European University Institute

ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES

Florence School of Regulation

Power Regulation: EU facing 3 challenges

ACCC & AER - Brisbane - Australia (27th July 2017)

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My Mom

Not my Mom

& Me

EU Power Regulation… What's challenging?

3 challenges seen at EU level

- **Cross-country regulation: addressing X-Border system & market**

How to get coherent rules for seamless power operation when both market and system cross borders of countries having separated national authorities (either regulators NRAs; or system operators TSOs)? ***EU is not a federal state***

- **Multi-country energy transition: Pledge & Review in a bunch of countries**

How to get a multi-country energy transition path followed when all key policy makers are national? ***EU is become kind of "COP21 Paris Agreement"***

- **Consumers exiting regulation: Empowerment by technology innovations**

What happens when new technologies (as PV & batteries) enable consumers to exit grid regulation? ***Fixed grids threatened by cell phones-like prosumers***

1st challenge seen from the EU

- ***Cross-country regulation:*** ***X-Border system & market***

How to get coherent rules for seamless operation when both market and system cross borders of countries having separated national authorities (regulators NRAs; system operators TSOs)?

- **National markets opening with no common design: 1996-2009**

1996: minimal national markets opening + National Transmission System Operators + Negotiated or Regulated Third Party Access

2003: full national markets opening + National Regulatory Authorities + Regulated TPA

- **EU common design produced by "mutualisation": 2009-2019**

National Authorities (regulators NRAs; system operators TSOs) are grouped at EU level to create:

*ACER (for mutualized EU regulation) > "EU Guide Lines"

**ENTSO-E (for mutualized EU operation) > "EU Grid Codes"

> Implementation of all EU Grid Codes achieved ~ in 2019

1st challenge seen from the EU

- **EU common operation produced by "mutualisation" is not seamless: 2017-??**

Seamless market & system require *grid capacity calculation & grid congestion management* to be seamless (= as with no borders).

1- Coordination of TSOs actions should overcome "national control zones rights"

2- Allocation of costs & benefits too should overcome "national control zones rights"

1st challenge seen from the EU

- **operation produced by "mutualisation" is not seamless: 2017-??**

3- Definition of all EU "market bidding zones" should overcome "national priority rights" to follow actual "EU grid structural congestions"

4- An EU wide grid investment process should overcome "national priority rights" to retrieve inefficient "EU grid structural congestions"

5- EU push for renewables in meshed grid & open market makes (1-4) more than sensible

2nd challenge seen from the EU

- ***Multi-country energy transition:* Pledge & Review in a bunch of countries**

***How to get a multi-country energy transition path followed when all key policy makers are national?*--**

- **EU countries had no common energy policy till 2008: EU market building was technology neutral – energy mix policy was national only**
- **EU Governments ("Council") decided to get common policy 20-20-20 till 2020: EU Parliament approved**

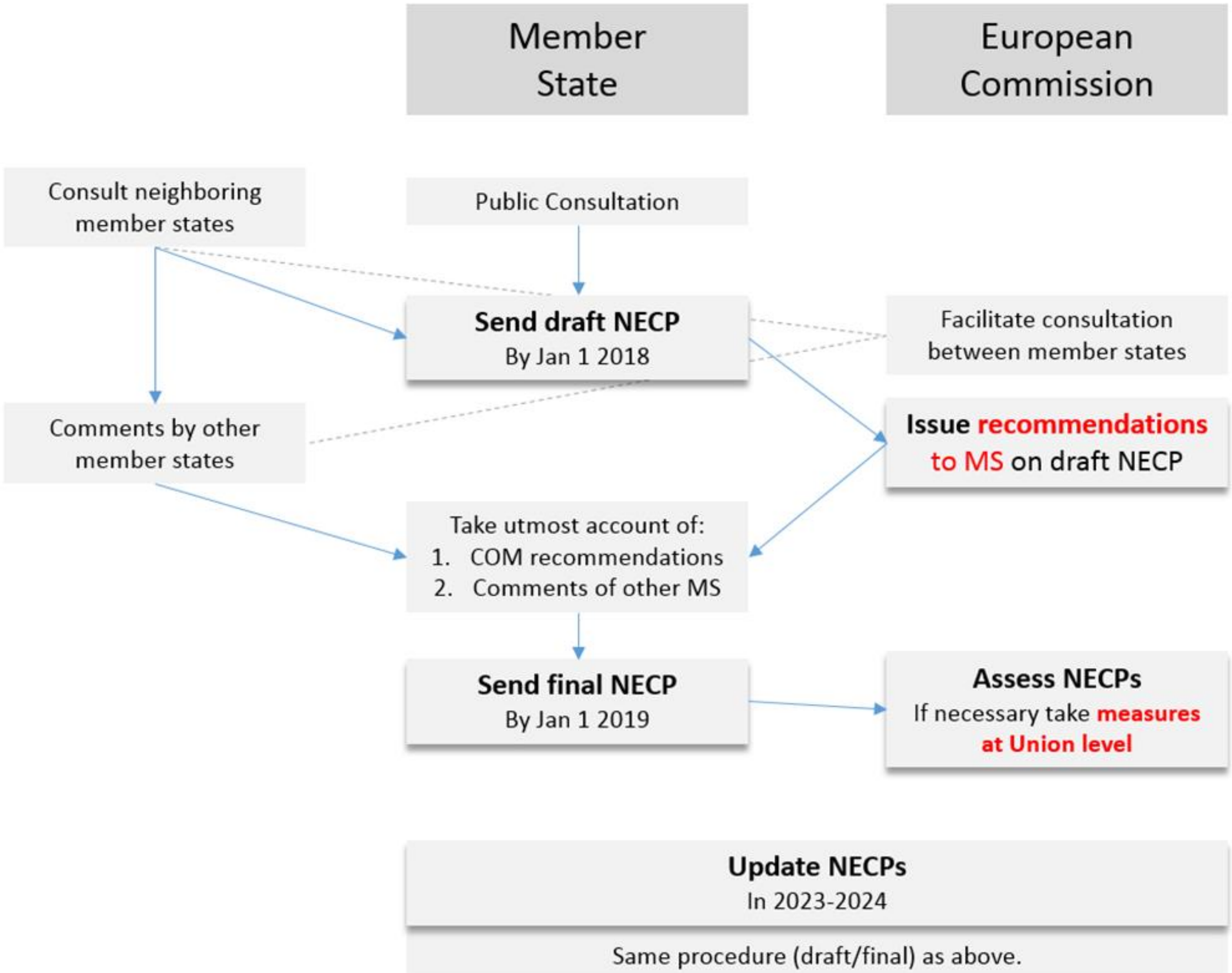
20% renewables and 20% GHG reduction are common EU goals allocated to each country by "burden sharing"

- **EU Governments ("Council") decided in 2014 to stop common policy 20-20-20 in 2020: Parliament disapproved but**

From 2020: EU gets new EU bidding target for both GHG (-40%) and RES (27%) but each EU country is free choosing its national path

From COP21: EU entering Paris Agreement will "pledge" for all EU in 2020 & coordinate Member States individual paths till checking 2023 & review 2025

Governance of Energy Union – from 2018

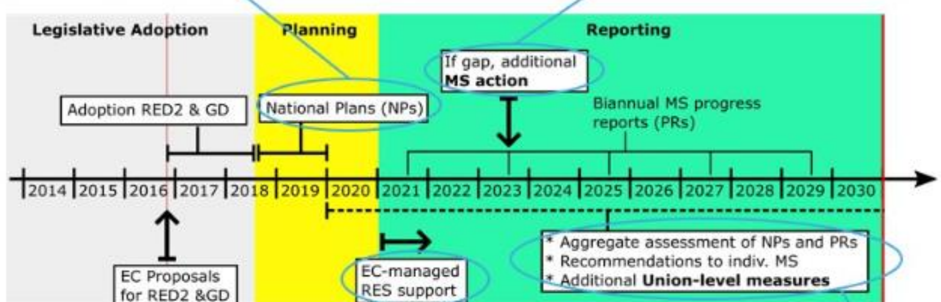


Ref: Vandendriessche, Saz Carranza, Glachant - 2017

Renewables governance: target compliance mechanism

Member state contributions *[Art. 4 (a2) & 5, Governance Directive]*
- „Integrated national energy and climate plans“
- 28 individual member state contributions to the target
- „member states shall collectively ensure that contributions add up to 27%“
- Ambition only to be updated upwards

Revision of national plans *[Art. 13 & Art. 27 (4), Governance Directive]*
- „member states shall ensure [...] that any emerging gap is covered“
- 4 options for member states:
  - Adjustment in heating and cooling quota
  - Adjustment in transport quota
  - Payment into EU financing platform
  - Other measures
- „taking into account early efforts“



CEPS ENERGY CLIMATE HOUSE

Commission-managed financing platform *[Art. 27 (4c), Governance Directive]*
- Initial funding by member states who missed the 2020 target
- Further funding (budget) uncertain
- Connection to revision of national plans

Gap-filling mechanism *[Art. 27 (1-3), Governance Directive]*
- Continuous aggregate assessment
- Union-level measures if „contributions are insufficient“
- Type of measures not specified
- „taking into account early efforts“

3d challenge seen from the EU

- ***Consumers exiting regulation:* Empowerment by technology innovations**

What happens when new technologies (as PV & batteries) enable consumers to exit grid regulation---

- **With PV:** consumers can escape grid as monopoly access to energy generation = **Empowerment by technology innovation**

- **With battery:** consumers can escape grid as monopoly access to system balancing flexibility = **Empowerment by technology innovations**

- **Consumers compare technology innovations to system connection costs:** key role given to consumer tariffs formula

Florence School "Distrib Grexit" research Frame

Schittekatte tests the implications of **3 network tariff structures** to recover costs:

1/ **Volumetric** network charges **with** net-metering: (*Elec. withdrawn) – (Elec. Injected)* # ***Grid offers free of charge the balancing of PV generation***

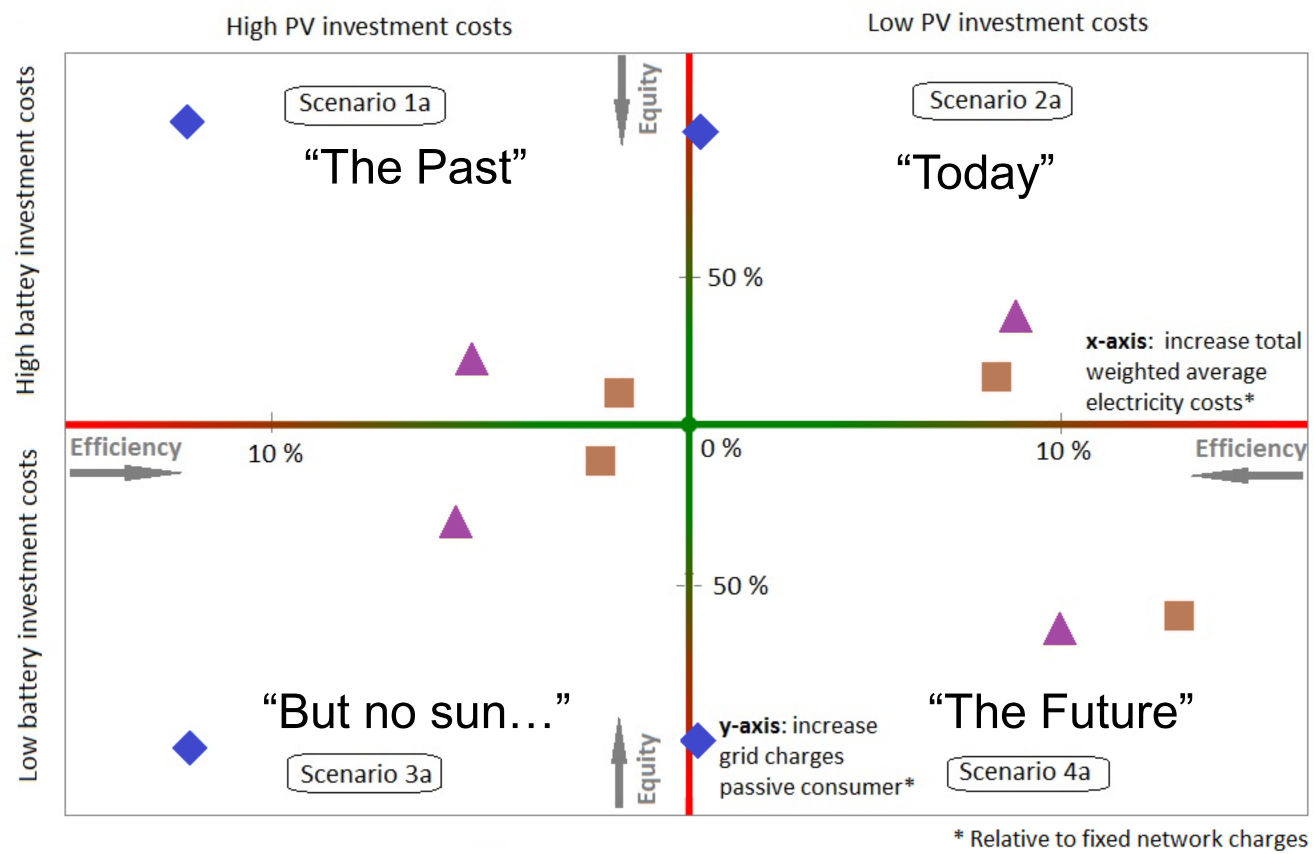
2/ **Volumetric** network charges **without** net-metering: (*Elec. withdrawn) + (Elec. Injected)* # ***Grid is paid for balancing PV generation*** > ***Role for battery***

3/ **Capacity-based** network charges: {+ *or –} capacity at peak* # ***Role for battery***

Schittekatte benchmarks using **2 metrics**:
a.) Weighted average annual system cost ~ ***proxy for efficiency***
b.) Increase of individual contributions paid by grid users ~ ***proxy for equity***

And **2 matrices** with each **4 states** of the world:
1/ ***Technology matrix***: cost level of solar PV & cost level of batteries
2/ ***Country context matrix***: wholesale price level & network cost level

TECHNOLOGY MATRIX: RESULTS WITH 50 % "POTENTIAL" PROSUMERS

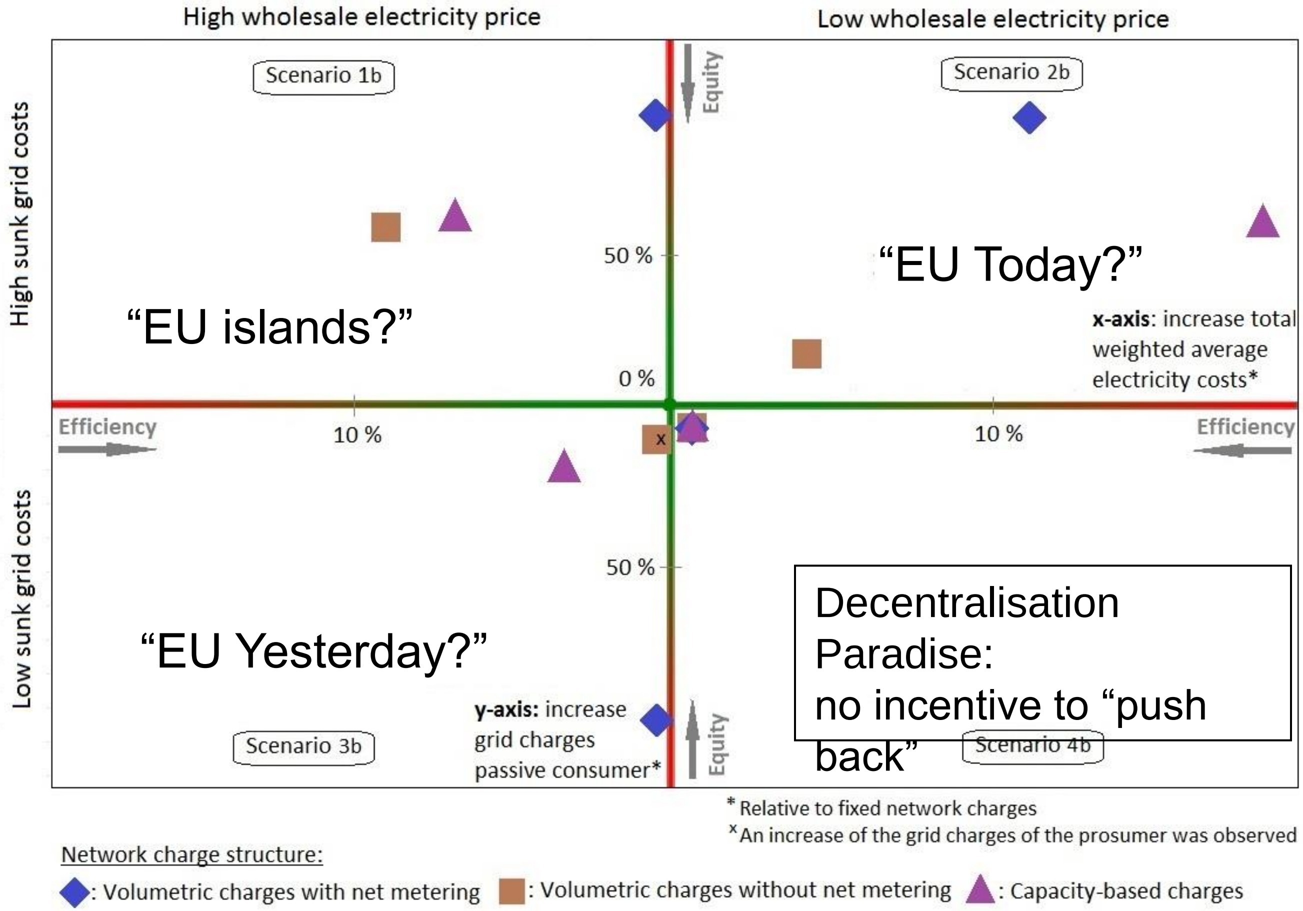


Network charge structure:

◆: Volumetric charges with net metering ■: Volumetric charges without net metering ▲: Capacity-based charges

	High technology costs	Low technology costs
Investment cost solar PV	4400 €/kW_{peak} (LCOE: 0.20 €/kWh)	2200 €/kW_{peak} (LCOE: 0.10 €/kWh)
Investment cost batteries	500 €/kWh (C-rate of 1)	250 €/kWh (C-rate of 1)
Proportion default network charges in consumer bill	40 % (770 €/year)	
Proportion default commodity costs in consumer bill	60% (1155 €/year)	
Default electricity cost consumer	1925 €/year	

COUNTRY MATRIX: RESULTS WITH 50 % OF PROSUMERS



	High wholesale electricity price		Low wholesale electricity price	
Wholesale electricity cost	0.20 €/kWh		0.10 €/kWh	
	High sunk cost	Low sunk cost	High sunk cost	Low sunk cost
Proportion default network charges in consumer bill	60 % (2310 €)	20 % (385 €)	60 % (1155 €)	20 % (195 €)
Proportion default commodity costs in consumer bill	40 % (1540 €)	80 % (1540 €)	40 % (770 €)	80 % (770 €)
Default electricity cost consumer	3850 €/year	1925 €/year	1925 €/year	965 €/year
Investment cost solar PV	3300 €/kW_{peak} (LCOE: 0.15 €/kWh)			
Investment cost batteries	375 €/kWh (C-rate of 1)			

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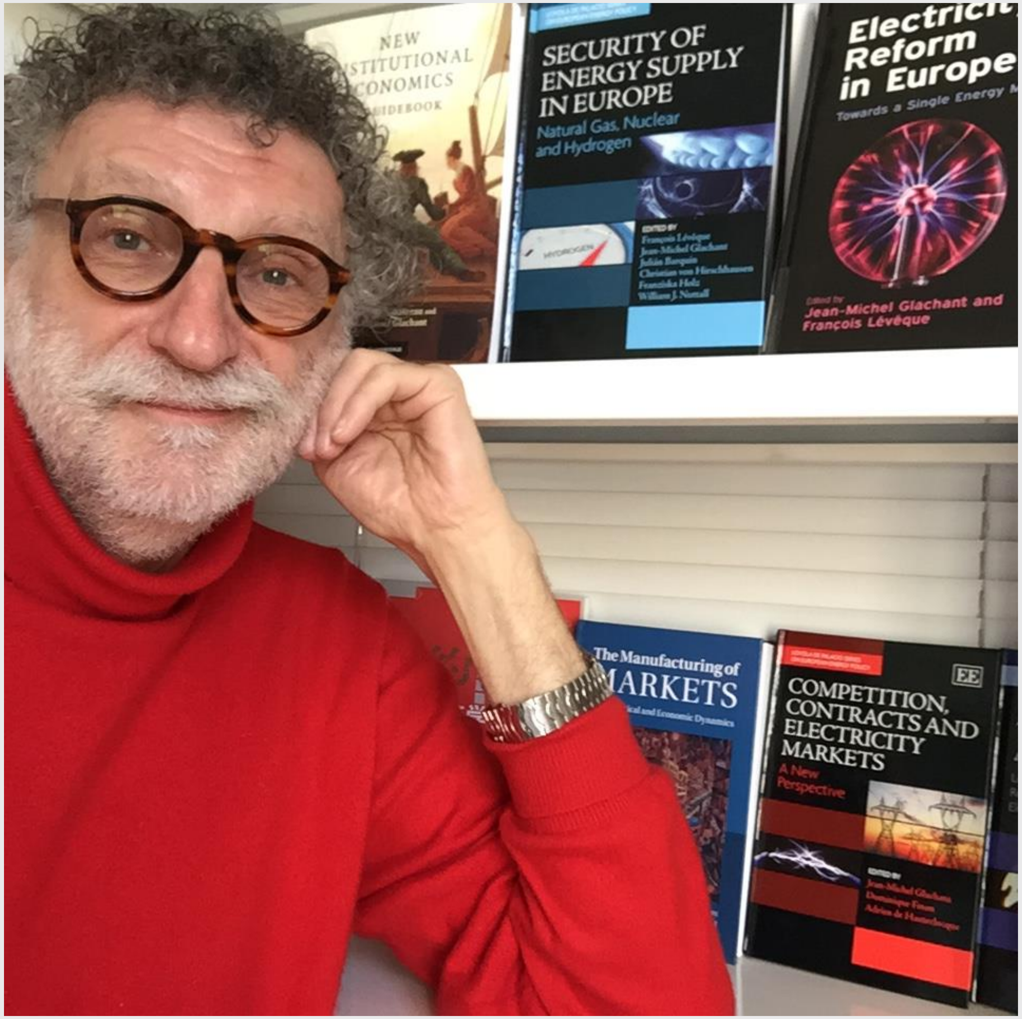
How to conclude such amount of novelties?

#I don't know! # To be seen in 2020?



3 challenges seen outside EU

- **Cross-country regulation: addressing X-Border system & market**

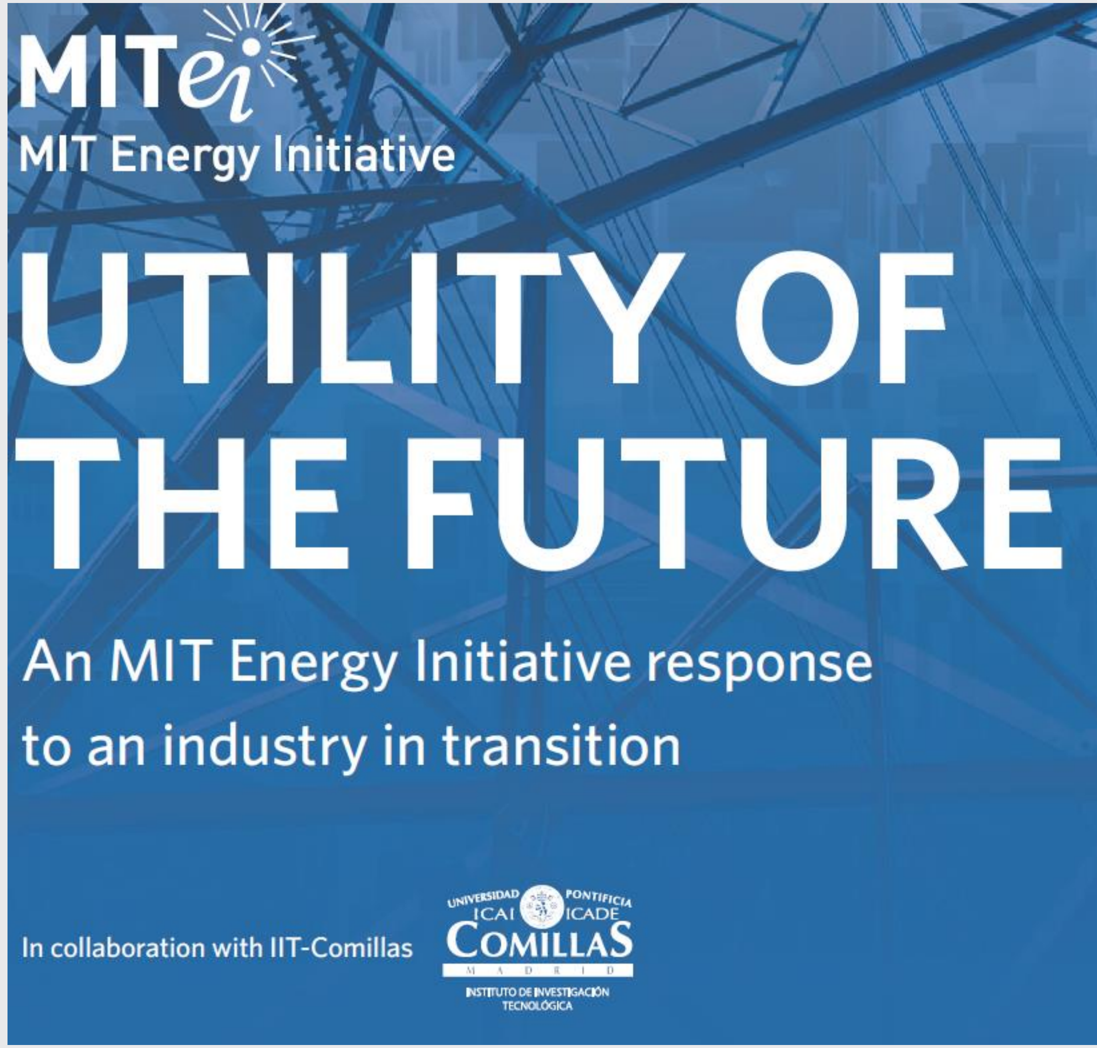
How to get coherent rules for seamless power operation when both market and system cross borders of countries having separated national authorities (either regulators NRAs; or system operators TSOs)? ***Not only EU?***

- **Multi-country energy transition: Pledge & Review in a bunch of countries**

How to get a multi-country energy transition path followed when all key policy makers are national? ***All countries at "COP21 Paris Agreement"?***

- **Consumers exiting regulation: Empowerment by technology innovations**

What happens when new technologies (as PV & batteries) enable consumers to exit grid regulation? ***Big institutional issue: MIT4 "Street Block regulation"***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Australian Energy Market Commission

Distribution Market Model

Thank you for your attention

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