ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Webinar on Time-of-Use Electricity Network Tariffs

Tuesday, 16 November 2021

Presentations:

Time-of-Use Network Tariffs

The rolling-out of 4-Periods Tariffs for Low Voltage users in France

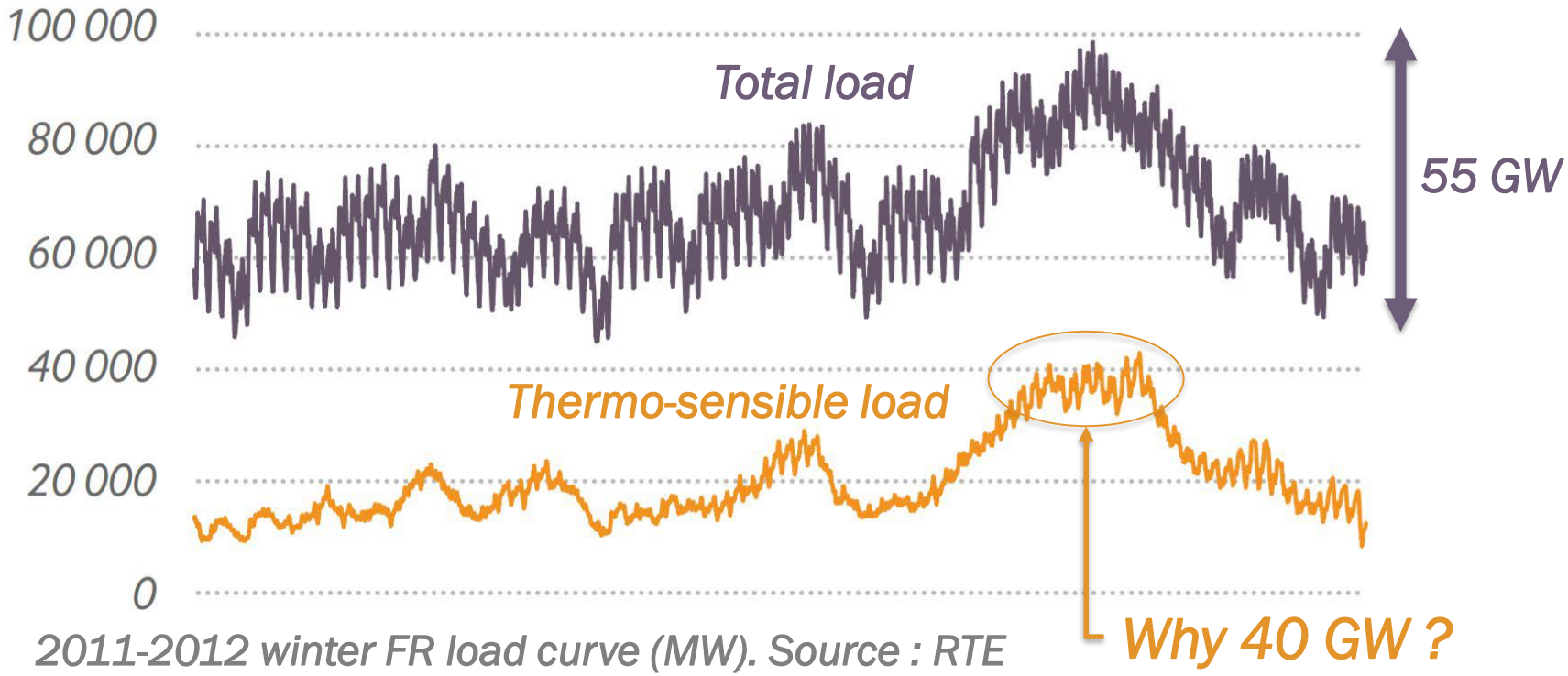
ACER Webinar on Time-of-Use Network Tariffs

Antoine Dereuddre

16 November 2021

WHY DID WE INTRODUCE A 4-PERIODS TARIFF?

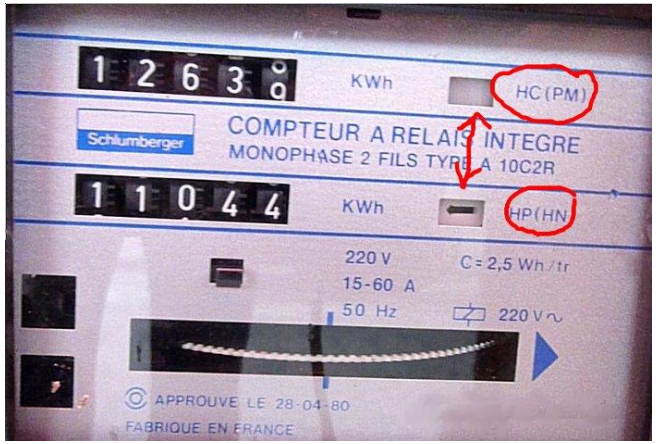
- Our motivation for the introduction of the 4-periods Time-of-Use Network Tariffs for Low Voltage was to tackle the volatility of load curve in winter
- The main innovation is the rolling-out of mandatory winter/summer time price signal for most low-voltage users from 2021 to 2025



2011-2012 winter FR load curve (MW). Source : RTE

IN FRANCE, THE 100 GW WINTER PEAK IS DUE TO ELECTRIC HEATING

- French households have been accustomed to Peak/Off-peak tariffs for more than 50 years
- Peak/Off-peak tariffs had two goals:
  - Incentivize electrification with cheap tariffs
  - Shift consumption from day to night
- These objectives have been reached
- Household heating is now 40% electric



- The combination of artificially inexpensive retail electricity during winter and insufficient thermal insulation has bred its own problems:
  - Thermo-sensible load: 40 GW
  - Low Voltage peak demand : 64 GW (and growing)
- Fossil fuel phasing-out will accelerate from now onward (net zero in 2050)

=> The problem we tried to solve was the growing network costs due to winter peak load, to prepare for a more efficient green transition

LOW-VOLTAGE AND SYSTEM-WIDE PEAK HOURS DIFFER

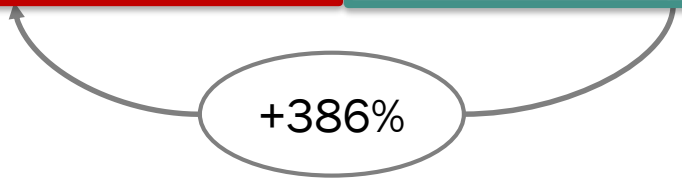
- We faced a conflict between the economic signals provided to the network users by the time-of-use network tariffs and by the spot price
- Peak demand hours depends on voltage level:
  - Systemwide spot market peak hours are 8:00 and 19:00
  - Residential areas: 23:00 because of water heating automatic start
- "Off-peak" hours are now maximum load hours for 50% of the LV network
- Our approach with the 4-period ToU tariff was to reflect the true load curve, leading to a lower price spread between "peak" and "off-peak" :

2024 LV Network Tariff	Winter Peak	Winter Off-peak	Summer Peak	Summer Of-peak
Short use option	61,0 €/MWh	41,7 €/MWh	13,0 €/MWh	8,1 €/MWh

MAIN LESSONS

- The main lessons learned so far are that **designing a price signal following the local load curve** should be the priority of a ToU network tarif
- In France, this means a very strong price signal in winter vs. summer

2024 LV Network Tariff	Winter Peak	Winter Off-peak	Summer Peak	Summer Of-peak
Short use option	61,0 €/MWh	41,7 €/MWh	13,0 €/MWh	8,1 €/MWh



- Even if this goes against the accepted wisdom of a higher peak/off-peak difference in France, **the winter/summer difference is the strongest signal at the low-voltage level**
- The seasonal price signal transmitted by the network tariff will be necessary to manage the transition toward more electric heating

NEXT STEPS

- The practice meet our original expectations. But the total process has taken more than 15 years:
  - 2009: first experimentation of smart-metering
  - 2012-2016: designing of the 1st version of seasonal tariff at the LV<36kV level
  - 2017: introduction of the 1st version to about 60% of users
  - 2018-2020: designing of the 2st version
  - 2021-2024: rolling-out of the 2nd version => 95% of users
- We will monitor the effect on load curves.
- More efficient heating and better thermal insulation should increase.

- Further improvements of ToU are currently under investigation by CRE:
  - Dynamic seasons and hours at the local grid level
  - Injection ToU tariffs

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Time-of-Use Network Tariffs: the Spanish case

Clara González Bravo

Time-of-Use Network Tariffs: the Spanish case

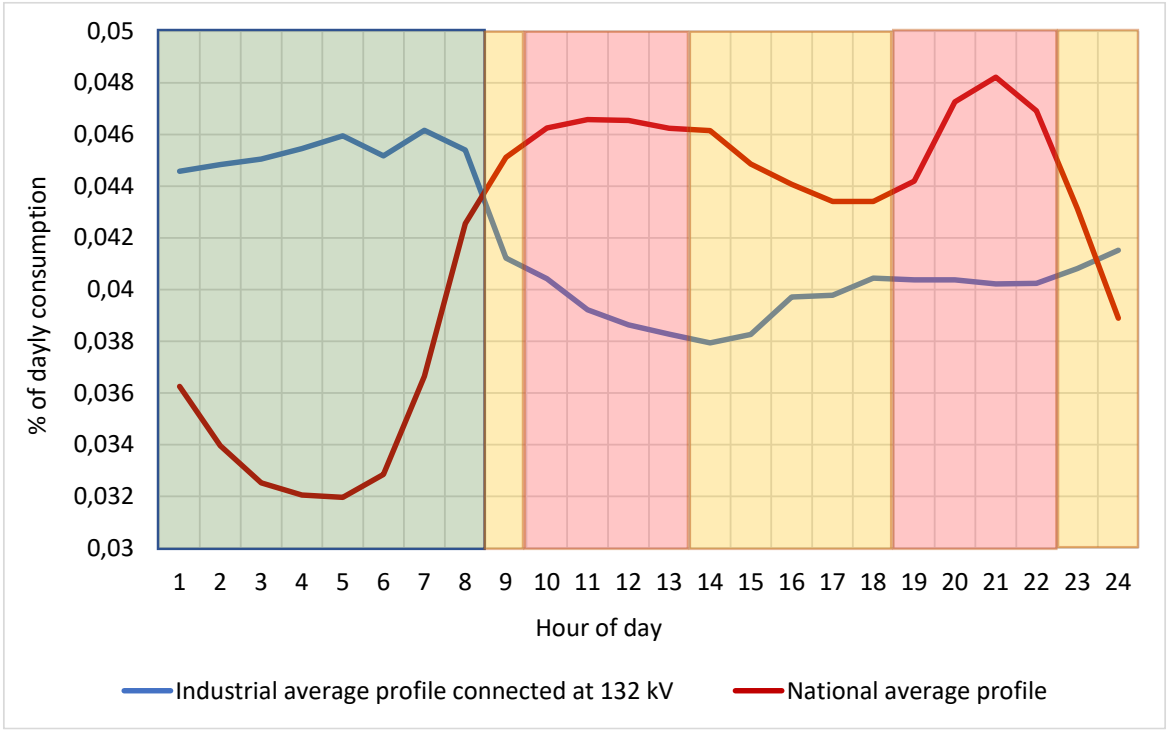
Background

- Since 2000, in Spain ToU Network tariffs have been applied:
  - Consumers connected to HV have six time-period both in energy and contracted capacity
  - Household consumers had a network tariff with a single capacity charge and the possibility to discriminate the energy charge in two periods (day/night), three periods (day/night/supervalley) or one single energy price.
- Since 2014, the default regulated tariff for domestic consumers (known as PVPC) is a pass-through of the hourly spot market price.
- Since 2019, the 99% of consumers have a smart meter

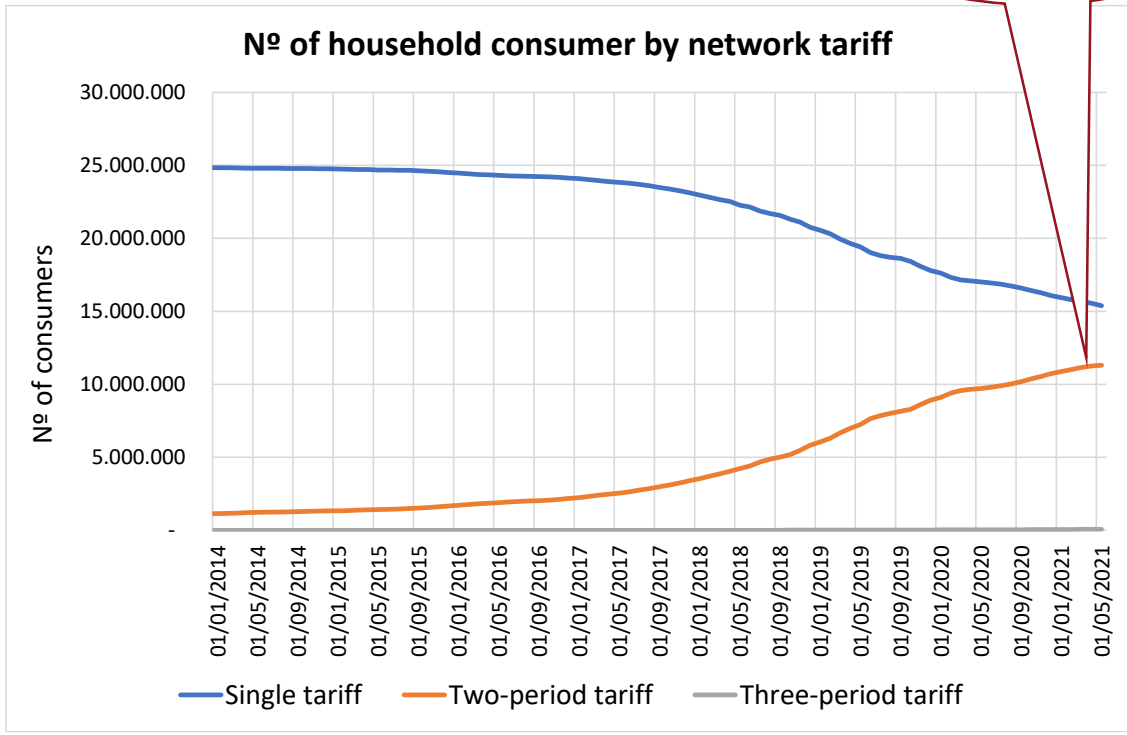
Time-of-Use Network Tariffs: the Spanish case

Background

- The price signal has worked quite well



43% of household consumers have a two-period tariff



Time-of-Use Network Tariffs: the Spanish case

The motivation

- In the current process of transition towards a low-emission economy, the **price signal** to the consumer takes on special importance in the methodology of the network tariffs with the aim of:
  - Increase electricity consumption to the detriment of energy consumption from fossil fuels
  - Induce efficient behaviors
  - Avoid unnecessary investments in networks are avoided
  - Reduce system costs
- European and national regulations configure the regulatory framework that must accompany the establishment of network tariffs methodology.
- Since June 1st, 2021, the ToU Network tariffs have compulsory for all network users

Time-of-Use Network Tariffs: the Spanish case

How is it implemented?

- New network tariff methodology (introduced on 1 June 2021) implements the energy policy objectives through two axes:
  - Simplification of network tariff structure
  - Price signal reinforcement

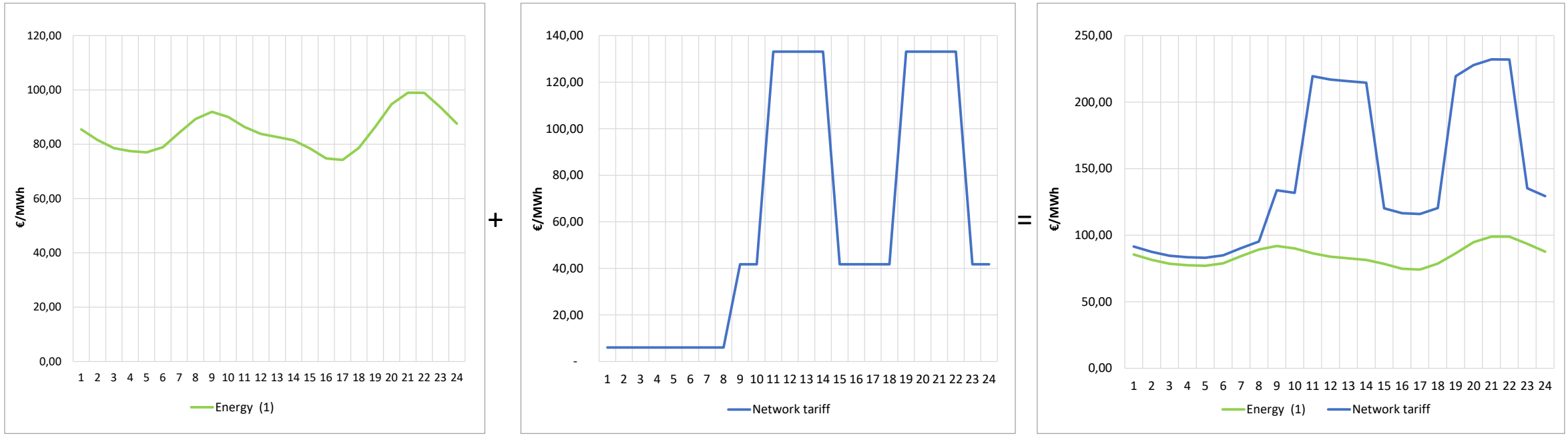
- Electric vehicle recharging
  - Private recharge: Possibility of contracting additional power in the valley at a reduced price in LV ≤ 15 kW.
  - Public recharge: Specific (transitory) network tariff for public recharge > 15 kW with less weight than fixed and more than variable

- Energy charges for renewable energy communities using the distribution network to share a self-generation facility.

Time-of-Use Network Tariffs: the Spanish case

How is it implemented?

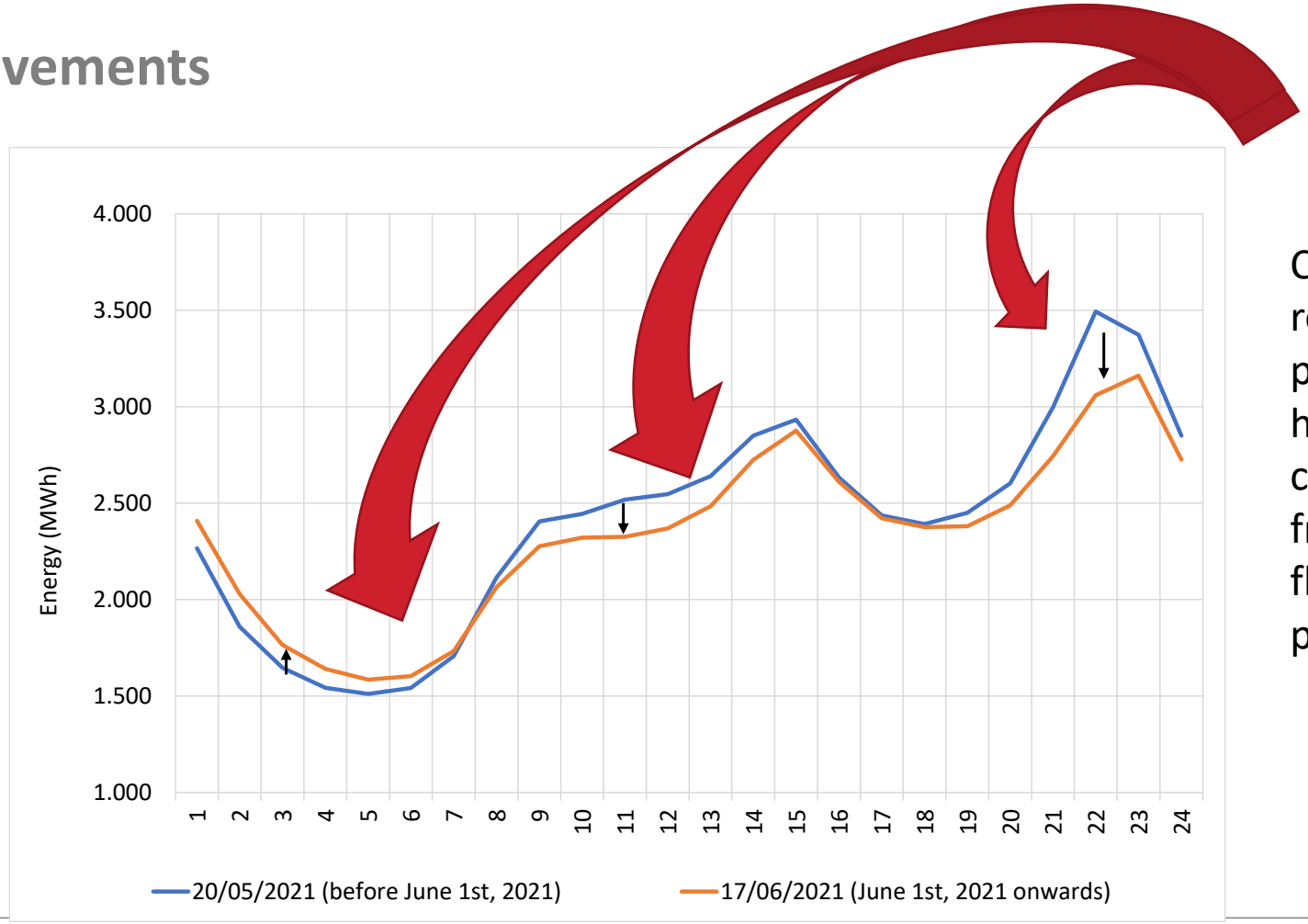
- The dynamic energy prices is combined with the TOU network tariff increasing the consumer price signal



(1) Average market price between January 1 and October 31, 2021

Time-of-Use Network Tariffs: the Spanish case

The achievements



Consumers have reacted to the price signal and have moved consumption from peak and flat hours to off-peak hours

Time-of-Use Network Tariffs: the Spanish case

The problems

The introduction of the new network tariff on June 1 has faced several difficulties:

- End-user misinformation
  - Information to consumers appears to have been insufficient
  - The debate has focused on negative aspects
- The introduction of this tariffs has coincided with an unusual period of high wholesale electricity prices
- Political pressure

I have made some changes to the bedroom to take advantage of the new tariffs

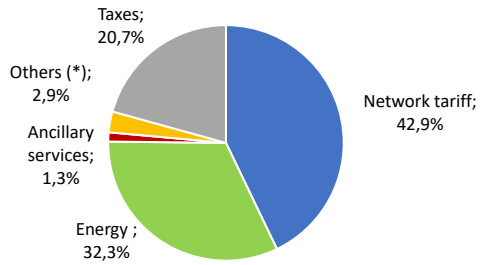
So, what are the windmills for?

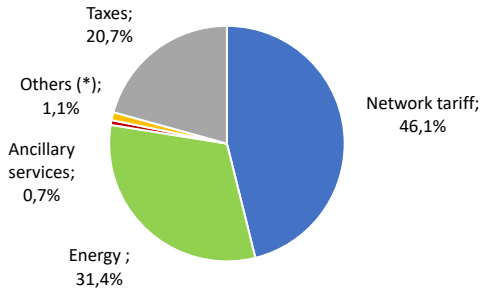
To make light cheaper or to ventilate the field

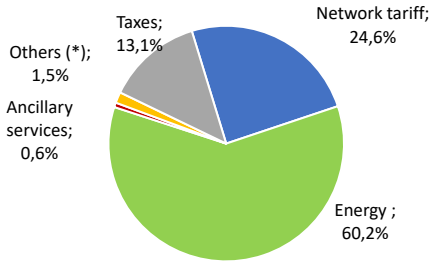
Time-of-Use Network Tariffs: the Spanish case

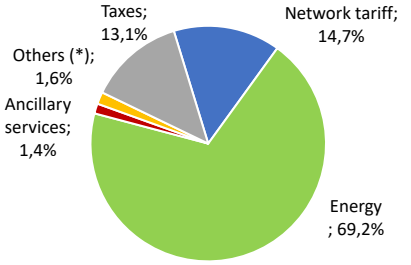
The problems

- The government has implemented measures to contain the increase in the electricity bill with an impact on the consumer price signal

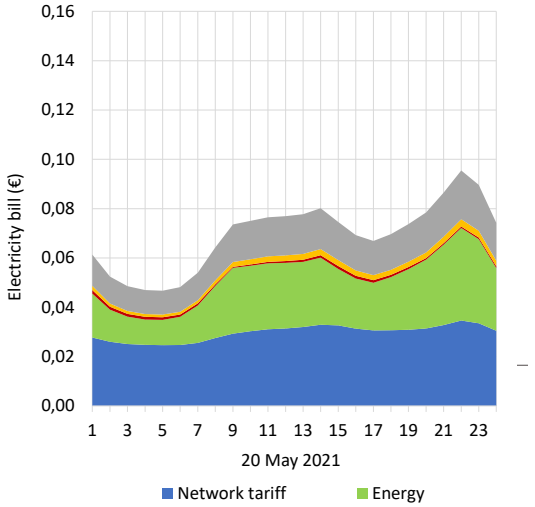




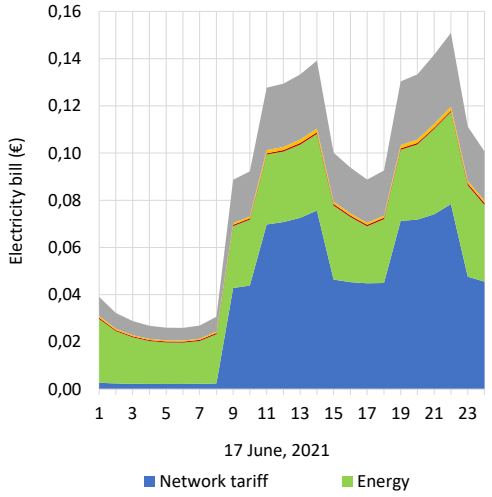




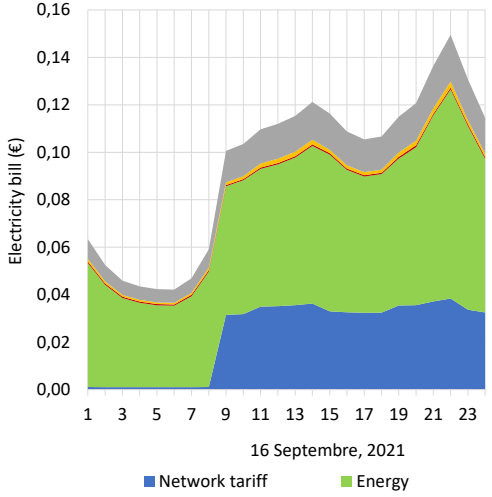
Before 1 June, 2021



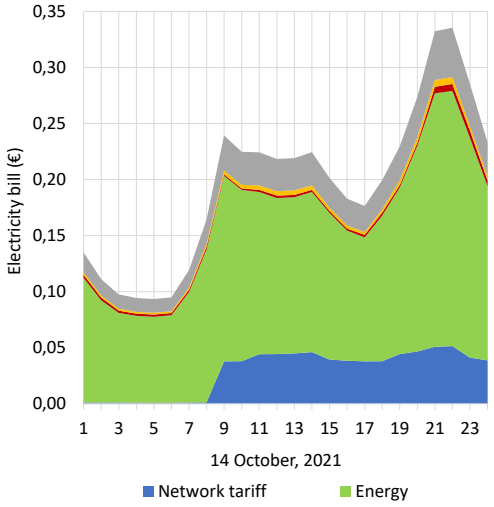
Following the introduction of new networks tariffs



New network tariffs with an increase in market prices



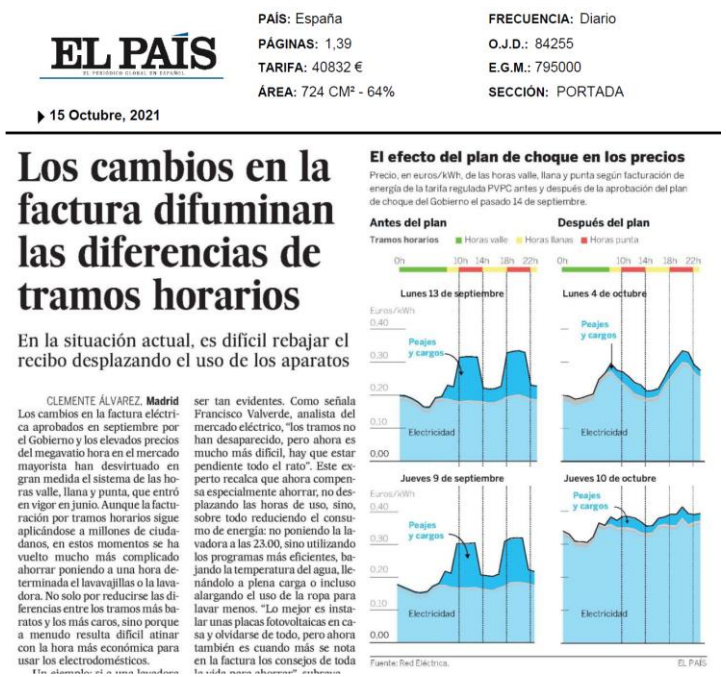
Following the Government's measures



Time-of-Use Network Tariffs: the Spanish case

The problems

- The media report daily on electricity **hourly market prices** and compare them to **time periods** of network tariffs, despite the fact that the price signal remains



EL PAÍS

PAÍS: España
PÁGINAS: 1,39
TARIFA: 40832 €
ÁREA: 724 CM² - 64%
FRECUENCIA: Diario
O.J.D.: 84255
E.G.M.: 795000
SECCIÓN: PORTADA

15 Octubre, 2021

Los cambios en la factura difuminan las diferencias de tramos horarios

En la situación actual, es difícil rebajar el recibo desplazando el uso de los aparatos

CLEMENTE ÁLVAREZ. **Madrid**
Los cambios en la factura eléctrica aprobados en septiembre por el Gobierno y los elevados precios del megavatio hora en el mercado mayorista han desvirtuado en gran medida el sistema de las horas valle, llana y punta, que entró en vigor en junio. Aunque la facturación por tramos horarios sigue aplicándose a millones de ciudadanos, en estos momentos se ha vuelto mucho más complicado ahorrar poniendo a una hora determinada el lavavajillas o la lavadora. No solo por reducirse las diferencias entre los tramos más baratos y los más caros, sino porque a menudo resulta difícil atinar con la hora más económica para usar los electrodomésticos.

ser tan evidentes. Como señala Francisco Valverde, analista del mercado eléctrico, "los tramos no han desaparecido, pero ahora es mucho más difícil, hay que estar pendiente todo el rato". Este experto recalca que ahora compensa especialmente ahorrar; no desplazando las horas de uso, sino, sobre todo reduciendo el consumo de energía: no poniendo la lavadora a las 23.00, sino utilizando los programas más eficientes, bajando la temperatura del agua, llenándolo a plena carga o incluso alargando el uso de la ropa para lavar menos. "Lo mejor es instalar unas placas fotovoltaicas en casa y olvidarse de todo, pero ahora también es cuando más se nota en la factura los consejos de toda

El efecto del plan de choque en los precios

Precio, en euros/kWh, de las horas valle, llana y punta según facturación de energía de la tarifa regulada PVPC antes y después de la aprobación del plan de choque del Gobierno el pasado 14 de septiembre.

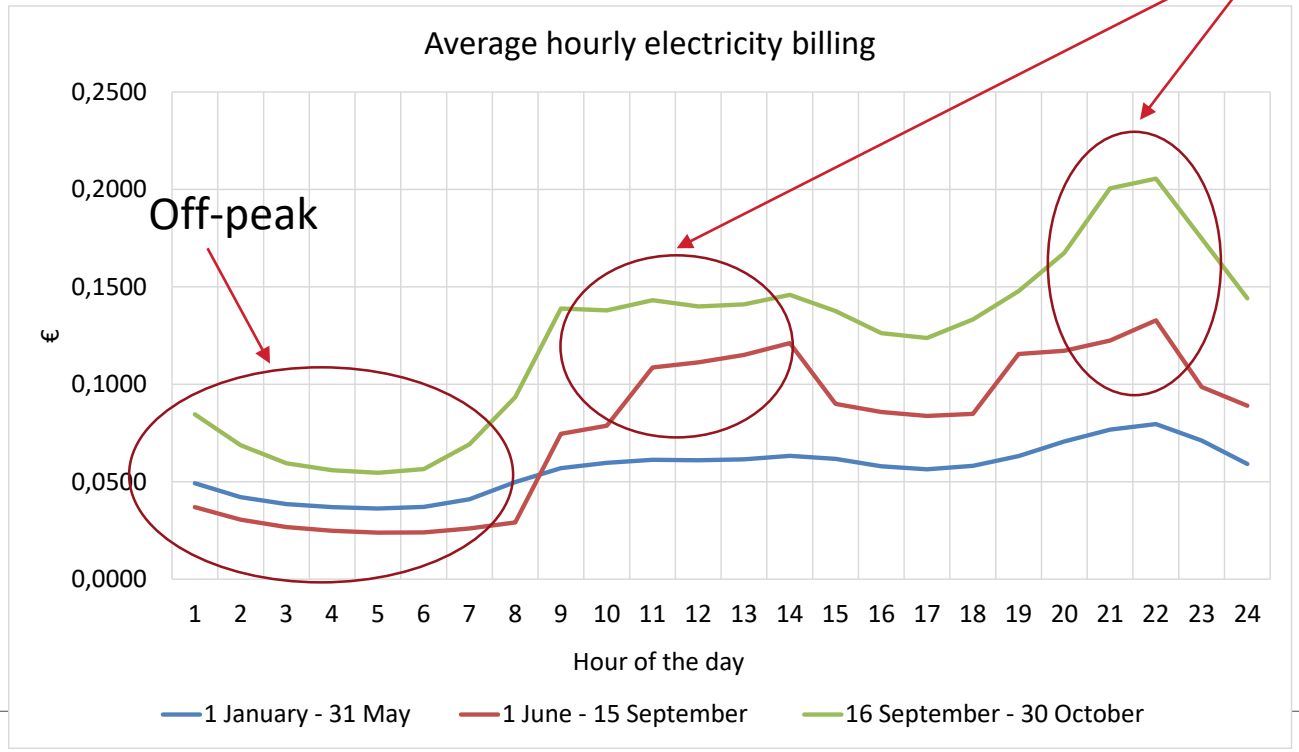
Antes del plan — Después del plan

Tramos horarios: Horas valle, Horas llanas, Horas punta

Lunes 13 de septiembre
Lunes 4 de octubre
Jueves 9 de septiembre
Jueves 10 de octubre

Peajes y cargos
Electricidad
Euros/kWh

Fuente: Red Eléctrica. EL PAÍS



Time-of-Use Network Tariffs: the Spanish case

Lessons learned

It may be a bit early to evaluate the new network tariffs introduced on June 1, however some issues of special relevance should be noted:

- Properly inform consumers
- Send clear and simple messages
- Avoid over information

And the **most important**

- Raise consumer awareness of the relevant role they have in the decarbonization process

Maybe you can afford to pay the bill, but the world cannot!!!

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Thank you for your attention!

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ToU NETWORK TARIFFS: THE CASE OF ITALY

ACER Webinar on Electricity Time-of-Use Network Tariffs

ARERA – Italian Regulatory Auhority
Luca Lo Schiavo
Deputy director for Energy Infrastructure Regulation

ACER webinar
16 November 2021

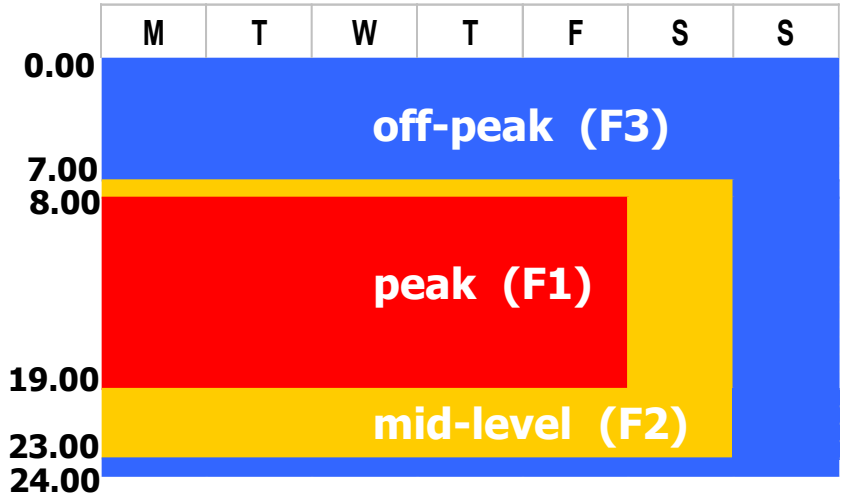
THE ITALIAN EXPERIENCE WITH ToU TARIFFS AND ToU PRICES

Customer size

ToU *network tariff* for large customers (mandatory) was phased out by ARERA on 31/12/2006

Based on 4 timebands

Timebands in use in Italy since 2007



2007 2008 2010 2016

ToU *energy price* for households (voluntary)

ToU *energy price* for households (mandatory for customers in «universal supply regime»)

ToU *network tariff* for reactive energy (mandatory)

… till now, ***static*** *timebands*

SOME KEY ISSUES OF SMART METERING IN ITALY
(1st generation since 2001; 2nd generation since 2017)

- **Contractual capacity limit (CCL): 3.0 kW** in 90% of households (HH) (all customers can choose their contractual capacity, size every 0,5 kW)
- Power absorption limited with **breaker** onboard the meter (customers can re-activate power supply by themselves); breaker trips when power absorption exceeds 1,1*CCL for a given lapse of time (the higher the load, the shorter the time)
- For decades this represented a powerful **energy efficiency** tool → there is a very limited thermal usage of electricity, **average household consumption is currently 2000 kWh/year**
- **3 timebands metering** introduced since 2008 for all LV customers up to 55 kW (households and small businesses); consumption of all customers > 55kW are hourly metered (and hourly settled)
- 2nd generation (2G) smart meters (current roll-out > 50%) are able to manage **15-minutes metering** and grouping data **up to 6 time-bands**
- **Time-bands are customizable by supplier** with 2G smart meters
- **Hourly metering & settlement below 55 kW progressively deployed**

THE ITALIAN EXPERIENCE WITH ToU PRICES: HOUSEHOLD RESPONSIVENESS

- At the time of introducing mandatory ToU energy pricing (2010-11) for customers that don't choose their supplier in the free market («universal supply regime»), each involved customer received bills with separate consumption (3 bands) at single price for 6 months in advance of the first ToU bill (2 prices for households; 3 prices for SME)

- A large survey was conducted on a sample of 8000+ household customers in order to make a fact-based comparison of consumption behavior before and after the introduction of the ToU energy prices. Main results:

  ➔ percentage of customers with at least 2/3 of consumption in low-price timeband: +5%

  ➔ percentage of customers that have moved consumption from higher-price to lower-price timeband: 60.1%

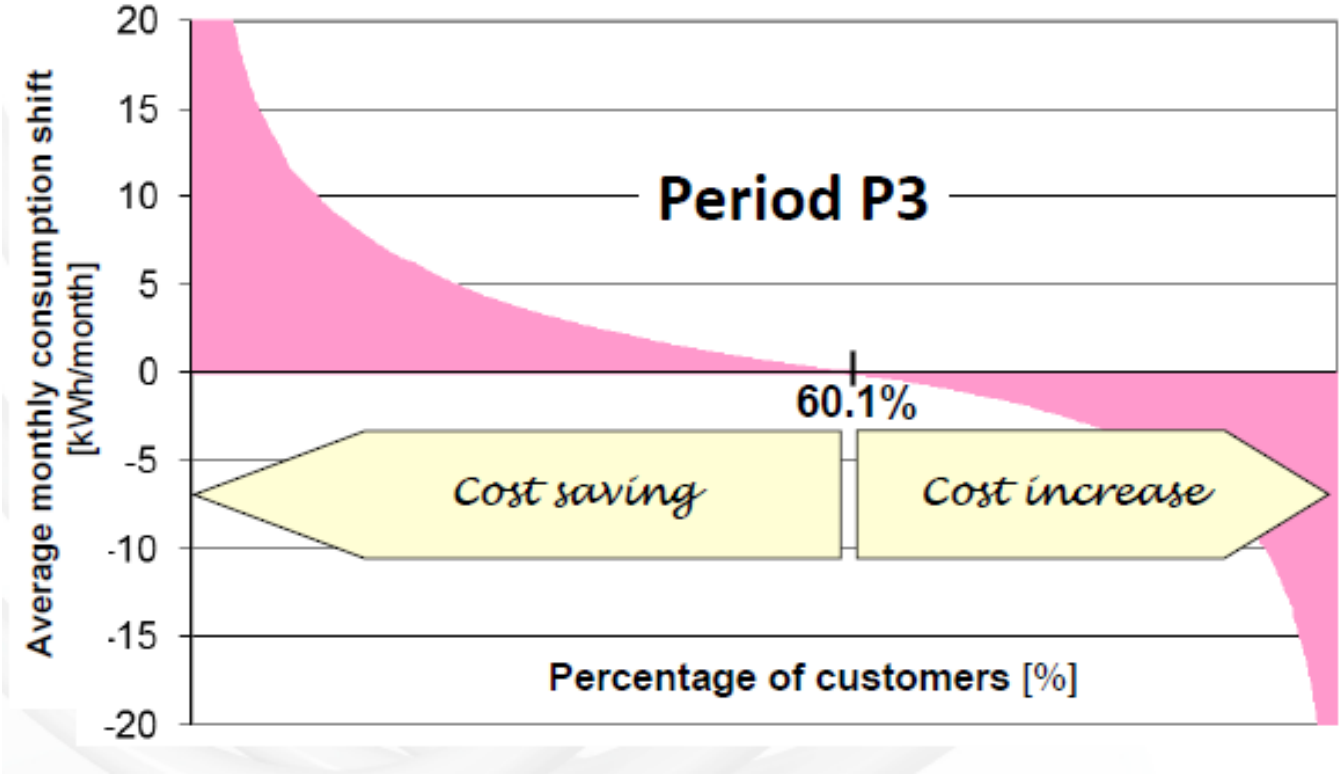
  ➔ although, limited consumption shift (as absolute values): 1% of energy

Source: Benini, Gallanti, Grattieri, Maggiore, «Impact of a mandatory time-of-use tariff on the Italian residential customers», RSE 2012

THE ITALIAN EXPERIENCE WITH ToU PRICES: HOUSEHOLD RESPONSIVENESS

Consumption shifting

(Restricted customer panel)



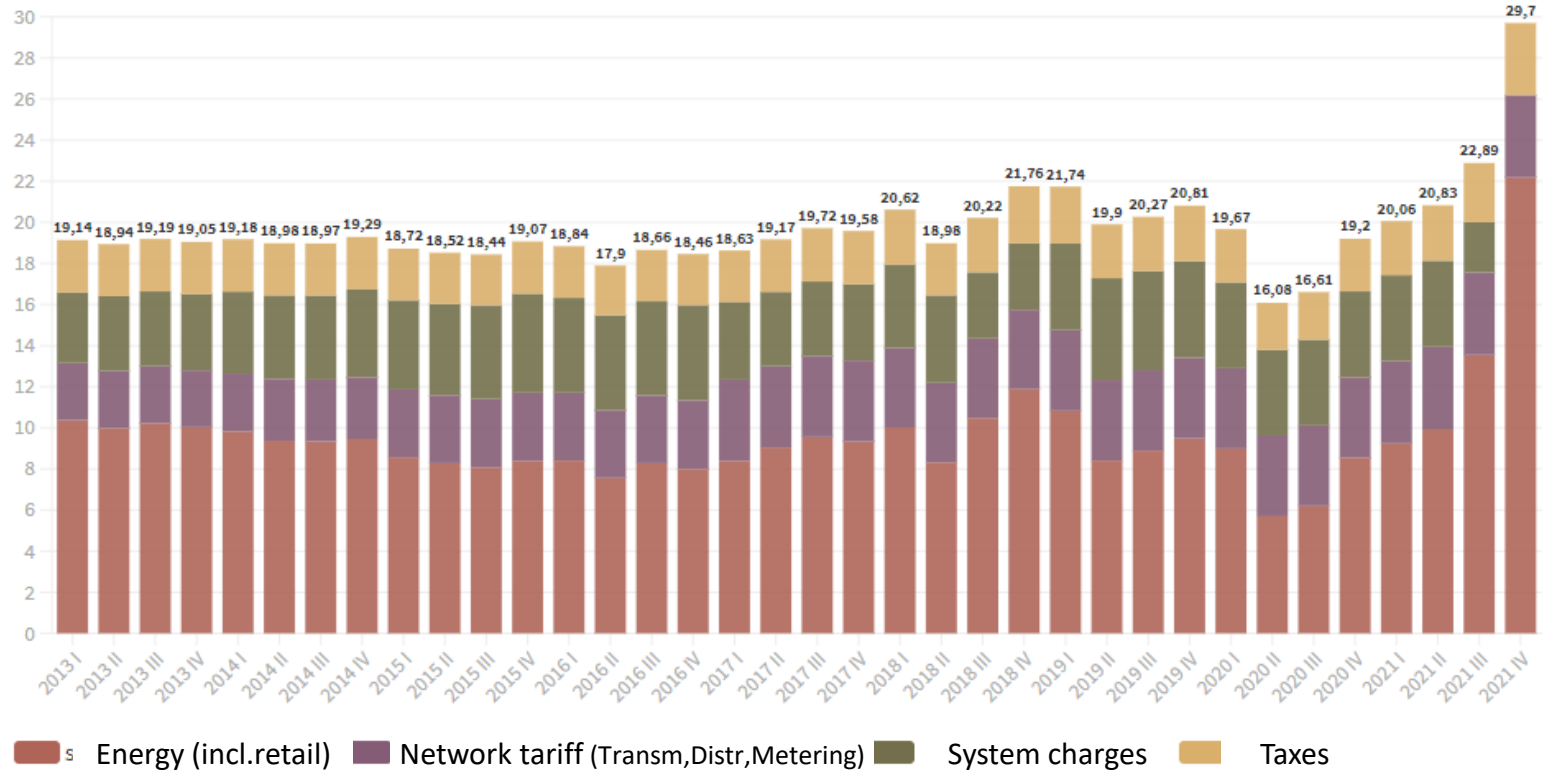
Controlled sample:

- always in the Universal Service Regime (no switching);
- no on-site generation;
- no variation of rated power;
- flat tariff in P1 before the change

Source: Benini, Gallanti, Grattieri, Maggiore, «Impact of a mandatory time-of-use tariff on the Italian residential customers», RSE 2012

THE RELATIVELY SMALL IMPACT OF NETWORK TARIFFS ON THE FINAL PRICE (HOUSEHOLDS)

Household electricity prices in Italy, per quarter
(reference customer: **3 kW** capacity, **2700** kWh/year, resident)



- **Network tariffs (violet bar)** account for around **20%** of the price in “normal” times
- In the recent high- price period, the network tariff impact is much lower, **down to 13%**

IN THE FREE MARKET HOUSEHOLD CUSTOMERS PREFER OFFERS BASED ON NON-ToU ENERGY PRICES

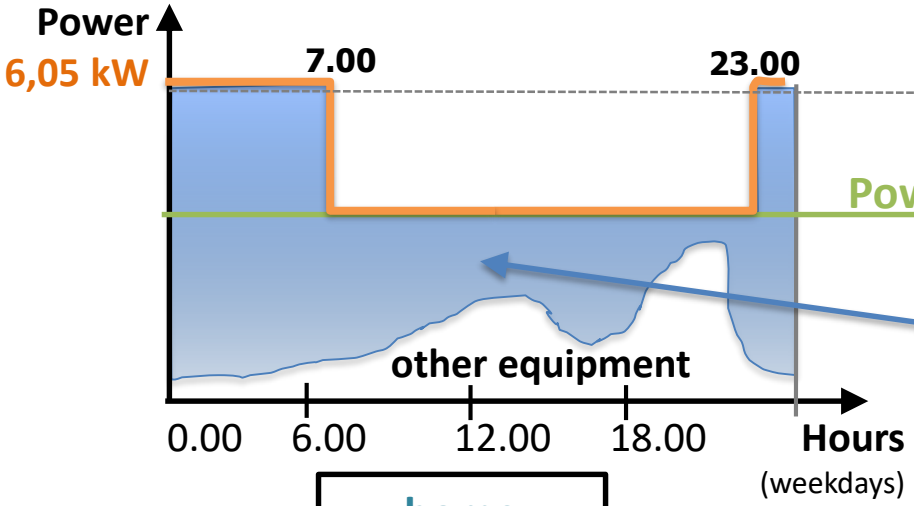
(2020)	MILLION CUSTOMERS IN THE FREE MARKET	% OF CUSTOMER WITH NON-ToU CONTRACTS
HOUSEHOLDS	16.1	62.1%
SMALL BUSINESS (LV)	4.5	31.0%
BUSINESS (MV)	0.1	8.1%

- Stable figures over years

KEY ISSUES FOR CONSUMER RESPONSE TO ToU

- **Motivation of consumers**, that can rely both on economic issues (relevance of the energy bill in comparison to the income, magnitude of the potential savings) and on the awareness and concern about environmental issues
- **Availability of smart meters** to allow an effective ToU pricing and billing **and costs of automation enabling technologies:** smart appliances, IoT infrastructures, open communication protocols available, etc
- **Concrete opportunities for time shifting of loads**, which strongly depends on the specific uses of electricity and on the equipment installed (electric boilers or heat-pumps, EV, storage, etc.) and in general from electricity intensity;
- **Consumers' awareness and engagement**, such as availability of in-home devices or mobile apps that can bring to the consumers information, suggestions and alerts, improving their knowledge about dynamic prices and stimulating behavioral changes

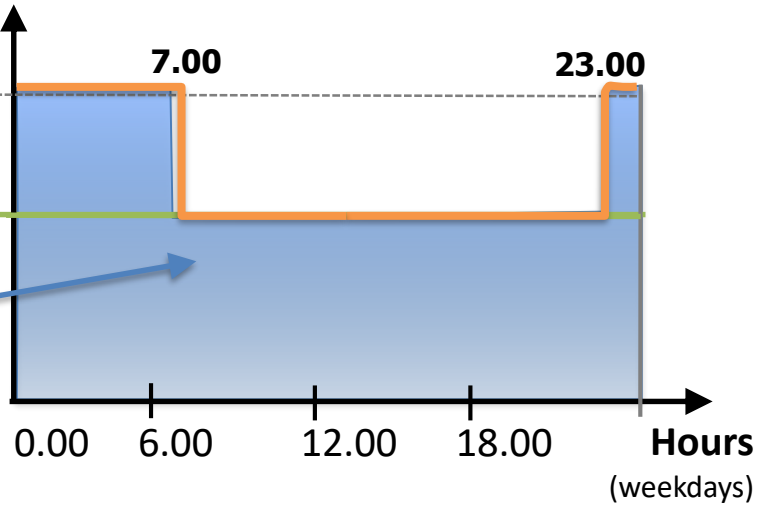
THE RECENT INITIATIVE FOR «SMART CHARGING» AT HOME (ARERA Decision 541/2020/R/eel)

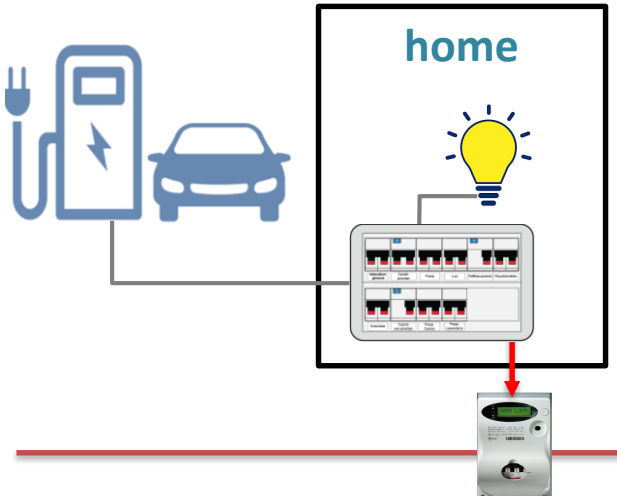


Power available in F3 (6,05 kW)

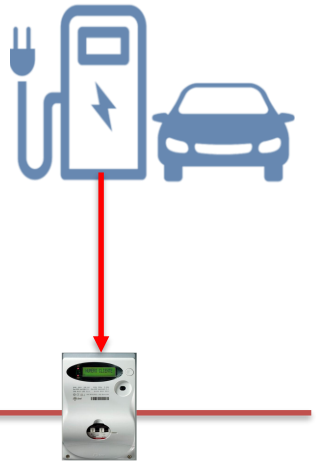
Power available at any time (2,2 – 4,95 kW)

Power available for EV charging





In the large majority of LV grids, users with contracts up to 4,5 kW are connected under technical standards that guarantee **electric safety** in absorbing continuously **up to 6,6 kW** → we expect almost all applications to this initiative will be managed remotely by DSO, without any need to go on-site.



Ordinary PoD

«dedicated» PoD

EXPERIENCE IN ITALY: SUMMARY

Smart metering fully available and used

- Energy *price* is mandatorily ToU for customers who don't choose their retail supplier
- ToU *network tariff* limitedly to reactive power (non-household customers >15 kW, mandatory)
- Static timebands so far
- new 2nd generation SM system enables timeband customization (on supplier's request)

Low customer motivation

- Customers who choose their retail supplier prefer non-ToU offers (3 out of 5)
- In Italy, network tariffs have a relatively low weight in the final price (20%, now less than 15%)

Innovation (pilot regulation)

- ToU approaches can be applied to the contractual capacity limits as a trigger for smart behaviours (as long as the smart meter is capable to disconnect supply or reduce capacity)

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ToU NETWORK TARIFFS: MAIN DOUBTS

Cost reflectivity

- Aren't **complexities** for truly cost-reflective of ToU D-network tariffs severe enough?
  (would require continuous mapping of the load of each single MV/LV transformer or LV feeder)

Mandatory vs voluntary

- Aren't cost-reflective ToU network tariff **inherently mandatory** ?
  (ToU network tariffs on a voluntary basis, due to self-selection issues, could not collect revenues)

Pancaking

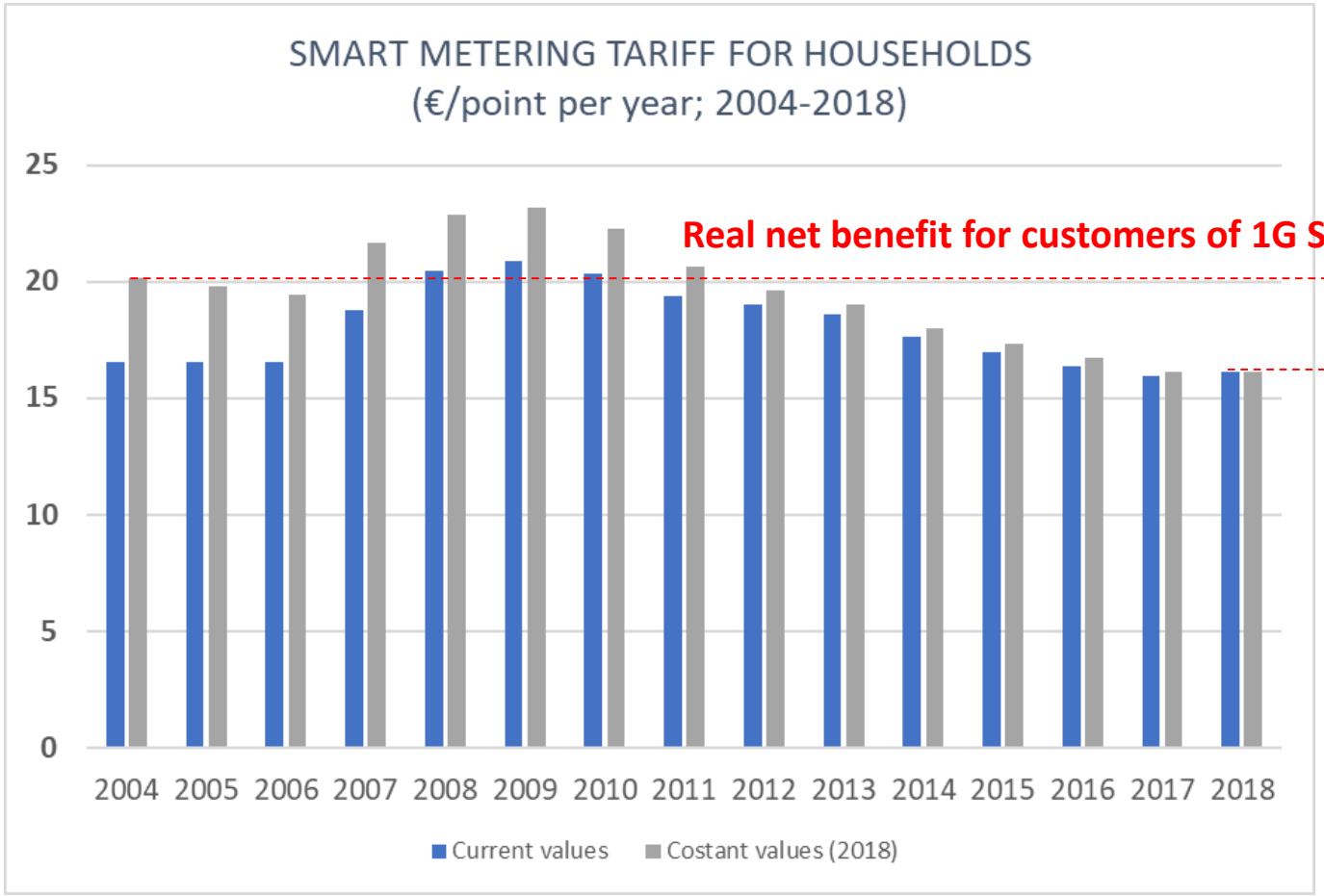
- What about **contradictory signals** between dynamic prices and ToU network tariffs ?
  (think of a residential area with air conditioning but without prosumers in a sunny summer Sunday)

Competition among suppliers (and single bill)

- What about suppliers that, in order to increase market share if customers don't want ToU, design **bundled offers without ToU in the final price** (provided there is a single bill for the whole supply) ?

Back-up

SMART METERING AND METERING TARIFF



Price-cap *X-factor* for metering costs:

2008-11: 5.0%

2012-15: 7.1%

2016-19: 1.0%

Real net benefit for customers of 1G SM over 15 years

19,9%

References to yearly tariff decisions

(«Mis» component)

Decision 5/04

Decision 275/06

Decision 348/07

Decision 199/11

Decision 654/15

Decision 799/16

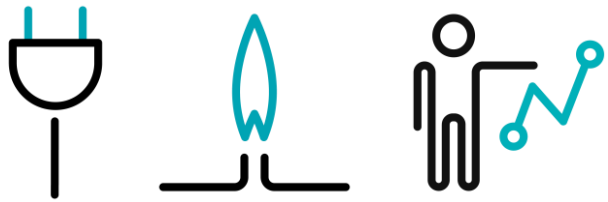
Decision 907/17

Time of Use Transmission Tariffs – Belgium

ACER WEBINAR ON TIMES OF USE TARIFFS

Gilles Wilmart

16/11/2021



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Commission de Régulation de l'Électricité et du Gaz

History of ToU and context

Since the begining of regulation (2002), tariffs for subscribed capacity had a ToU component

-> Big fix annual component

-> Smaller monthly component with ToU signal with 2 choices :

- *3 time periods (Peak/offpeak/week-end)*
- *2 seasons (Summer/winter)*

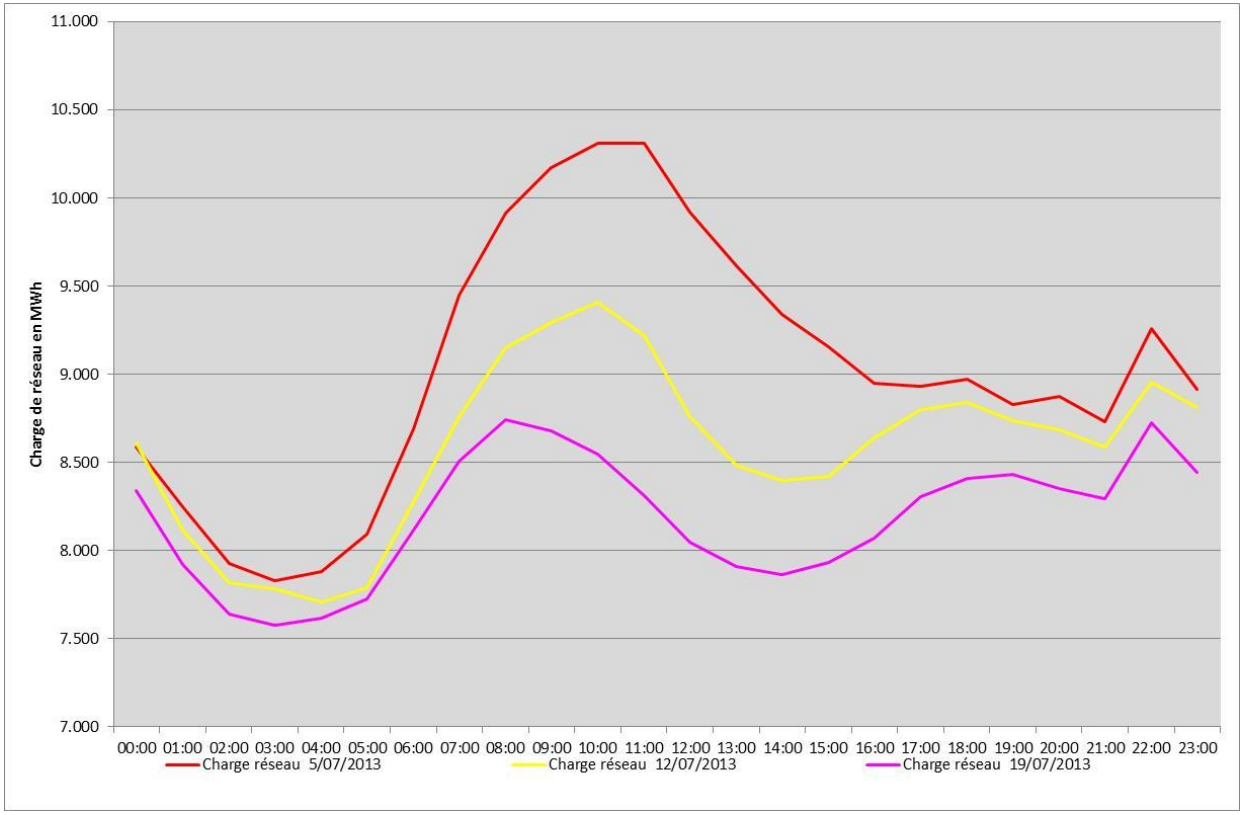
6 monthly tariffs representing less than 10% of the capacity tariffs

- *2 time periods (Day/night)*
- *2 seasons (Summer/winter)*

4 monthly tariffs representing around 20% of the capacity tariffs

Complex but effective in a stable electrical context

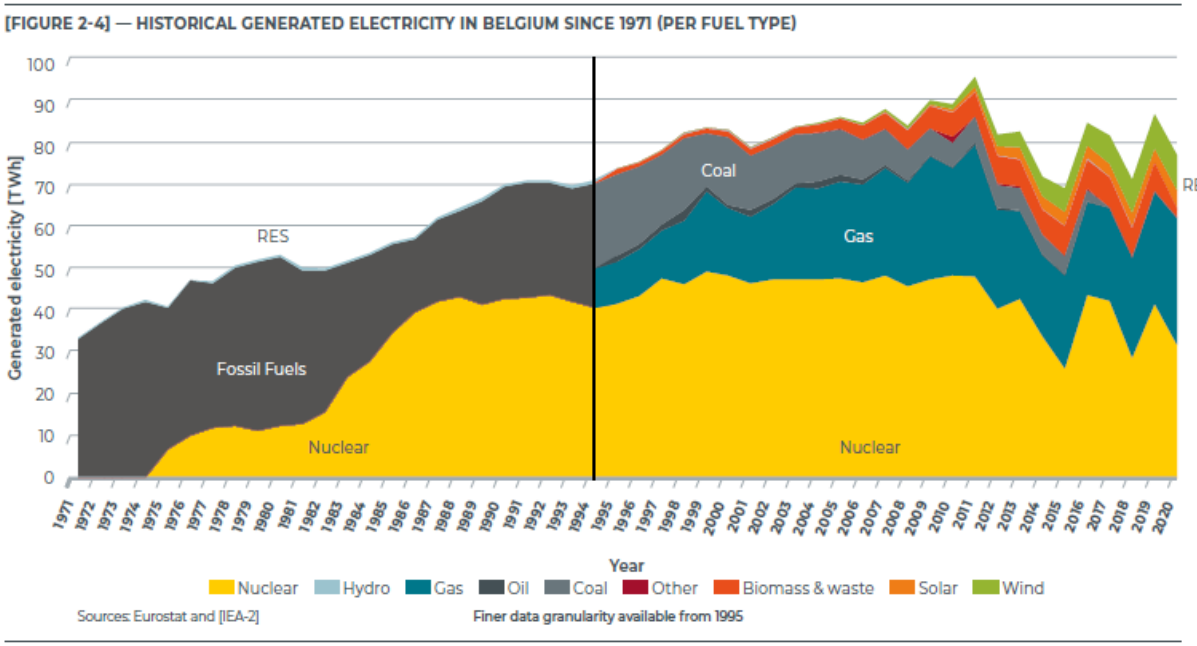
Stop ToU tariff as from 2016



Reason to stop old ToU tariffs :

- *Complexity*
- *Peak Load Pricing*
- *Less Stable & Changing Load Pattern*
  - ***Risk of Contraproductive Signal !***

New ToU tariff as from 2016



Problems to solve

- *Continuity*
- *Adequacy issues in BE*
- *Load evolutions : EV, …*
- *Old transmission network (10 billions investment plan to 2030)*

Minimize synchronous peak !

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*Source : Adequacy Study Elia

Synchronous peak

2014

	Mois de l'année	Jour de la semaine	Heure du jour	
0			0,0%	
1	24,0%	12,0%	0,0%	
2	0,0%	38,0%	0,0%	
3	0,0%	30,0%	0,0%	
4	0,0%	20,0%	0,0%	
5	0,0%	0,0%	0,0%	
6	0,0%	0,0%	0,0%	
7	0,0%	0,0%	0,0%	
8	0,0%		0,0%	
9	0,0%		0,0%	
10	0,0%		0,0%	
11	0,0%		4,0%	
12	76,0%		0,0%	
13			0,0%	
14			0,0%	
15			0,0%	
16			4,0%	
17			46,0%	92,0%
18			46,0%	
19			0,0%	
20			0,0%	
21			0,0%	
22			0,0%	
23			0,0%	

*max 50 qh

2014

	Mois de l'année	Jour de la semaine	Heure du jour	
0			0,0%	
1	31,0%	15,7%	0,0%	
2	8,0%	21,0%	0,0%	
3	0,0%	31,7%	0,0%	
4	0,0%	27,7%	0,0%	
5	0,0%	4,0%	0,0%	
6	0,0%	0,0%	0,0%	
7	0,0%	0,0%	0,3%	
8	0,0%		2,7%	
9	0,0%		2,7%	
10	0,0%		3,0%	
11	7,0%		4,3%	
12	54,0%		2,7%	
13			2,7%	
14			2,7%	
15			2,7%	
16			4,3%	
17			27,7%	72,0%
18			37,3%	
19			7,0%	
20			0,0%	
21			0,0%	
22			0,0%	
23			0,0%	

*max 300 qh

- *Estimation of the synchronous peak time range*
  - *Synchronous peak appears statically on Winter months between 5 and 8 PM*

Annual peak tariff only during the "peak tariff period"

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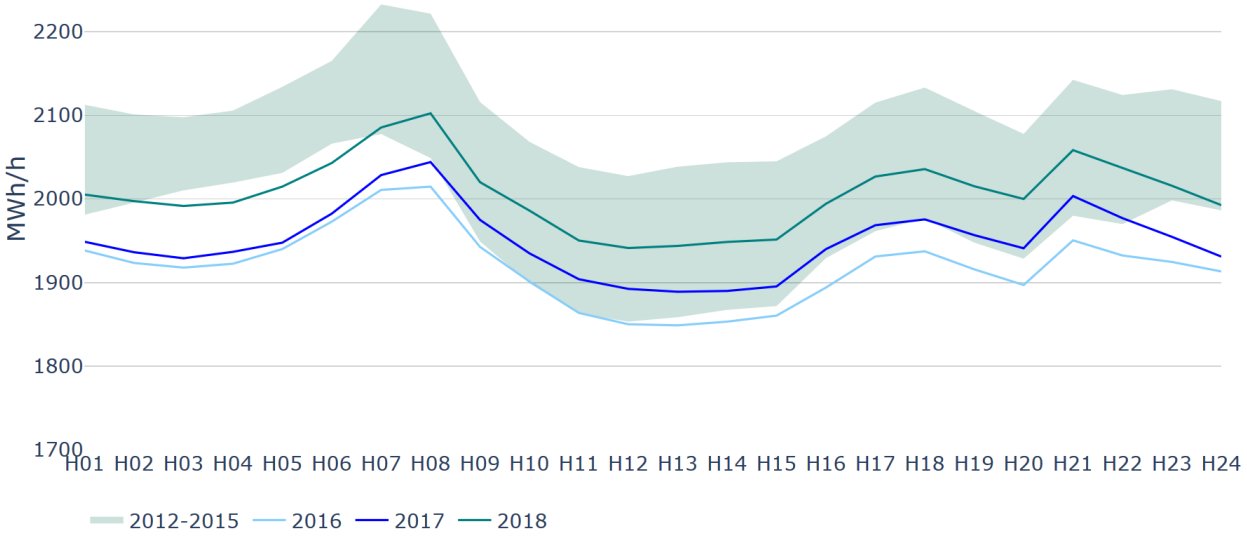
Results

Average industrial consummers withrawals



**Source : CREG (F)2126*

- No significant impact yet
- No contra-productive impact
- No conflict
- Simple

Increase the signal ?

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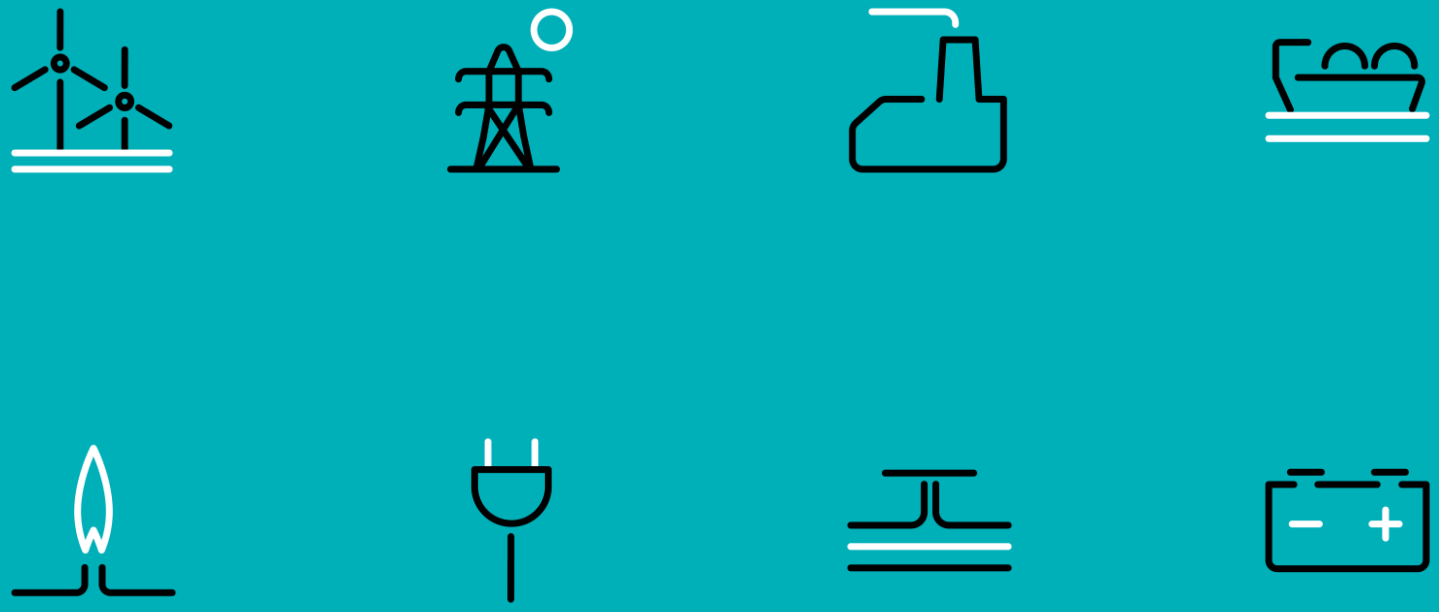

Commission de Régulation de l'Électricité et du Gaz

November 2021

Time-of-Use Network Tariffs

ACER Workshop

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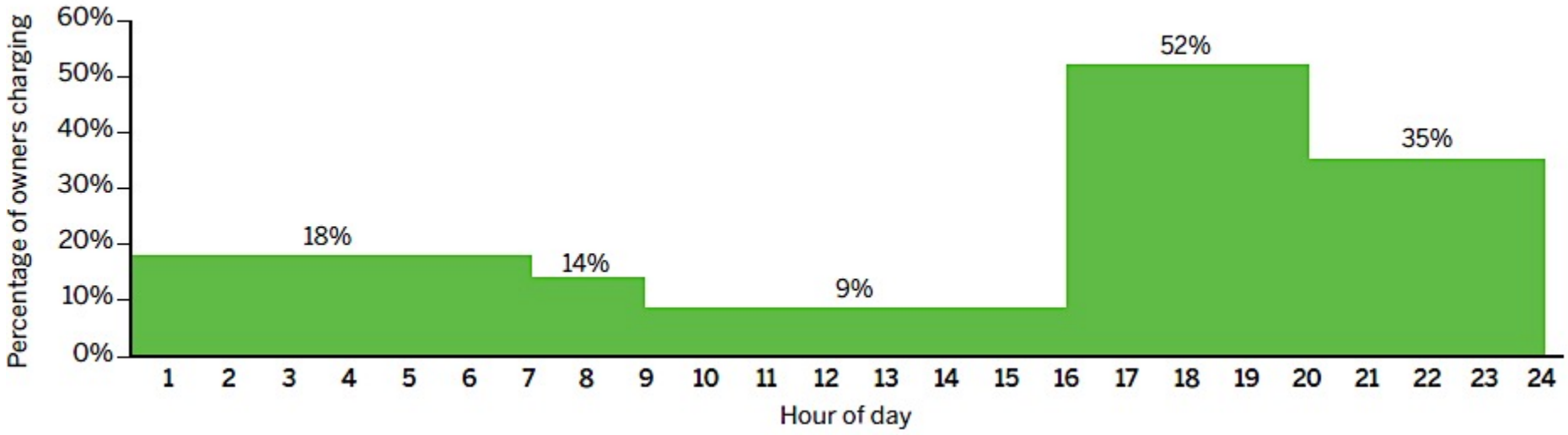
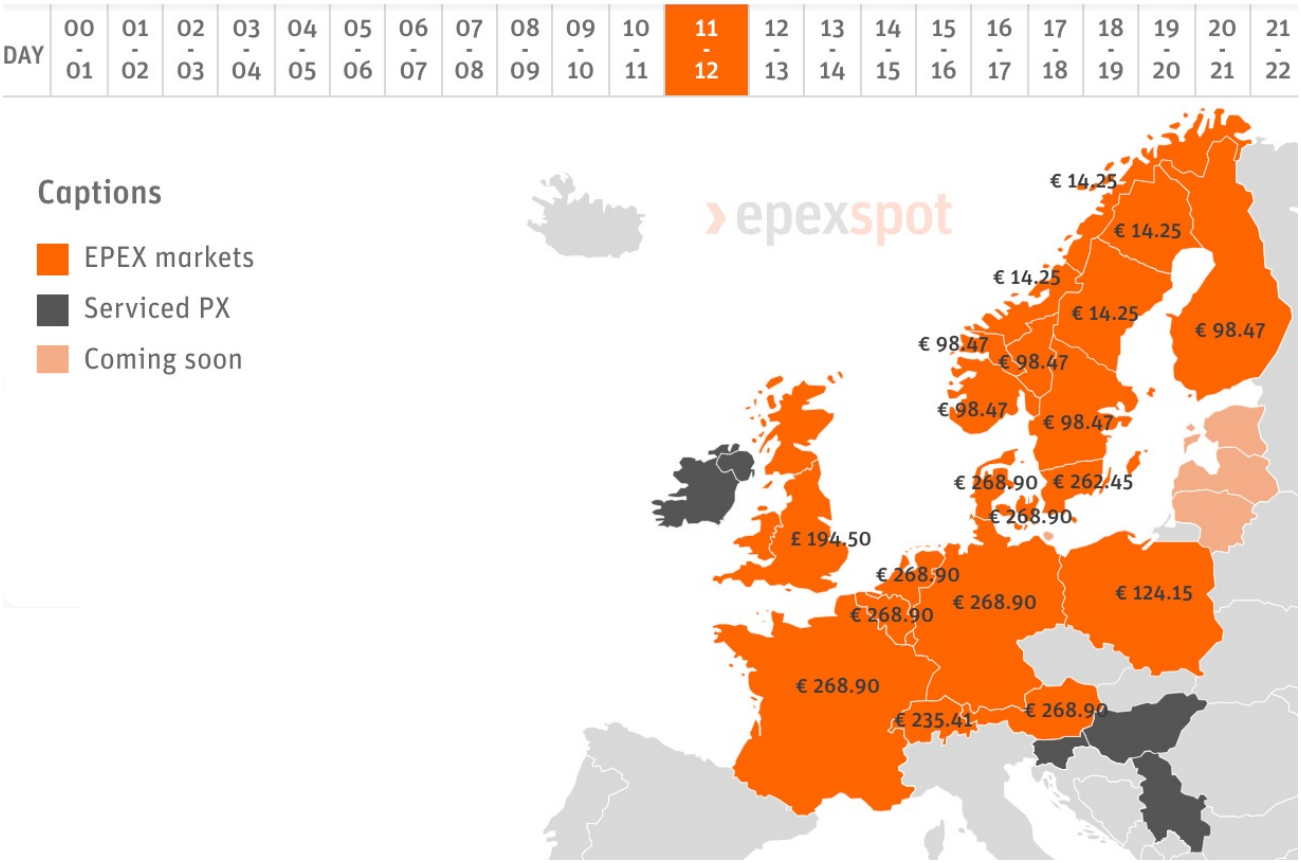
EV charging times exacerbate most congested hours on network



Source: Norwegian Electric Vehicle Association. Norwegian battery electric vehicle owner survey 2018.

Time-of-use incentives only through bidding zone prices

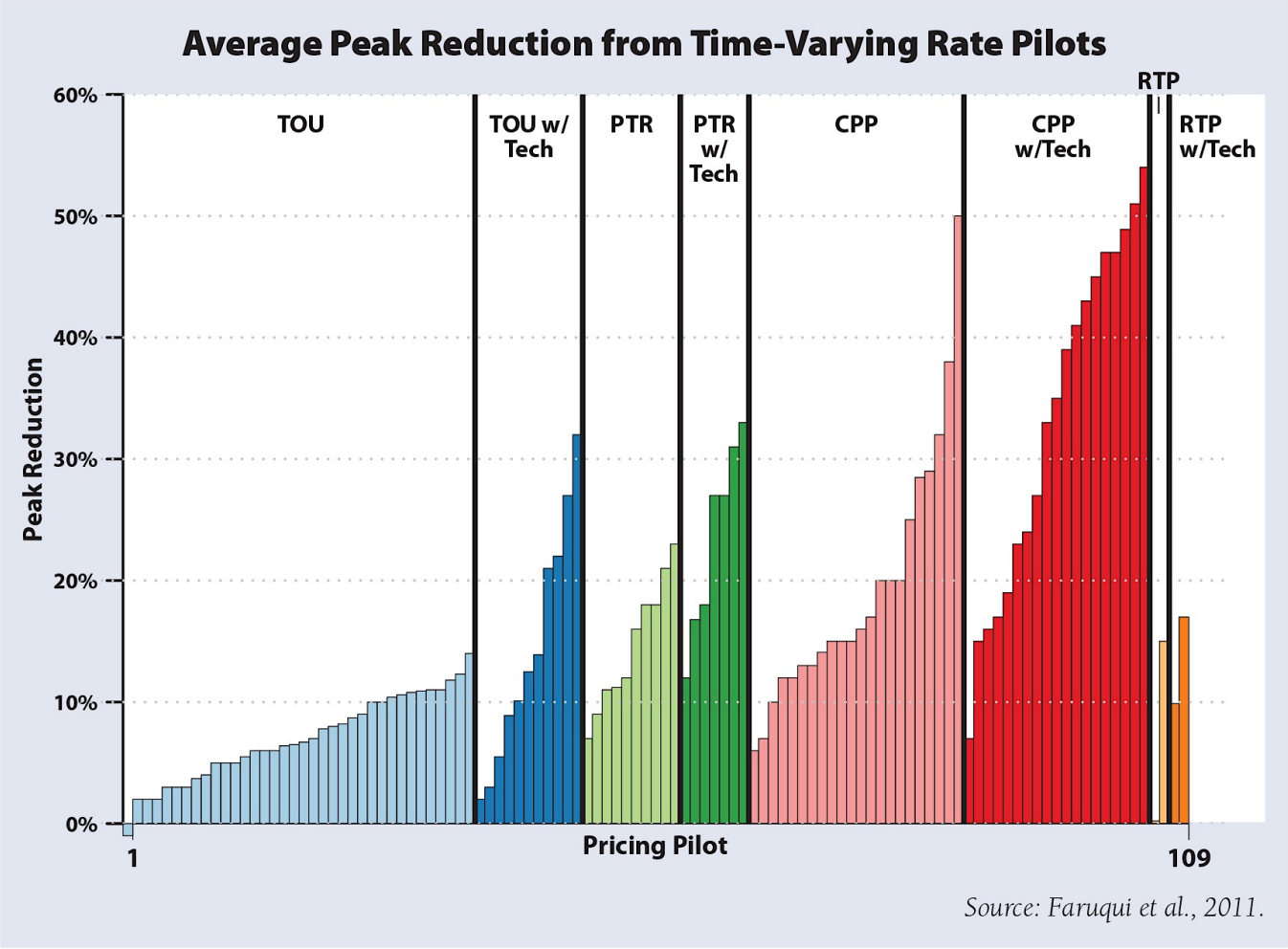


Source: EPEX spot

How to address cost-efficient networks?

- Most of the time, distribution networks are not fully utilised.
- Customers can consider congestion/peak time on networks only if this is visible via price signals.
- Time-of-use pricing enables demand to use the existing networks more efficiently.

ToU tariffs are an effective measure to reduce peak demand



ToU network fees for precise dynamic tariffs

- Bigger suppliers must offer dynamic tariffs for all customers - based on wholesale prices.
- Additional ToU network fees incentivises business cases and creates consumer awareness.
- ➢ Lower system costs (networks and RES).

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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ACER Webinar on Time-of-Use Electricity Network Tariffs

Tuesday, 16 November 2021

Tim Schittekatte (FSR/MIT):

Point 1: Cost-reflectivity and spatial granularity

How heterogeneous is grid use across regions and voltage levels?

Figure 7 – *Timing of peak demand for summer-peaking zone-substations*[22]

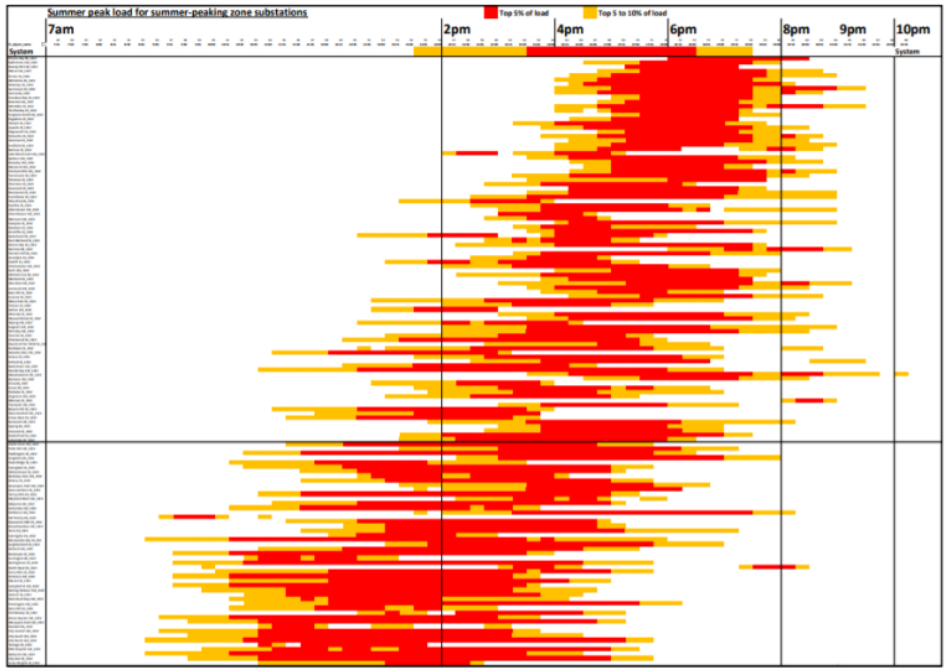
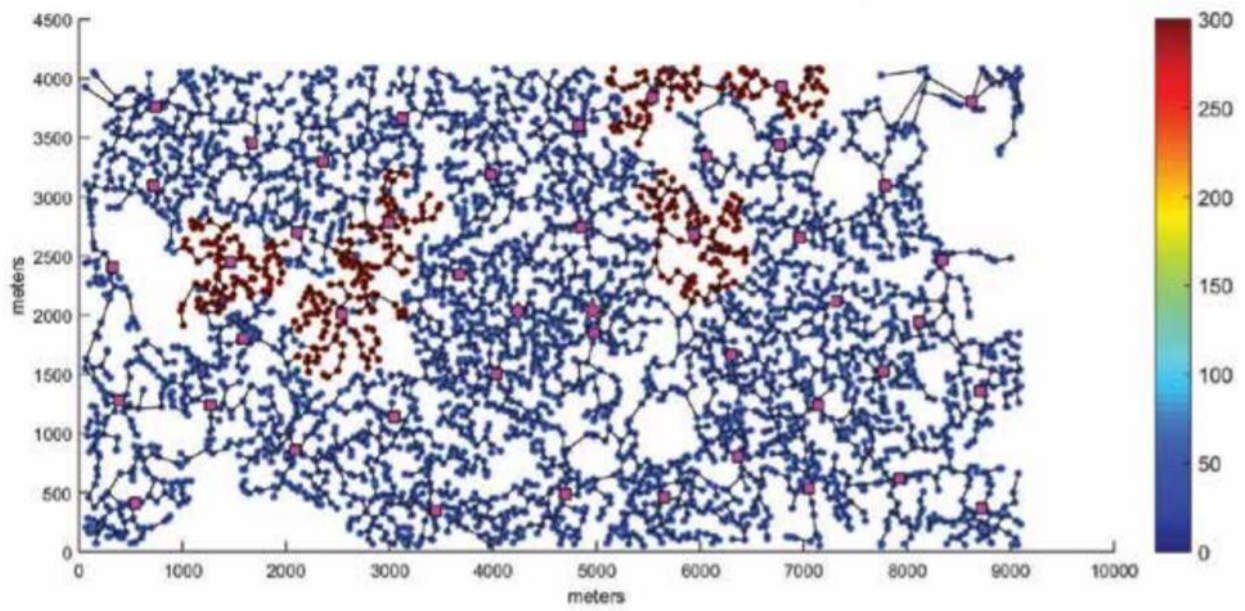


Figure 4.12: Spatial Variation in Distribution-Level Active Power LMPs Caused by Network Congestion in the Network of Figure 4.10



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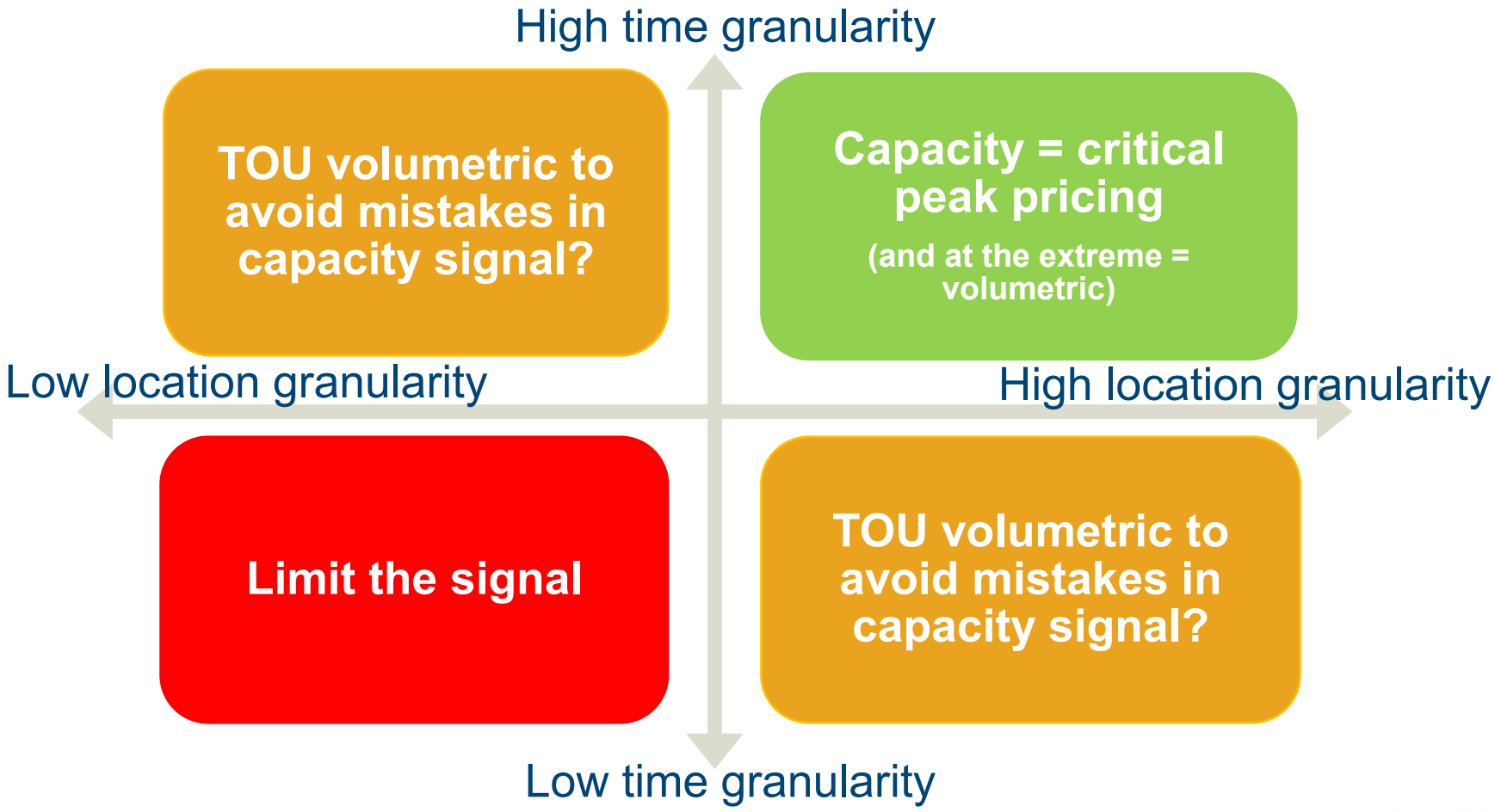
The level of complexity/dynamics you are willing/able to accept, drives the choice of options



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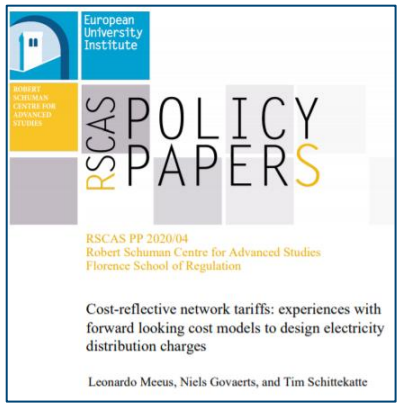
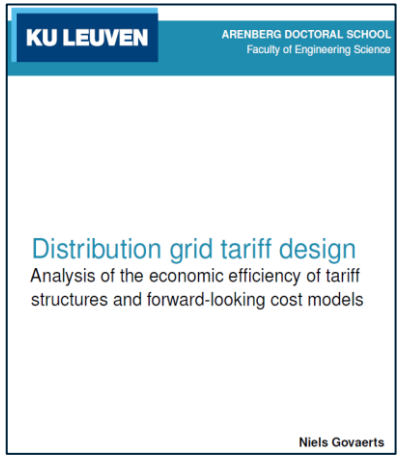
Point 2: calibrating the network charge - from cost accounting to forward-looking charges

Network planning models

- Taking the existing grid as the baseline
- For a forecasted network use (withdrawal and injection) optimize an expansion plan, and;
- (Ideally) allow estimating any sort of relation between end-user network use and forward costs

allocation method and a theoretical benchmark. The results show that LRIC always achieves a social welfare gain compared to historical cost allocation but that the magnitude of this gain varies significantly with the demand growth rate, demand elasticity, and network upgrade cost. The mechanisms driving the social welfare gains are also analyzed, revealing that these are sometimes driven by network cost savings, and sometimes by an increase in consumer surplus.





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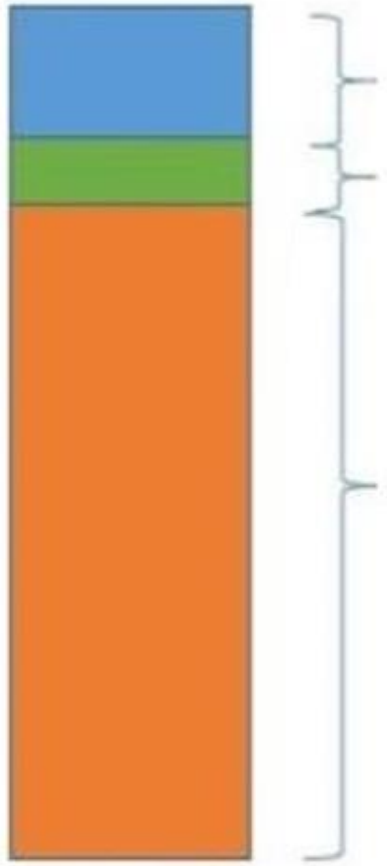
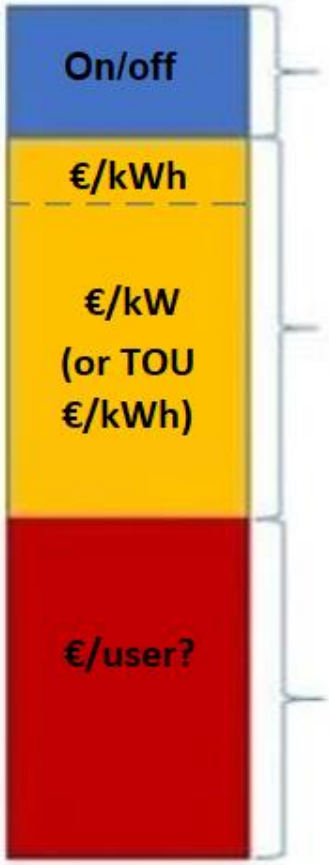
Forward-looking charges ≠ grid cost recovery



Efficiently incurred connection costs
Attributable to a specific user

Losses Very hard to attribute to a specific user

Efficiently incurred general network costs and other costs
Very hard to attribute to a specific user



Connection charges
Paid by the specific grid user

Access charges
Cost-reflective charges
Paid by all users to recuperate some of the losses and to signal the impact of users on future investment costs

Residual charges
Paid by all grid users to recuperate the remaining grid costs

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