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SCHUMAN
CENTRE FOR
ADVANCED
STUDIES



FSR teaching & research in electricity Focus on the Clean Energy Package

Jean-Michel Glachant

4 February 2020

Content presentation

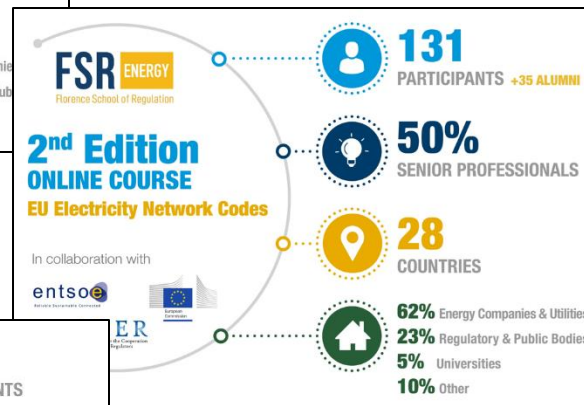
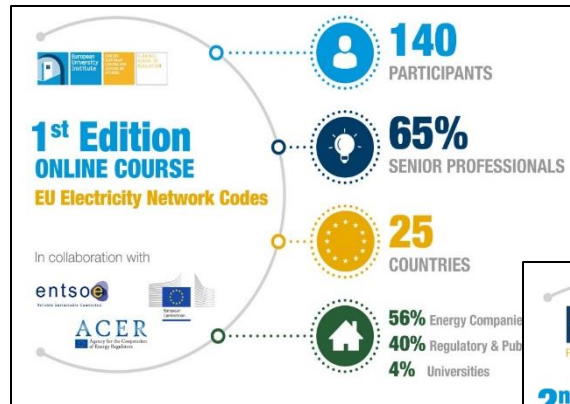
- Teaching: 2 flagship online courses
- Research:
 - The Clean Energy Package
 - Other relevant electricity research

Teaching

Two flagship online courses

EU Electricity network codes (°Autumn 2017 – 9-weeks)

Clean Energy Package (°Spring 2018 – 6-weeks)



+500 alumni!

Our partners for these courses



Sample of our audience

corejs

Authority for
Consumers & Markets

Vestas



ELEXON



Bird & Bird



ADMHE
ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ
ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ



nationalgrid



The EU Electricity network codes

Originate from the 3th package (2009) - First adopted NC in 2015 & last one in 2017

How to integrate power markets?
Market codes

- Forward Capacity Allocation (FCA GL)
- Capacity Allocation and Congestion Management (CACM GL)
- Electricity Balancing (EB GL)

How to seamlessly operate a
power system?
System operation codes

- System Operations (SO GL)
- Emergency and Restoration (ER NC)

How to harmonize connection
rules?
Grid connection codes

- Demand Connection Code (DCC NC)
- Requirements for Generators (RfG NC)
- HVDC Connections (HVDC NC)

The Clean Energy Package for all Europeans

4th Energy Package



8 legislative texts

- Energy Performance in Buildings
- Renewable Energy
- Governance
- Energy Efficiency
- Electricity Regulation
- Electricity Directive
- Risk Preparedness
- ACER

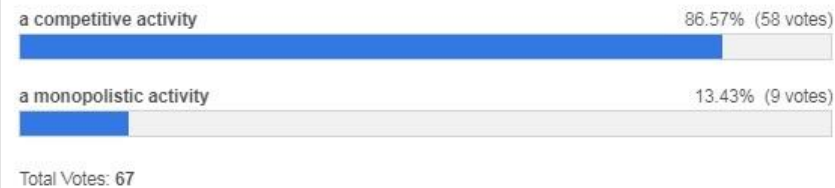
The three elements of our online courses

Course text and quizzes

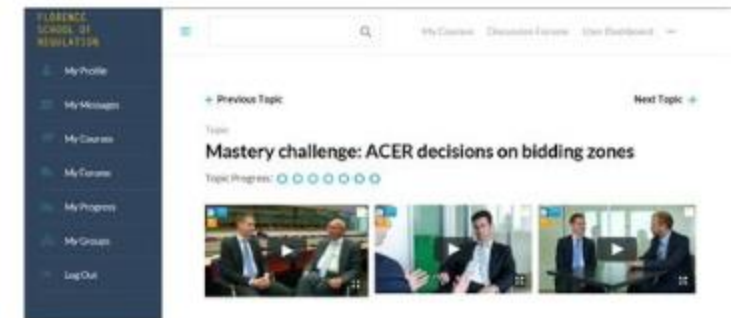


Forum debates and live classes

Market operation should be



Mastery challenges with expert panels



In which markets a NEMO designated in one member state has the right to offer trading services with delivery in another member state?

- In both day-ahead and intraday market, with exceptions
- In the intraday market
- In the day-ahead market
- In both day-ahead and intraday market

Correct
Article 4 (5,6,7) of the CACM GL. The scope and tasks of a NEMO are also discussed in Section 4.1.1 of the course text.



Syllabus



01. INVESTIGATOR



02. ADVOCATE



03. MASTER

EU Electricity network codes

Week 1: Establishing national wholesale markets (CACM GL, FCA GL)

Week 2: Integrating wholesale markets (CACM GL, SO GL)

Week 3: Establishing national balancing markets (EB GL, SO GL)

Week 4: Integrating balancing markets (EB GL, SO GL)

Week 5-6: Mastery Challenges

- Bidding zone review
- Integration of DER

Week 7: Legal dimension of the codes

Week 8: Grid connection codes (RfG NC, DC NC)

Week 9: Digital data (SO GL, CACM GL, CEP, ...)

Clean Energy Package

Week 1: Electricity markets – Ensuring the internal market level playing field

Week 2: Electricity grids – Adapting to the decentralisation of the power grid

Week 3: The New Deal – Empowering customers and citizens

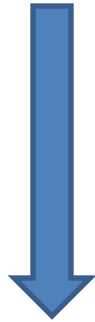
Week 4: Governance of the Energy Union

Week 5-6: Mastery Challenges:

- Mapping and appraisal of the CEP
- Citizen Energy Communities

The future – Reframing our electricity courses

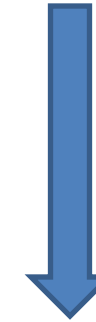
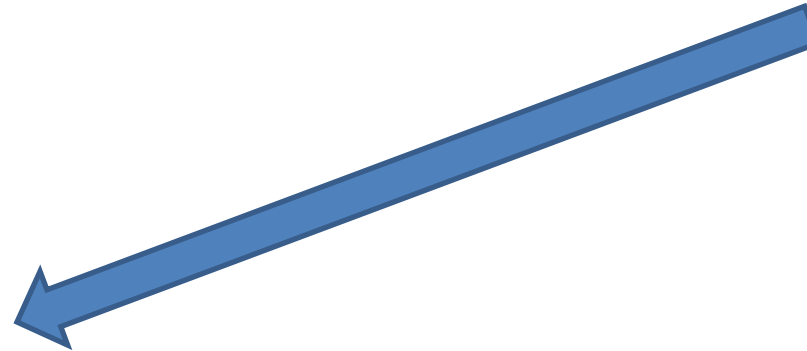
EU Electricity network codes



EU electricity markets: evolution
and current challenges
(2020)



Clean Energy Package



EU Green Deal
(2021)



Research

The Clean Energy Package

FSR research strategy

1. Identification of areas where the revised Electricity Directive forces Member States to innovate
2. Monitoring implementation by pioneering MS
 - Identification of relevant dimensions for the analysis based on literature/controversies
3. Analysing trends and differences
4. Recommendations for EU intervention through network codes (too early, principles, harmonization, single EU approach)

Identification of 4 research topics

4y research plan (2019-2023)



Table 1: Overview of identified research domains ('State of play matrix')

New research domain	Relevant CEP articles (most important in bold)	Relevant network code areas	Possible research topics (non-exhaustive)
Flexibility mechanisms	E-Directive, Art. 32 E-Regulation, Art. 18, 30, 51, 57	E-Regulation, Art. 13(1-3,5,7), 59.1(a-e) and 59.2(b)	<ul style="list-style-type: none"> - Market-based procurement of flexibility for distribution grids ('flexibility markets') - Smart connection agreements - TSO-DSO cooperation, including exchange of and access to relevant data
Consumer Data Management	E-Directive, Art. 3, 13, 15, 17,20, 23-24 , 34, 59 E-Regulation, 30, 51	E-Regulation, Art. 59.1(e) and 59.2(b)	<ul style="list-style-type: none"> - Level of harmonisation of data management models and/or data exchange processes - Scope and interoperability of data exchange platforms - Level of access to consumer data
Framework for Aggregators	E-Directive, Art. 13 , 17	E-Regulation, Art. 59.1(c-e) and 59.2(a)	<ul style="list-style-type: none"> - Baseline methodologies for aggregators - Market rules between aggregators and suppliers
Peer-to-peer and Community-based Energy Trade	E-Directive, Art. 15-16 REDII, Art. 21-22	E-Regulation, Art. 59.1(e) and 59.2(a, c)	<ul style="list-style-type: none"> - Regulation of metering of consumers with multiple energy supply contracts - Roles and responsibilities of alternative energy suppliers (e.g. community, P2P exchange,..) versus traditional retailer - The market design and transparency requirements of P2P exchanges

TOPIC 1: Flexibility mechanisms

Research: Spring/Summer 2019

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

Flexibility markets

Origin in the CEP



Article 32

Incentives for the use of flexibility in distribution networks

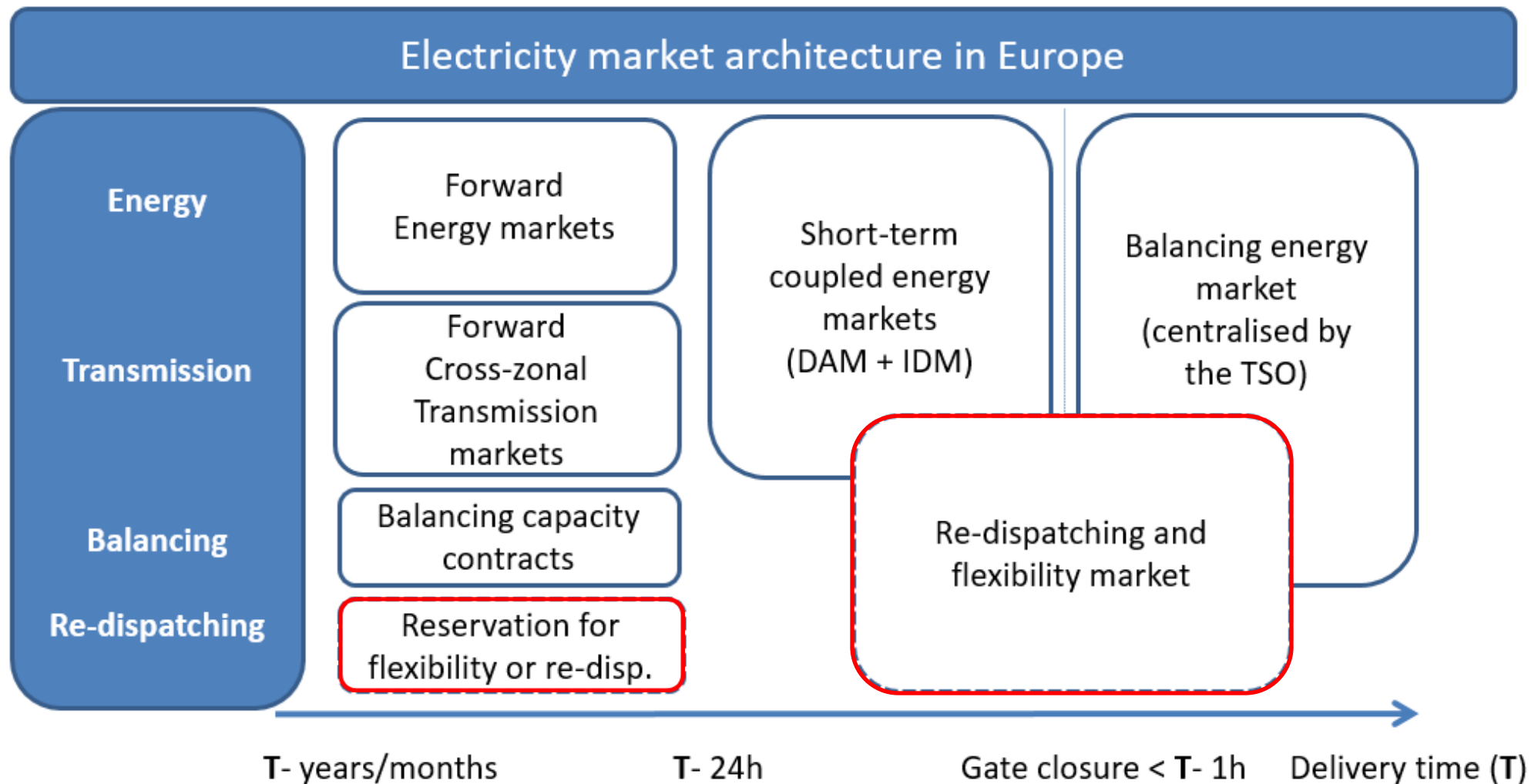
1. Member States shall provide the necessary regulatory framework to allow and incentivise distribution system operators to procure *flexibility services, including congestion management in their service area*, in order to improve efficiencies in the operation and development of the distribution system. In particular, regulatory frameworks shall *ensure that* distribution system operators to procure services from resources such as distributed generation, demand response or storage and consider energy efficiency measures, *when such services cost-effectively* supplant the need to upgrade or replace electricity capacity and which support the efficient and secure operation of the distribution system. *Distribution system operators shall procure these services according to transparent, non-discriminatory and market based procedures unless regulatory authorities have established that the procurement of such services is economically not efficient or if this leads to severe market distortions or to higher congestions.*

Article 55

Establishment of network codes

1. The Commission is empowered to adopt *implementing acts in order to ensure uniform conditions for the implementation of this Regulation by establishing* network codes in the following areas:
 - ...
 - (g) capacity-allocation and *congestion-management* rules *implementing Article 6 [Recast electricity Directive] and Articles 6, 7 to 9, 12 to 15 and 32 to 34*, including *day ahead, intraday and forward capacity calculation methodologies and processes, grid models, bidding zone configuration, redispatching and countertrading, trading algorithms, single day-ahead and intraday coupling, firmness of allocated cross-zonal capacity, congestion income distribution, cross-zonal transmission risk hedging, nomination procedures, and capacity allocation and congestion management cost recovery*;

Where do flexibility markets fit in?





4 pioneering local flexibility markets

piclo[®] Flex 












GOPACS 








NØDES  




Six key dimensions

	YES	NO	
1. Is the flexibility market integrated in the existing sequence of electricity markets?	GOPACS and NODES	Piclo Flex and Enera	Difference
2. Is the flexibility market operator a third party?	All projects. GOPACS is not a market platform operator but an intermediary. Currently, the market platform is ETPA.	/	Trend
3. Is there a reservation payment?	Piclo Flex	Enera, GOPACS and NODES (all projects envision to integrate reservations)	Difference
4. Are products standardized in the flexibility market?	Piclo Flex, Enera and GOPACS (IDCONS)	NODES	Difference
5. Is there TSO-DSO cooperation for the organization of the flexibility market?	GOPACS (TSO and DSOs use the same intermediary). Enera and NODES (soon the TSO will be active on the same platform)	Piclo is solely a DSO platform	Difference
6. Is there DSO-DSO cooperation for the organization of the flexibility market?	Piclo Flex (6 DSOs), GOPACS (4 DSOs), Enera and NODES (one DSO per installation but soon more will join)	/	Trend

FSR interaction and dissemination

Closing the loop between teaching and research

FSR Energy @FSR_Energy

Today the FSR community of #NetworkCodes experts joined our panel online to discuss:

Market-based procurement of flexibility services for distribution grids.

Thanks to S. Georgiopoulos, E. Lahmar @EPEXSPOT_SE, F. Wiersma @TenneT_DE E. Lauen, T. Schittekatte, @LeonardoMeeus

Leonardo Meeus and Agder Energi

6:51 PM · Apr 24, 2019 · Twitter Web Client

Jean-Michel Glachant @JMGlachant

Tim Schittekatte introduces the 4 cases of electricity flexibility markets
Studied at @FSR_Energy

Copenhagen Forum

#energyIF2019
@CSEICBS
@LeonardoMeeus

2:23 PM · May 24, 2019 · Twitter for iPhone

Contents lists available at ScienceDirect

Utilities Policy

Journal homepage: <http://ees.elsevier.com>

Flexibility markets: Q&A with project pioneers

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^b Vlerick Business School, Vlerick Energy Centre, Bolwerklaan 21, B-1210 Brussels, Belgium

ARTICLE INFO	ABSTRACT
Keywords Market design Flexibility DSO Flexibility markets Distributed energy resources Redispatch	Flexibility markets are a promising tool to make better use of existing distribution grids. We analyse four pioneering projects implementing flexibility markets: Pico Flex, Enera, GOPACS, and NODES. Based on a literature review, we develop a six-question framework. We find that all of the considered flexibility markets are operated by a third party. All projects also engage with multiple DSOs to become the standardized platform provider. Differences among the projects are found in the extent to which the flexibility markets are integrated into other existing markets, the use of reservation payments, the use of standardized products, and the way TSO-DSO cooperation is done. The answers to these questions vary for the projects because of different visions, use cases, or project maturity. Our case study analysis of four pioneering projects enriches the taxonomy and shows that practice is moving faster than the conceptual debate around flexibility markets.

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Florence School of Regulation

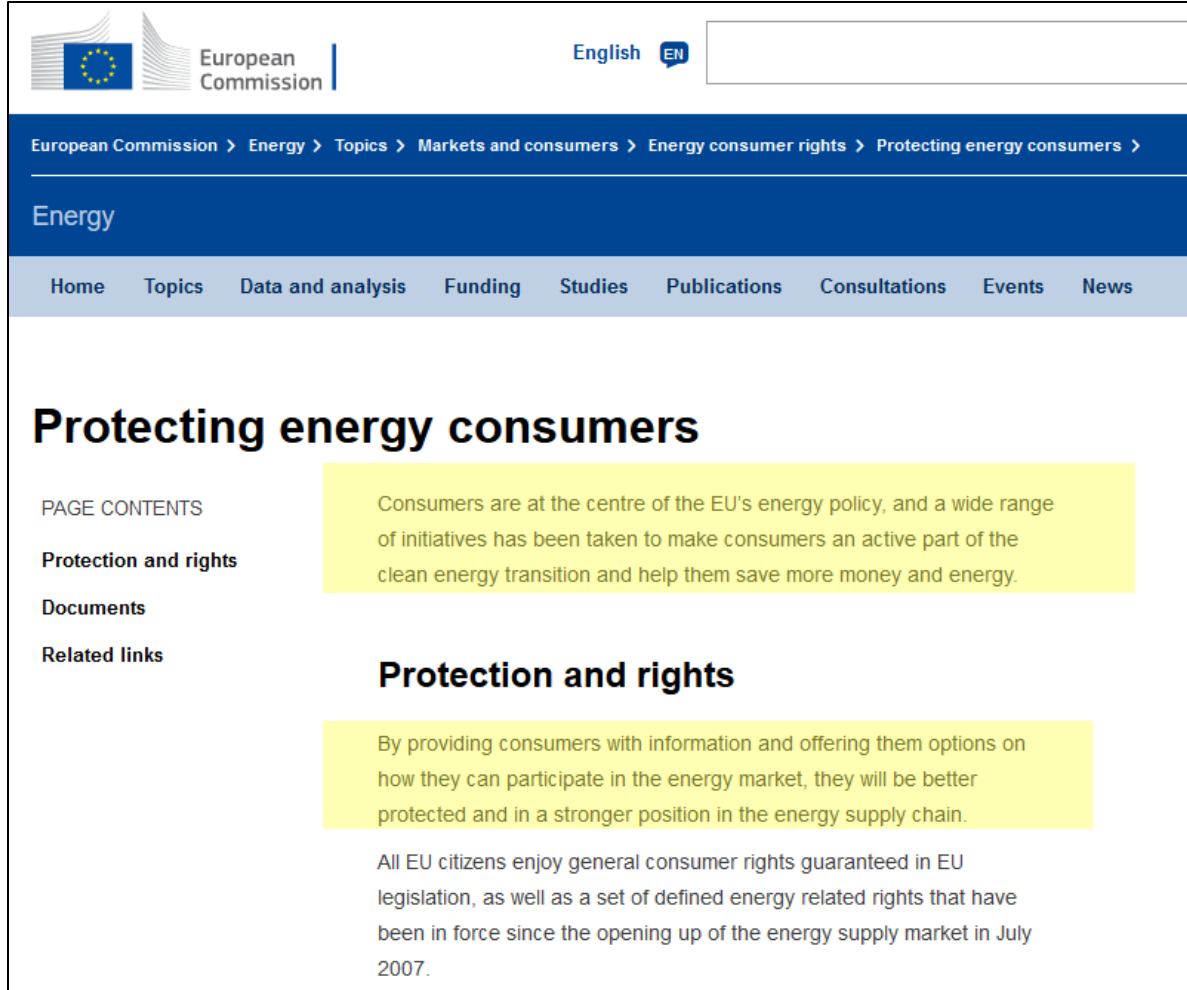
Triggered by the Clean Energy Package
discussing a second generation

The Clean Energy Package and the future of network codes | FSR Topic of the Month

0:13 / 1:41

TOPIC 2: Consumer data management

Autumn 2019 – Spring 2020



The screenshot shows the European Commission website. The header includes the European Commission logo, the language 'English', and a search bar. The breadcrumb trail is: European Commission > Energy > Topics > Markets and consumers > Energy consumer rights > Protecting energy consumers >. The main navigation menu includes: Home, Topics, Data and analysis, Funding, Studies, Publications, Consultations, Events, News. The page title is 'Protecting energy consumers'. On the left, there is a 'PAGE CONTENTS' sidebar with links for 'Protection and rights', 'Documents', and 'Related links'. The main content area features a yellow highlighted box with the text: 'Consumers are at the centre of the EU's energy policy, and a wide range of initiatives has been taken to make consumers an active part of the clean energy transition and help them save more money and energy.' Below this is a section titled 'Protection and rights' with another yellow highlighted box: 'By providing consumers with information and offering them options on how they can participate in the energy market, they will be better protected and in a stronger position in the energy supply chain.' At the bottom, it states: 'All EU citizens enjoy general consumer rights guaranteed in EU legislation, as well as a set of defined energy related rights that have been in force since the opening up of the energy supply market in July 2007.'



The screenshot shows a tweet from Energy4Europe (@Energy4Europe). The tweet text is: 'The Clean energy for all Europeans package - strengthening your consumer rights! #CleanEnergyEU #EUconsumers → europa.eu/!hF73NJ'. Below the text is a video thumbnail showing a family (a man, a woman, and a child) in a kitchen. A white banner with blue text is overlaid on the video, reading: 'All designed to help European consumers'. At the bottom of the tweet, it says: '11:12 vorm. · 22. Mai 2019 · Twitter Web App'.

Consumer data management – Step 1: Teaching Network codes online training Autumn 2019

3rd edition FSR Online Training Electricity Network Codes

New learning week on digital data and data exchange

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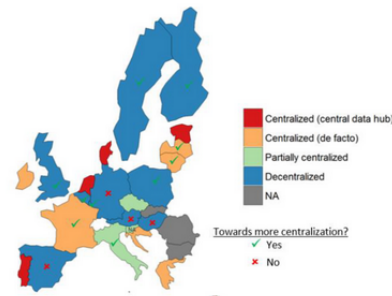


Figure 7: Data management models across Europe (modified from Tractebel (2018))⁵³

In its Impact Assessment for the Market Design Initiative, the EC (2016b) identifies differences in data management as possible market entry barriers for new actors. The EC also lists three options for future data management models: (i) sole responsibility by the MS, (ii) common criteria and principles and (iii) a common EU model.

TSOs and DSOs were of the opinion that no one-size-fits-all data management model is applicable in all European countries (ENTSO-E et al., 2016). National requirements shall be respected while, at the same time, common principles have to be set on a European level to provide for a common framework to the different DMMs in Europe. Such common criteria and requirements shall e.g. guarantee privacy and security of data, facilitate competition, markets and innovation, guarantee neutral and non-discriminatory access to data, ensure transparency of data exchange, improve overall transparency in the power sector, consider cost-efficiency and simplicity of design decisions, business models and processes, and aim for harmonisation of standards at least on a national level and, where applicable and efficient, on a European level (ENTSO-E et al., 2016; THEMA, 2017).



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Week 9 expert panel

Digital data

Florence School Online

3 December 2019

Panellists



Manuel Sanchez-Jimenez





Uros Gaborjel





Paul de Wit





Olivier Aine





Ioannis Retsoulis





Marc Van Stiphout



Anonymous
12:05 PM Nov 27

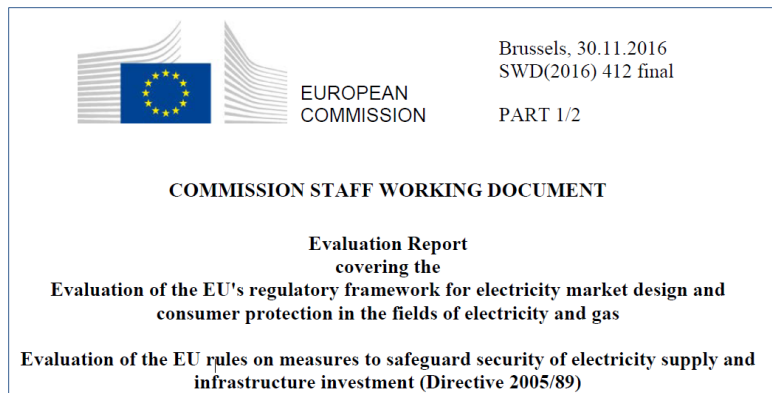
Steve Wilkin: This may not be up to date. I am no expert but I believe that GB, for example, can be classed as partly centralised as it has a central smart Data Communication Company which states - Communication Services: 'Smart DCC provides the communication and data service between smart meters and the energy suppliers, network operators and other authorised Smart DCC users.'

[Show less](#)

Consumer data management – Step 2: Research Better regulation and the Clean Energy Package

Ex-post EC evaluation report 2016

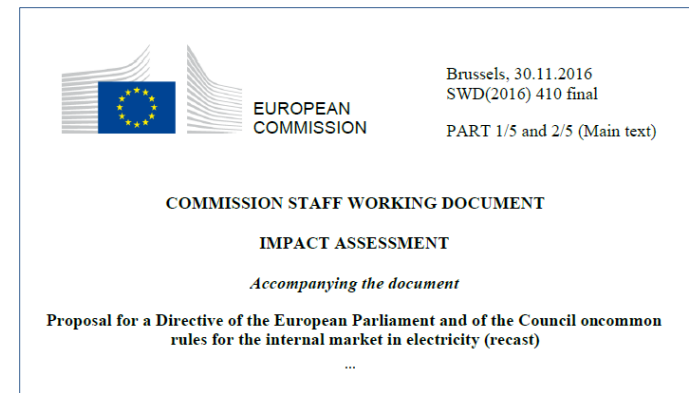
“[...] current legislation [was not] designed to address currently known challenges in managing large, commercially valuable consumption data flows.”



Ex-ante EC impact assessment 2016

Options for future
data management model:

- MS primarily responsible
- **Common criteria and principles**
- A standard EU model (data hub)



Consumer data management in the Clean Energy Package



E-Directive Article 23 Data management

1. When laying down the rules regarding the management and exchange of data, Member States or, where a Member State has so provided, the designated competent authorities shall specify the rules on the access to data of the final customer by eligible parties in accordance with this Article and the applicable Union legal framework. For the purpose of this Directive, data shall be understood to include metering and consumption data as well as data required for customer switching, demand response and other services.
2. Member States shall organise the management of data in order to ensure efficient and secure data access and exchange, as well as data protection and data security.

E-Directive Article 24 Interoperability requirements and procedures for access to data

1. In order to promote competition in the retail market and to avoid excessive administrative costs for the eligible parties, Member States shall facilitate the full interoperability of energy services within the Union.
2. The Commission shall adopt, by means of implementing acts, interoperability requirements and non-discriminatory and transparent procedures for access to data referred to in Article 23(1). Those implementing acts shall be adopted in accordance with the advisory procedure referred to in Article 68(2).
3. Member States shall ensure that electricity undertakings apply the interoperability requirements and procedures for access to data referred to in paragraph 2. Those requirements and procedures shall be based on existing national practices.

Who is responsible for consumer data management?

First attempt at classification

TSO



DSO



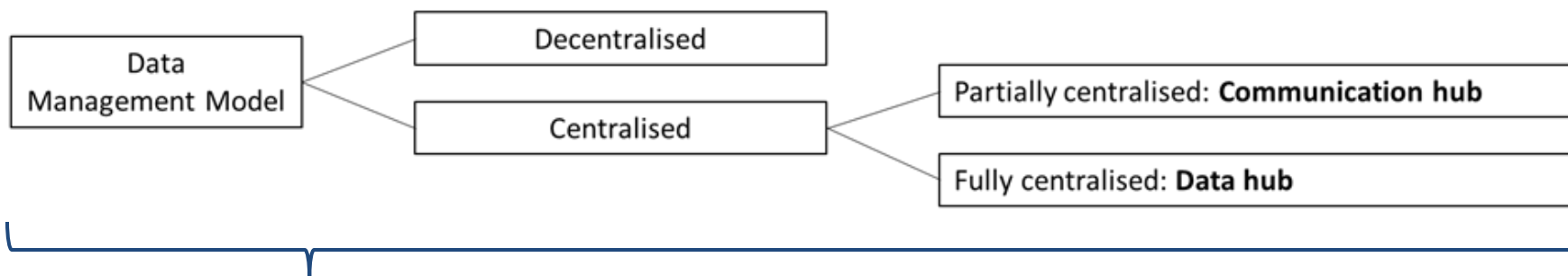
Third Party



Classifying consumer data management models is more complicated than it seems

- Level of centralisation of data management model
 - Centralised
 - Partially centralised
 - Decentralised
- Roles and responsibilities in data management
 - Data reading
 - Data validation
 - Data storage

FSR research strategy on consumer data (Spring 2020)



Estfeed
Elering's smart grid data exchange pl...
Estfeed is an energy data exchange layer that uses X-road technology and has been developed by Elering (Estonian transmission system operator) for accessing, sharing and managing energy meter data between data suppliers (data hubs) and data users (energy...)

NordREG
Nordic Energy Regulators
20th June 2018
Implementation of data hubs in the Nordic countries
Status Report, June 2018

European Smart Grids Task Force
Expert Group 1 – Standards and Interoperability
Working Group on Data Format & Procedures
Final Report
Towards Interoperability within the EU for Electricity and Gas Data Access & Exchange
March 2019

DIRECTIVES

DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast)

Article 24

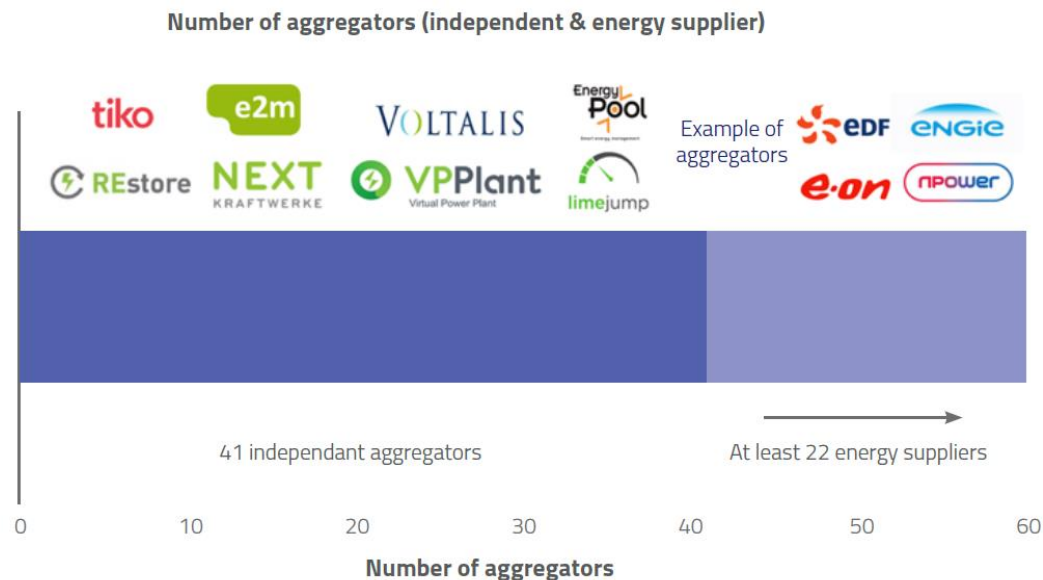
Interoperability requirements and procedures for access to data

TOPIC 3: Aggregators



- Aggregator as a retailer in reverse
- “Retail-size” consumption and generation units are activated, packed and their output sold on the wholesale market or to the system operator

Figure 35 - Estimate of the number of aggregator companies active in Europe, 2018 (source: ENTSO-E)



- Important role in procuring flexibility for a decentralised and decarbonised electricity system
- Two business models: independent vs integrated aggregators

Framework for aggregators



- CEP aims to develop a comprehensive framework and facilitate aggregators' participation in the market
- Need to clarify roles and responsibilities of aggregators and their relations to suppliers and balance responsible parties
- E.g., definition of the customer baseline (accurate, simple and robust to manipulation)



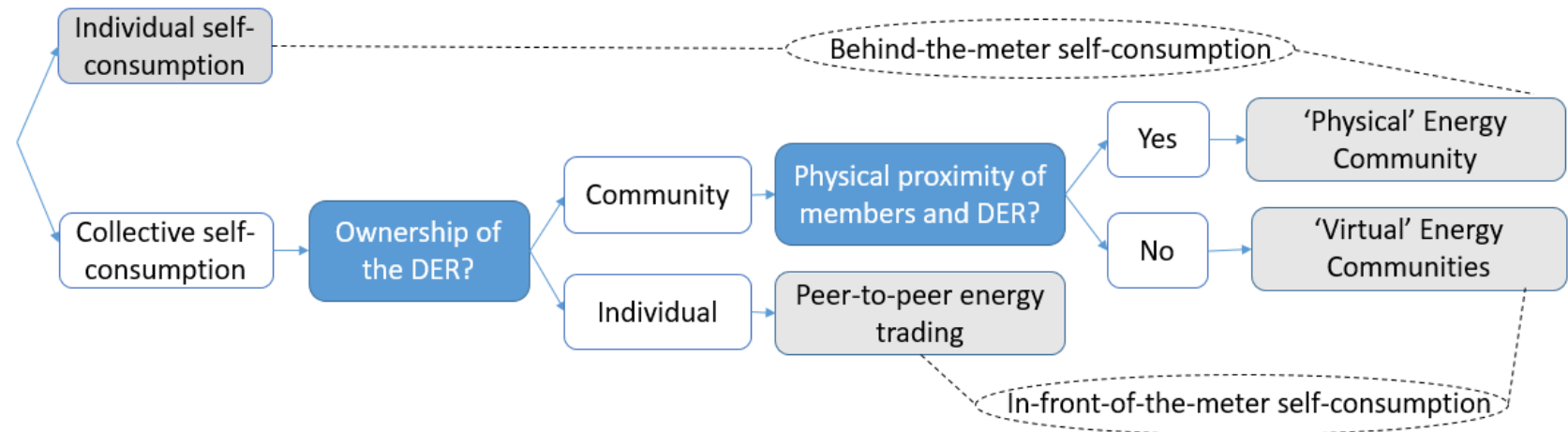
Measuring the Intangible: An Overview of the Methodologies for Calculating Customer Baseline Load in PJM

By Nicolò Rossetto¹,
Florence School of Regulation

TOPIC 4: Peer-to-peer and community-based energy trade

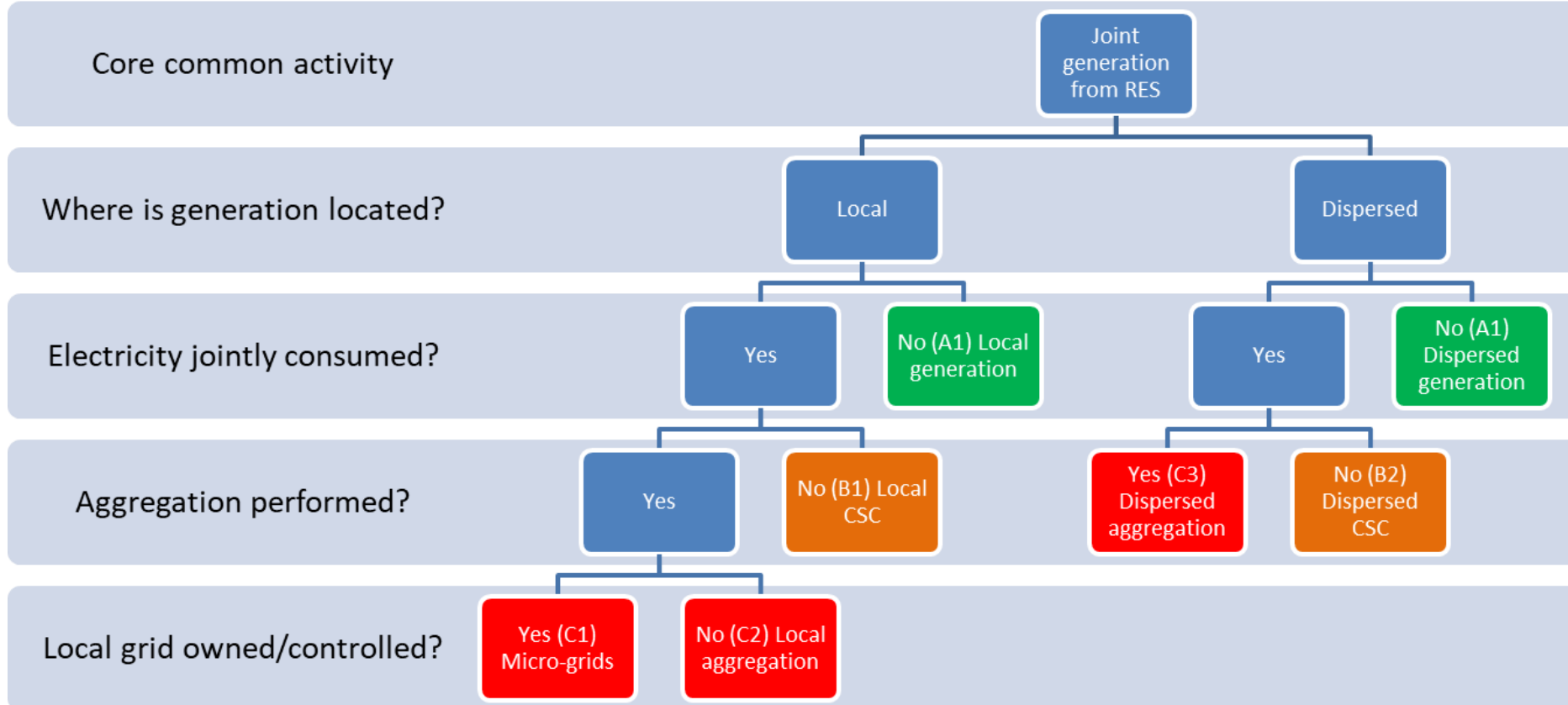
- The three Ds call for and allow a more active role energy consumers, both individually and collectively
- New models for production, consumption and exchange of energy are emerging
- Classification of these models still under debate

- Proposal from FSR

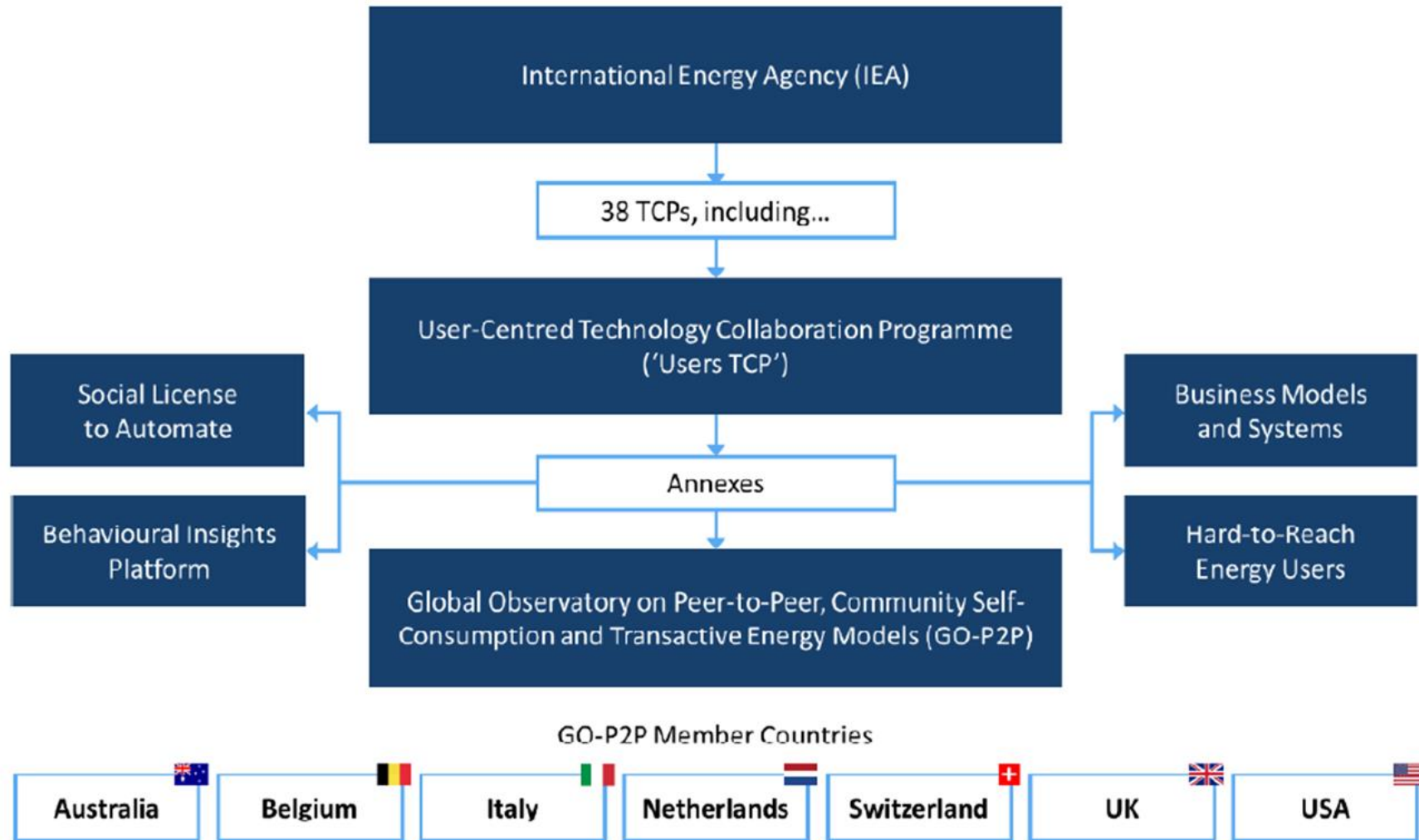


A FSR taxonomy for energy communities

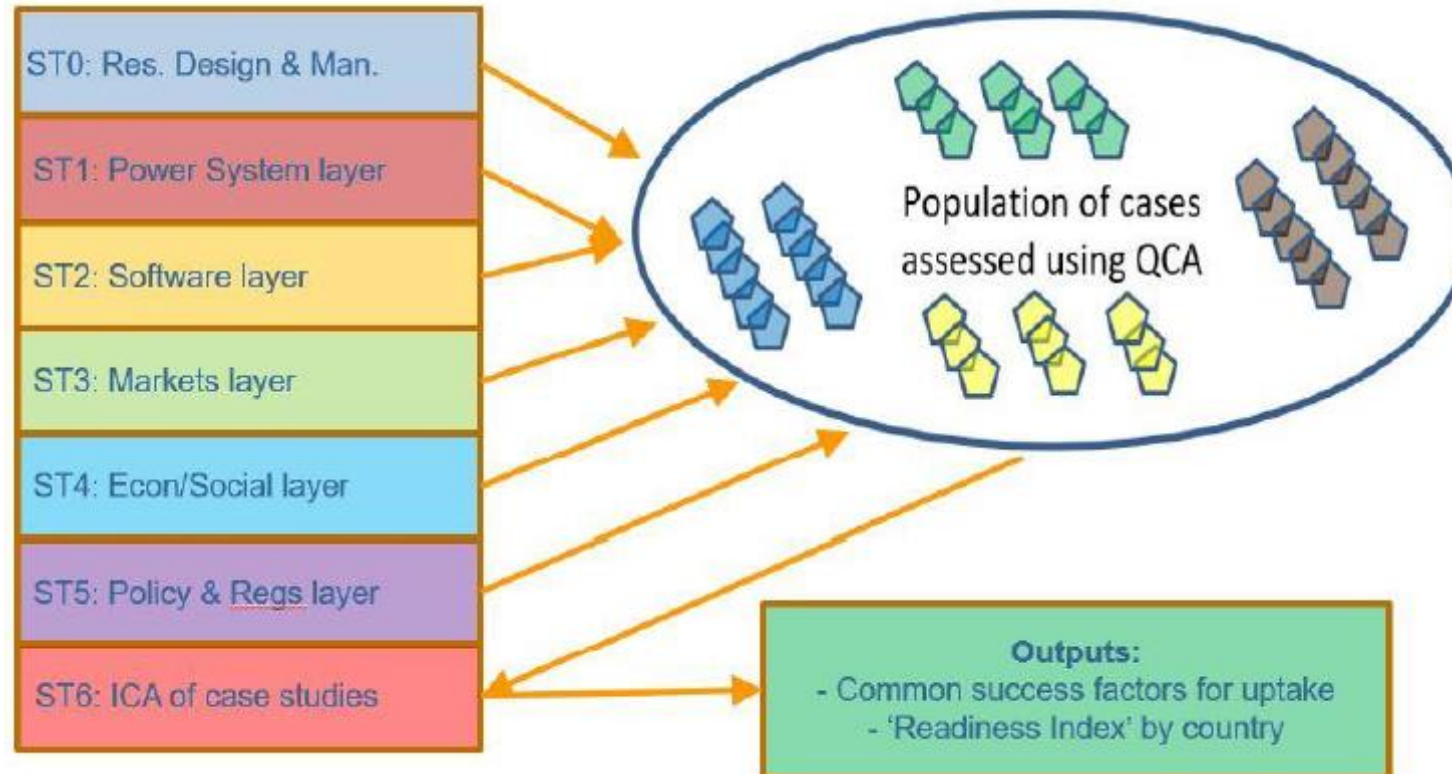
- Communities dealing with renewable energy can perform many functions
- Based on what they do, you may have different policy and regulatory implications



A Global Observatory to monitor a fast evolving field



- Three and a half year project (kick-off in London in September 2019)
- Observatory goals:
 - Provide a forum for international collaboration between stakeholders to understand the conditions necessary to support the wider deployment of P2P, CSC, and TE models
 - Inform evidence-based policymaking at national and international level
- Observatory leader: University College London



Do you want to come and see?

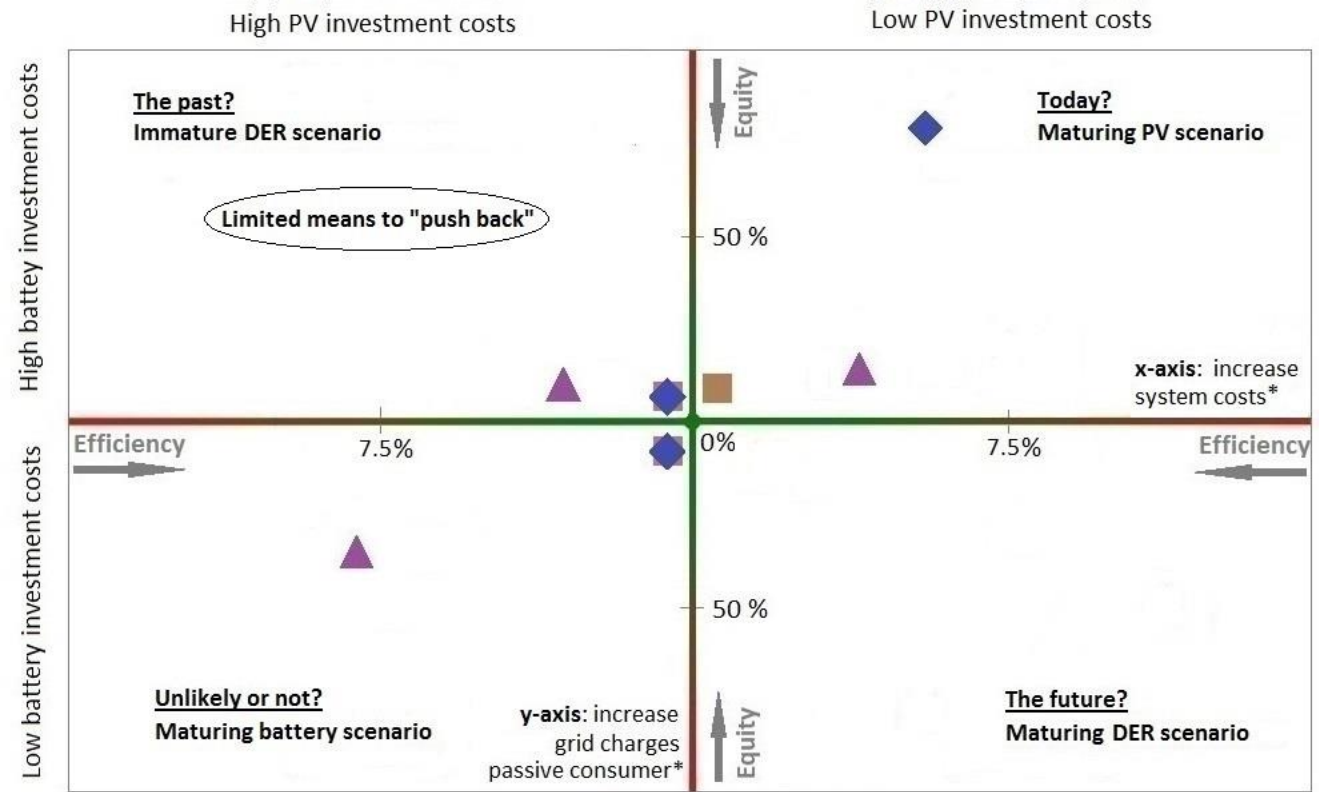


For more info on the Observatory: <https://userstcp.org/annex/peer-to-peer-energy-trading/>

Research

Other relevant research – selection

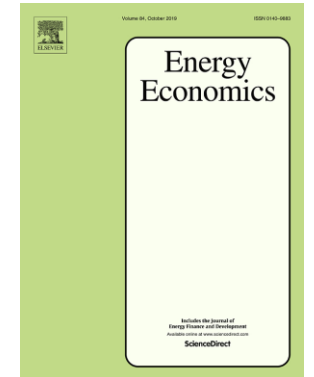
Distribution network tariffs



Network tariff design option:

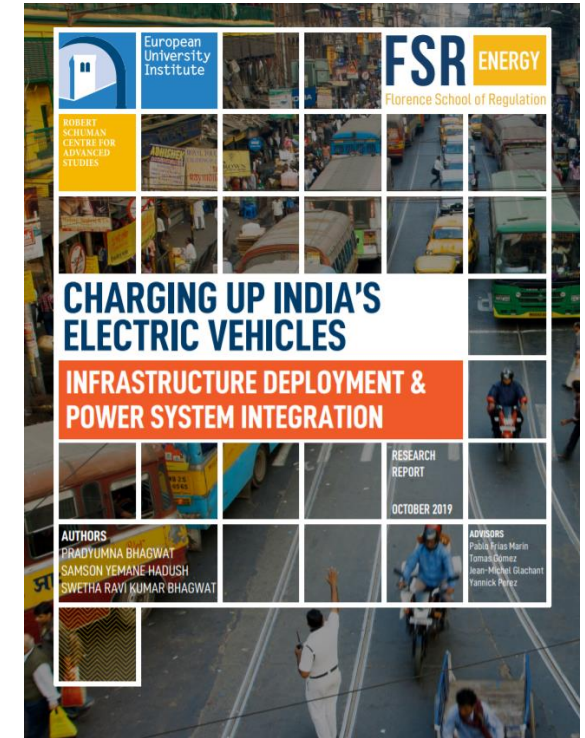
* Relative to fixed network charges

- ◆ TS1: Volumetric net-metering
- TS2: Volumetric without net-metering
- ▲ TS3: Capacity-based



Electro-mobility: the next big thing in electricity

- Heating & cooling and mobility must be decarbonised to reach Paris Agreement's target
- Electrification as a possible way ahead
- Massive impact on electricity markets and grid regulation
- Not only in Europe, but at the world level
 - India as a first case addressed by FSR



FSR launches a Global Regulatory Hub and a new report on Electric Vehicles

FSR Global
FSR | NEWS | JAN 10, 2020



Digitalisation of electricity



The Digital World Knocks at Electricity's Door: Six Building Blocks to Understand Why

*By Jean-Michel Glachant and Nicolò Rossetto,
Florence School of Regulation*

Digitalisation

Infrastructure
Changes

Market Changes

Transaction
Frontier

Proper digital
infrastructures

Smart
infrastructures
internal to
bricks-and-
mortar
networks

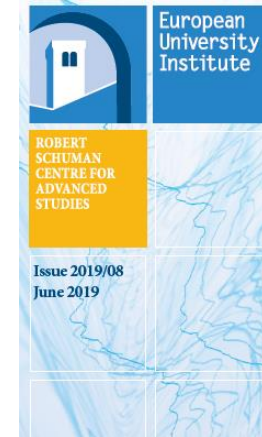
Platforms for
direct digital
production
and
consumption

Platforms for
interaction
within two-
sided markets

Digital
communities
with dis-
intermediated
P2P
transactions

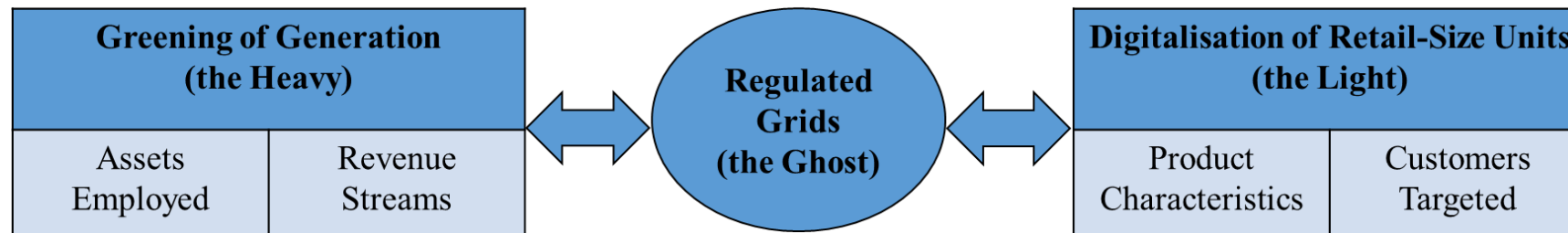
Virtual resorts
for artificial
intelligence

New business models in electricity



New Business Models in Electricity: the Heavy, the Light, and the Ghost

By Nicolò Rossetto, Piero Carlo Dos Reis and Jean-Michel Glachant, Florence School of Regulation



Greening of Generation			
Onshore Wind	Offshore Wind	Utility-Scale PV	Rooftop PV

Digitalisation of Retail-Size Units		
Aggregator of Distributed Energy Resources	Platform for Direct Trade	Smart Manager of Autonomous Territories Behind the Meter



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FSR teaching and research in electricity- focus on the Clean Energy Package

Jean-Michel Glachant

February 2020