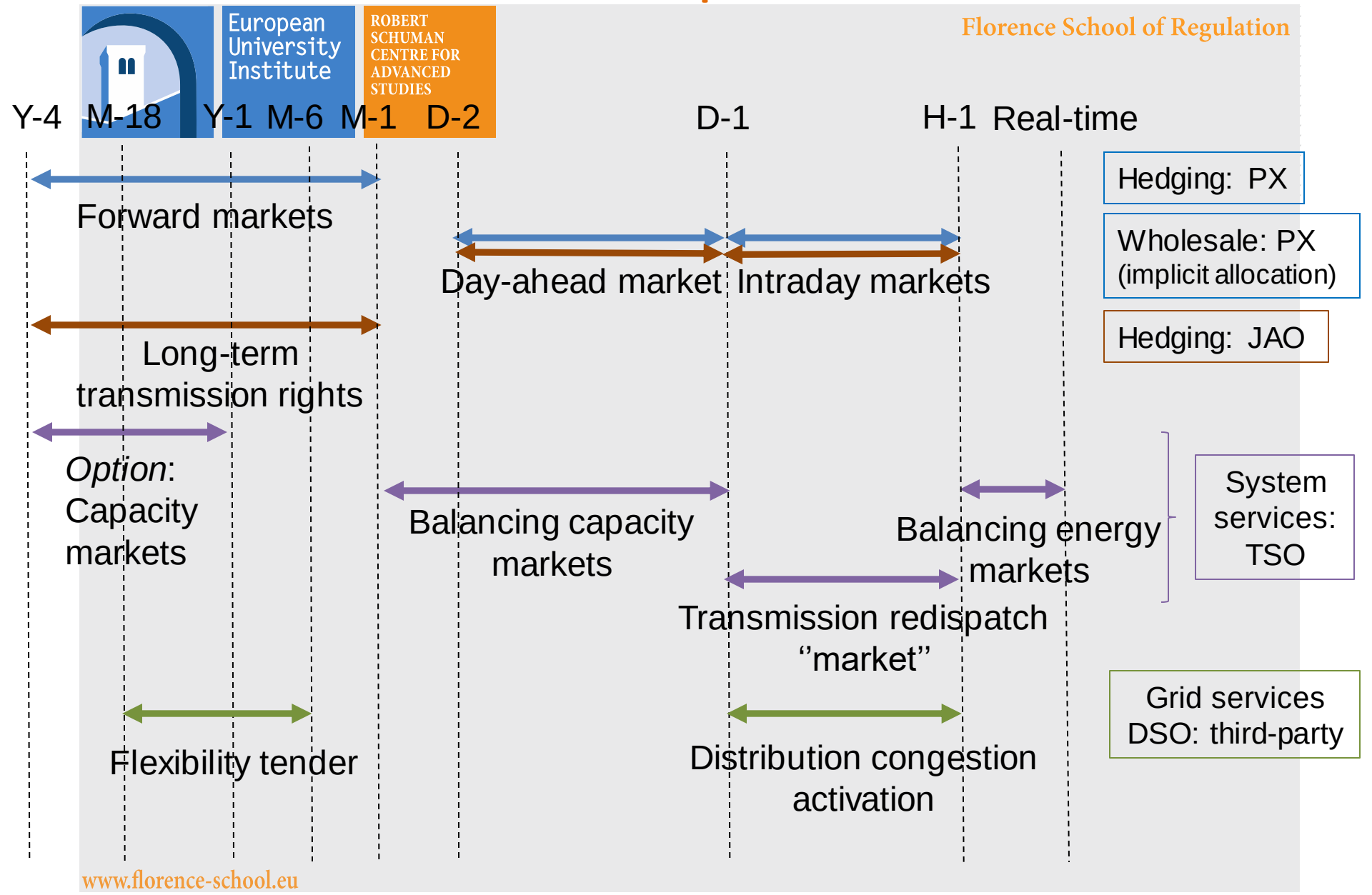
Future landscape- Piclo Flex



Option 2: Separate service – a short-term (independent) flexibility market

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EWE netz · avacon · TenneT Taking power further

The structure of the enera flex market

In the enera model region, local flexibility markets should bring together the local flexibility needs of network operators and the available flexibility potential of the region.

The European power exchange EPEX SPOT will operate the enera flex market on the same infrastructural basis as the existing intraday market. Comparable market processes, such as the start of trading at 3 pm on the day before and the end of trading five minutes before the start of delivery and the trading of 15-minute and 1-hour products, have very limited market entry barriers for (intraday) marketers. They can therefore rely on existing processes, roles and interfaces. Furthermore, EPEX SPOT, as the marketplace operator, guarantees the completely fair and non-discriminatory processing of all orders as well as the anonymisation of all trades.

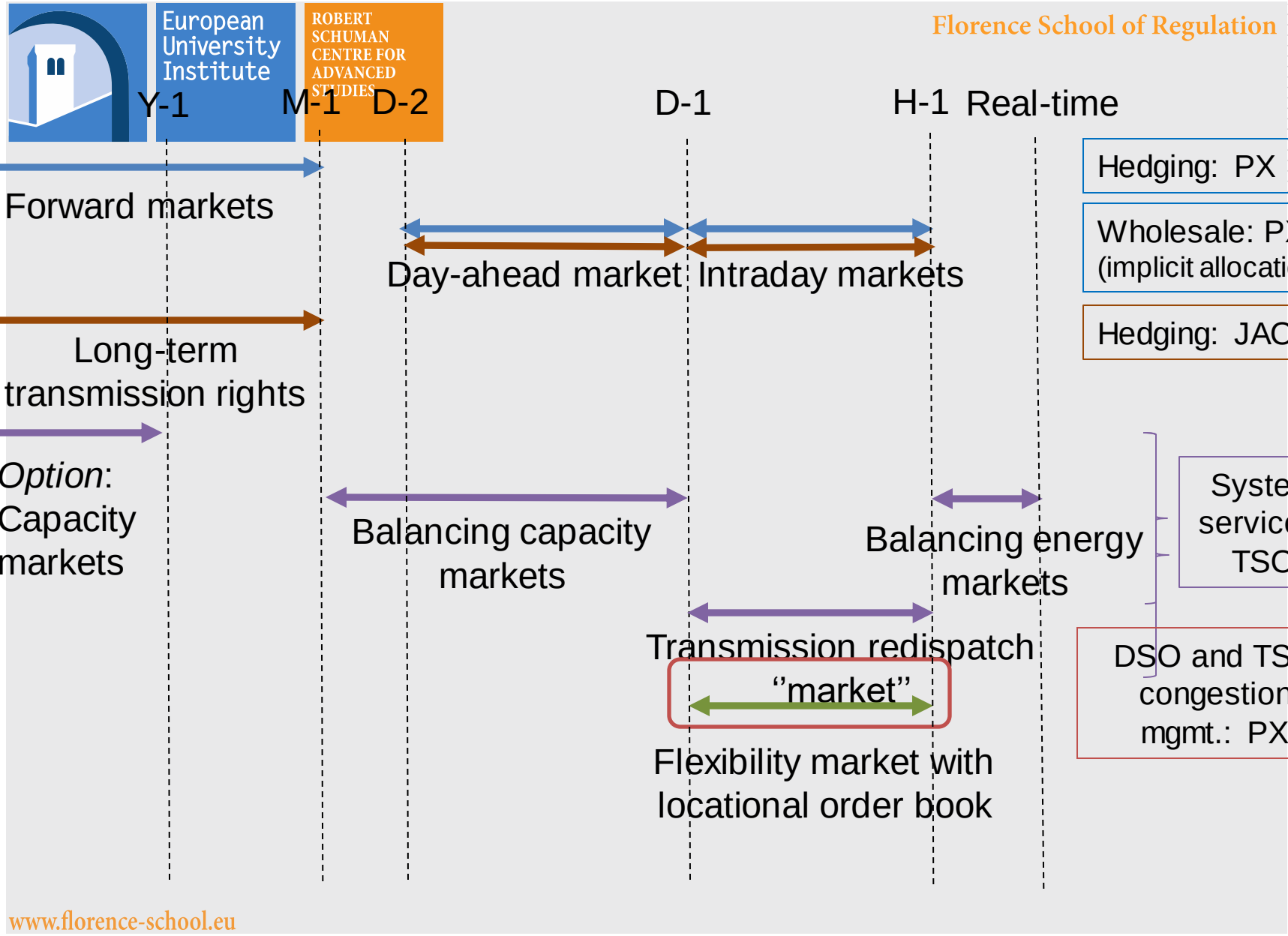
Only network operators can adjust their demand bids on the basis of their projected demand for flexibility, which makes the enera market a single-buyer market.

EPEX SPOT
4,069 followers
18h
+ Follow

This is a pivotal moment for the #energytransition in Germany and in Europe explains @EPEXSPOT_SE Philippe Vassilopoulos: yesterday @ewenetz purchased #flexibility from @Audi factory, alleviating congestion before it occurred @EworldEssen

44 Likes · 1 Comment

Future landscape- Enera



Option 3: Integrated- Add-on to a local wholesale market (ID)

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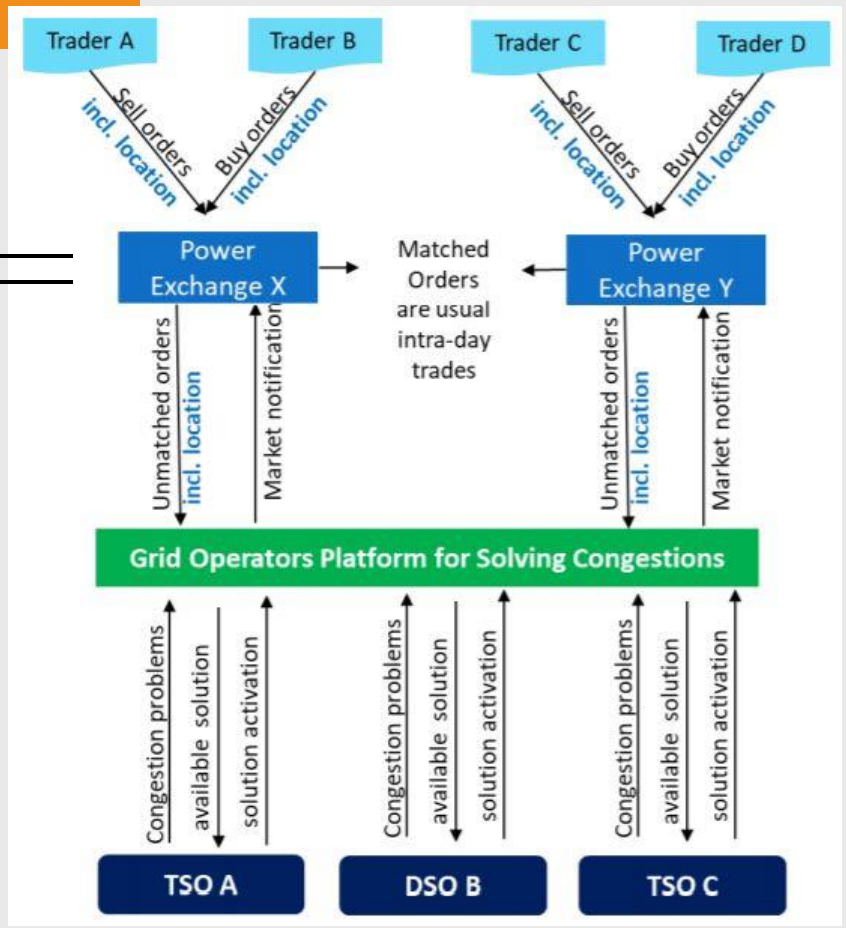
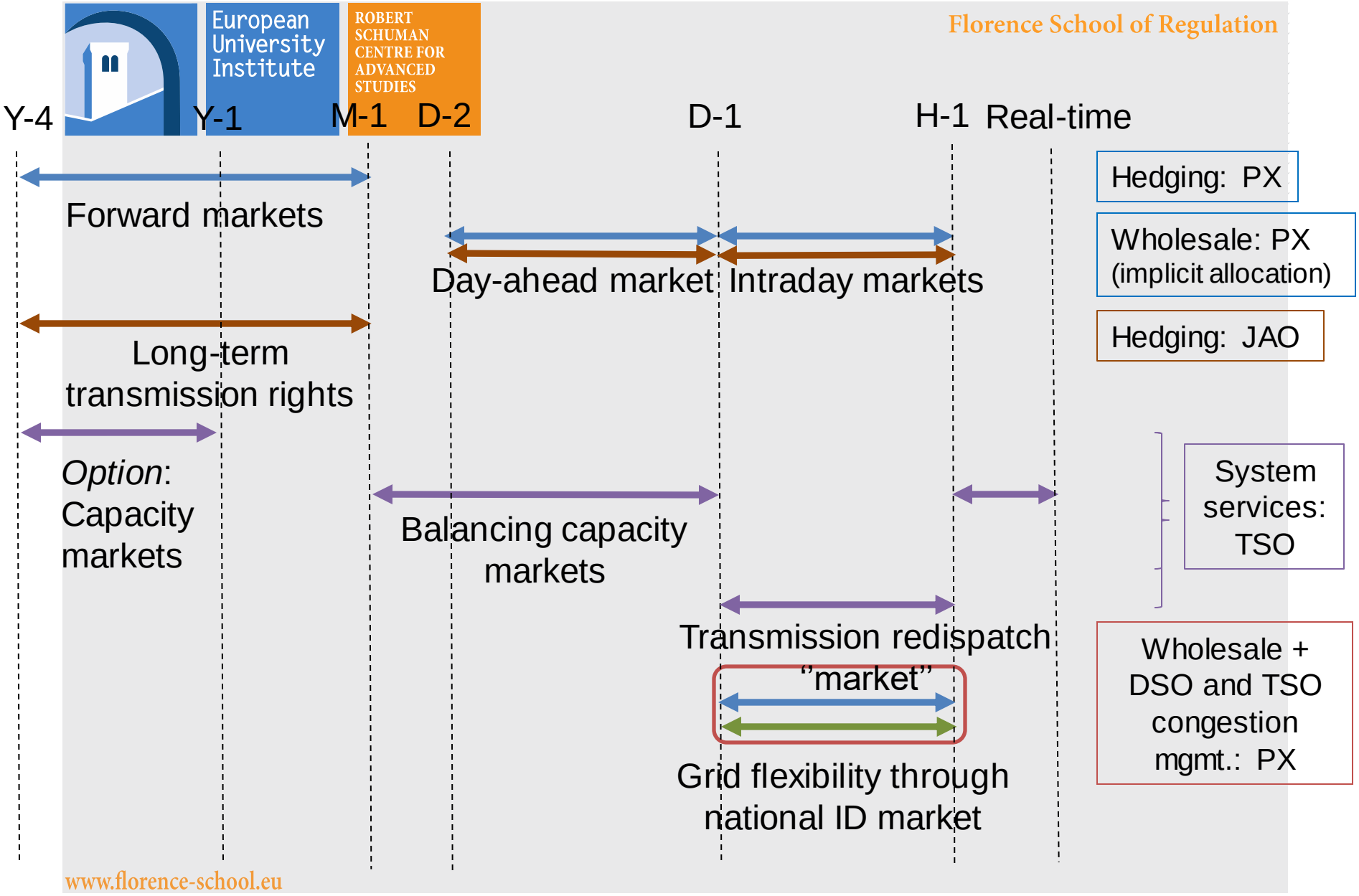
ETPA Energy Trading Platform



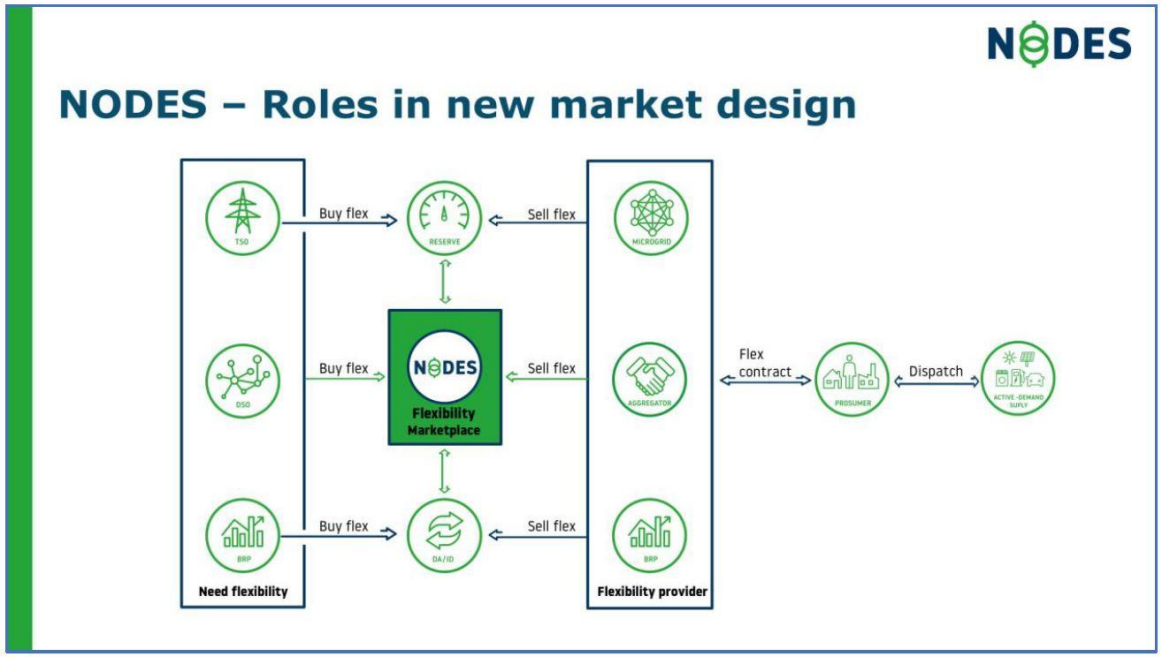
TenneT Taking power further · Stedin.net · Liander · Enexis Groep · Westland energy solutions

GOPACS is zelf geen marktplatform, maar het maakt gebruik van bestaande marktplatforms. ETPA is het eerste (intraday) marktplatform dat is aangehaakt op GOPACS. Zij brengen via hun marktplatform buy orders en sell orders samen en geven geschikte intraday orders door aan GOPACS, het netbeheerdersplatform. Als deze orders voorzien zijn van locatiegegevens en concreet bijdragen aan het kosteneffectief oplossen van congestie in het net, dan betalen de netbeheerders de spread zodat alsnog een match tot stand komt.

Future landscape- GOPACS



Option 4: Integrated -Flexibility market integrated with other existing markets



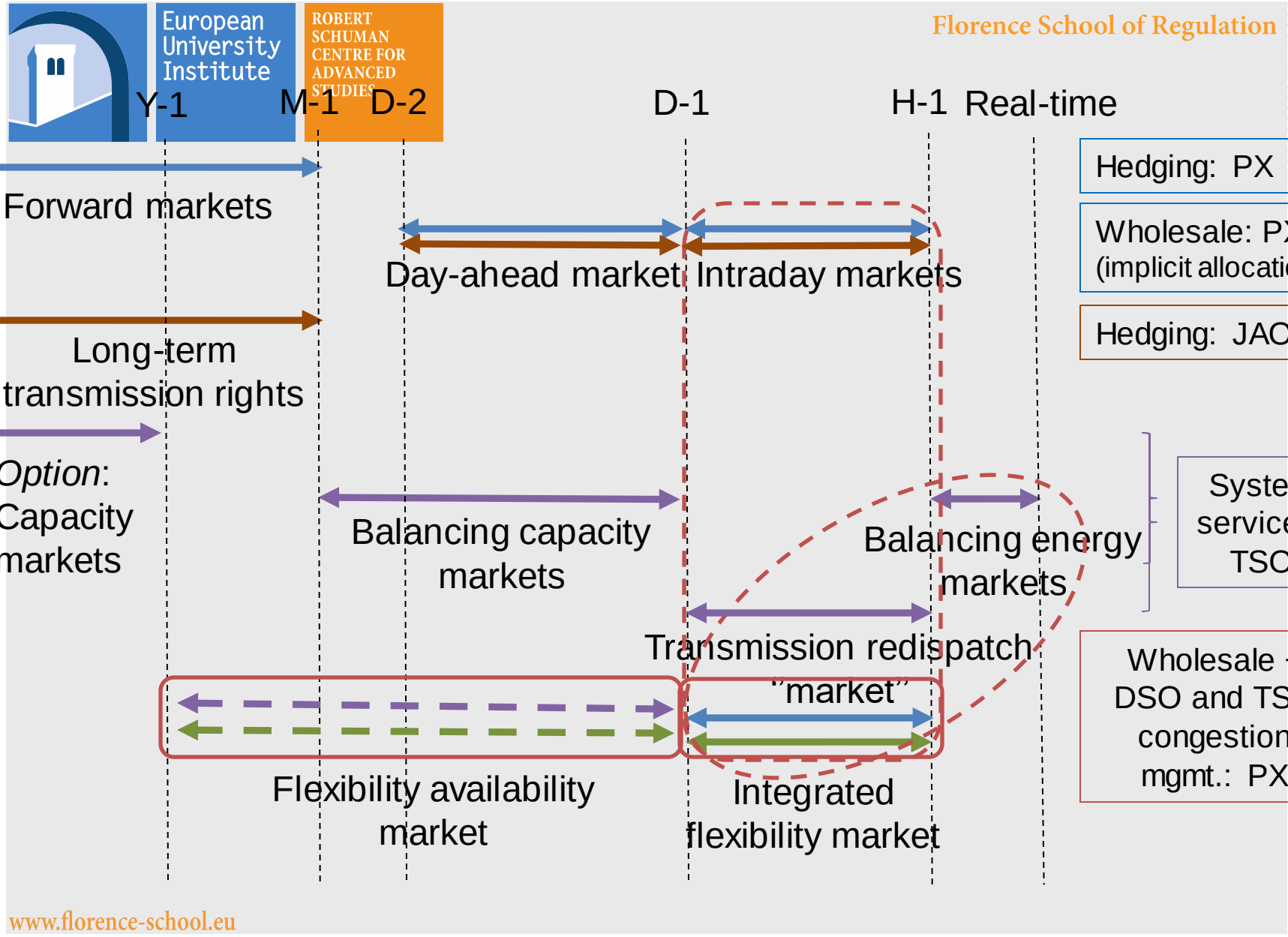
NORD POOL

agder energi

This is illustrated in figure 3 below. All flexibility assets need to be tagged with their location. As an example: in one pilot both meter-ID and GPS coordinates were used. Another alternative is the postal code. All flexibility within a **Grid Location** (GL) can be aggregated by the flexibility provider to one or more offers into NODES. The TSOs or the DSOs are free to decide how granular they want the offers, i.e.

For the majority of operating hours during a year the flexibility is not needed locally at the actual GL – often it is needed only a few hundred hours a year. But it can still have a value in the rest of the system, for balancing purposes by the TSO or in the ID market for the BRPs. NODES will establish an **interface that makes the flexibility available for these markets**.

Future landscape- NODES



(III) *Second case*: Opening national markets to EU cross-border Balancing

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Agenda

- Balancing philosophies
- European platforms for balancing energy
- Benefit of integration

BALANCING ALTERNATIVES

Central dispatch vs self-dispatch

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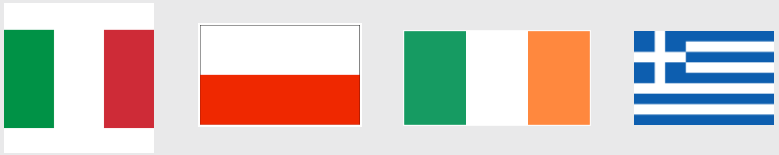
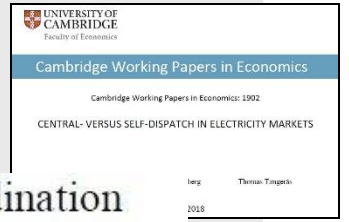
EB GL

(18) 'central dispatching model' means a scheduling and dispatching model where the generation schedules and consumption schedules as well as dispatching of power generating facilities and demand facilities, in reference to dispatchable facilities, are determined by a TSO within the integrated scheduling process;

(19) 'integrated scheduling process' means an iterative process that uses at least integrated scheduling process bids that contain commercial data, complex technical data of individual power generating facilities or demand facilities and explicitly includes the start-up characteristics, the latest control area adequacy analysis and the operational security limits as an input to the process;





All electricity markets are coordinated by an operator in real-time, but central coordination ahead of delivery differs between markets. Decentralized electricity markets have little coordination ahead of delivery, while centralized electricity markets could be coordinated by a market operator long before delivery.

Differences within self-dispatch models: proactive vs reactive

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Florer

ance. However, the apparent conflict of philosophies tend to center on other concerns, such as the division of responsibility between the TSO and the market [66], and how to keep balancing operations cost efficient. While a proactive strategy aims to ensure efficiency through centralized planning and pooling of resources, a reactive strategy can arguably increase participation in the balancing market through the empowerment of market actors. Here, a key element is the real-time publication of price signals. In practice, most TSOs use both reactive and proactive measures in the balancing process [64]

Martin Håberg

Optimal Activation and Congestion Management in the European Balancing Energy Market

Doctoral thesis
for the degree of Philosophiae Doctor

Trondheim, July 2019

Norwegian University of Science and Technology
Faculty of Information Technology and Electrical Engineering
Department of Electric Power Engineering

October 17, 2014 [FINAL REPORT OF STEP 2 OF XB BALANCING PILOT PROJECT BE-NL]

Esther van Wanrooij	TenneT NL
Frank Nobel	TenneT NL
Bob Hebb	Elia
Jan Voet	Elia

Design of a harmonised reactive balancing market with cross zonal optimisation of frequency restoration between LFC Blocks

The responsibility of the TSO applying a reactive concept (see Figure 3) is restricted to maintaining the power balance based on actual system imbalances. In regards to the TSO processes to maintain balance, this means that the TSO bears the responsibility for the frequency containment process and the frequency restoration process, but does not make use of a reserve replacement process. The intraday market takes the place of the replacement process and market players maintain as much as possible the system energy balance.

3
4

Pros & Cons

different approaches

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PENTA
Pentalateral Energy Forum

Penta SG3

Approaches	Conditions	Impact	Countries
Optimisation of balancing price = Proactive balancing		Low ID liquidity Reduced balancing costs	ES, FR
Optimisation of balancing volume = Reactive balancing	ISP 15 minutes, 15 products	Imbalance price volatility, reduced balancing energy volumes	DE, AT,BE, NL

Exception 1: specific products

E.g. French case

COMMISSION DE RÉGULATION DE L'ÉNERGIE

DELIBERATION NO 2017-155

Deliberation by the French Energy Regulatory Commission of 22 June 2017 on guidelines for the French electricity system balancing roadmap

Present: Christine CHAUVET, Hélène GASSIN, Jean-Laurent LASTELLE and Jean-Pierre SOTURA, commissioners.

Standard products and specific products

CRE considers that standard products shared on European platforms should be prioritised by RTE for system balancing, in order to take full advantage of European integration.

In addition, RTE may continue to use specific national products for congestions management, reconstitution of margins and resolving imbalances (only when they cannot be covered by standard products) in order to secure the electricity system.

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Exception 2: Activation purpose methodology

Explanatory document to all TSOs' proposal for classification methodology for the activation purposes of balancing energy bids pursuant to Article 29(1) of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing

18 December 2018

2.1 Definition and classification of activation purposes

2.1.1 Proposal for activation purposes list

The proposed list includes two main activation purposes categories, namely "Balancing" and "System constraints".

2.1.2 Classification criteria

...

For the system constraints, the reason for activating a standard balancing energy product bid is a reason different than the mismatch between the scheduled and the actual or forecasted position on system level such as, at least, (i) process congestions, or (ii) rebuild system margin so as to ensure enough margin and/or avoid entering into alert state.

REQUEST FOR AMENDMENT (RfA) BY ALL REGULATORY AUTHORITIES

ON

ALL TSOs' PROPOSAL FOR CLASSIFICATION METHODOLOGY FOR THE ACTIVATION PURPOSES OF BALANCING ENERGY BIDS PURSUANT TO ARTICLE 29(3) OF COMMISSION REGULATION (EU) 2017/2195 ESTABLISHING A GUIDELINE ON ELECTRICITY BALANCING

23 July 2019

The classification criteria to flag each activation as Balancing or System Constraints, refer to a list of activation purposes that can be carried out according to the SOGL. All the activation that aim to achieve the control target of the reserve replacement process in accordance with Article 144(1) of the SOGL and all the activation that aim to achieve the control target of the frequency restoration process in accordance with Article 144(3) shall be classified as "Balancing".

EUROPEAN PLATFORMS FOR BALANCING ENERGY

Vision ENTSO-E, vision ACER

PENTA
Pentalateral Energy Forum

BALANCING 6/06/2016

According to ENTSOE, there is no need to harmonize all the dimensions and starting without complete harmonization seems efficient. The only dimension that must be harmonized is the standard products for balancing energy & capacity (this includes harmonization of GCT). Whereas , at least at the beginning, a complete harmonization of imbalance settlement and imbalance settlement period (ISP)

ACER
Agency for the Cooperation of Energy Regulators

27/11/2015

ACER path towards the balancing market integration

ACER versus ENTSO-E

ENTSO-E

- Standard products

ACER

- Pricing methods
- Harmonizing ISP

- Activation rule
- Standard products
- Activation purpose

What we agreed – Netting

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ENTSO-E:

''TSOs have agreed to use the IGCC as a reference project and thereby as starting point for the European platform for the imbalance netting process.''

EU platforms for the exchange of balancing energy

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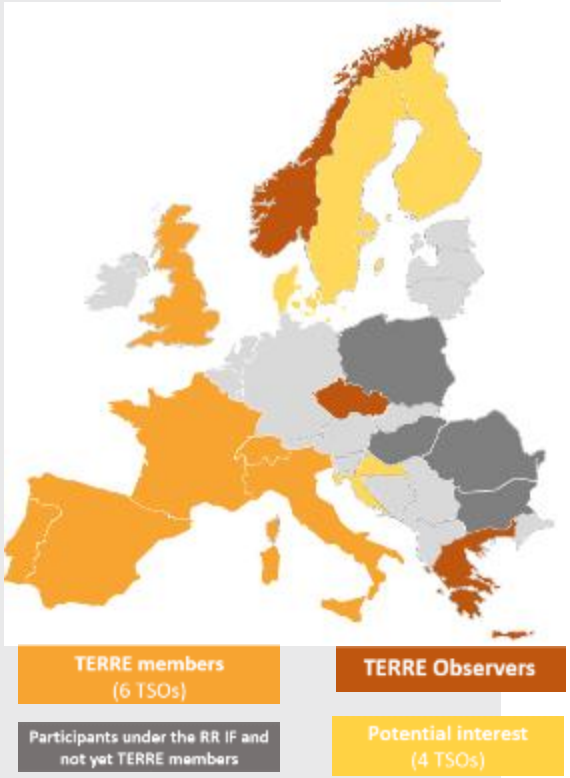
PICASSO (aFRR)

MARI (mFRR)

LIBRA (RR)



Where are we?

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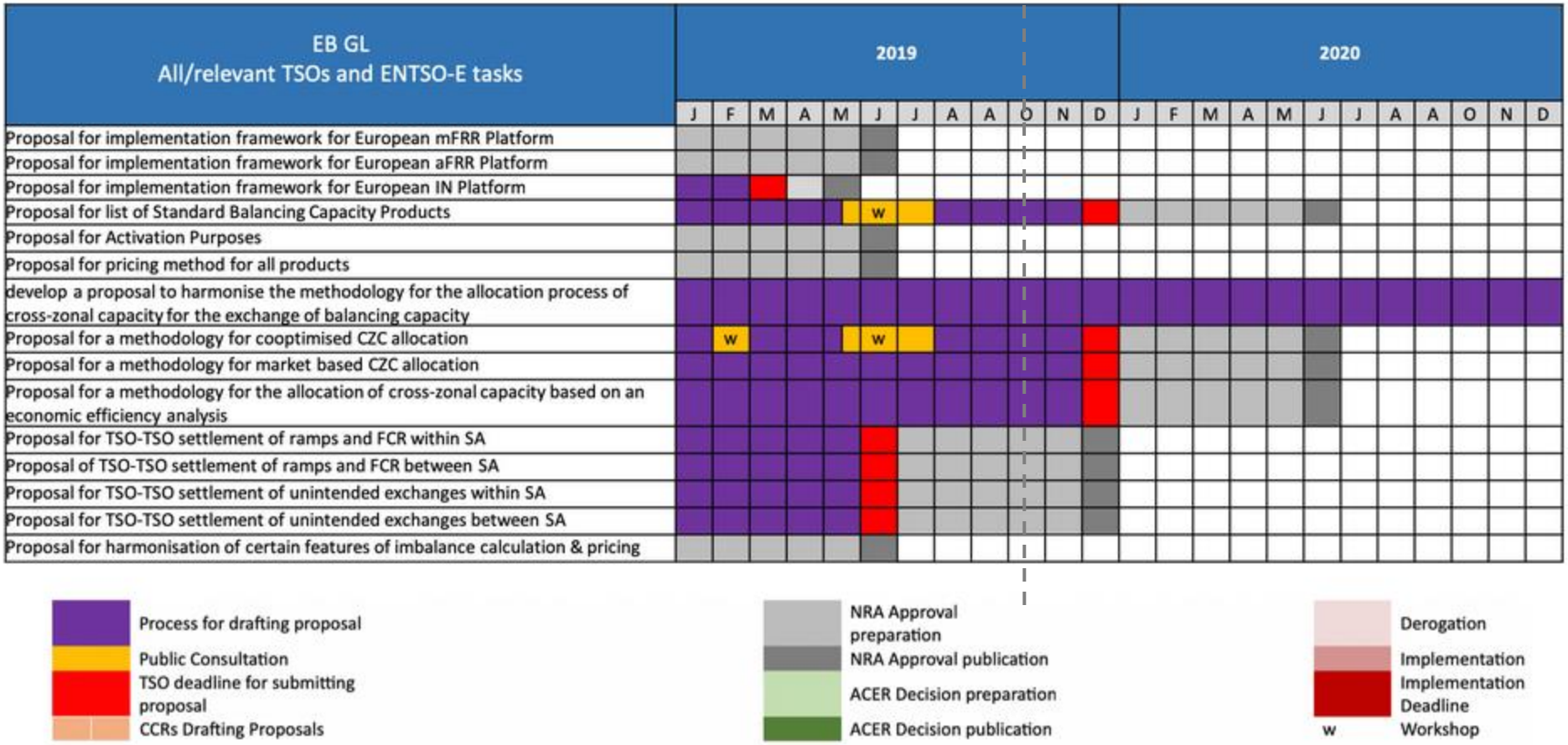

https://electricity.network-codes.eu/network_codes/eb/

Conclusions

- 1 Energy Regulation towards 2050
- 2 Flexibility Markets & Transactive Energy
- 3 Cross-Border Balancing & Regionalisation of System Operation

Many Thanks…
for your attention

Email contact: jean-michel.glachant@eui.eu

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