

A satellite view of Earth at night, showing the curvature of the planet and numerous glowing city lights across the continents. The background is the dark, starry space.

The role of retail business in tomorrow's power systems

Carlos Batlle

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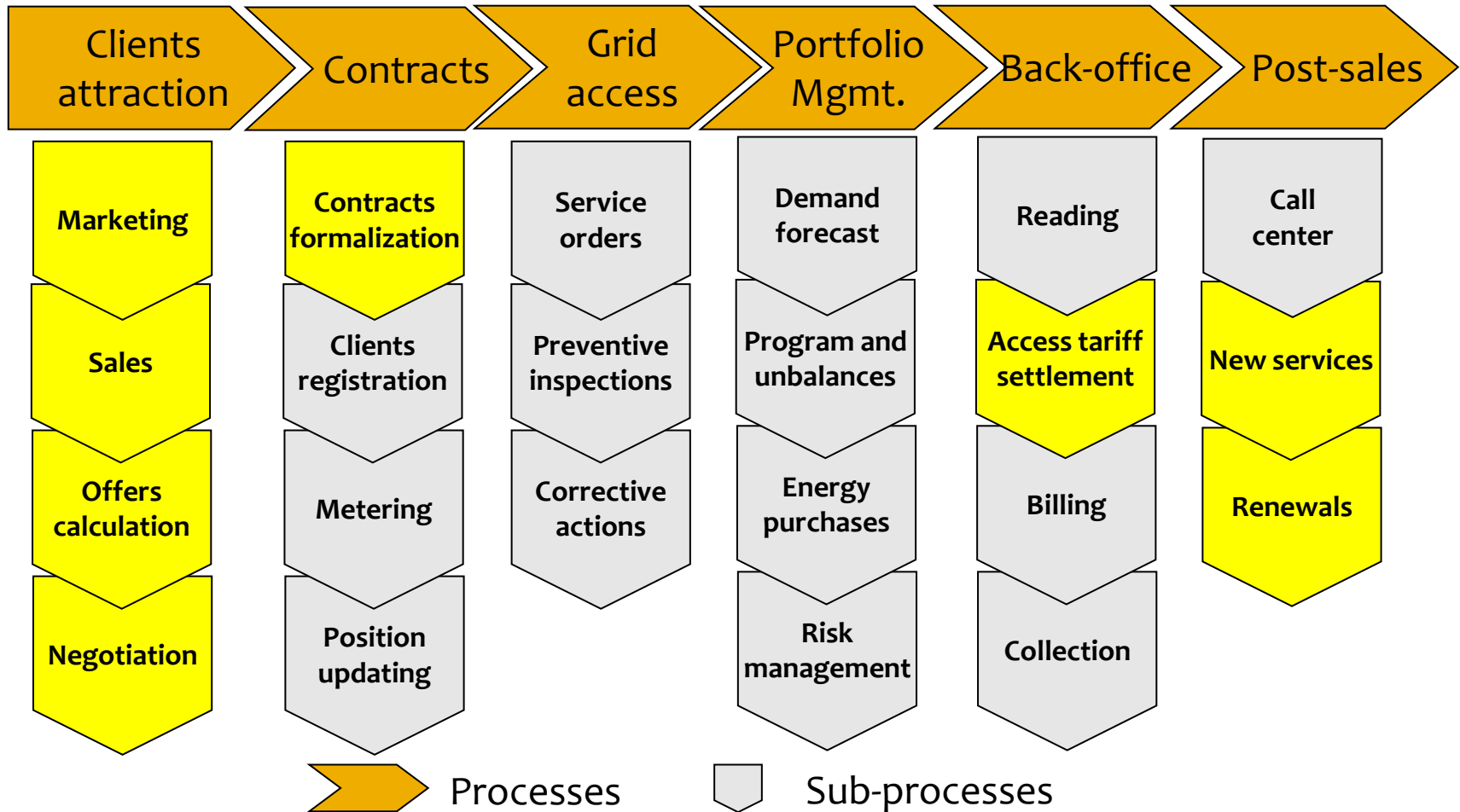
Abraceel workshop

October 31, 2019, Florianópolis, Brazil

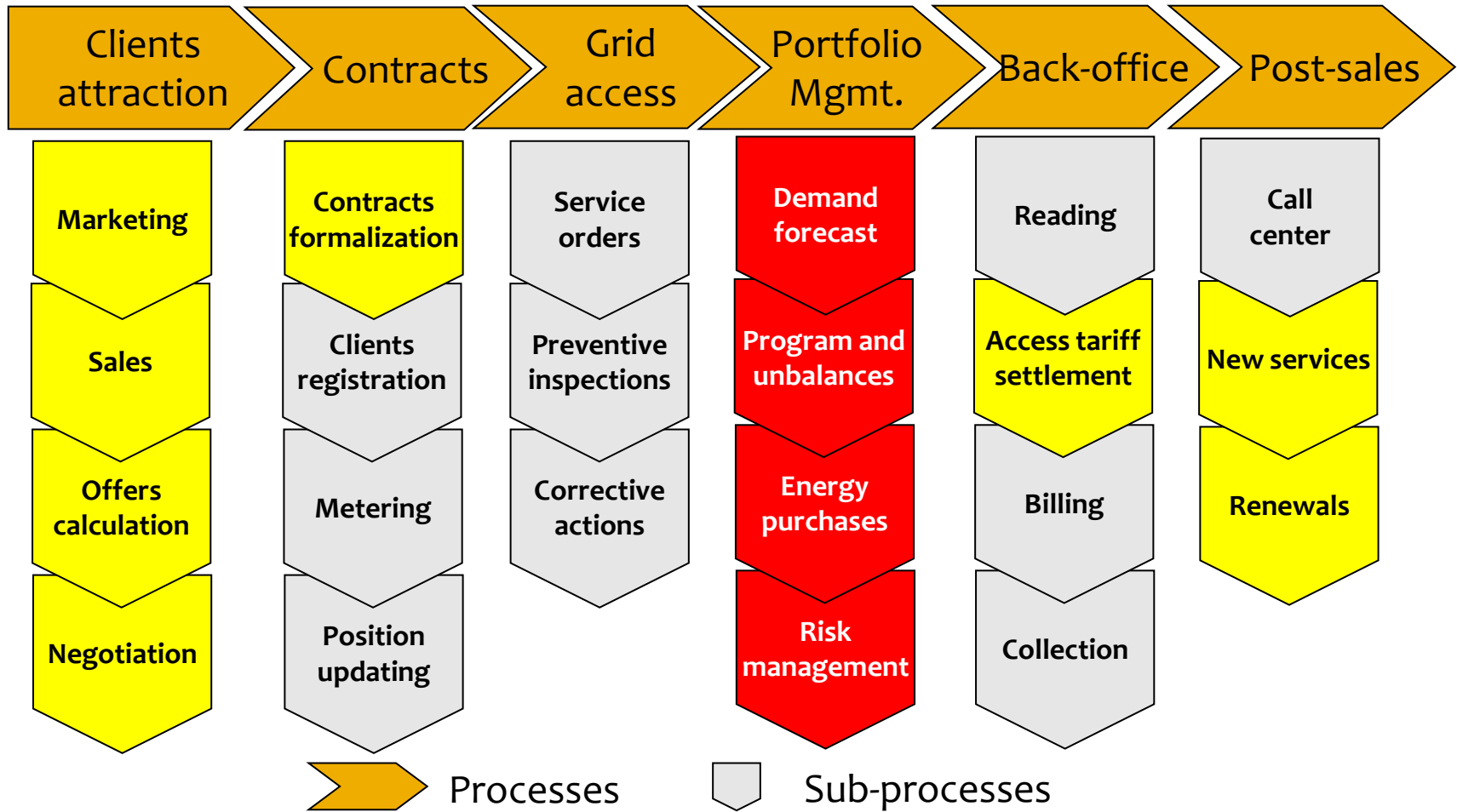


The old world
WHAT'S A RETAILER?

Old and new retail processes



Old and new retail processes





The (not-so) new world

GAME CHANGERS

Distributed technologies

Learning curves

• Solar PV

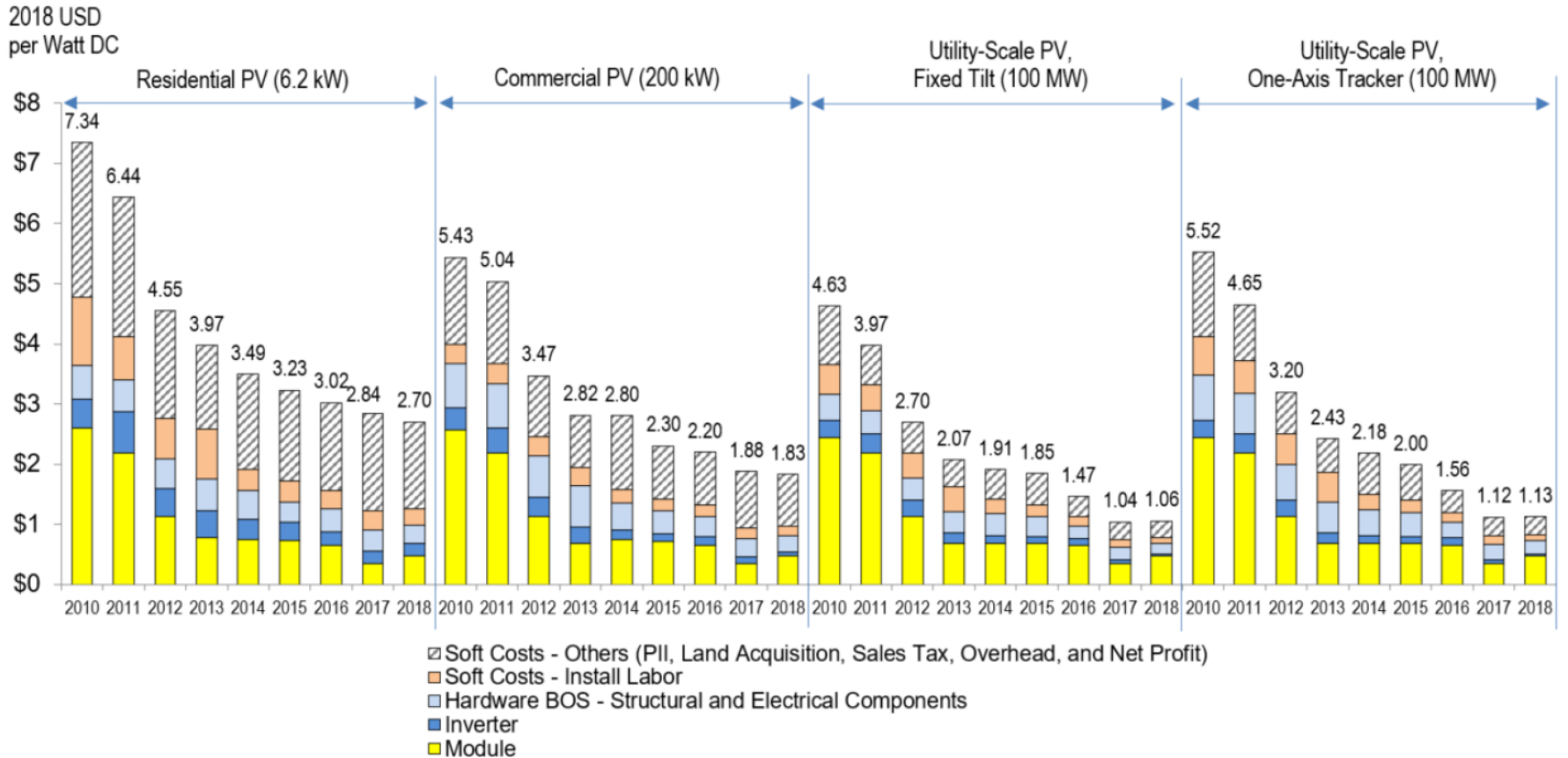
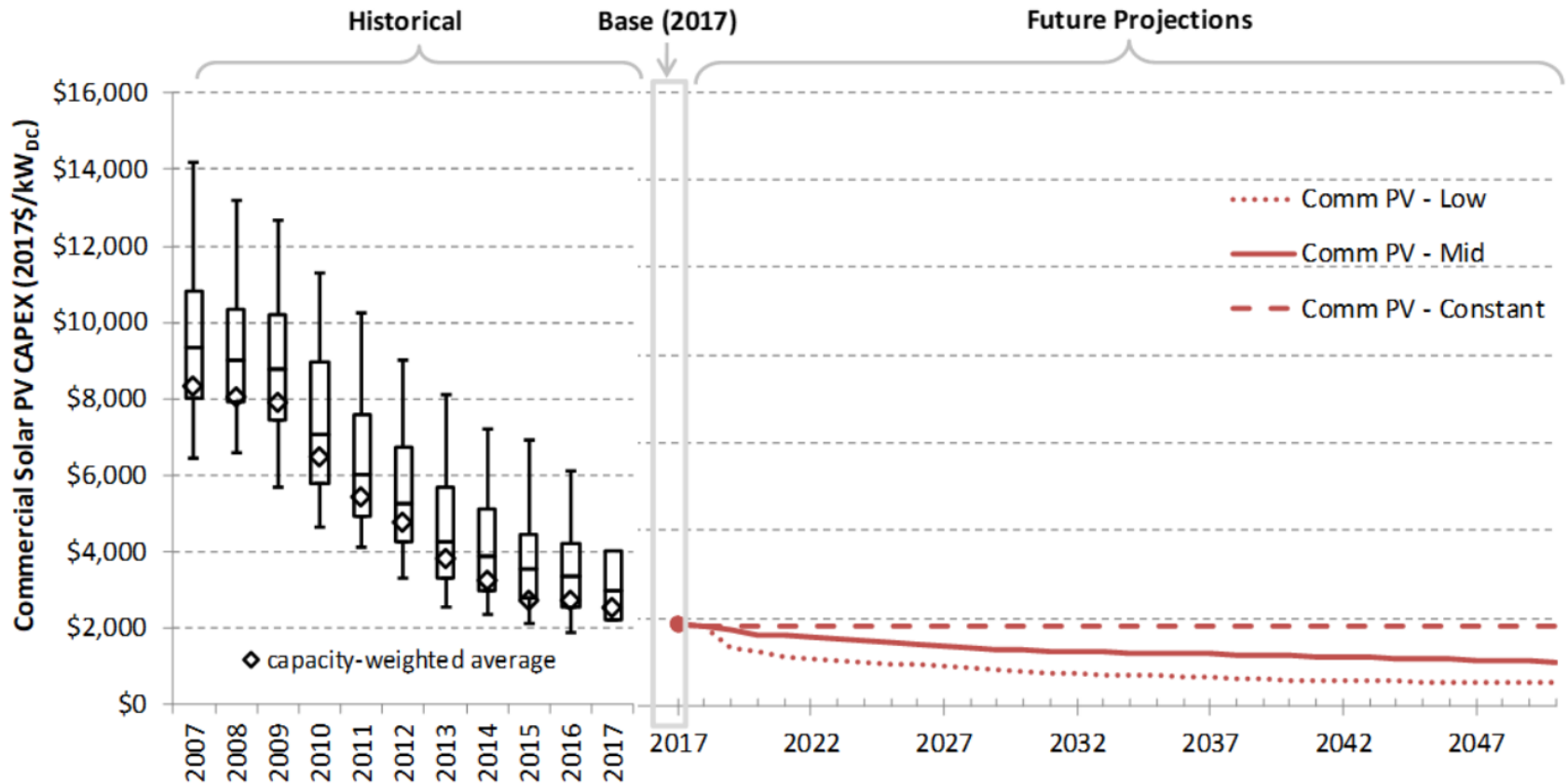


Figure ES-1. NREL PV system cost benchmark summary (inflation adjusted), 2010–2018

Distributed technologies

Learning curves

• Solar PV



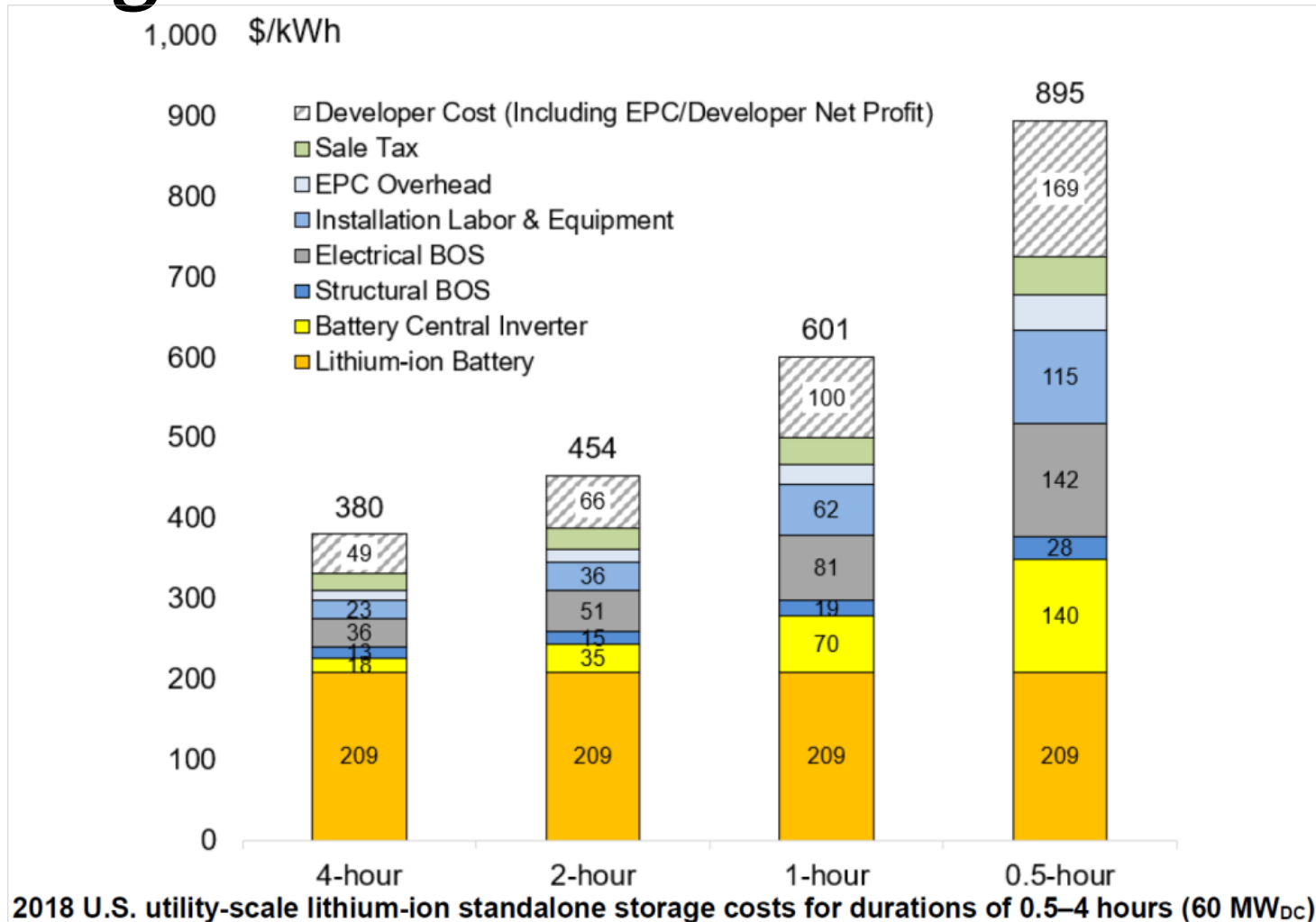
CAPEX historical trends, current estimates, and future projection for commercial PV (DC)

Source: National Renewable Energy Laboratory Annual Technology Baseline (2019), <http://atb.nrel.gov>

Distributed technologies

Learning curves

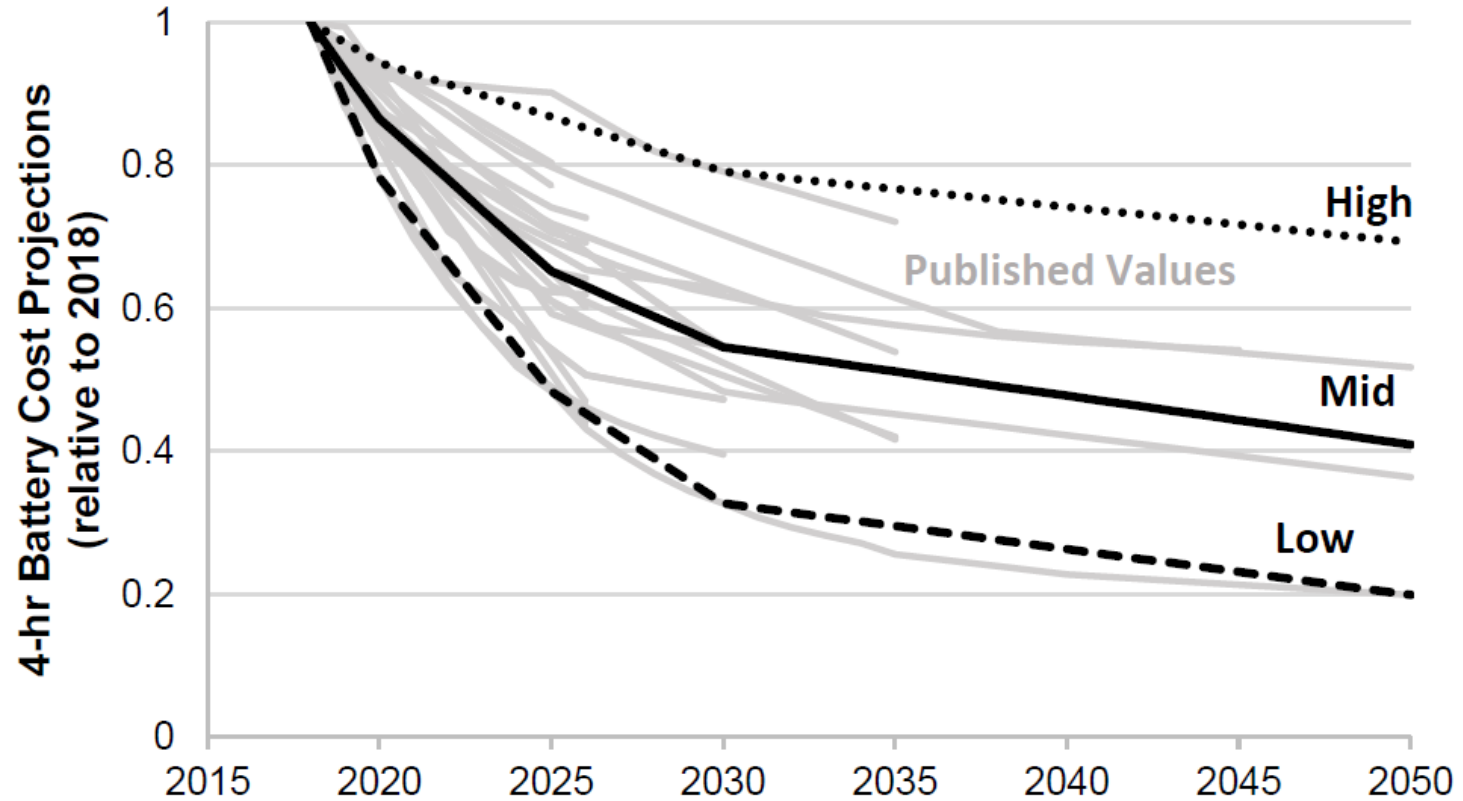
• Storage



Distributed technologies

Learning curves

- Storage



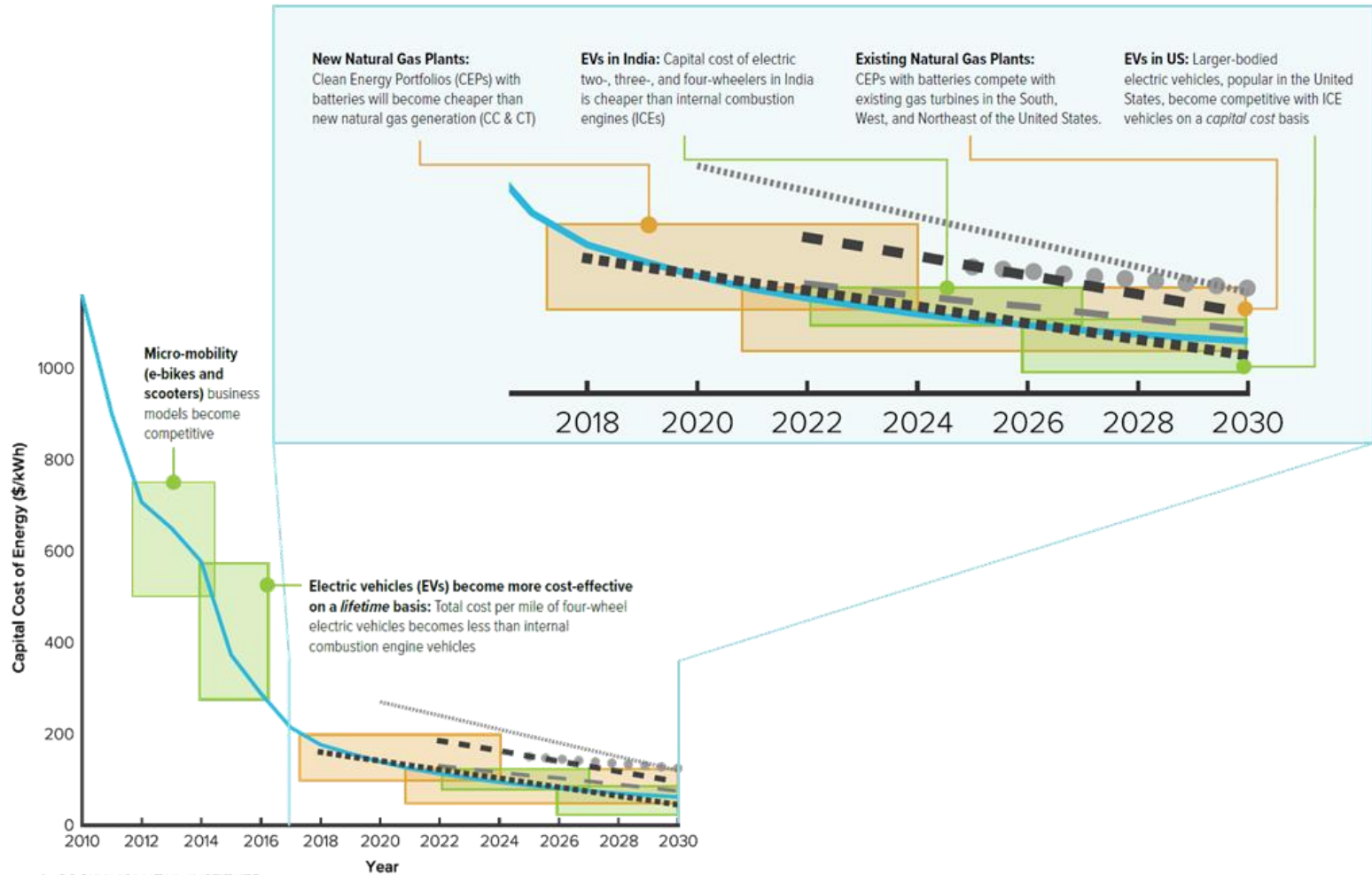
Distributed technologies

Learning curves

• Storage

Estimated Competitive Thresholds for Advanced Battery Technologies to Displace Incumbent Technologies

— Li+ ion
 - - - Li-metal
 - - - Li-S
 ● ● ● ● ● Zinc based
 ⋯ Flow
 ● ● ● ● ● High Temperature

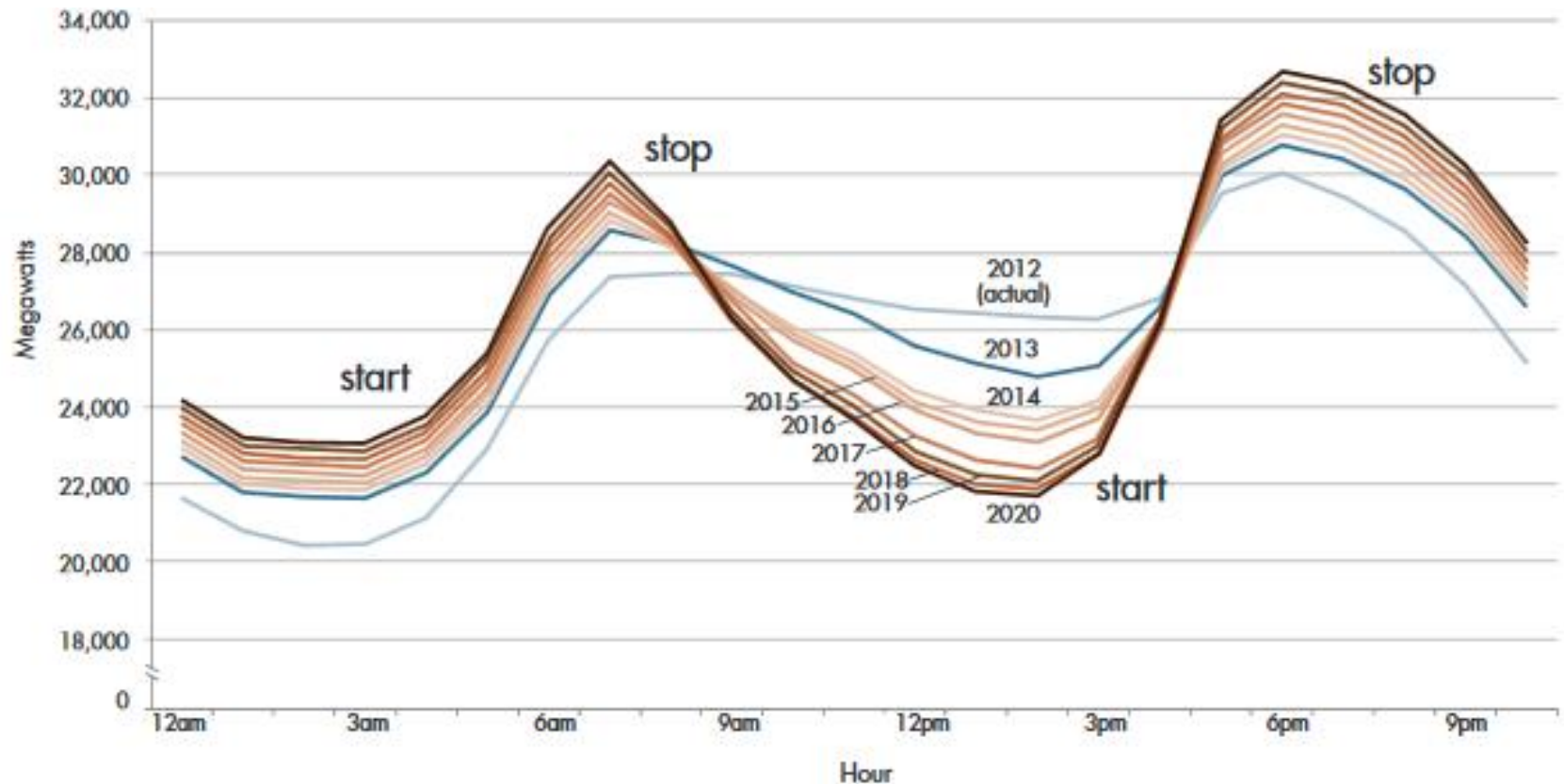


8 | ROCKY MOUNTAIN INSTITUTE

Variable energy resources

Spot prices

- Variability and ramps*



Duck Curve (CAISO, 2016)

* Not an issue in Brazil at least before 2150 (!)

Variable energy resources

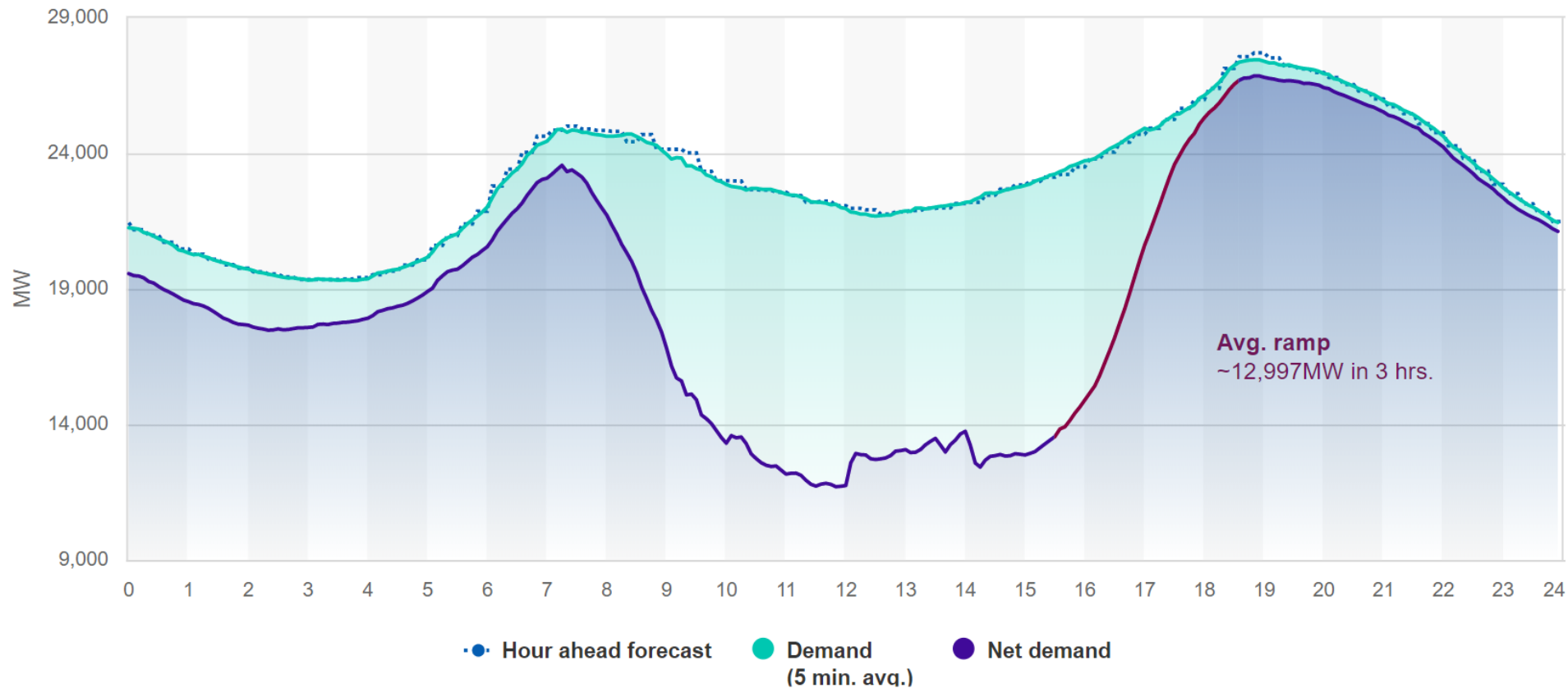
Spot prices

- **Variability and ramps**

10/30/2019

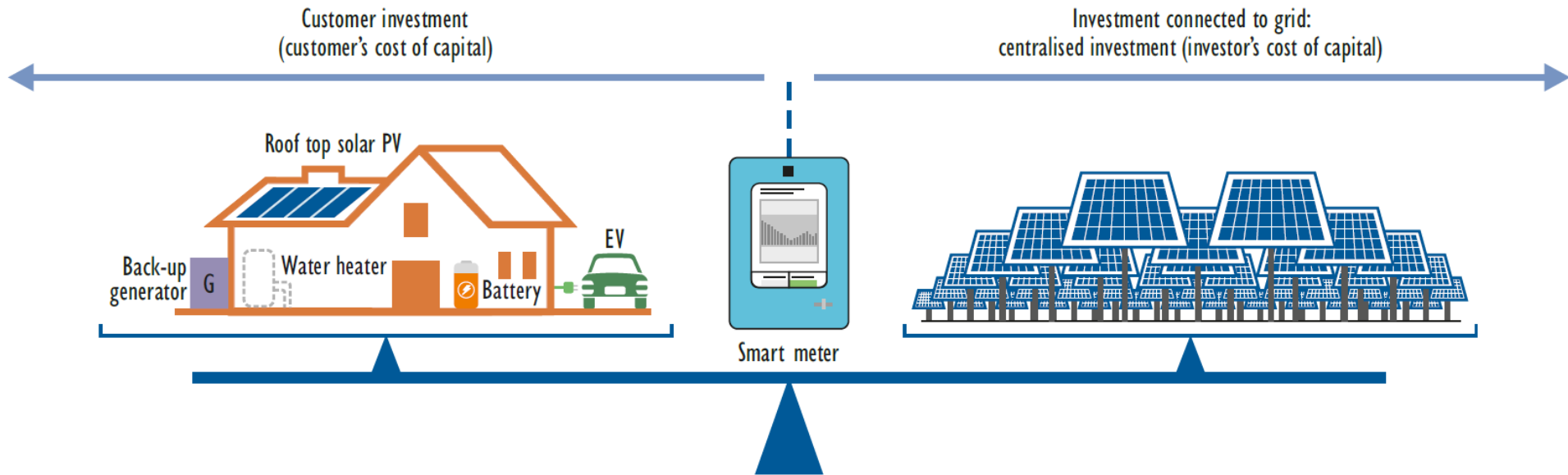
Net demand trend

Data



Avg. ramp
~12,997MW in 3 hrs.

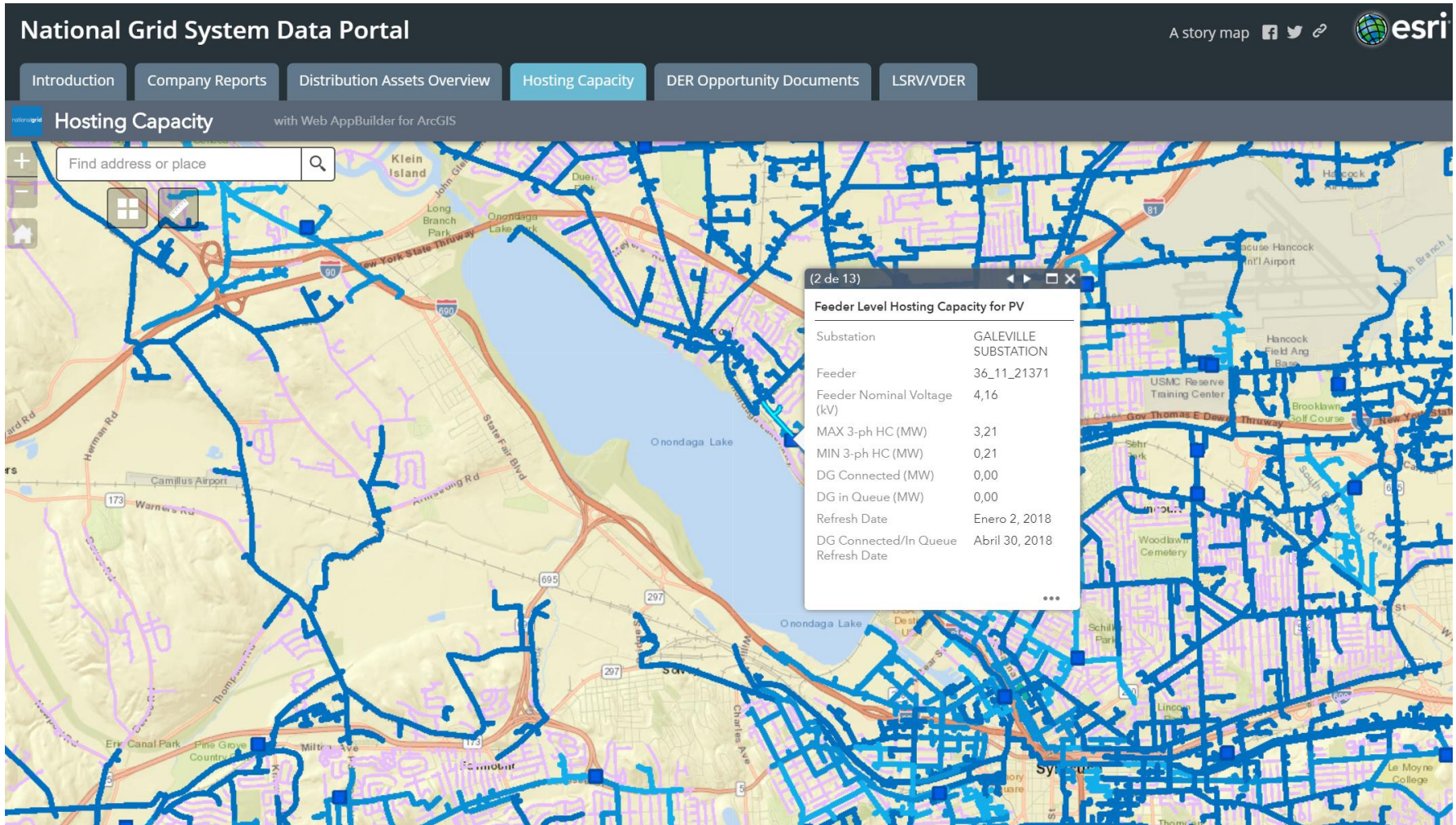
Future organization of the market



Locational value Towards a modern grid

- **Hosting capacity**

<http://ngrid.maps.arcgis.com>



Locational value

Towards a modern grid

- Location system relief value

<http://ngrid.maps.arcgis.com>

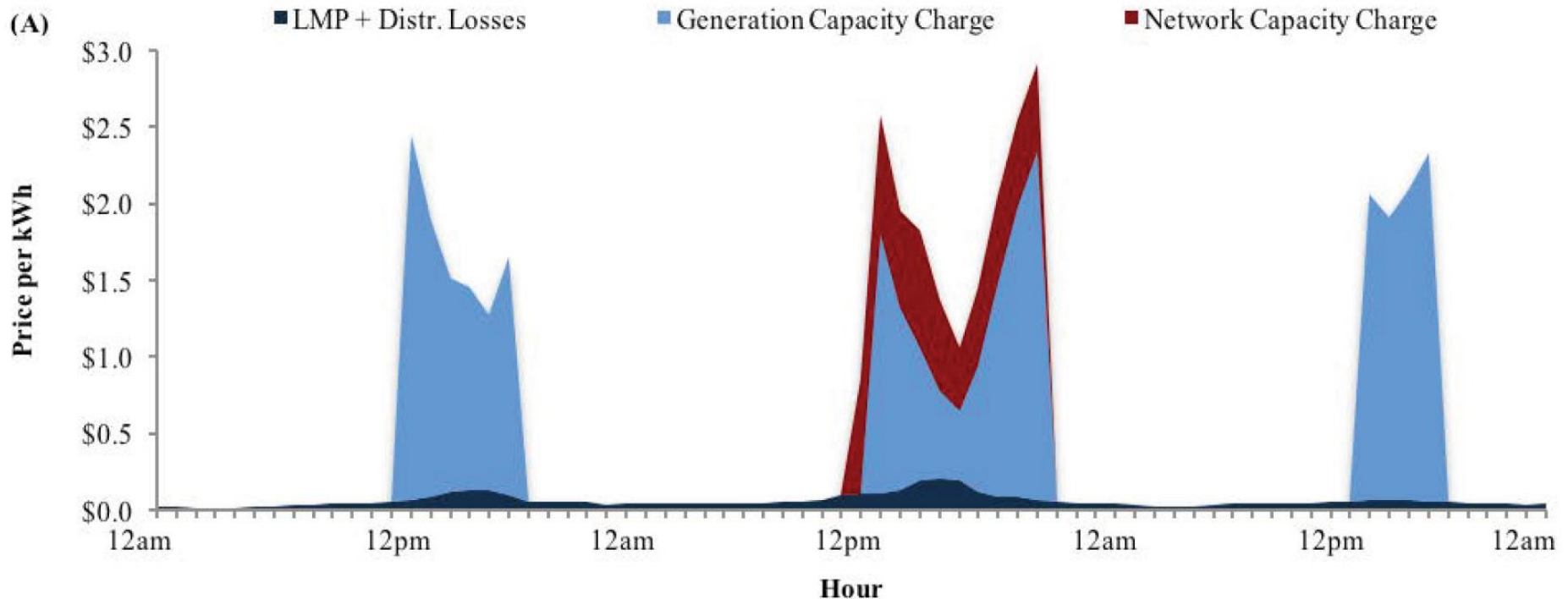
The screenshot displays the National Grid System Data Portal interface. At the top, there are navigation tabs: Introduction, Company Reports, Distribution Assets Overview, Hosting Capacity, DER Opportunity Documents, and LSRV/VDER. Below the tabs, the page title is "National Grid System Data Portal" and the sub-header is "LSRV with Web AppBuilder for ArcGIS". A search bar is present with the text "Find address or place". The main map area shows a geographic view of the Syracuse, NY region, with various streets and landmarks labeled. A popup window titled "(1 de 3)" is open, displaying details for a substation named "HANCOCK".

Substation: HANCOCK	
Distribution Planning Area	Syracuse
Substation	HANCOCK
MW Allocated	0,00
Single or Multi-Bank	S
Number of Banks	
From Voltage (kV)	34,5
To Voltage (kV)	4,2
MW Cap	0,10

End-user prices

New rate formats

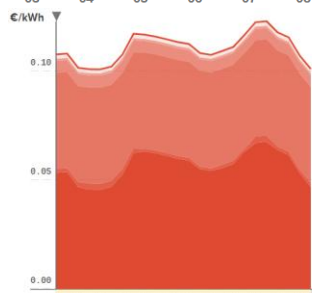
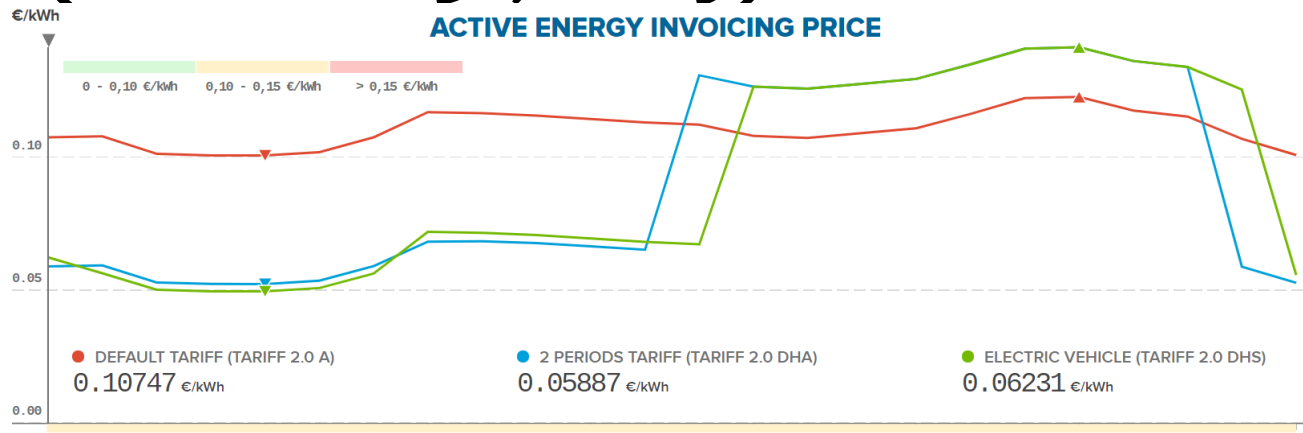
- Forward-looking peak-coincident network capacity charges...
... and scarcity-coincident generation capacity charges



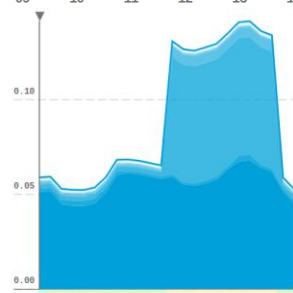
End-user prices

Hourly prices

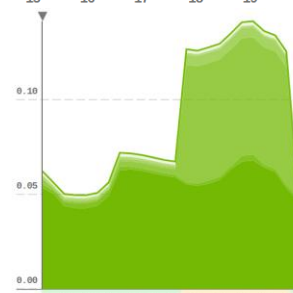
• Spain (October 31, 2019)



- DAY AHEAD AND INTRADAY MARKETS **0.05322 €/kWh**
- ANCILLARY SERVICES **0.00175 €/kWh**
- DISTRIBUTION AND TRANSMISSION TARIFF **0.04403 €/kWh**
- CAPACITY PAYMENT **0.00549 €/kWh**
- INTERRUPTIBILITY SERVICE **0.00092 €/kWh**
- OS FEES **0.00013 €/kWh**
- OM FEES **0.00003 €/kWh**
- VARIABLE RETAILING COST **0.00190 €/kWh**



- DAY AHEAD AND INTRADAY MARKETS **0.05124 €/kWh**
- ANCILLARY SERVICES **0.00169 €/kWh**
- DISTRIBUTION AND TRANSMISSION TARIFF **0.00222 €/kWh**
- CAPACITY PAYMENT **0.00092 €/kWh**
- INTERRUPTIBILITY SERVICE **0.00089 €/kWh**
- OS FEES **0.00013 €/kWh**
- OM FEES **0.00003 €/kWh**
- VARIABLE RETAILING COST **0.00176 €/kWh**



- DAY AHEAD AND INTRADAY MARKETS **0.05344 €/kWh**
- ANCILLARY SERVICES **0.00176 €/kWh**
- DISTRIBUTION AND TRANSMISSION TARIFF **0.00288 €/kWh**
- CAPACITY PAYMENT **0.00129 €/kWh**
- INTERRUPTIBILITY SERVICE **0.00093 €/kWh**
- OS FEES **0.00013 €/kWh**
- OM FEES **0.00003 €/kWh**
- VARIABLE RETAILING COST **0.00184 €/kWh**

Hourly prices

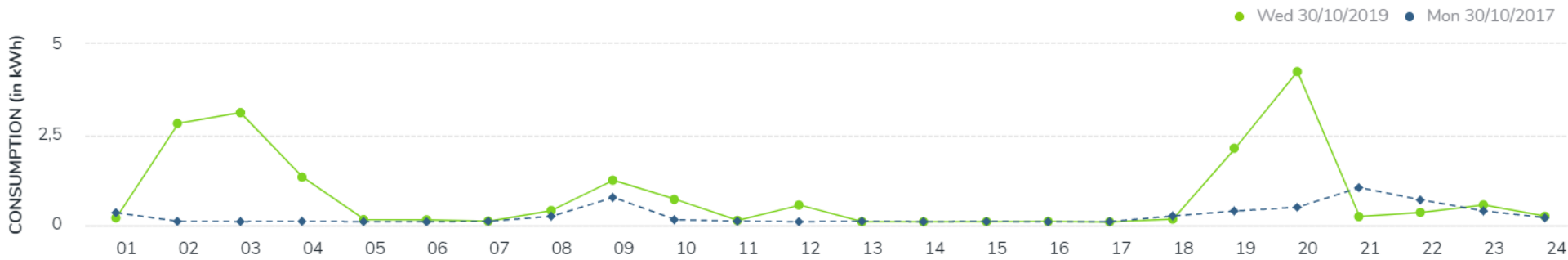
• Spain (Oct., 2017 vs. Oct. 2019)

Comparativa de consumo

Mon 30/10/2017

6 kWh

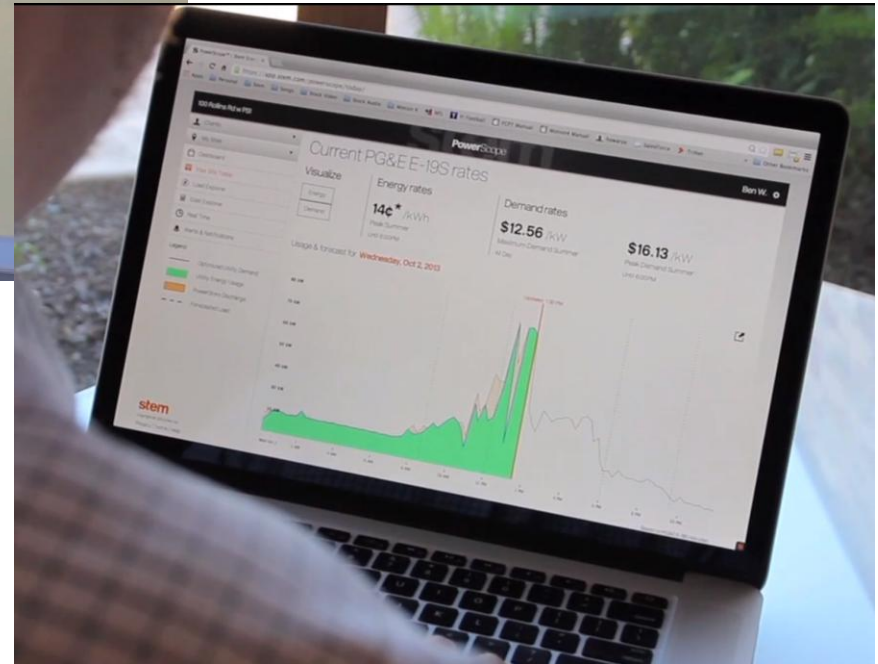
Total consumption



Energy Service Companies



stem | Energy Superintelligence™



<http://www.stem.com>

Fashionable and wearable power

TESLA

MODEL S MODEL X MODEL 3 ROADSTER ENERGY

SHOP

Energy

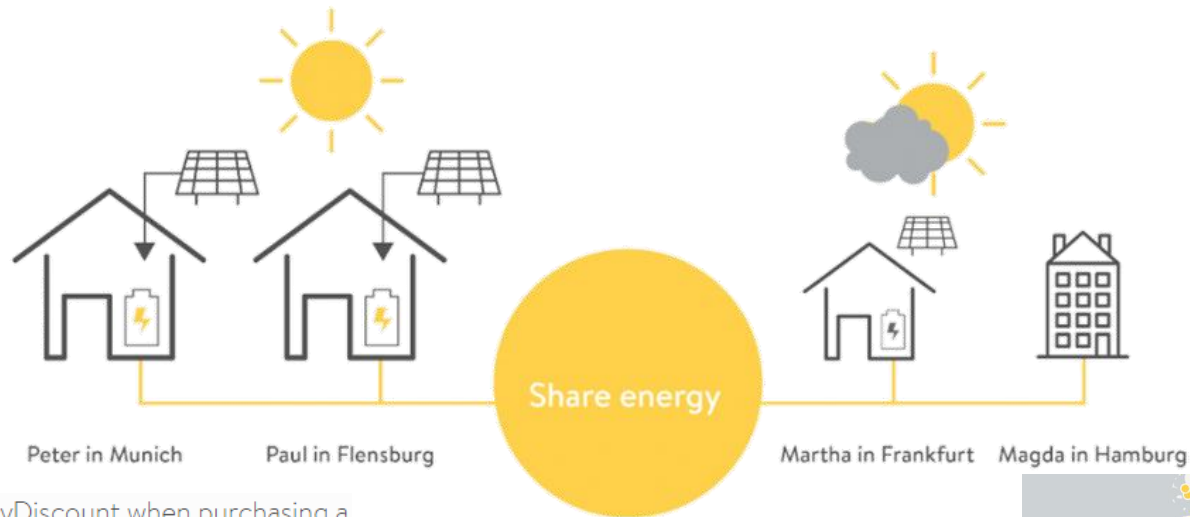
Solar Panels Powerwall Solar Roof Commercial Utilities



Energy Communities

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

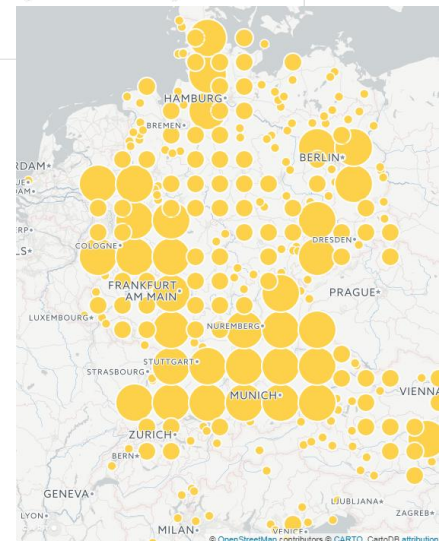
Feed-in (last 12 months)

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



Products ▾ Rooms ▾ IDEAS New at IKEA



Home > IKEA > IKEA home solar panels and battery storage

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

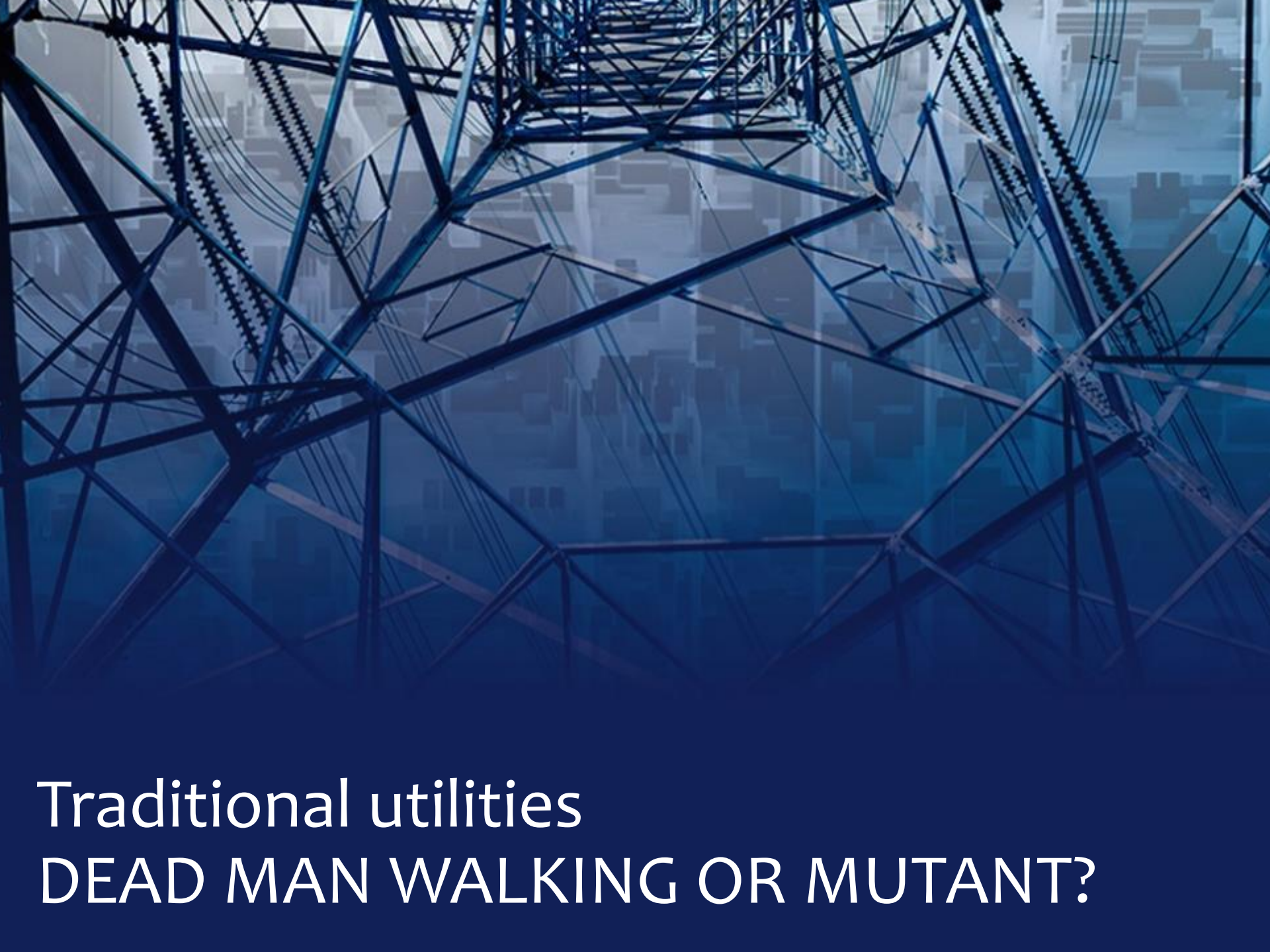
GO

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.

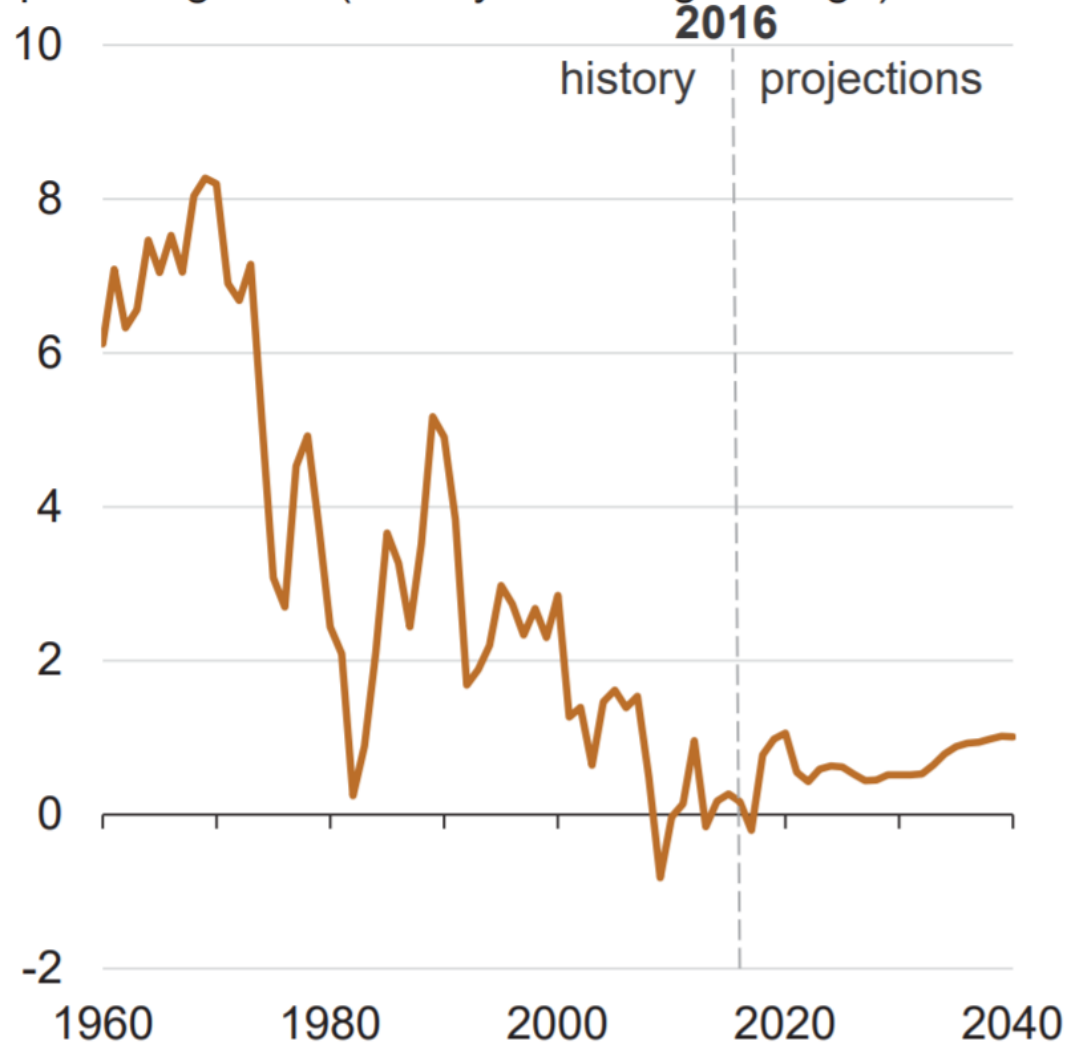


Traditional utilities
DEAD MAN WALKING OR MUTANT?

Shrinking or growing business?

Electricity use growth rate

percent growth (three-year rolling average)



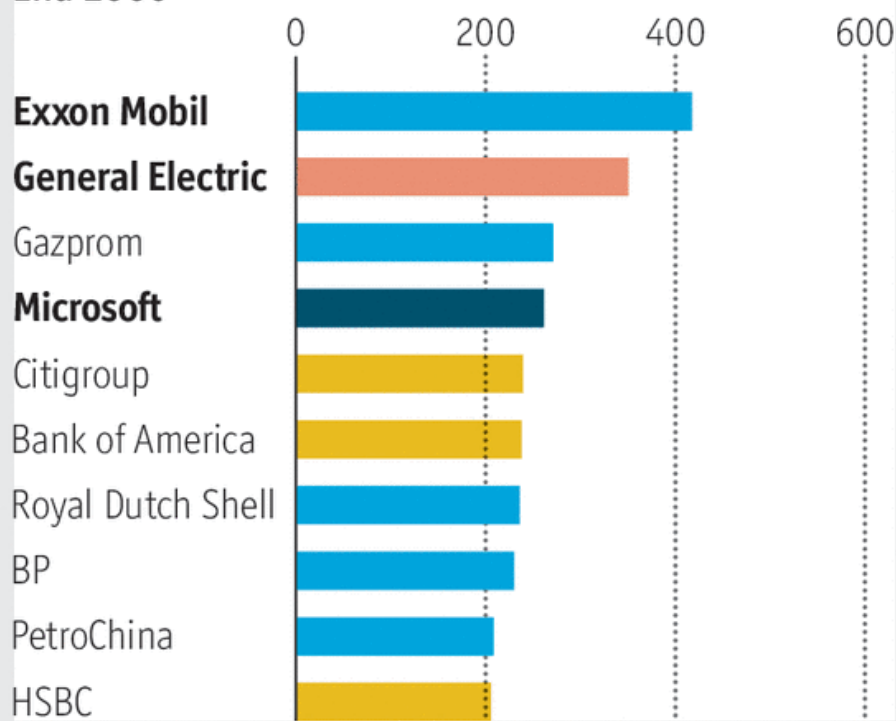
Data, the life jacket?

A virtually new world

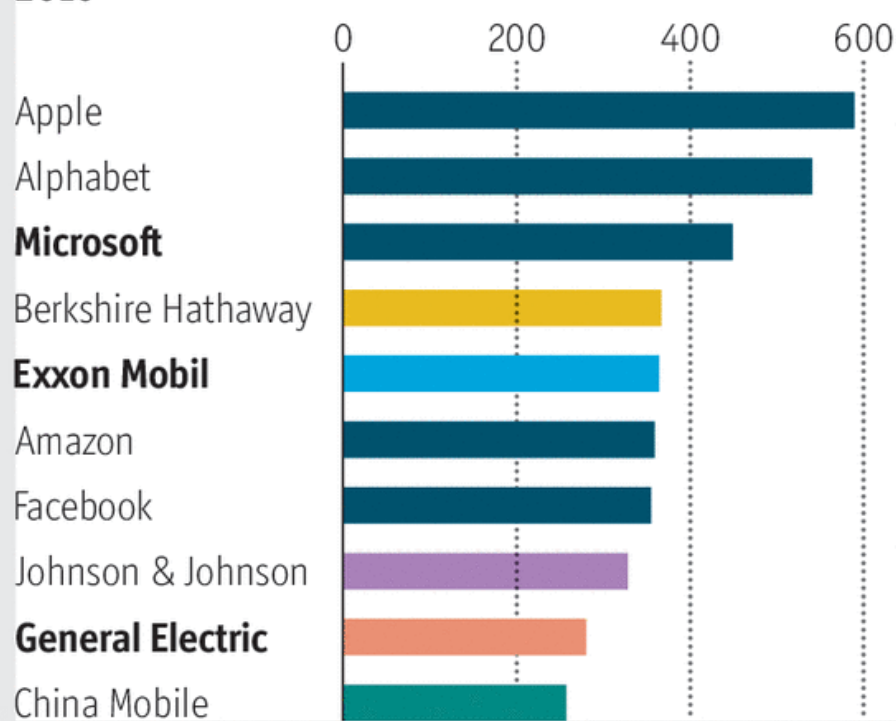
World, largest listed companies by market capitalisation, \$bn

Sector: ■ Energy ■ Financials ■ Health care ■ Industrials ■ IT ■ Telecoms

End 2006



2016*



Source: Bloomberg

*At August 24th 2016



REUTERS

German utility E.ON to split in two in major overhaul

BUSINESS NEWS | Sun Nov 30, 2014 | 10:35pm GMT

- **"E.ON's existing broad business model can no longer properly address these new challenges," Chief Executive Teyssen**

New corporate strategy: E.ON to focus on renewables, distribution networks, and customer solutions and to spin off the majority of a new, publicly listed company specializing in power generation, global energy trading, and exploration and production

New perspectives on energy

No wind? No sun? No problem!

We make sure you always have light and heat. We provide backup for renewables and are always there for you. With power we produce whenever it's needed. With natural gas sourced worldwide. And with innovative solutions.

➤ [Find out more about our operations](#)

The *mannschaft*



• [Private](#) [Business](#) [Investor Relations](#) [New Energy](#) [About E.ON](#)



The mannschaft



Electric vehicles that provide power for your home.

we are

Our solar experts on site

The sky's the limit

Energy freedom can be limitless - and the outlook is sunny. But what goes into getting your home set up for solar? We followed our expert installation team as they assess a customer's home.

Think ahead

A new energy world is emerging. At E.ON, our business is completely focused on a future that is decentralised, green and networked.

We are tech nerds!

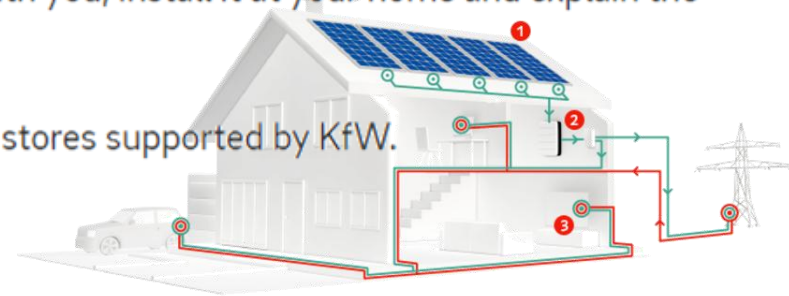
From :agile to our R&D lab

E.ON's corporate accelerator and incubator, :agile, supports young business ideas. Each project receives individual support, including financial resources, coaching, engineering expertise and work spaces - as well as advice on marketing and sales. Have a business idea?

E.ON Aura

Benefit from solar energy - produce your own green electricity

- **Favorable:** With self-generated green electricity you permanently reduce your energy costs.
- **Independent:** Thanks to the highly efficient E.ON Aura power storage unit, you can provide approximately 70% economic self-sufficiency.
- **Regenerative:** With our exclusive electricity tariff for Aura customers you will save your remaining electricity as a 100% green electricity from the network.
- **Transparent:** The E.ON Aura Manager informs you at any time about all electricity flows and costs.
- **Safe:** For all technical components we guarantee E.ON certified quality.
- **Protected:** Through our E.ON Complete **Protection**² you are fully protected for five years.
- **Regional:** Our selected partner companies plan your installation with you, install it at your home and explain the operation.
- **Reachable :** E.ON is your direct contact at any time.
- **Eligible :** E.ON Aura electricity storage is one of the few electricity stores supported by KfW.



This is how E.ON works

The *mannschaft* (iii)



stem

commercial

grid

customers

• about

news

contact

login



RWE leads second tranche of Series C Financing for Stem, Inc.

Intelligent storage company adds major European utility to board of directors

Millbrae, California – August 13, 2015—[Stem, Inc.](#), a leading provider of intelligent energy storage, today announced the close of its Series C funding round at \$45 million in total. The second tranche in the round was led by RWE Supply & Trading, the energy trading arm of Germany-based [RWE Group](#), one of Europe's largest electricity and gas companies. RWE Supply & Trading will also take a seat on Stem's board of directors to support the company's evaluation of new markets.

La Azurra a l'attacco

BIENAL DA ENERGIA - CE x

Our business | Enel X x

Es seguro | https://www.enelx.com/content/enel-x-it/en/who-we-are/our-business.html?zoneid=who_we_are-tile_small



Home Business City Electric mobility

Who we are Guide and support

Our business wants to offer a platform of energy-related services. We want to be a factory of innovative solutions that are the result of a completely new and constantly evolving view of energy

Enel X covers a global field of action

In order to provide the new solutions requested by customers and to be ready for the future, we have decided to structure our business line into four Global Product Lines:

e-Industries, offering solutions aimed at large-scale customers, with a particular focus on flexible services (consulting, technologies linked to energy efficiency, distributed generation and the creation of off-grid and Demand Response solutions);

e-Mobility, covering every type of customer, with the aim of becoming the technological leader in the sector and promoting increasingly widespread and efficient electrical mobility with charging infrastructures, Vehicle-to-Grid (V2G) and second-battery life services;

e-Home, dedicated to residential customers, with services like installation and maintenance of advanced technological solutions for the home; for smarter homes, capable of saving more and more energy and offering greater wellbeing;

e-City, offering public administrations and municipalities integrated services and connectivity solutions, like the wholesale offer of fibre optic services.

La Azurra a l'attacco

How we organised

enel x



e-Industries

Consulting and auditing service

Distributed generation on/off site

Energy efficiency

Flexibility solutions



e-City

Smart lighting

Fiber optic wholesale network

Distributed generation & energy services

Flexibility solutions



e-Home

Installation, maintenance and repair services

Automated home management

Financial services

Home 2 Grid



e-Mobility

Charging infrastructure (public & private)

Maintenance and other services

OEM back-end integration

Vehicle Grid Integration

Flexibility

La Azurra a l'attacco

#1 Smart Lighting is evolving towards smart cities solutions



Smart Lighting Solutions

e-City counts **2.5 mn of lighting points worldwide**. In Italy about 1,700,000; in Chile 280,000; in Colombia 410,000 and in Spain 100,000.

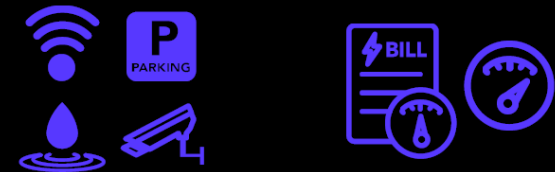
Artistic lighting: portfolio of solutions targeting architectural “attractions” driving both artistic/decorative enhancement and energy savings



Smart City Solutions

e-City offers to governments, public administrations and municipal utilities a comprehensive portfolio of **energy related digital solutions**.

Energy efficiency, video surveillance, urban analytics, urban advertising, e-Bus services and other lighting related ancillary services.



UBB

e-City aims to become a **multi-regional wholesale fiber operator in LATAM**, leveraging synergies with Enel's power distribution network.

- **Ultra Broadband connectivity (FTTx) for residential and enterprise;**
- **4G network densification;**
- **5G introduction;**
- **IOT and smart city infrastructure.**



La Azurra a l'attacco

#5 Our credit cards for low income customers



Product



- 3 Different credit cards
 - Standard
 - VIP (Higher limit)
 - Lower credit limit approved
- 98% of the clients are low income strata
- Personal loans



0.9 M customers



370 M EUR Portfolio



Personal Loans



9 K customers



1.6 M EUR Portfolio



Personal Loans



21 K customers



0.5 M EUR Billed/Mth

Characteristics

- ✓ Credit up to 4 times client's income
- ✓ Monthly charges in Enel's energy bill
- ✓ Deferred purchases between 1 and 48 installments
- ✓ Access to more than 7,000 stores
- ✓ It is not required to have credit experience

- ✓ Financing products in retails: appliances and others
- ✓ Monthly charges in Enel's energy bill

- ✓ Billing & Collection - financial institutions
- ✓ Monthly charges in Enel's energy bill

Around 1 Mln customers adopt our credit cards and personal loans in Latam

A satellite view of Earth at night, showing the curvature of the planet and numerous glowing city lights across the continents. The background is a deep black space.

The role of retail business in tomorrow's power systems

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