

# Regulación inteligente para sistemas eléctricos inteligentes, pero sobre todo eficientes

Carlos Batlle

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“Transformación hacia la Utility del futuro”

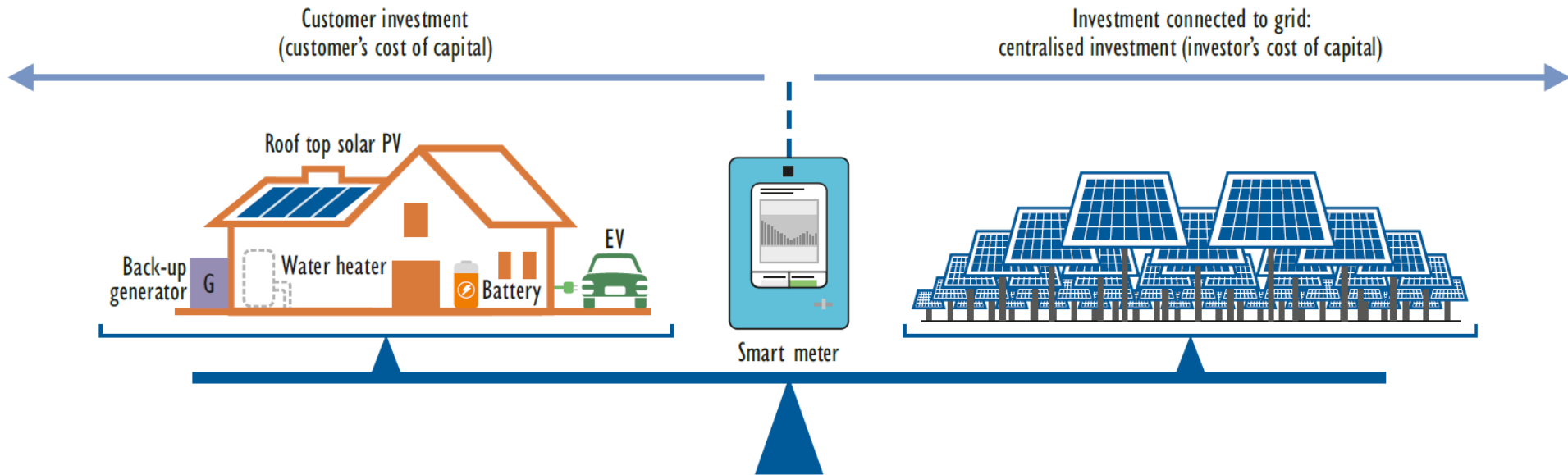
Primer Foro FISE-DER

28 de noviembre de 2018, Medellín, Colombia



Game changers: Power to the people?

# Future organization of the market



# Energy Service Companies



PROBLEMS WE SOLVE

PRODUCTS

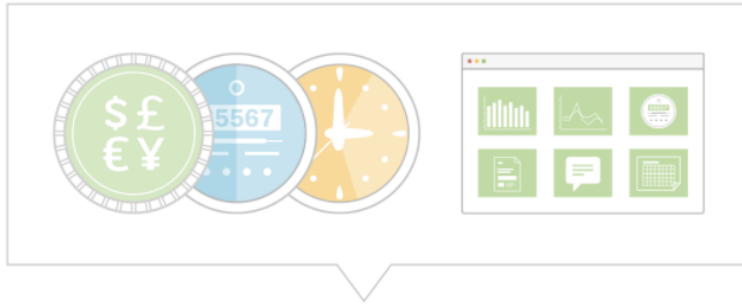
INDUSTRIES

BUY



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Get a Demo



## Tackle Your Biggest Challenges with Better Energy Intelligence

Whether you need a focused solution to a specific problem or a broad solution to a range of issues, our technology-enabled solutions and world-class team of experts can help you address your key energy management challenges.

- **Energy Intelligence Software** enables your business to boost facility efficiency, simplify utility bill management, ease reporting burdens, and more.
- **Demand Response** generates revenue and improves your bottom line.
- **Energy Procurement** tools and services help you buy energy more strategically, manage risk, and ensure the best price.

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EnerNOC - Get More from Energy: <http://bit.ly/2trZW38>

# Energy Service Companies



Advanced Microgrid Solutions

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## AMS ADVANTAGE

We make sites smarter by turning them into low-footprint, high-impact energy storage systems.

[Learn about Hybrid Electric Buildings®](#)



### SOFTWARE



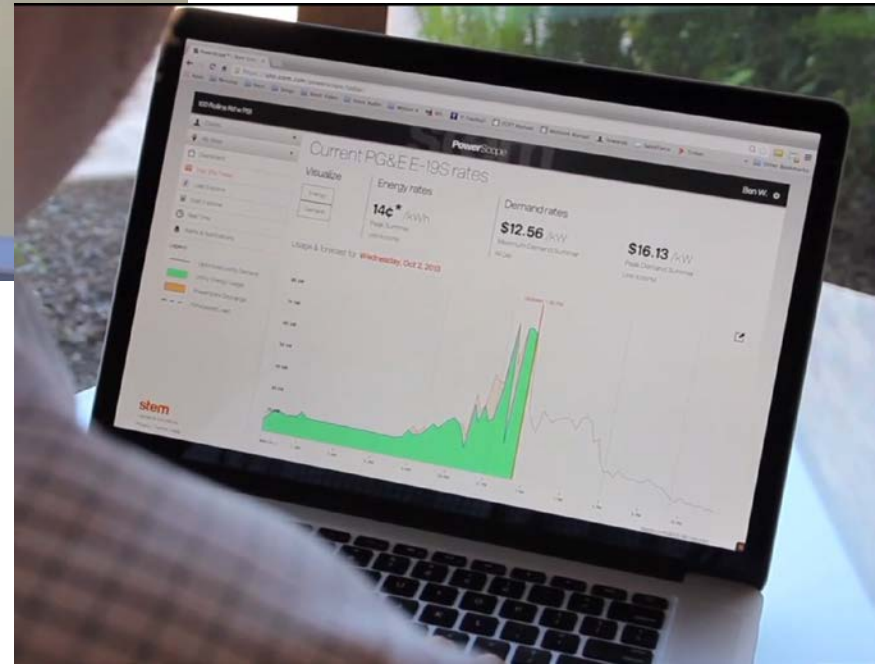
### TECHNOLOGY



# Energy Service Companies



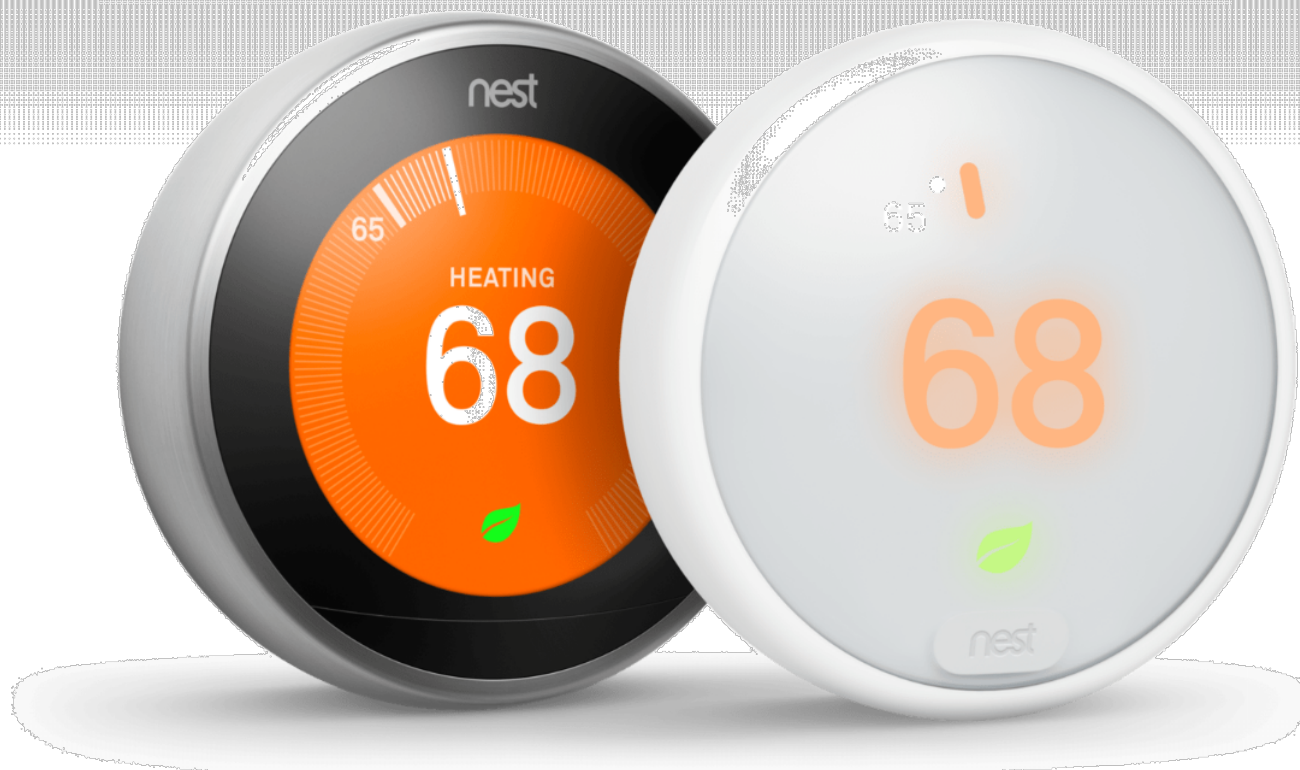
**stem** | Energy Superintelligence™



<http://www.stem.com>

# Fashionable and wearable power

What makes a Nest thermostat  
a Nest thermostat?



It's beautifully designed to keep you comfortable and help save energy.



**Proven energy savings.**  
Can pay for itself in two  
years or less.<sup>1</sup>



Turns itself down when  
you're away.



Control it from anywhere.<sup>2</sup>



Remote temp sensing.  
[Learn more >](#)

# Behavioral science

OPower Products Why Opower Clients Resources Company

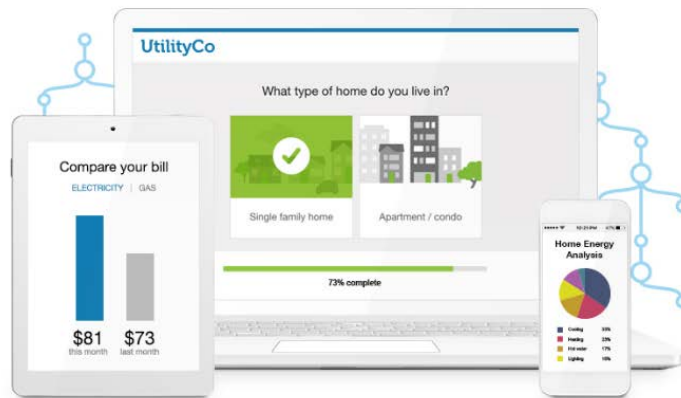
Elevate your customer experience  
Make the key moments count with Opower's customer engagement platform

SEE WHAT WE DO REQUEST A DEMO

12% less

**Oracle Buys Opower**  
[LEARN MORE](#)

**A customer engagement platform  
tailor-made for utilities**



#### BENEFITS

- ✓ Raise satisfaction and loyalty
- ✓ Manage energy demand
- ✓ Lower service costs
- ✓ Unlock new revenue

Alex Laskey: How behavioral science can lower your energy bill: <http://bit.ly/Mo8pe1>

Opower's Behavioral Demand Response Solution: <http://bit.ly/2tn3t2l>



# Europe also...



# Europe also...

## Bespaar met Toon

Stap nu over op Eneco 4 jaar  
en ontvang Toon en installatie (t.w.v. €275)

BEKIJK AANBOD



[Toon Thermostaat](#)

[Wat is Toon?](#)

[Hoe werkt Toon?](#)

[Bekijk aanbod](#)

[Toon Service](#)

## Met Toon inzicht in je verbruik

Met de slimme thermostaat Toon weet je precies hoeveel energie je verbruikt. En wat dit je kost. Per dag, week of maand. Met wat slimme stekkers van Fibaro en Toon zie je ook nog eens welke apparaten in huis de grootverbruikers zijn. Bespaar tot wel 10% op je energierekening.



**TOON**<sup>®</sup>

ONTDEK TOON

# Fashionable and wearable power

TESLA

MODEL S MODEL X MODEL 3 ROADSTER ENERGY

SHOP

Energy

Solar Panels Powerwall Solar Roof Commercial Utilities



# Also for utilities...

TESLA

MODEL S MODEL X MODEL 3 ROADSTER ENERGY

SHOP

Utilities

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Solar Panels Powerwall Solar Roof Commercial **Utilities**



# Europe also again...



green power

Ökogas

about us



SERVICE & HELP

BUSINESS CUSTOMERS ▶

## "We are changing the energy of tomorrow with green electricity."

Calculate the tariff



### 100% green electricity!



With LichtBlick, you will get 100% green electricity from German hydropower. Monthly cancellable and without advance payment.

### Excellent!



We always give our best. We are awarded many times for our quality of products and service.

### Fair and competent!



More than 1 million lightblickers and 19 years of experience make us Germany's largest independent green energy provider.

<https://www.lichtblick.de/> (google translate)

# Again, Europe also...



[sonnenBatterie](#) [Vision](#) [Press](#) [Careers](#) [Contact](#) | [Partnerlogin](#)



sonnenBatterie - It's time  
to declare your  
independence

A clean, reliable and affordable energy supply for all  
is finally here.

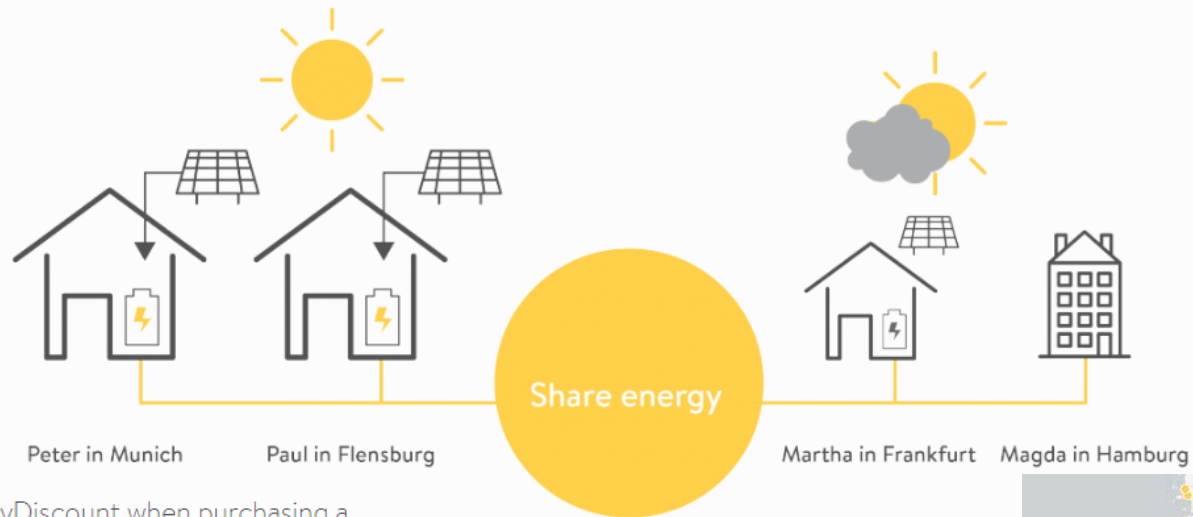
[REQUEST A CALL](#)

[ABOUT SONNENBATTERIE](#)

# Again, Europe also...

## What is the sonnenCommunity?

The sonnenCommunity is a community of sonnenBatterie owners who are committed to a cleaner and fairer energy future. As a member you can share your self-produced energy with other members of the sonnenCommunity. Since you are exclusively using energy from the community, there is no need for a conventional energy provider anymore.



- 1,875 € (gross) CommunityDiscount when purchasing a sonnenBatterie.
- 10 years guarantee on your sonnenBatterie.
- Energy from 23 Cent
- Extensive software updates for all existing functions.
- Free weather forecast updates.
- Free energy usage optimisation to match weather predictions for your home location.
- Free remote maintenance and monitoring.
- Intelligent usage control.
- Low-priced energy from the sonnenCommunity.


14,746,807 kWh

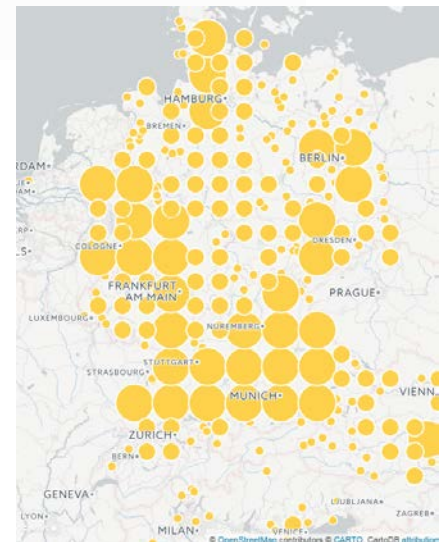
Feed-in (last 12 months)

8,240,783 kWh

Grid consumption (last 12 months)

8,980,805 t  prevented CO2

718,464  to produce this amount of CO2



# Solar panels and home battery packs

## IKEA home solar panels and battery storage

Bring a little  
sunshine into  
your home

We know that you care about the world you live in, and so do we. That's why IKEA is bringing the world's most sustainable energy source to your home.

**Find out how much you can save...**

Include battery storage? NO  YES

**GO**

We've teamed up with Solarcentury, the UK's leading solar company; a partnership that can be trusted to deliver the most affordable solar solutions on the market.

**IKEA®  
FAMILY**  
15% off for IKEA FAMILY members

**An average household can save up to £380\* on their annual electricity bill.**



# Solar panels and home battery packs

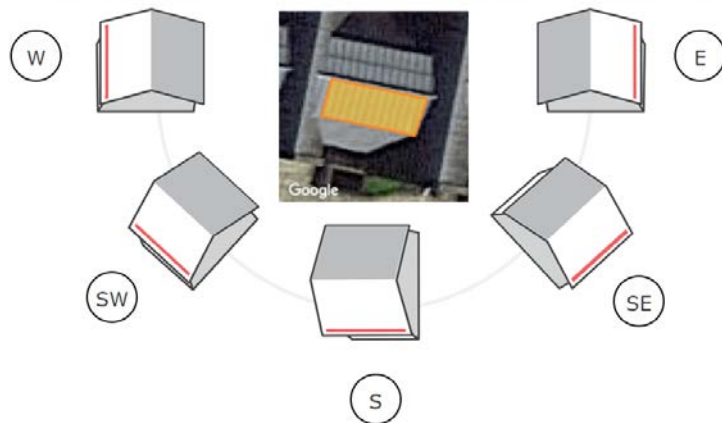
## IKEA home solar panels and battery storage

### Building details

1. Zoom in and point to the corners of the sunny side of your roof



2. Great! Now choose the icon that reflects the position of your gutter



Next

Your estimate

- Size **21.0m<sup>2</sup>** ⓘ
  - Orientation
  - Pitch
  - Time of day use
  - Access
- ① ② ③ ④ ⑤

### Your results

The table shows your savings and cost. This is very much an estimate at this stage. You can receive a much more accurate assessment of solar for your home by requesting a quote. [Check the assumptions.](#)

Option	Rooftop	Rooftop PLUS	Built-in PLUS
No. of panels	12	12	13
Panel	Canadian Solar 270W	JA Solar 280W	Sunstation 270W
Include battery storage		No <input type="radio"/> Yes <input type="radio"/>	
Year one savings	£339	£348	£359
Savings over 20 years	£10,038	£10,288	£10,591
Cost of system	£4,848	£5,325	£6,500

# Is the future distributed?



# The future is integrated



**MITEi**  
MIT Energy Initiative

# UTILITY OF THE FUTURE

An MIT Energy Initiative response  
to an industry in transition

In collaboration with IIT-Comillas



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# We need to move to the implementation phase!

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*“L'avenir, tu n'as point à le prévoir mais à le permettre”  
Citadelle, Antoine de Saint-Exupéry, 1948*

**“The future, you do not have to foresee it,  
but to enable it”**

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Update electricity  
markets design

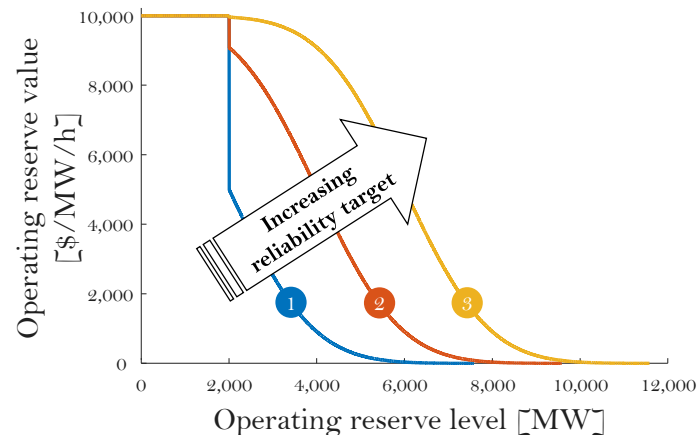
# Part 2: Understanding distributed energy resources (DERs) and the new ways of providing electricity services

## IMPROVE WHOLESALE MARKET DESIGN TO BETTER INTEGRATE DERS

Reward **flexibility** improving bidding formats, time granularity and reserves pricing and **evolve RES support mechanisms** for a **level playing field** for all technologies

# Updating wholesale market design

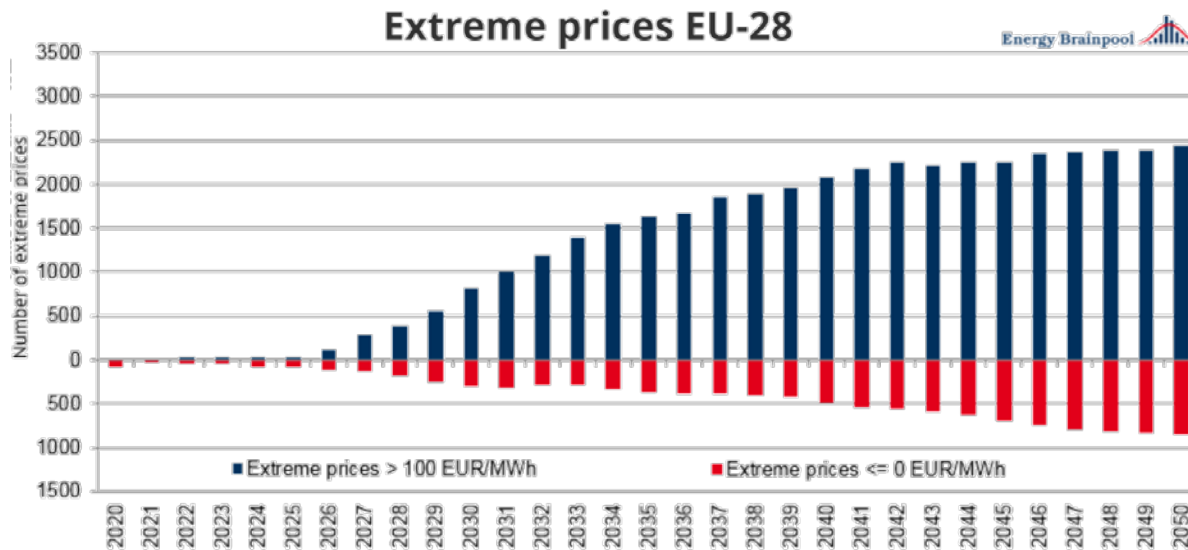
- **Market mechanisms to enhance efficiency in short-term operations and long-term investment**
  - Participation of DERs in wholesale and ancillary services markets
  - E.g. bidding formats in short-term markets, ORDCs, etc.





# Updating wholesale market design

- **Efficient regulatory interventions, such as:**
  - Intraday and balancing markets
  - Capacity remuneration mechanisms
  - Technology support subsidies



# Improved network regulation



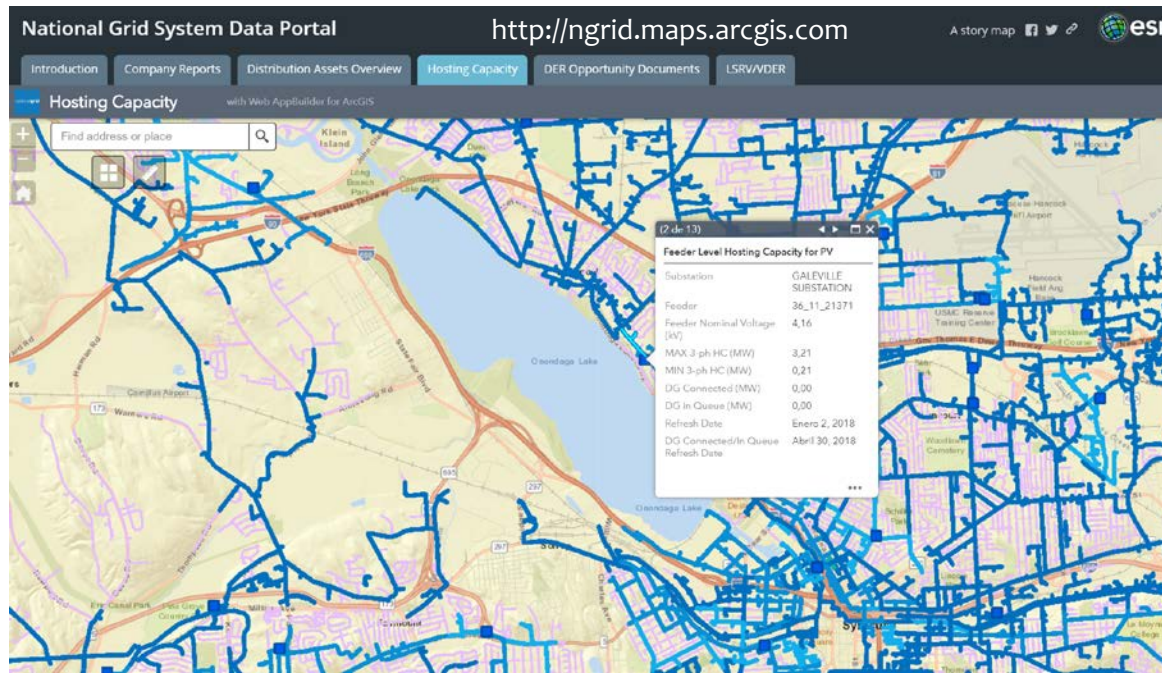
# Part 2: Understanding distributed energy resources (DERs) and the new ways of providing electricity services

## ENHANCE DISTRIBUTION REGULATION

To **enable** the development of more **efficient & innovative** distribution utility **business models**

# Remuneration of distribution

- **TotEx and output-based regulation**
  - Regulatory tools to induce accurate utility forecasts and minimize strategy behavior
  - Incentives for longer-term innovation and demonstration projects



# Remuneration of distribution

## • Non-Wires Alternatives

**REV** CONNECT



**UPDATED OCTOBER 25, 2018**

Non-Wire Alternatives projects allow utilities to defer or avoid conventional infrastructure investments by procuring distributed energy resources (DER) that lower costs and emissions while maintaining or improving system reliability. We invite you to browse the current and upcoming Non-Wire Alternatives procurements of each utility. Responses to open Non-Wire Alternatives procurements should be made directly to the offering utility. Do not submit RFP/RFI responses to REV Connect.



**CENTRAL HUDSON OPPORTUNITIES**



**CON EDISON OPPORTUNITIES**



**NATIONAL GRID OPPORTUNITIES**



**NYSEG OPPORTUNITIES**



**ORANGE AND ROCKLAND OPPORTUNITIES**



**RG&E OPPORTUNITIES**

# Revisit industry structure



# Part 2: Understanding distributed energy resources (DERs) and the new ways of providing electricity services

**RETHINK INDUSTRY STRUCTURE TO  
MINIMIZE CONFLICTS OF INTEREST**

**Responsibilities and independence of network providers, system operators and market platforms through unbundling and strict regulatory oversight**

# Revisiting Industry Structure

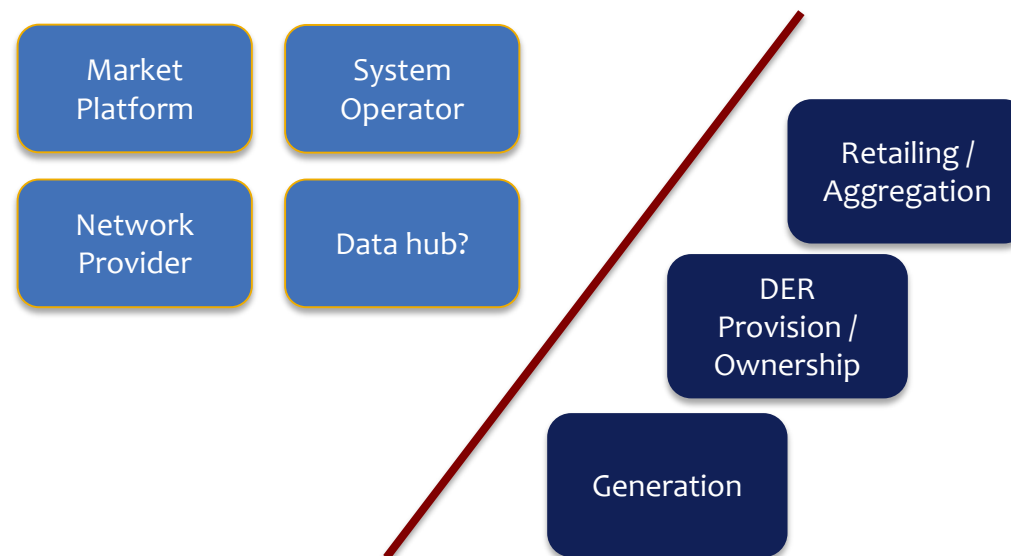
## Value of locational services from DERs

	Locational	Non-locational
Power system values	<ul style="list-style-type: none"><li>• Energy</li><li>• Network capacity margin</li><li>• Network constraint mitigation</li><li>• Power quality</li><li>• Reliability and resiliency</li><li>• Black-start</li></ul>	<ul style="list-style-type: none"><li>• Firm generation capacity</li><li>• Operating reserves</li><li>• Price hedging</li></ul>
Other values	<ul style="list-style-type: none"><li>• Land use</li><li>• Employment</li><li>• Premium values*</li></ul>	<ul style="list-style-type: none"><li>• Emissions mitigation</li><li>• Energy security</li></ul>
	* Private values; do not need to be reflected in prices and charges	



## Role of network and system operators

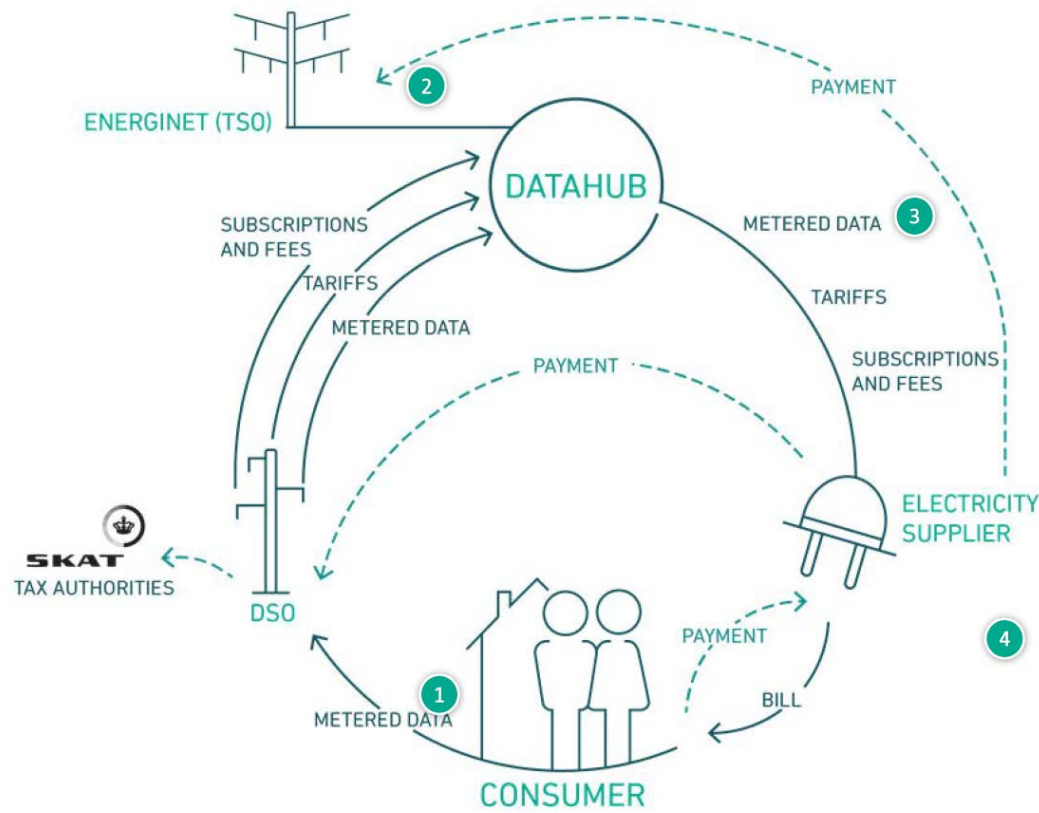
- **Independent or otherwise – in future system operations?**
  - DSO – DNO – Retail unbundling?
  - Should DNOs own and operate DERs?
  - TSO – DSO coordination?



# Revisiting Industry Structure

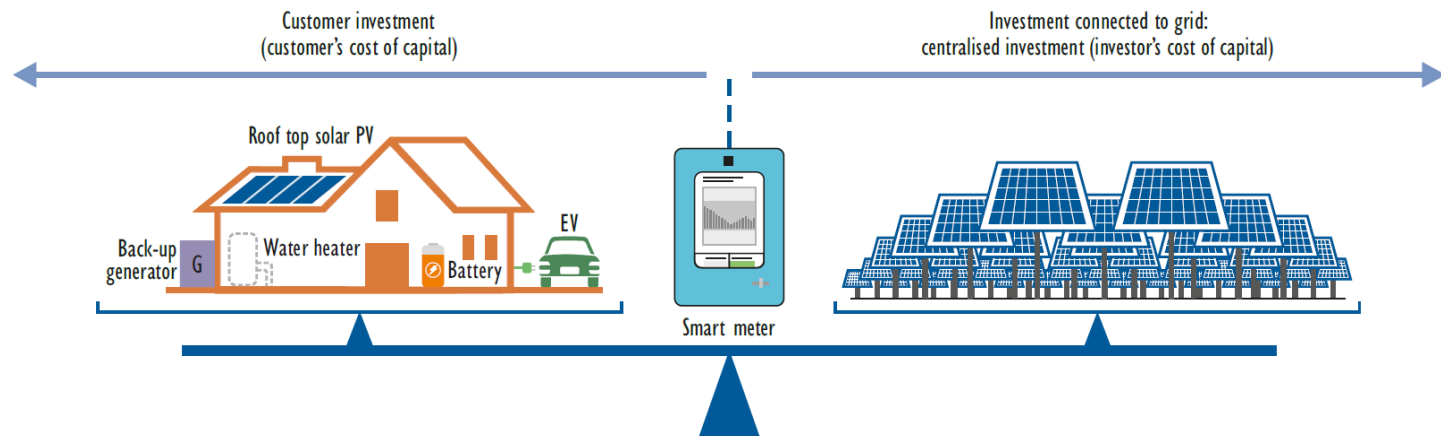
## The key to it all: data

- Is an independent data manager necessary?



# Integrated operation and planning

- How to integrate (wholesale and network) exploitation of investments (eg. storage)?
- Which regulatory business models are need to take the most out of DERs?
  - E.g. rate signals or long term contracts?



# Cost-reflective prices and charges



# Part 2: Understanding distributed energy resources (DERs) and the new ways of providing electricity services

## CREATE A COMPREHENSIVE & EFFICIENT SYSTEM OF PRICES & CHARGES

The only way to put all resources (**centralized & distributed**) on a **level playing field** and achieve **efficient operation and planning**

# Basic principles of rate design

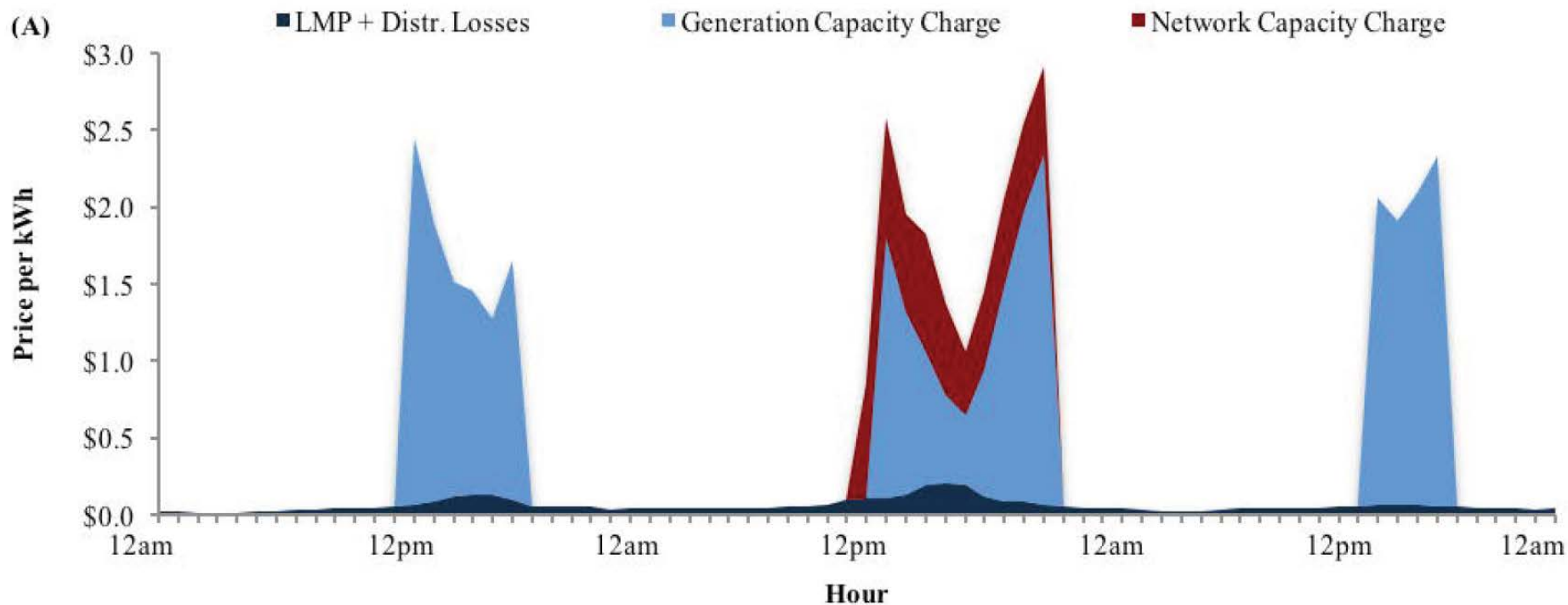
- **Two key objectives that prices and charges should accomplish**

**(1) Send efficient economic signals to the agents in the system, and**

**(2) Recover the regulated costs**

# Efficient redesign of end-user rates

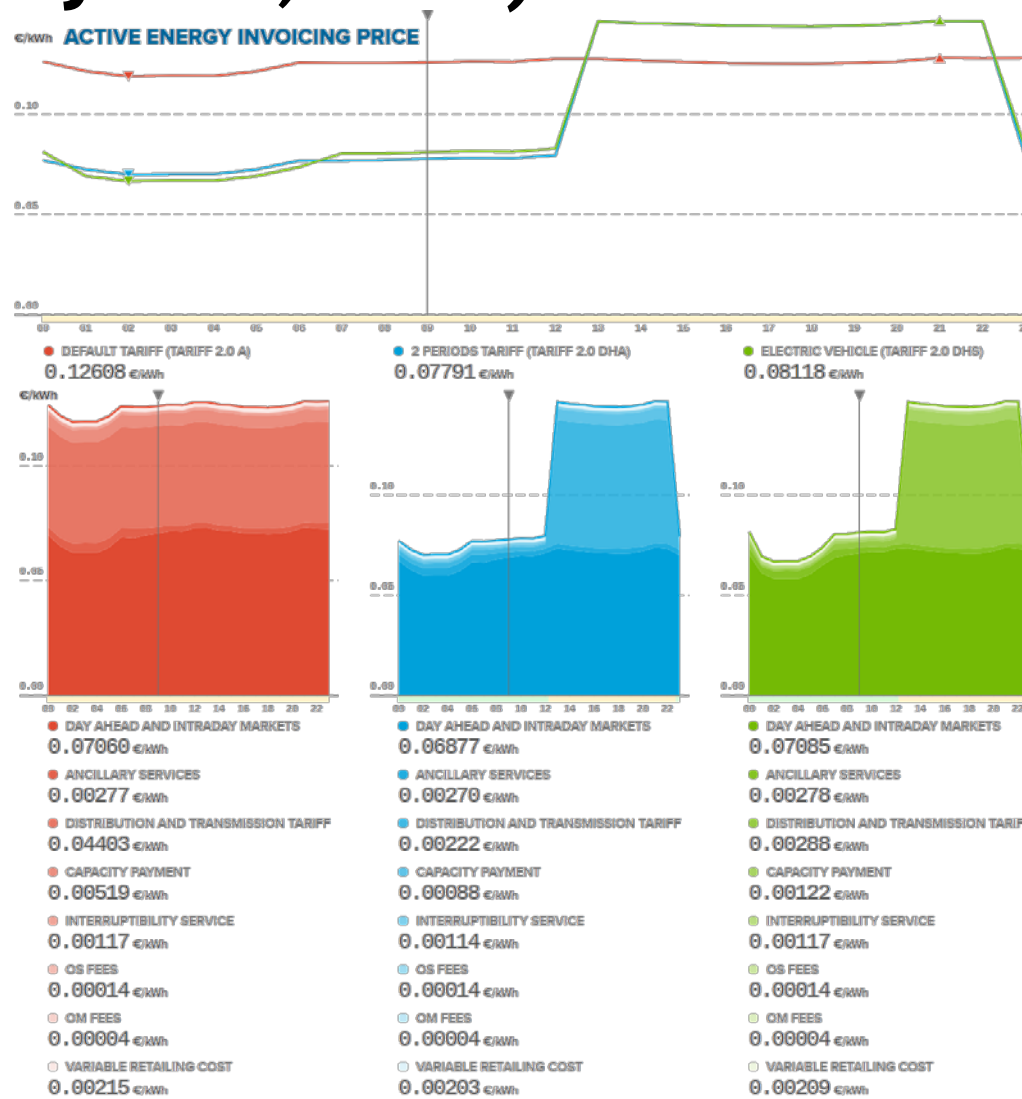
- Forward-looking peak-coincident network capacity charges...  
... and scarcity-coincident generation capacity charges



# Efficient redesign of end-user rates

## Hourly prices

- Spain (July 2nd, 2018)





# Efficient redesign of end-user rates

## Hourly prices

- Spain (Oct., 2017)

### Consumo horario facturado i

MADRID - MADRID

Por factura

20/11/2017 Normal

Entre dos fechas

*(Período máximo 4 meses)*

01/10/2017



31/10/2017



01/10/2017 a 31/10/2017



# Efficient redesign of end-user rates

## Hourly prices, adapted consumption

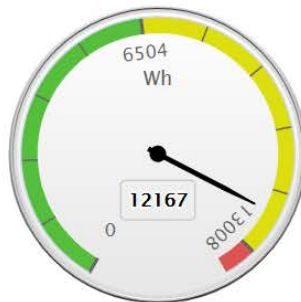
- Spain (Friday, June 29, 2018)

Consumo diario

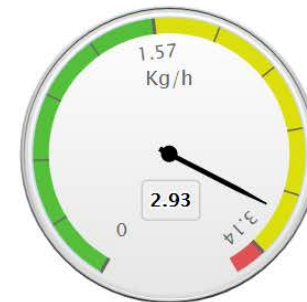
Viernes 29 de junio de 2018



Consumo ⓘ

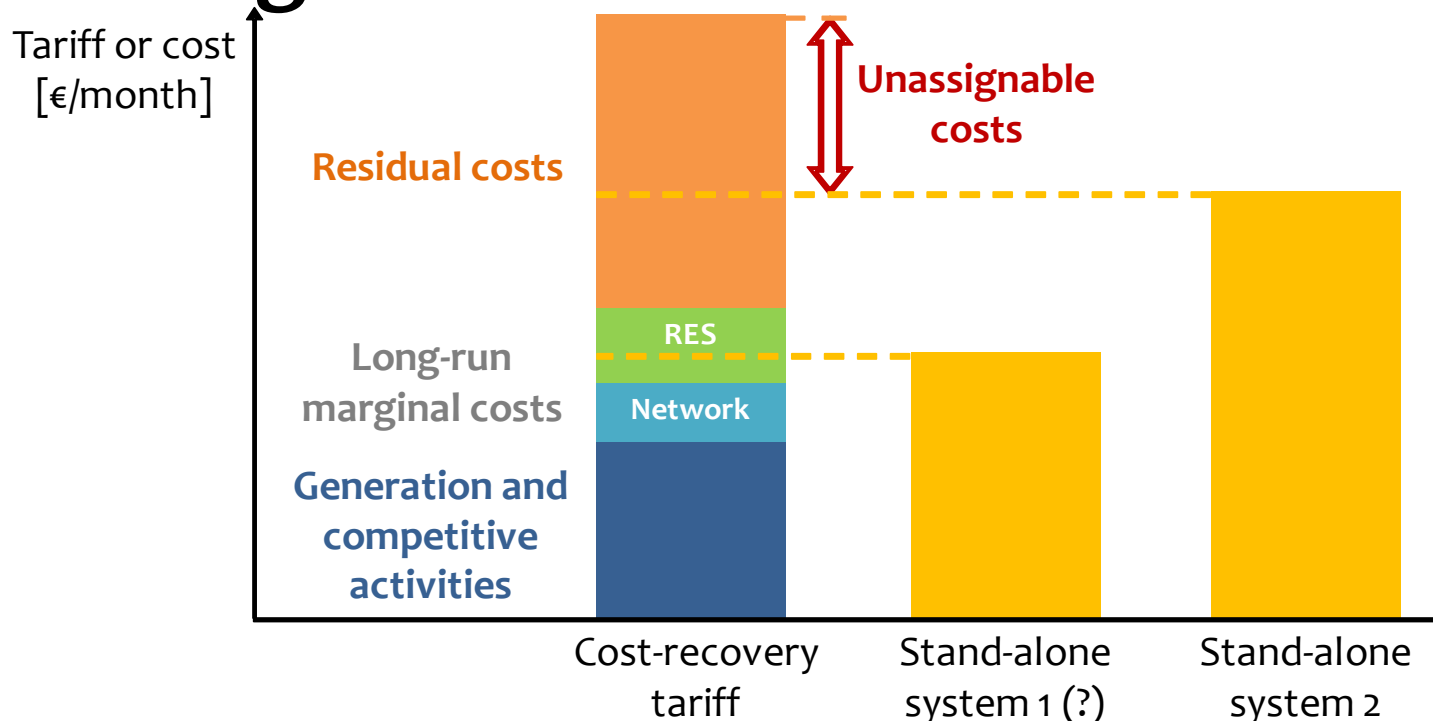


CO<sub>2</sub> ⓘ



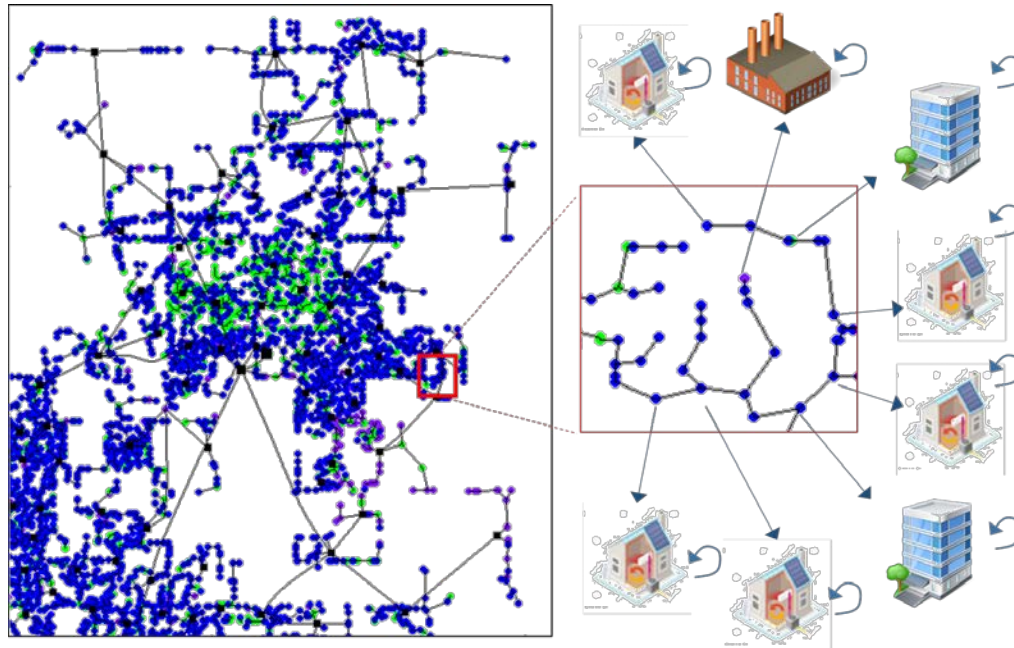
## Allocation of residual regulated costs

- Can recovery of residual network costs be guaranteed?
- Network and policy costs without distorting efficient incentives



## Distributional effects

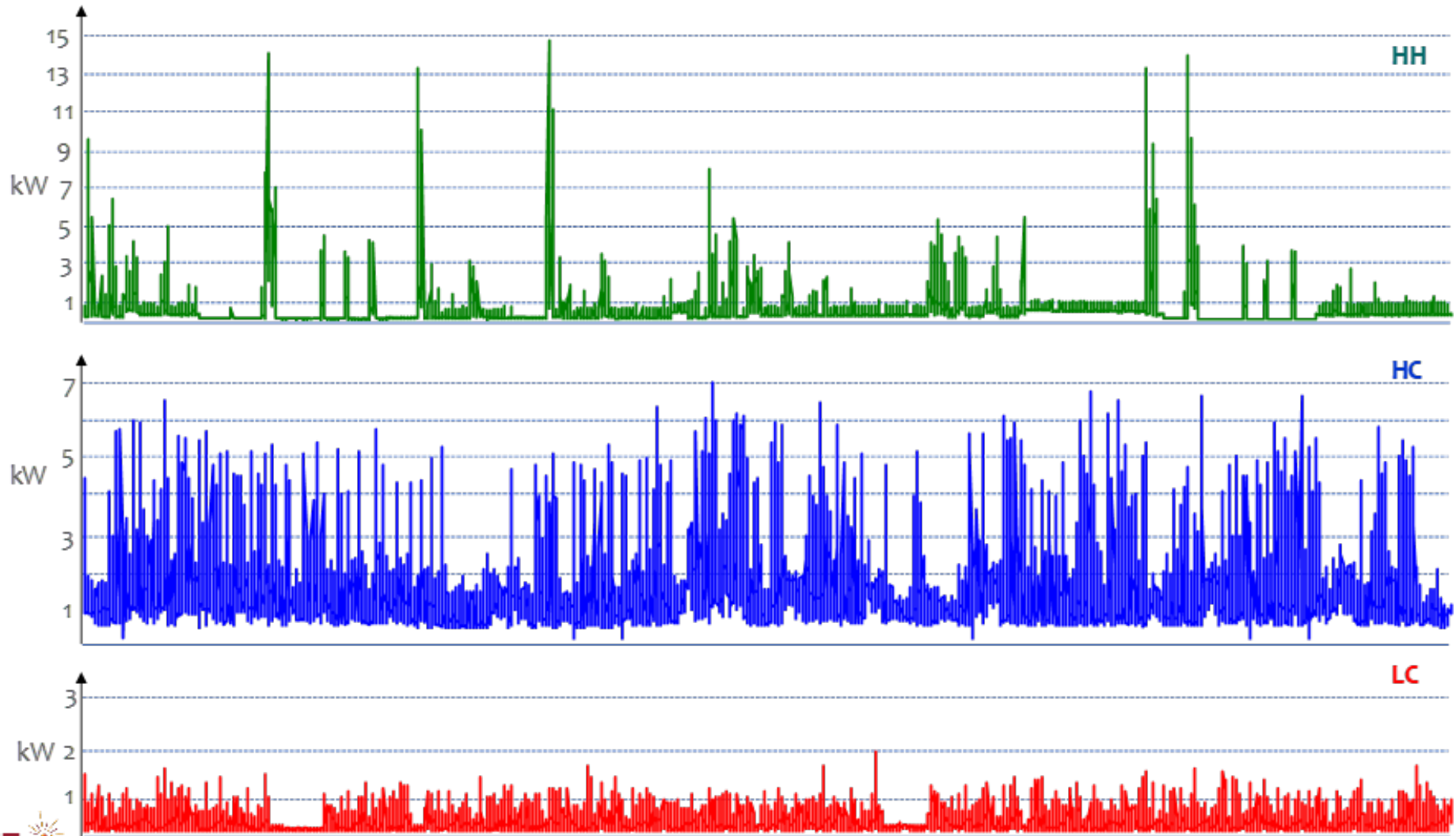
- **Balancing economic efficiency objectives and distributional concerns**
  - How good is good enough for electricity pricing granularity?
    - System efficiency gains vs. implementation costs



# Efficient redesign of end-user rates

## Distributional effects

- Three different real residential consumers



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