

El poder del consumidor en la mejora de la eficiencia energética.

Potencial para la transición energética.

Cátedra BP de Energía y Sostenibilidad Convocatoria GREDS



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Madrid, 6 de junio de 2018



Smartgrid.cat

1. ENERGY TRANSITION

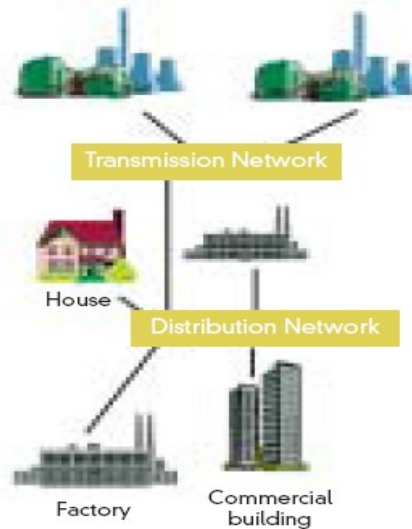
New role for Consumers

CONSUMER & ENERGY TRANSITION

- Passive → **Active** [based on data & digitalization]
- Paying → **Getting revenues** [market participation]
- Individual → **Community** [new business models]

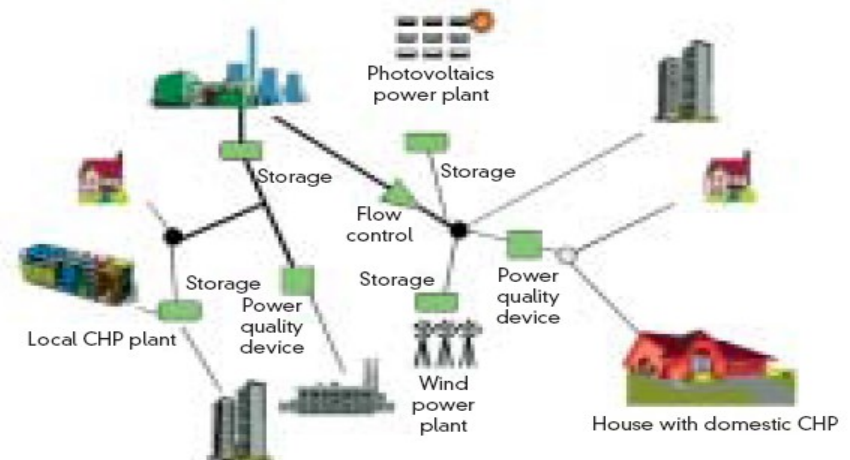
Yesterday

Central power station



Tomorrow

distributed/on-site generation with fully integrated network management



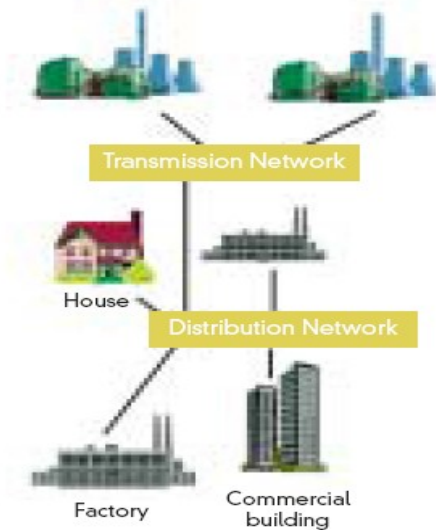
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Central power station



➤ The costs of the electricity system are around 17B€ (2016)

Concept	Cost (2016)	%
Transport networks	€1.709.997,00	10,09%
Distribution	€5.174.169,00	30,52%
Renewables (old)	€6.402.128,00	37,76%
No peninsulars	€382.809,00	2,26%
Interrumpibilidad	€6.530,00	0,04%
Capacity	€421.187,00	2,48%

Concept	Cost (2016)	%
CNMC	€20.559,00	0,12%
Nuclear fuel	€137,00	0,00%
Debt - annuality	€2.840.473,00	16,75%
Adjustments	-€2.091,00	-0,01%
Total	€16.955.898,00	100%

1. ENERGY TRANSITION

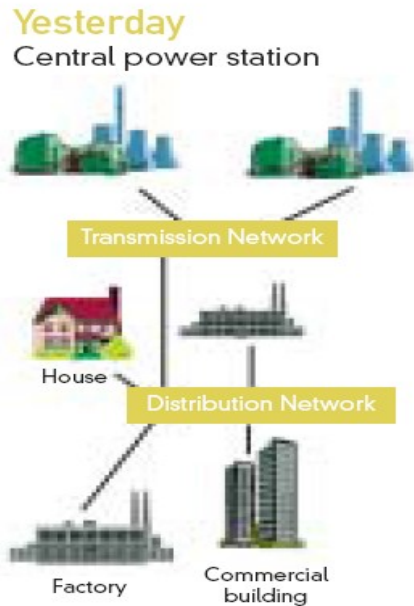
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➤ Consumers: pay **78,8%** (13.359,6 M€) of total costs [Generators: 0,76%]

- ✓ 99.7% are connected to low voltage (residential and SMEs)
- ✓ represent 83.1% of the contracted power and 46.6% of the energy consumed
- ✓ are paying 75.2% of the network charges, but **CAN NOT DECIDE / PARTICIPATE**



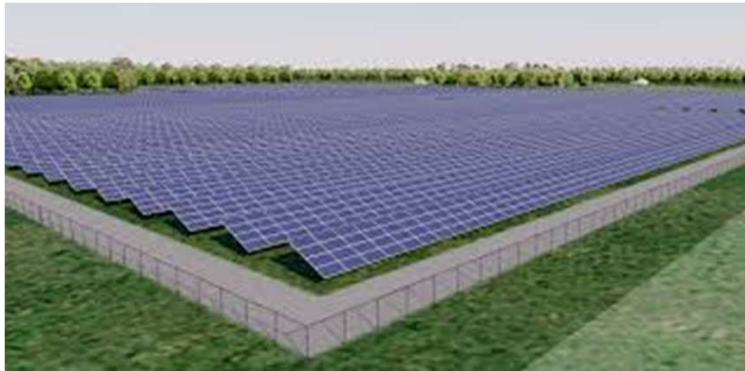
Tensión	Tarifa	Num. consumidores	%	Potencia (MW)	%	Energía (GWh)	%	Contribución (M€)	%
Baja	2.X.Y	27.851.301	97,1%	122.507,00	71,1%	75027	31,7%	7.940.487,00	59,4%
	3.0	733.963	2,6%	20.661,00	12,0%	35214	14,9%	2.103.674,00	15,7%
Media	3.1	87.325	0,3%	6.394,00	3,7%	15927	6,7%	846.926,00	6,3%
	6.1.X	20.385	0,1%	13.508,00	7,8%	58280	24,6%	1.861.560,00	13,9%
Alta	6.X	2.648	0,0%	9.192,00	5,3%	52.341,0	22,1%	606.483,00	4,5%
Total		28.695.622	100%	172.262,00	100%	236.789,0	100%	13.359.130,00	100%

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- Economy of scale
- Optimization (O&M, location, ...)

Vs



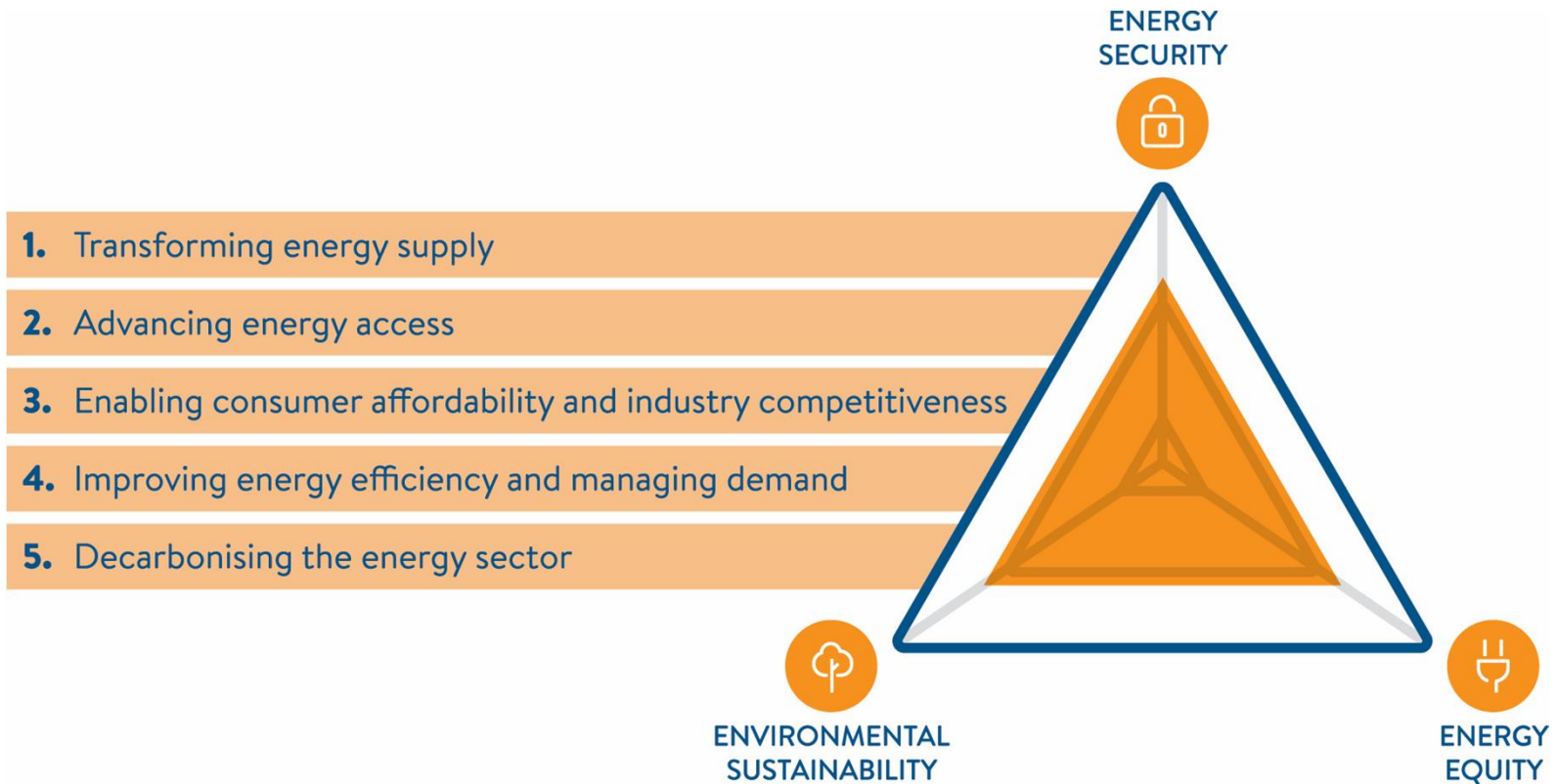
- Consumer centric approach
- Resilience (+++ security of supply)
- Energy affordability for consumers
- Market competition (retailer)
- Efficiency (reduction of losses)

2. ENERGY TRILEMMA

Potential of Consumers

CONSUMER & ENERGY TRILEMMA

- Energy **affordability** = f (cost of energy – revenues for services)
- **Diversification & Security of supply** (DR, sizing, location, ownership)
- **No CO₂ emissions and reduction of losses**



2. ENERGY TRILEMMA

Potential of Consumers

- Multiple power sources (different sizes and location) to increase resilience
- Potential use of batteries (islanding mode)
- Smart Home (demand response)
- (Re)Definition of quality of supply (based on price)

CONSUMER & ENERGY TRILEMMA

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2. ENERGY TRILEMMA

Potential of Consumers

- - GHG emissions thanks to
 1. Active measures (energy efficiency, labelling)
 2. Passive measures (insulation, design)
 3. Behaviour (change of)
- Electrification (mobility, heating/cooling)
- Generation (self-consumption, ownership of REN)
- Energy choices (eg green energy, products and services)
- Environmental impact of REN facilities
- Education

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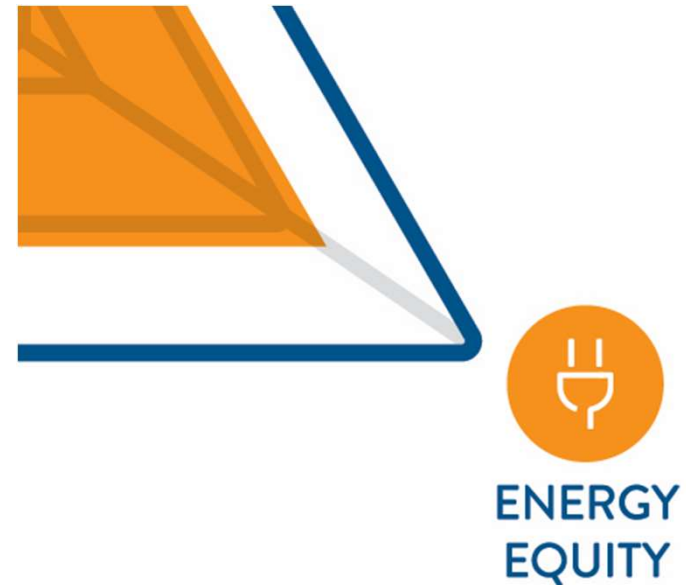
2. ENERGY TRILEMMA

Potential of Consumers

- Cost savings (due to efficiency and load shifting)
- Revenues (selling services to energy & balancing markets)
- Increase Competition (energy retailers, energy communities)
- New Business models (based on services, instead of kWh)
- Innovative financing schemes
- Tariffs

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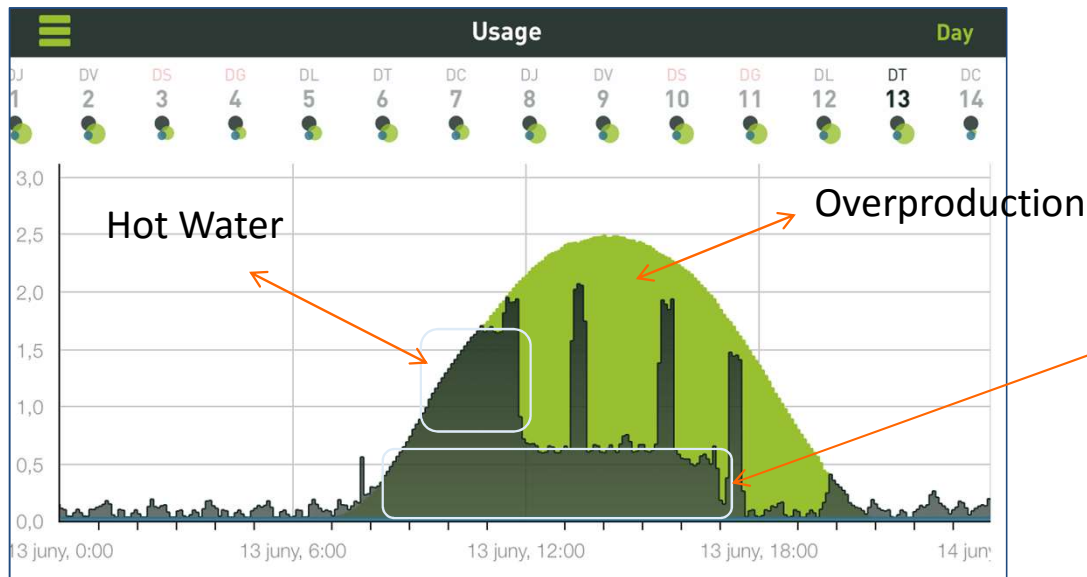
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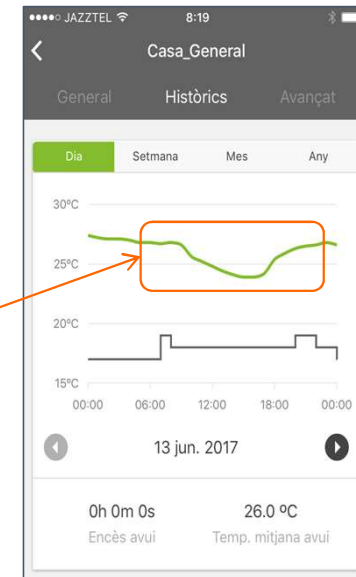
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Solar production and consumption (2017 June, 13)



T^a at home

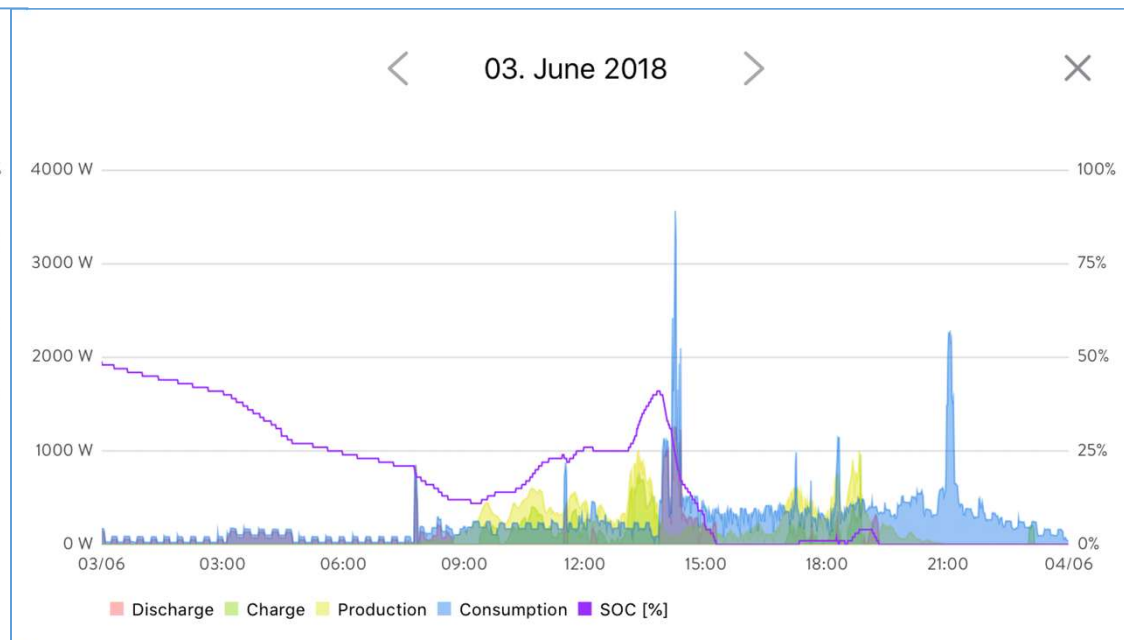
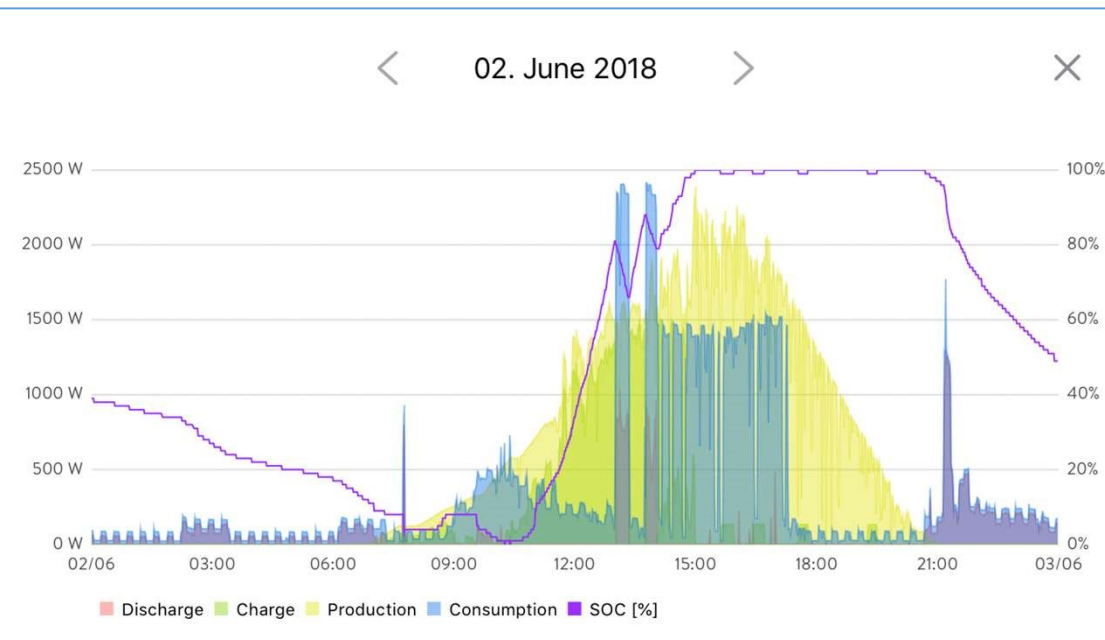


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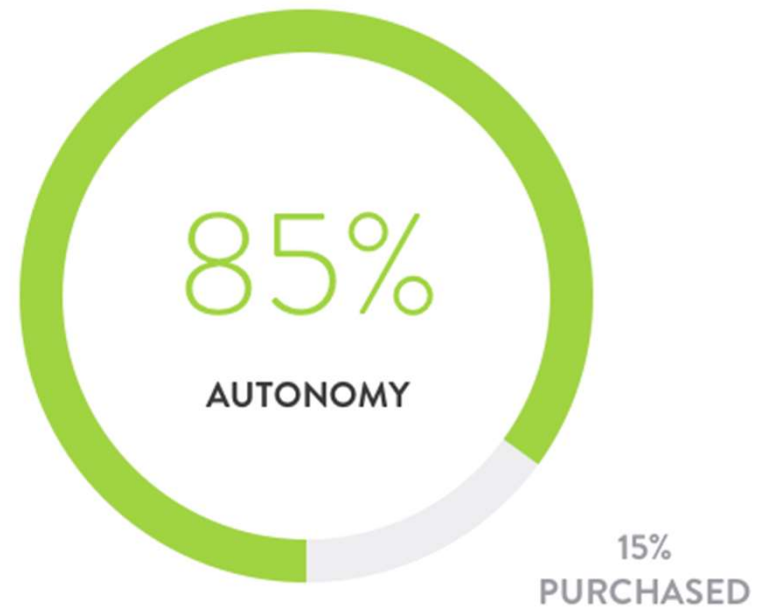
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04. May - 02. June

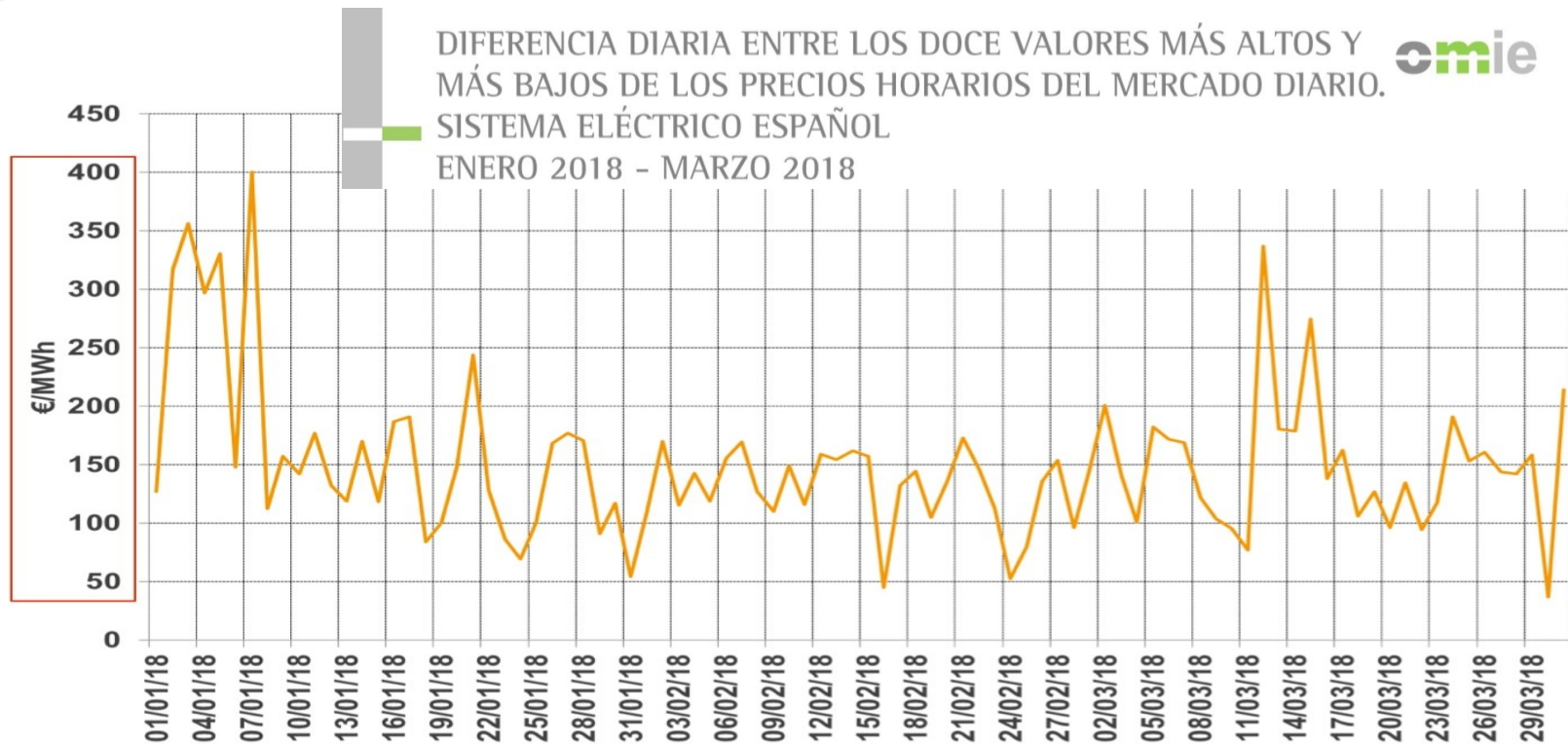


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Potential of Consumers

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Enercon E-103 EP2 – 2,35MW

31st May 2018: 1.500 h; 986.926 kWh

El primer molino eólico comunitario del sur de Europa se inaugura en...

La ONG considera que este tipo de iniciativas demuestran que es posible obtener energía limpia, que no emita CO2 y sin depender de las grandes...

expansion.com

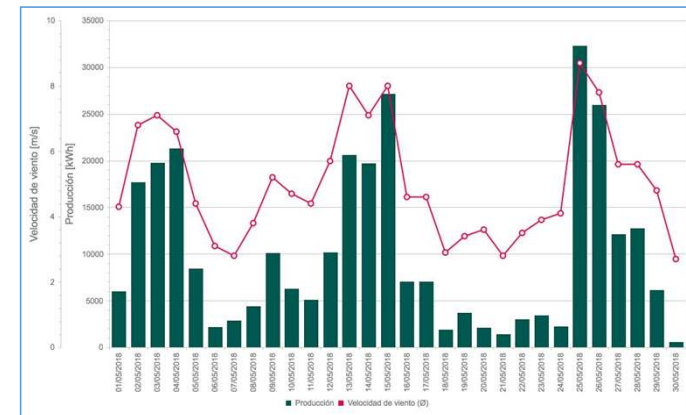
<http://www.viuredelaire.cat>

Participació en el projecte

Entitats participants, nombre de persones preinscrites i import dels compromisos d'aportació

PARTICIPAR

Data	Nombre de persones/entitats	Aportacions compromeses (€)
01/06/2018	533	2.366.380



2. ENERGY TRILEMMA

Potential of Consumers

<https://www.ecrowdinvest.com/>

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Energia

Energía solar y depuración de aguas para nuevo albergue ecológico - La Granja de Flix

Finançament col·lectiu de la instal·lació fotovoltaica aïllada i del sistema de depuració...

100%

IMPORT : **120.250€**
INTERÈS ANUAL:
TERMINI: **84 MESOS**
INVERSORS: **146**



Energia

Eficiencia energética para estaciones aisladas de telefonía móvil - Fase 1

Inversions destinades a l'eficiència energètica amb la reducció del consum d'energies fòss...

100%

IMPORT : **139.775€**
INTERÈS ANUAL:
TERMINI: **48 MESOS**
INVERSORS: **126**



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100%

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Energia

Red local de energía para población aislada - ENERKIA-1 - Fornells de la Muntanya

Millora de la gestió energètica de la zona amb la substitució del consum de gasoil per gas...

100%

IMPORT : **100.425€**
INTERÈS ANUAL:
TERMINI: **84 MESOS**
INVERSORS: **148**

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Octava isla | Experiencia piloto para la penetración de renovables



Nombre:

Fecha: // Placas y cámara de vigilancia (en primer término) en el techo de la cofradía de pescadores de La Graciosa, en una imagen captada ayer. | A.F.

El sol carga las pilas de La Graciosa

Un proyecto constata la capacidad de la Isla para generar, almacenar y distribuir su producción energética solar ■ El recibo mensual de la luz puede bajar el 30%

La acción se denomina Graciosa, como el nombre de la Isla, iniciales de Generación Renovable con Almacenamiento y Consumo Inteligentes para la Operación de Redes de Distribución con Sistemas de Autoconsumo.

La implantación de ese sistema supondrá un ahorro del 30% en la factura mensual de la luz para los usuarios. De momento, en los ensayos de esta innovadora experiencia han intervenido el colegio Ignacio Aldecoa, la cofradía de pescadores, la oficina del Ayuntamiento de Teguise y dos domicilios particulares, en Caleta de Sebo, en cuyas cubiertas se han colocado placas fotovoltaicas. En determinados

Improvement of penetration of PV in the island from 15% to 45%



2. ENERGY TRILEMMA

Potential of Consumers

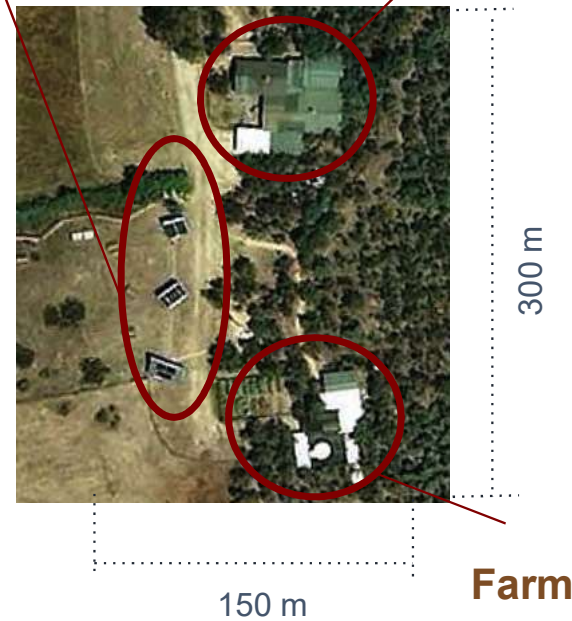
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Farm Masia Mas Roig



PV, wind, micro CHP Masia



2. ENERGY TRILEMMA

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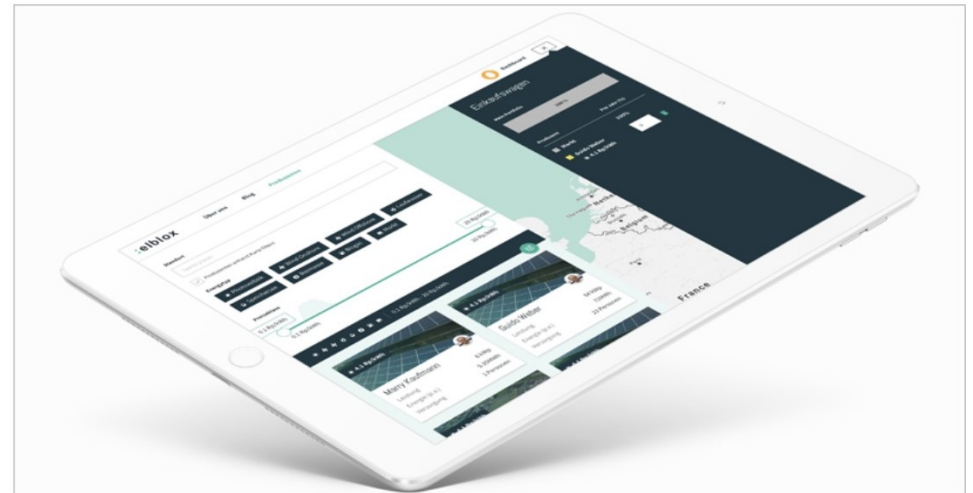
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Prueban una plataforma de compra y venta directa de energía renovable a través de blockchain

Publicado: 15/03/2018



La tecnología blockchain se pone al servicio de pequeños productores de energía renovable y consumidores en Alemania, donde el grupo suizo Axpo está llevando a cabo un proyecto junto con la comercializadora energética local Wuppertaler Stadtwerke (WSW) por el que los clientes pueden elegir su propio mix energético mediante un programa digital que permite a los operadores y propietarios de plantas solares, eólicas, hidroeléctricas y de biomasa la venta directa de electricidad producida a clientes finales.



La plataforma basada en blockchain permite a consumidores en Alemania elegir su mix energético mediante la compra y venta directa de energía renovable de productores locales.

<https://www.smartgridsinfo.es/2018/03/15/prueban-plataforma-compra-venta-directa-energia-renovable-a-traves-blockchain>

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Virtual Energy Advisor

Your **GPS** for Energy efficiency



- Savings achieved through change of Behaviour
- 200 households (Barcelona area)
- Data from Smart Meters and Submetering

15%

94€

3. LEGAL FRAMEWORK

New Deal for Energy Consumers

CONSUMERS & LEGISLATION: CEP

- Putting energy efficiency first
- Achieving global leadership in renewable energies
- **Providing a fair deal for consumers**



<https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans>



https://ec.europa.eu/energy/sites/ener/files/publication/Energy_consumers_en.pdf

3. LEGAL FRAMEWORK

Consumers Rights

CONSUMERS & LEGISLATION: CEP

- Putting energy efficiency first
- Achieving global leadership in renewable energies
- Providing a fair deal for consumers



1. An electricity connection: have your home connected to the local electricity network and supplied with electricity.

2. A choice of supplier: choose your supplier and enter into contract with any EU electricity and/or gas supplier offering services to you

3. An easy and fast switch of supplier: change your electricity and/or gas supplier in an easy and quick way, without extra charges.

4. Clear contract information and right of withdrawal: receive clear information on your energy contract before signing, and an advance notice if any changes are made to the contract, with the possibility to end the contract if you do not accept the new conditions. You also have the right to withdraw from a new contract within fourteen days if the contract was concluded outside the supplier's business premises or by distance means of communication (such as Internet or telephone).

5. Accurate information on your consumption and billing based on it: have access to accurate information on your consumption of electricity and/or gas in order to regulate your energy consumption, and be billed based on actual consumption.

6. Information on how to use energy more efficiently and on the benefits of using energy from renewable sources: be properly informed on the benefits of using equipment and vehicles using renewable energy and be properly informed on how much energy you use and how to use energy more efficiently.

7. Specific consumer protection measures, if you are a 'vulnerable' customer: receive adequate safeguards, if you are defined as a 'vulnerable customer' by relevant national rules.

8. Easy resolution of complaints and disputes: file a complaint to your gas or electricity supplier and, in the event your complaint is not managed to your satisfaction, send your complaint to an independent body for an inexpensive, prompt and fair out-of-court settlement.

9. An energy performance certificate for your home: receive information about the energy efficiency of the property you wish to buy or rent.

10. A national contact point for energy: contact a single point in your country where you can find more information on these rights.

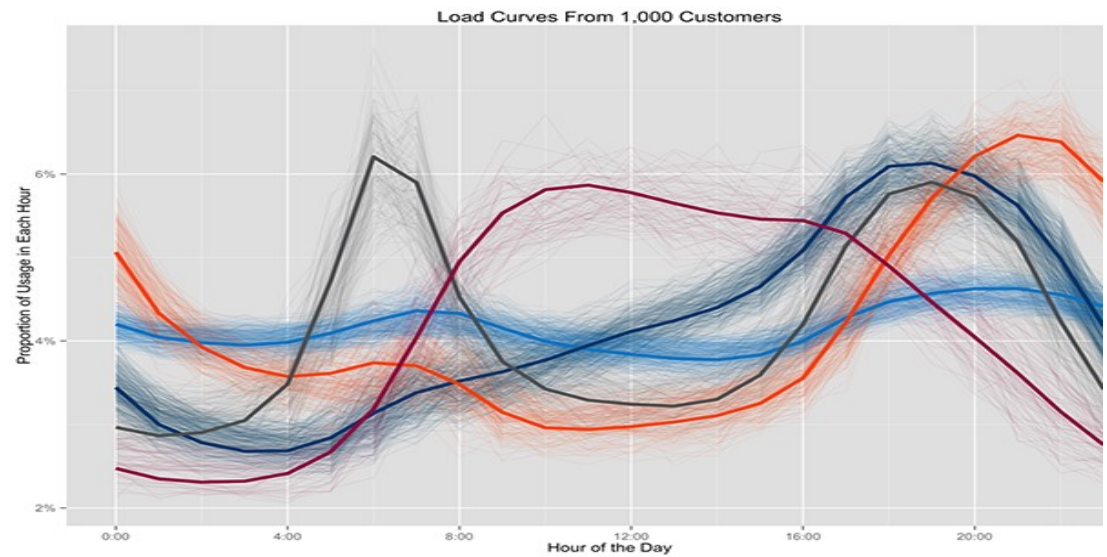


4. CASE STUDI #1

Smart Meter Data Acces

DATA ACCES & CONSUMERS

- Consumer's **right**
- **Energy savings** and change of behavior
- Enabling **new business** based on product and services



Source: Opower (2014)

4. CASE STUDI #1

Smart Meter Data Acces

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Directive 2009/72/EC

Common rules for the internal electricity market

Countries are required to conduct CBA for smart meter deployment

For positive CBA:
80% smart meter deployment by 2020

Article 41 requires member states to create well-functioning and transparent retail markets to **facilitate access for new entrants**

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Directive 2012/27/EC - Energy Efficiency Directive

Utilities need to bill customers on actual consumption, and provide **real time and historical data**

9.2 (d) Metering data is made available to consumers or to a third party

10.3 (a) Energy billing and historical consumption data should be made available at the request of the consumer to an **energy service provider designated by the consumer.**

Directive 95/46/EC on the protection of personal data

Consumer data rights:

Freedom to transfer from one service provider to the other

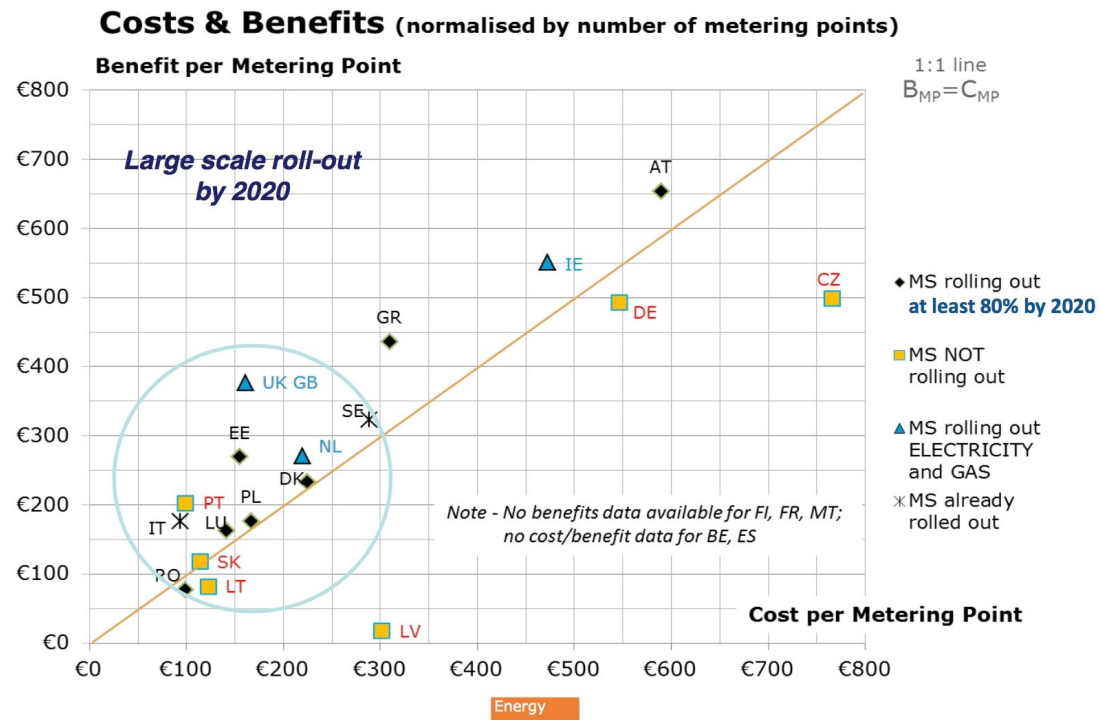
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Smart metering for electricity – costs & benefits



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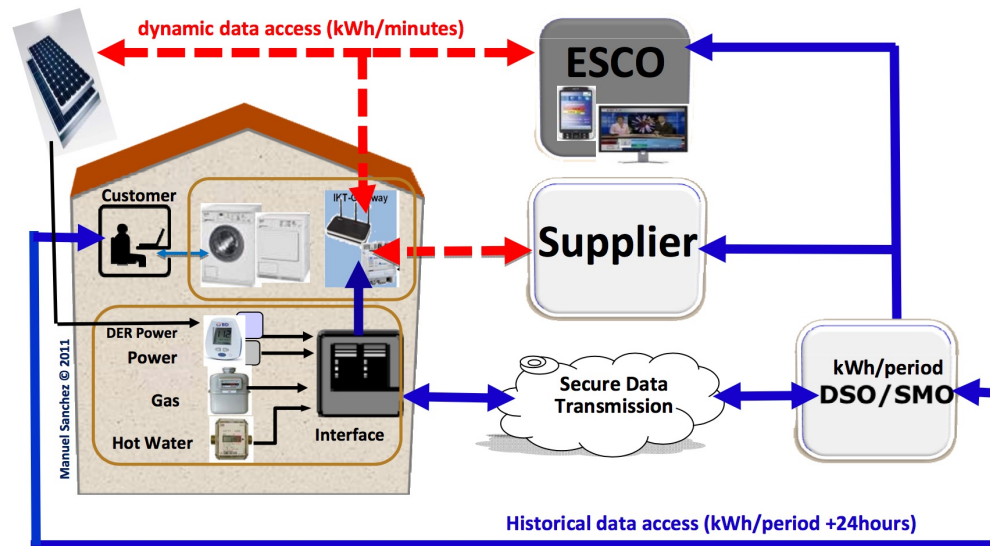
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Open model for consumption data flow – an example

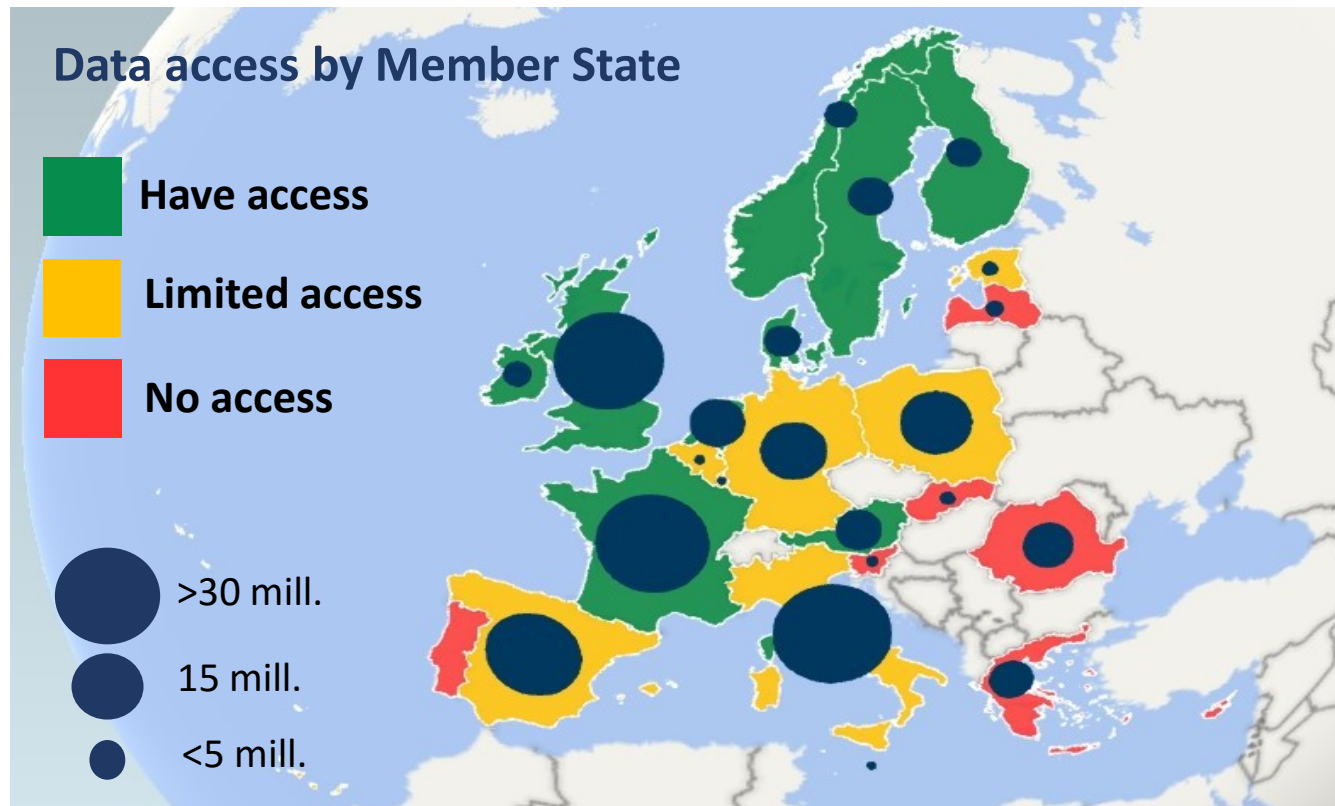


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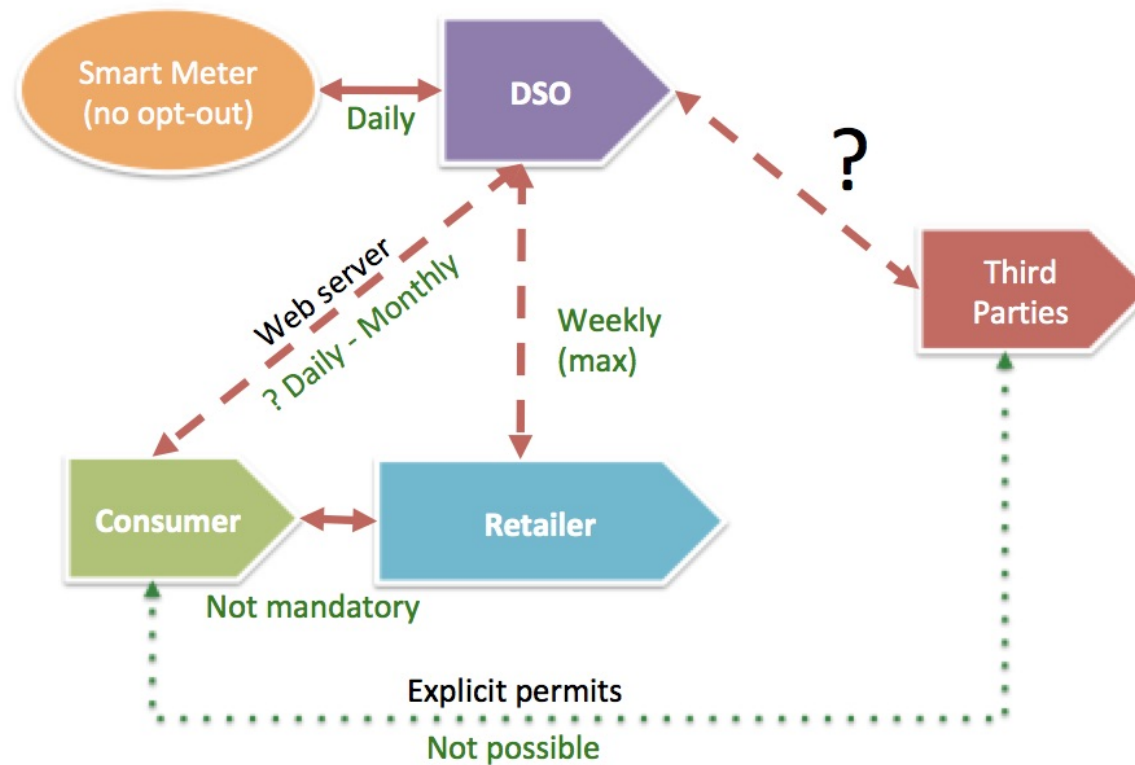
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Data access in Spain



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- **Cost:** charged into the **costumer's electric bill** and regulated cost
- Opportunity cost: **Lack of information** to the consumer and **not polite enough**
- Consumer can not decide when. No **Opt-out**
- O&M: [Catalonia] **one unique vendor** (no competition)
- Complex and **difficult process to sing-up** into the data portal
- **Quality of information** depends on the DSO
- **Confuse branding** between DSO (regulated activity) and retailer (liberalised)
- **Access to third parties not possible**
- **Not neutrality** in data access
- **Hourly-based tariff** only for consumers with regulated contract (PVPC)

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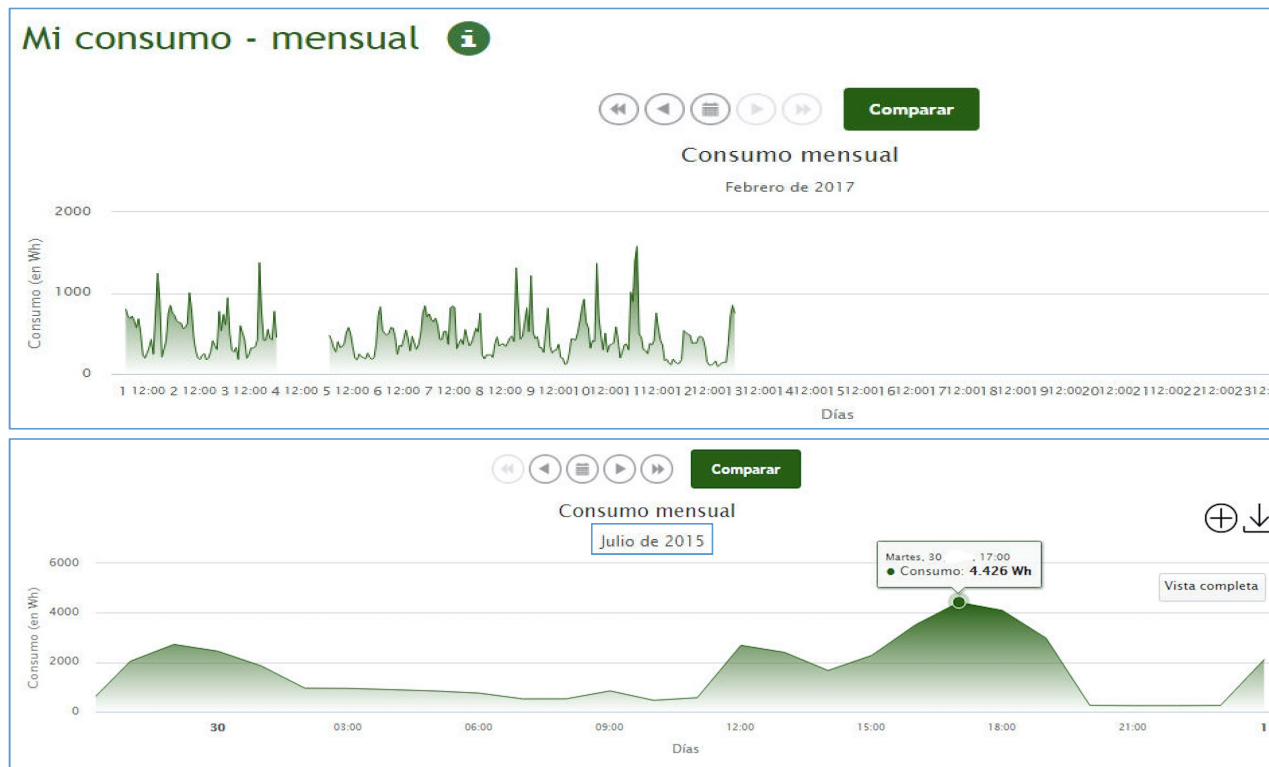


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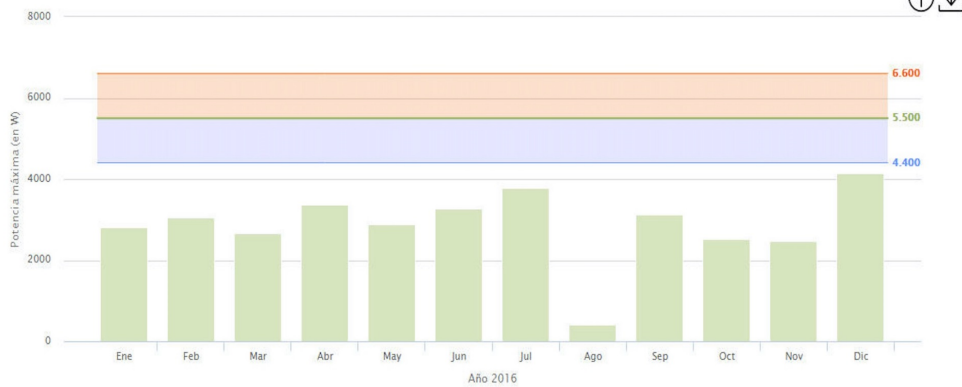
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¿Qué potencia necesito? 



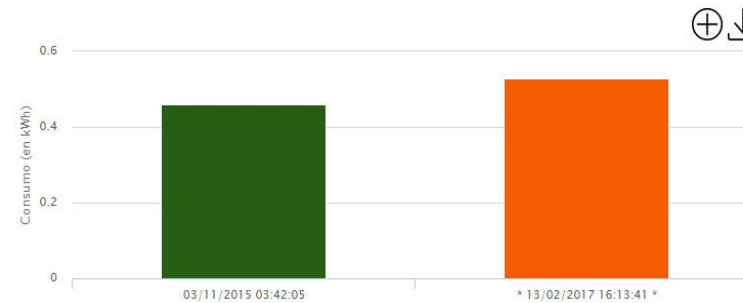
POTENCIAS MÁXIMAS REGISTRADAS



Pot. máx. mensual Pot. contratada Pot. inferior Pot. superior

Acceso on-line al contador 

Compruebe su consumo actual de forma instantánea pulsando sobre el botón Nuevo escenario. Puede grabar hasta 10 mediciones distintas para comparar diferentes escenarios.



Borrar escenario

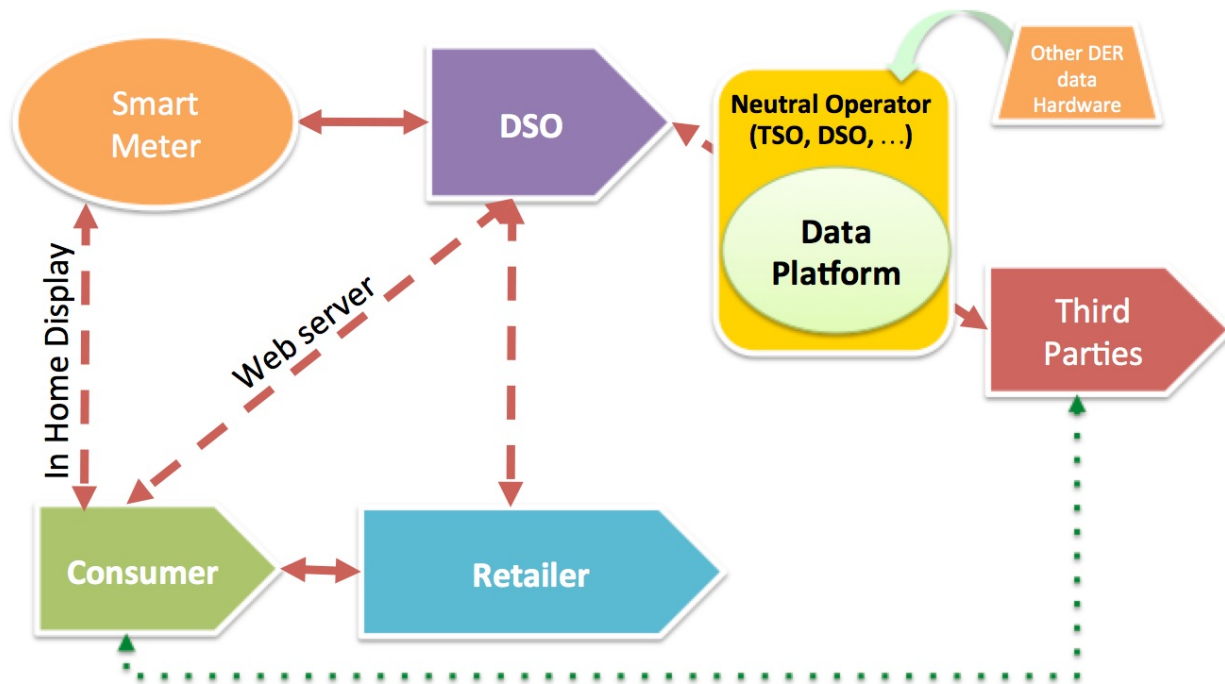
+ Nuevo escenario

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TRANSITION NEEDS DATA

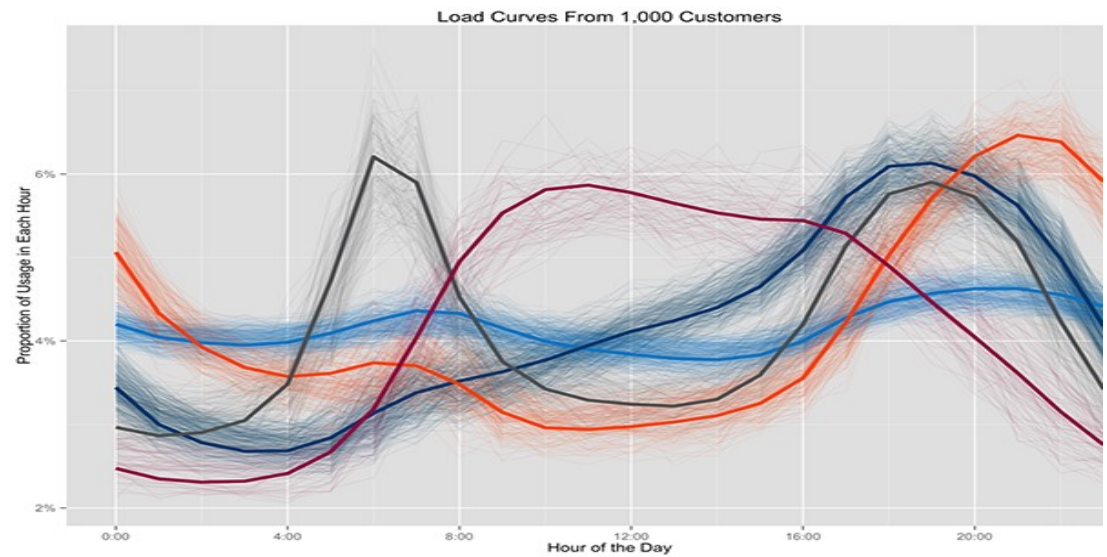
- **DATA PLATFORMS:** enable DER data access to third parties (cities, companies, municipalities ...) with the consent of citizens to leverage new energy services.
- **INTEGRATION and INTEROPERABILITY** of DER and its reliable management. E.g. DSP New York (integrated system planning, Grid operations, market layer).
- **QUALITY:** Provide System Data at the level of granularity and timeliness appropriate for the market
- **PRIVACY** data belongs to consumer and requires his explicit permit to be transferred (consumer's right)

5. CASE STUDI #2

Aggregation of DER

DATA ACCES & CONSUMERS

- Consumer's **right**
- **Energy savings** and change of behavior
- Enabling **new business** based on product and services



Source: Opower (2014)

5. DEFINITION

Function of Aggregation (what really matters)

LEGAL FRAMEWORK (what ' s coming ?)

Clean Energy Package – Legislative (needs transposition to MS 2019-2020)

Balancing Guidelines (EB BG) – Network Code (direct to MS 2018-2019)

'AGGREGATOR' (Clean Energy Package): a market participant that combines multiple customer loads or generated electricity for sale, for purchase or auction in any organised energy market. **'INDEPENDENT AGGREGATOR'** is an aggregator that is not affiliated to a supplier or any other market participant.

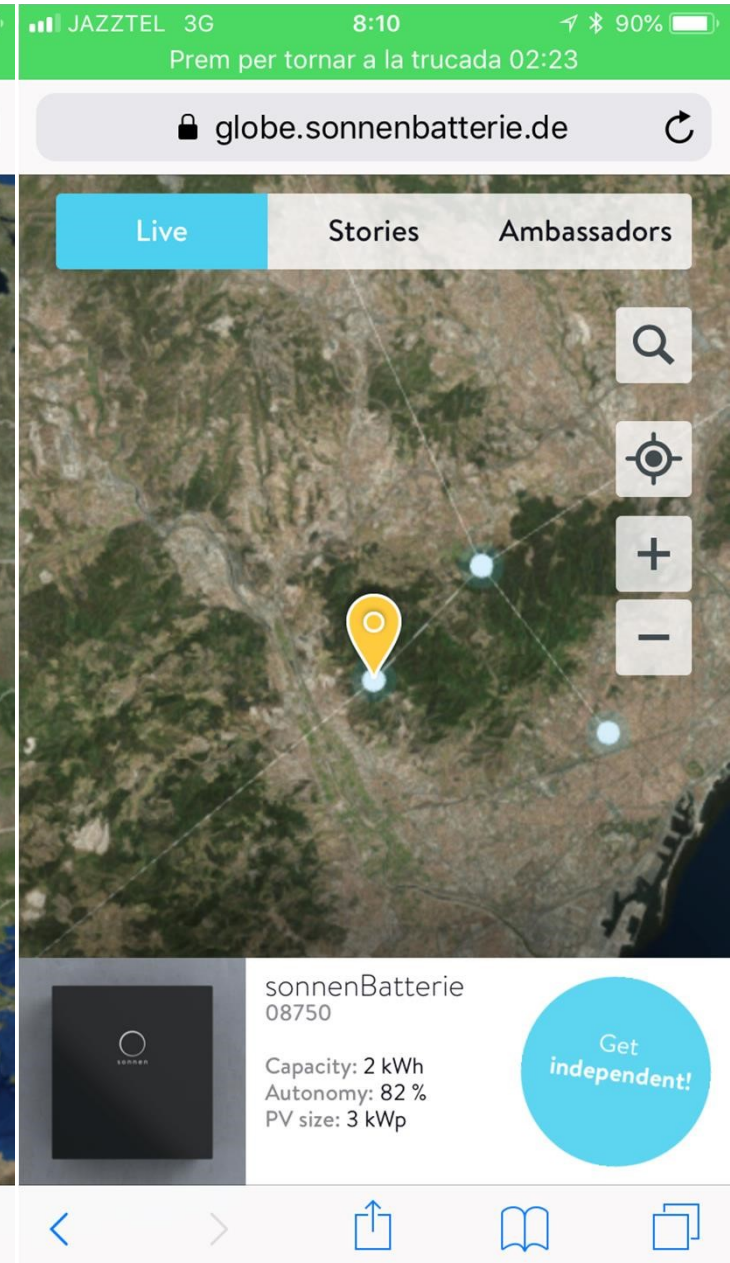
TYPE/PLAYER	Non-Independent Aggregator	Independent Aggregator
<p>VIRTUAL (DER interacts in independent low voltage networks across the region)</p>	<ul style="list-style-type: none"> ➤ “Representante” ➤ Energy retailer 	<ul style="list-style-type: none"> ➤ Assets manufacture (eg. Batteries) ➤ IT developer (eg. Aggregation OS)
<p>PHYSICAL (all DER aggregated are connected at the same low voltage network). E.g. Microgrids, Local Energy Communities</p>	<ul style="list-style-type: none"> ➤ Local System Operator (LV network) 	<ul style="list-style-type: none"> ➤ Local Energy Community ➤ ESCo

5. DEFINITION

Function of Aggregation
(what really matters)

- 30.000 consumers with batteries
- 210MW capacity - VPP

<https://www.reuters.com/article/us-sonnen-batteries-funding/german-solar-battery-maker-sonnen-secures-shell-cash-to-expand-idUSKCN1I00DO>



5. FUNCTIONS

Why is aggregation so important?

SUPPORTING THE WHOLE SYSTEM

- DER Aggregation provides **value** both **to the consumer and the electric system**
- **Development of Balancing Guidelines** (network code) in Spanish market must enable different functions
- **Cost-Benefit Analysis** is necessary to prioritise

REGULATED MARKET	LIBERALISED MARKET	SOCIETY
DSO <ul style="list-style-type: none"> - provide flexibility for voltage control and congestion management (reduction of peaks) - reduce investments in grid extension - Congestion Management - Coordinating and controlling DERs 	Consumer <ul style="list-style-type: none"> - Participation in organized markets - reduction of energy bills (self-production, demand response) - consumer's empowerment - local energy communities - behaviour change 	Economy <ul style="list-style-type: none"> - New business models - Creation of local jobs - reduction of network charges - acceleration of urban development - Efficient DER support mechanisms - competition in balancing services
TSO <ul style="list-style-type: none"> - Balancing (Primary regulating) - Secondary Regulation - Tertiary Regulation - Congestion - System Adequacy (peak demand) - Strategic Reserves - Coordinating information exchange between various power markets 	BRP/retailer <ul style="list-style-type: none"> - Spot Market and Intra-day market - optimization of deviations in wholesale market - Self Balancing and Passive Balancing - Hedging and portfolio adequacy - Virtual Power Plants - Customer loyalty 	Environment <ul style="list-style-type: none"> - Reduce energy losses - Less GHG emissions - Healthy cities (less pollutants)

TYPE	DESCRIPTION
ECONOMIES OF SCALE	<ol style="list-style-type: none"> 1. Maximizing DER deployment 2. Provides marketable size 3. Offer resources to the market
ECONOMIES OF SCOPE	<ol style="list-style-type: none"> 1. Sharing knowledge 2. Reduction of transaction costs 3. Market participation cost 4. Increase the value for the consumer 5. Active consumer push
RISK MANAGEMENT	<ol style="list-style-type: none"> 1. Hedge price risks 2. Managing uncertainty of energy price
COMPETITION AND INNOVATION	<ol style="list-style-type: none"> 1. Microgrids and innovative distribution system Markets participation 2. New solutions to consumers 3. Boost innovation

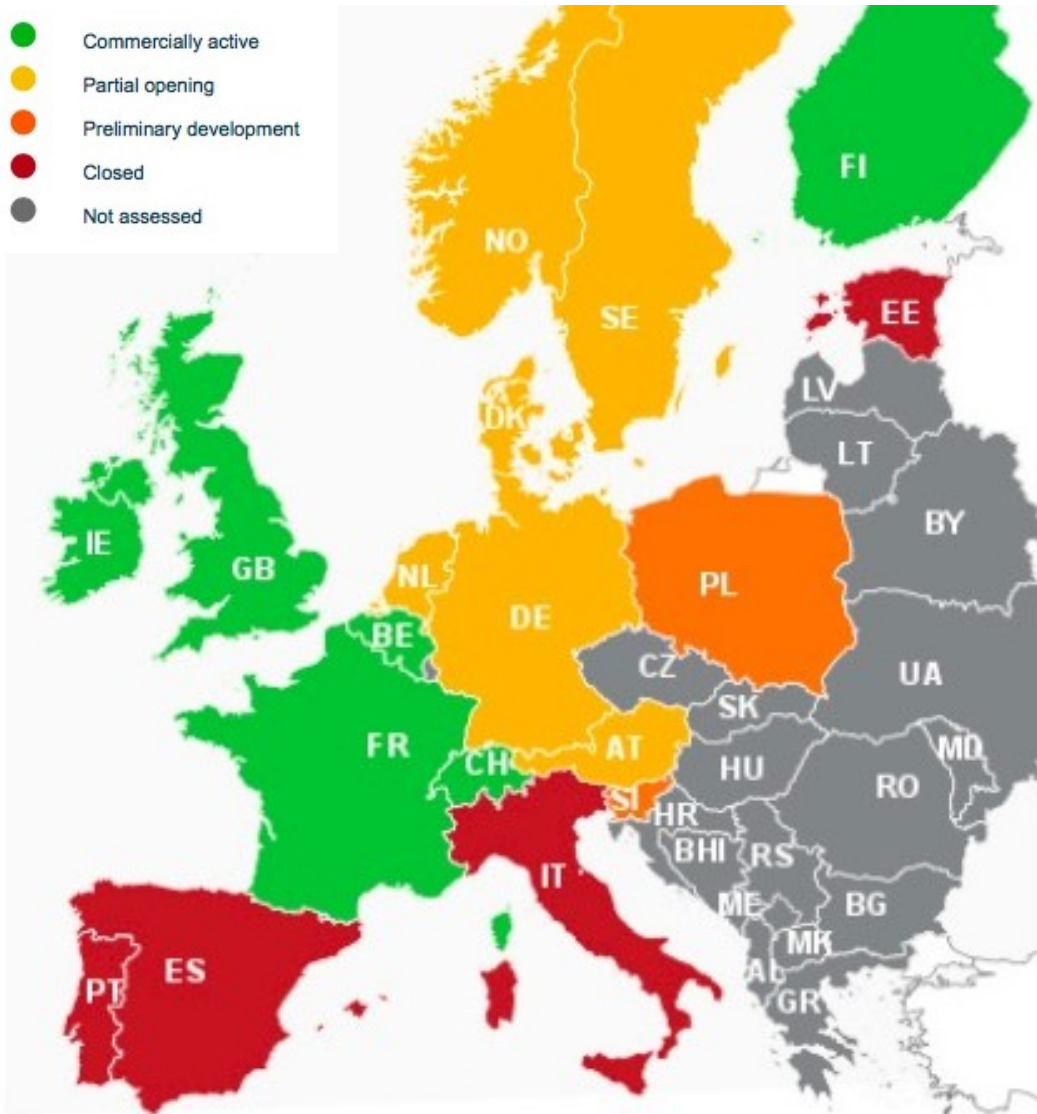
5. SERVICES PROVIDED

Why is aggregation so important?

A G G R E G A T I O N O F D E R

- **Reduces the cost and LCoE** (economies of Scale)
- **Increase the revenues** (enable market participation of DER).
- **Reduce Risk for all stakeholders** (technical and financial)

Source: Adapted from 'The Utility of the Future' MIT



Map of explicit Demand Response development in Europe 2017. Source: SEDC

5. STATE OF THE ART

An European overview (2017)

TODAY IN EUROPE (2017)

- The most advanced countries (Ireland, UK) enable both **demand response and independent aggregation**. Belgium and France have both defined the roles and responsibilities of independent aggregator.
- Netherlands, Germany and Austria are in the process of **enabling Demand Response through the retailer only**
- While Demand Response may be 'legal', the rest of Member States **have not adjusted their regulatory structures to enable demand side resources to participate in the markets.**

Source: JRC

<http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101191/Idna27998enn.pdf>

TYPE	DESCRIPTION
GENERATION	<ul style="list-style-type: none"> ➤ Shared Self consumption at building level (among neighbours) ➤ “Representante” aggregates renewable offers ➤ Balancing Secondary regulation – aggregation of generation 300MW (Zona de regulación) ➤ Renewables energy can offer Balancing Services
STORAGE	<ul style="list-style-type: none"> ➤ Batteries (peaks avoidance – not market participation, no balancing services)
DEMAND RESPONSE	<ul style="list-style-type: none"> ➤ Implicit (price driven) - PVPC (despite was not inspired by). ➤ Explicit – at R&D level (eg. AGREGA project) ➤ “Interrumpibilidad” (auction) for technical or economical needs ➤ R&D (ex. Project “Agrega”)
DEMAND	<ul style="list-style-type: none"> ➤ “Representante” aggregates consumers ➤ High consumers go direct to market (eg. ICS)
MICROGRIDS	<ul style="list-style-type: none"> ➤ R&D (Smart Rural – Estabanell) ➤ Off grid projects
EV	<ul style="list-style-type: none"> ➤ Gestor de Carga (can re-sell energy), “supervalley” hours, smart charging.

6. STATE OF THE ART

Market Opportunities in Spain

T O D A Y I N S P A I N

- The function of “**demand aggregation**” is not forbidden, nor regulated in Spain.
- **Electricity Balancing Guidelines** (network code) approved → regulatory framework will be develop in 2018. Public Consultation by REE (18th May). ON GOING → **Aggregated DER will participate in energy markets soon (2019-)**
- **Demand flexibility (interrumpibility) will compete into adjustment markets in 2018 but aggregation of demand is still not possible**
- **‘Representante’ and/or Retailer** could evolve to DER-A, but also **Independent Aggregator** must be recognised.
- “Informe Comisión de Expertos sobre Transición Energética propone el agregador de demanda independiente”

5. REVENUE STREAMS

Aggregation in Spain (1/2)

POTENTIAL

- **Open markets** to small units (consumption, generation)
- New revenue streams based on **selling flexibility**
- **Services provided to market operator and system operator**

MERCADOS	DESCRIPCIÓN
MERCADOS A LARGO PLAZO (OMIP)	<ul style="list-style-type: none"> • COBERTURA DE RIESGO A LA VARIACIÓN DE PRECIO A LARGO PLAZO • MEJOR NEGOCIACIÓN DE LA ENERGÍA AL HACERLO DE MANERA AGREGADA
MERCADOS DE CAPACIDAD (Mercados Only Energy. No hay mercado en España)	<ul style="list-style-type: none"> • LA DEMANDA GESTIONABLE PUEDE PARTICIPAR EN SEMEJANTES CONDICIONES QUE LA GENERACIÓN • COMPROMISO DE REDUCCIÓN DE LA DEMANDA COMPROMETIDA ANTE DETERMINADOS SUCESOS (PRECIOS...) • PARTICIPACIÓN EN EL MERCADO DE UNIDADES DE REDUCIDO TAMAÑO
DEMAND RESPONSE (reducción o interrupción del consumo)	<ul style="list-style-type: none"> • LA DEMANDA AGREGADA A PARTIR DE UNIDADES DE REDUCIDO TAMAÑO PUEDE PARTICIPAR EN SEMEJANTES CONDICIONES QUE LOS GRANDES CONSUMIDORES
MERCADO DIARIO (24 períodos)	<ul style="list-style-type: none"> • LA DEMANDA GESTIONABLE PUEDE MODIFICAR SUS PERÍODOS DE CONSUMO EN FUNCIÓN DE LOS PRECIOS
MERCADO INTRADIARIO (renegociación 24 períodos con precios diferenciados)	<ul style="list-style-type: none"> • LA DEMANDA GESTIONABLE PUEDE MODIFICAR SUS PERÍODOS DE CONSUMO EN FUNCIÓN DE LOS PRECIOS
MERCADO INTRADIARIO CONTINUO (hasta 1 hora antes del suministro)	<ul style="list-style-type: none"> • LA DEMANDA GESTIONABLE PUEDE MODIFICAR SUS PERÍODOS DE CONSUMO EN FUNCIÓN DE LOS PRECIOS • AGREGADOR LLEVA A CABO UNA GESTIÓN COMÚN DE LAS DISTINTAS DEMANDAS PARTICULARES, HACER TRADING Y BENEFICIARSE DE SUS GRADOS DE FLEXIBILIDAD PARA OBTENER BENEFICIOS

5. REVENUE STREAMS

Aggregation in Spain (2/2)

POTENTIAL

- **Open markets** to small units (consumption, generation)
- New revenue streams based on **selling flexibility**
- **Services provided to market operator and system operator**

SERVICIOS COMPLEMENTARIOS	DESCRIPCIÓN
SERVICIO DE SECUNDARIA (aFRR)	<ul style="list-style-type: none">• AGREGACIÓN PERMITE AGRUPAR DISTINTOS RECURSOS DISTRIBUIDOS (DEMANDA, GENERACIÓN, BATERÍAS) DE PEQUEÑO TAMAÑO PARA OFRECER EL COMPROMISO DE MODIFICAR EL PROGRAMA (GENERACIÓN O CONSUMO) ANTE SEÑALES INSTANTANEAS DEL OPERADOR DEL SISTEMA Y RECIBIR REMUNERACIÓN.
GESTIÓN DE CONGESTIONES	<ul style="list-style-type: none">• AGREGACIÓN DE RECURSOS DISTRIBUIDOS PARA MODIFICAR LA CURVA DEMANDA PARA SOLVENTAR PROBLEMAS LOCALES A PETICIÓN DEL OPERADOR DEL SISTEMA, A PESAR QUE DE SER RECURSOS INICIALMENTE NO COMPETITIVAS PARA ENTRAR EN EL MERCADO
MERCADO DE BALANCE	<ul style="list-style-type: none">• LA DEMANDA AGREGADA A PARTIR DE UNIDADES DE REDUCIDO TAMAÑO PUEDE APORTAR ESTE SERVICIO AL OPERADOR DEL SISTEMA PARA LOS INCREMENTOS/DECREMENTOS DE ENERGÍA NECESARIOS EN LA HORA ANTERIOR AL SUMINISTRO (ACTUALMENTE PERÍODOS HORARIOS, CON POSIBLE EVOLUCIÓN A PERÍODOS INFERIORES COM OTROSD PAÍSES UE)
MERCADOS LOCALES (A desarrollar y en período de estudio en la UE)	<ul style="list-style-type: none">• INTRODUCCIÓN DE MECANISMOS DE MERCADO PARA PERMITIR LA GESTIÓN DE LAS REDES LOCALES (DISTRIBUCIÓN) ANTE UN PREVISIBLE NÚMERO ELEVADO DE RECURSOS ENERGÉTICOS DISTRIBUIDOS.• EL AGREGADOR LLEVA A CABO UNA GESTIÓN COMÚN DE LAS DISTINTAS DEMANDAS PARTICUALRES Y, EN SU CASO, BENEFICIARSE DE LAS CONDICIONES LOCALES PARA MAXIMIZAR LOS BENEFICIOS (EN COORDINACIÓN CON EL OS Y EL OM)

5. BARRIERS

For a comprehensive market development (1/2)

BARRIERS MITIGATION

- **Legal:**
 - ✓ Certainty for long term investments
 - ✓ Definition of real energy system costs
- **Market:**
 - ✓ Open the markets
 - ✓ Clear price signals to consumers
 - ✓ CBA of different flexibility mechanisms
 - ✓ Clarify incentives and fair-distribution
 - ✓ Reduce artificial market entrance barriers
- **Economic:**
 - ✓ Avoid price distortions
 - ✓ Long term signals
 - ✓ Simplification of procedures

BARRIER	DESCRIPTION
LEGAL	<ol style="list-style-type: none">1. LSE Financial stability principle → DER-A affects incomes of electric system as grid charges are defined today2. Legal insecurity in energy sector (no incentives to invest in DER)3. Lack of regulations flexibility to enable innovation
MARKET	<ol style="list-style-type: none">1. Limited access to flexibility markets: Balancing markets and Demand Response market are closed to DER. Capacity Market closed to demand2. Wrong signals and incentives (penalise DG)3. Market concentration: high entrance costs4. Tariff (energy, charges) structure doesn't offer a Business Case at low voltage (hourly/location flexibility)5. Pricing doesn't provide signals to prosumers to react to through DER (Caps and Floors in spot market)6. Promotion and support schemes to DG (in front of auctions)
ECONOMIC	<ol style="list-style-type: none">1. Overcapacity (potential of demand-side flexibility)2. Transactional costs are too high (admin, tech, finance)3. Cost of opportunity of DG Vs Centralised due to sunk costs (thermal power plants, network, ...)4. Taxation does not support low carbon technologies (externalities) and final energy usages (gas, fuel)5. Network charges supported by consumers and DG (transmission and Distribution is also used by generators)

5. BARRIERS

For a comprehensive market development (2/2)

BARRIERS MITIGATION

➤ Technical:

- ✓ Definition of POs (by REE-SO in collaboration with other stakeholders)
- ✓ DER data platform

➤ Political:

- ✓ Climate and Energy Law (DER Security of Supply)
- ✓ Energy transition role of cities and regions

➤ Social:

- ✓ prepare consumer (and society) to tackle price signals (time, location)
- ✓ Make sector trustable

BARRIER	DESCRIPTION
TECHNICAL	<ol style="list-style-type: none">1. Overcapacity (thermoelectric generation, networks)2. Interoperability of hardware (to allow future aggregation of DER)3. Cibersecurity4. Reliability (lack of PO – Operational Procedures)5. Smart meters technical specifications6. DER Data access to third parties not possible7. Low international interconnection (Energy Union)
POLITICAL	<ol style="list-style-type: none">1. Lack of vision and strategy (long term vision)2. Limited and unambitious transposition of European directives and reglamentation (network codes)3. Governance among administrations and stakeholders (e.g.#1 relation between government and regulator; e.g.#2 regional energy transition plans and municipalities)
SOCIAL	<ol style="list-style-type: none">1. Lack of knowledge for changing the behaviour2. Opacity of energy market and lack of confidence3. Demand anaesthesia – reactive consumer

5. MAIN POINTS - AGGREGATION

For a comprehensive market development in Spain (1/2)

1. **On time:** Legal context is totally in favor of DER-A (CEP, Balancing Guidelines). It is time to **define an appropriate regulatory long-term framework to facilitate market access for the flexible customer/prosumer and unlocking flexibility (including DR) to participate in energy markets and to provide ancillary services in competition with producers** (equal footing) where it is most valuable to make the **future energy system more cost-effective** (market prices already provide benefits to DR).
2. The **function of aggregate DER** to provide **flexibility** is basic to allow **cost-effective penetration of REN** (different sizes) alongside with centralized REN (as it brings economy of scale + increase of revenues). DER provides value across the **energy trilemma**.
3. The **function of “aggregation”** is what matters, consumers should decide who will provide the service. Definition (Clean Energy Package) of **Independent Aggregator** (Virtual Vs Physical) to **promote competition**.
4. Re-designing **price signals, tax policy and grid charges** are critical to move towards an energy transition that does not affect the competitiveness of economy and consumers’ energy cost. **Exposition to dynamic prices and tariffs (without CAPS) can play key role to incentivize market parties to invest in unlocking flexibility (demand response, storage, REN...).**



5. MAIN POINTS - AGGREGATION

For a comprehensive market development in Spain (1/2)



5. **Consumer centric policies** are part of energy transition within Energy Union. DER-A empowers consumers. Proper legal framework enables consumers to **valorize flexible assets and demand response potential**.
6. **Potential of DER-A needs free market** participation to obtain a **fair price for DER flexibility** (reduction of the period - 30 '15' - and bring the negotiation closer to the supply periods - 15 ', 5' -)
7. **Technical reliability in front the SO** is crucial to provide value to the system. Definition of POs are crucial (Avoiding unnecessary investments). **Interoperability** should be requested in all DER devices to provide resources scalability and reliability.
8. **New business models in energy sector** to promote low carbon economy are enabled by **digitalization**. **DER data access is key** to planning, operate the electric system and open markets.

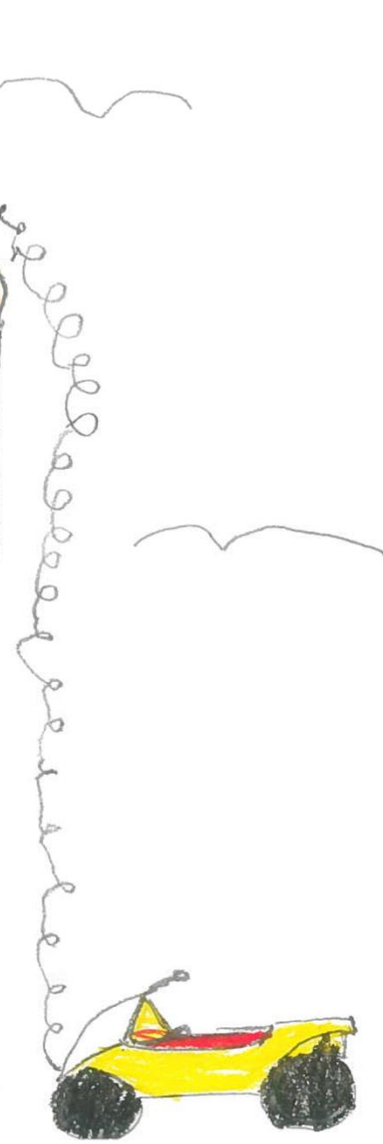
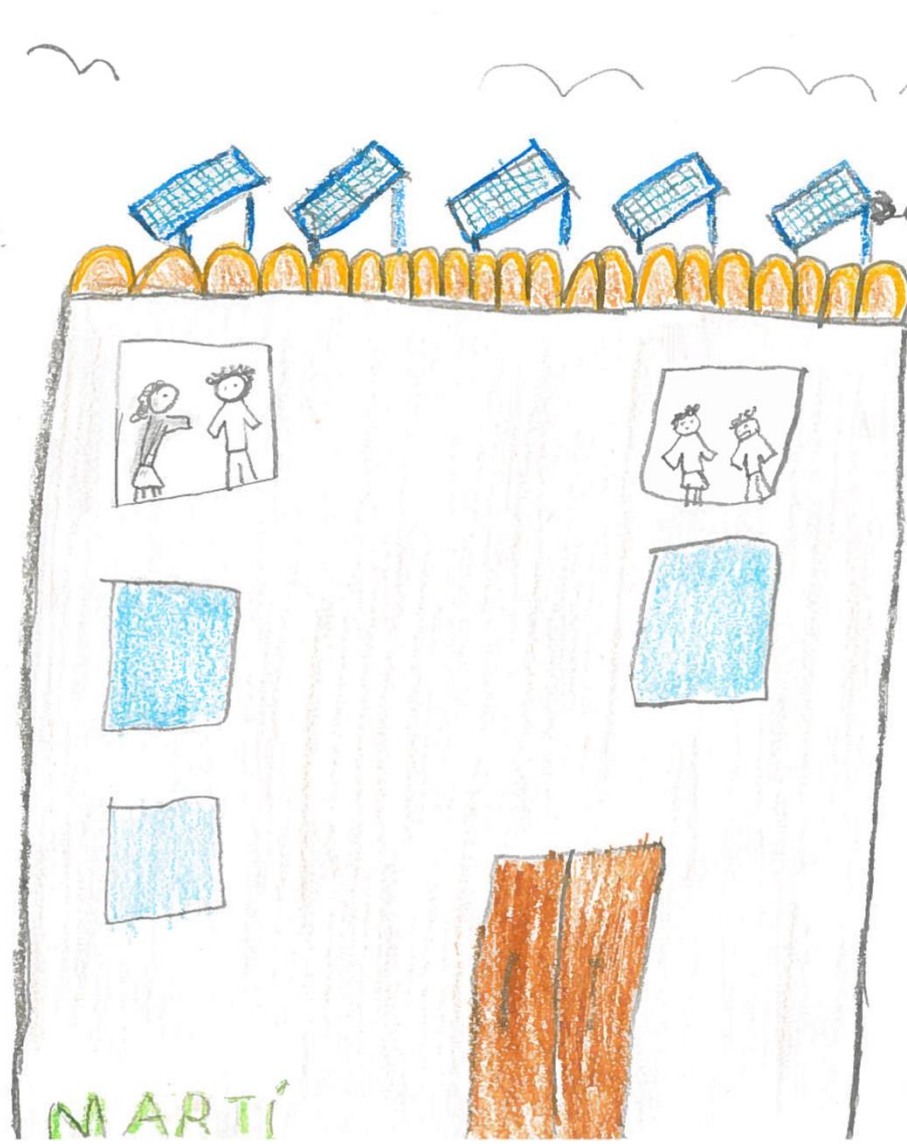
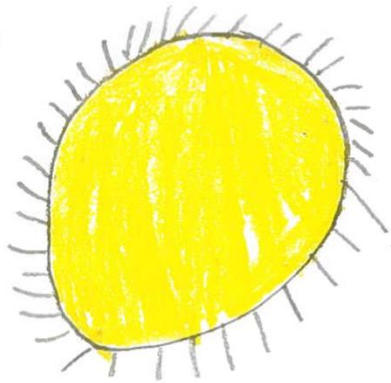


6. CONCLUSIONS

Consumer and Energy Transition



- Energy transition is not only a matter of energy mix, but change of players and their roles. After 20 years of liberalization... energy system is moving **from utilities-centric to consumers-centric approach**. New framework.
- Re-designing **price signals, tax policy and grid charges** are critical to move towards an energy transition that does not affect the competitiveness of economy and consumers' energy cost. **Exposition to dynamic prices and tariffs (without CAPS) can play key role to incentivize market parties to invest in unlocking consumer's potential (demand response, storage, REN, competition...)**.
- **New business models** (e.g. aggregation) **in energy sector** to promote low carbon economy are enabled by **digitalization**. **Neutral data access of Distributed Energy Resources** (demand, storage, self-consumption, ...) **is key** to empower consumers.
- Technology is (almost) ready, but several **barriers still remain...** also from consumer's point of view



El poder del consumidor en la mejora de la eficiencia energética.

Potencial para la transición energética.

GRACIAS. DEBATIMOS?

Cátedra BP de Energía y Sostenibilidad
Convocatoria GREDS



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