Future Utility Models based on Distributed Energy Resources
The sector already faced the challenge of renewables…

From a **value chain** based on **conventional generation**…

…to successfully integrate a **growing and massive** input of **centralized renewable generation** projects
... with large utilities reacting successfully ...

<table>
<thead>
<tr>
<th>Traditional Business</th>
<th>Renewable Energy Business</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Renewable Energy Generation</strong></td>
</tr>
<tr>
<td>Conventional</td>
<td><strong>E.ON Climate &amp; Renewables:</strong></td>
</tr>
<tr>
<td>Generation</td>
<td>Renewable generation subsidiary</td>
</tr>
<tr>
<td></td>
<td>(2007)</td>
</tr>
<tr>
<td>Energy Management</td>
<td>5 GW Onshore, Offshore, Solar</td>
</tr>
<tr>
<td>Transmission and</td>
<td><strong>Gaz de France</strong></td>
</tr>
<tr>
<td>Distribution</td>
<td>5 GW Onshore, Offshore, Solar, Biomass</td>
</tr>
<tr>
<td>Retail</td>
<td><strong>RWE Innogy</strong></td>
</tr>
<tr>
<td></td>
<td>Renewable generation subsidiary</td>
</tr>
<tr>
<td></td>
<td>(2008)</td>
</tr>
<tr>
<td></td>
<td>2.8 GW Onshore, Offshore, Solar</td>
</tr>
<tr>
<td></td>
<td><strong>Southern California Edison</strong></td>
</tr>
<tr>
<td></td>
<td>4 GW Onshore, Geothermal</td>
</tr>
<tr>
<td></td>
<td><strong>IBERDROLA Renovables</strong></td>
</tr>
<tr>
<td></td>
<td>Renewable generation subsidiary (2001)</td>
</tr>
<tr>
<td></td>
<td>14 GW Onshore, Offshore, Solar, Marine, Biomass</td>
</tr>
</tbody>
</table>
... and the industry value chain keeps evolving ...

From a traditional energy model based on ASSETS ...

...to an innovative CLIENT-focused business model, which uses new facilitators (DER, ICT) to offer more innovative and competitive products and services
## Energy efficiency / Distributed Energy Resources / Smart infrastructures

<table>
<thead>
<tr>
<th>New companies</th>
<th>Acquisitions / Joint Venture</th>
<th>Corporate Venture Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E.On Connecting Energies</strong>&lt;br&gt;Distributed Energy Resources</td>
<td><strong>Matrix (£85M- £100M)</strong>&lt;br&gt;Energy efficiency in commercial buildings UK</td>
<td><strong>E.On Ventures</strong>&lt;br&gt;[Logos]**</td>
</tr>
<tr>
<td><strong>COFELY</strong>&lt;br&gt;Energy and Environmental Efficiency</td>
<td><strong>Balfour Beatty</strong>&lt;br&gt;UK Facilities Management business</td>
<td><strong>GDF Corporate Venturing</strong>&lt;br&gt;[Logos]**</td>
</tr>
<tr>
<td><strong>RWE/ Partnerships</strong></td>
<td><strong>Green GECCO</strong>&lt;br&gt;(RWE Innogy + 29 Municipal Utilities)</td>
<td><strong>Innogy Venture Capital</strong>&lt;br&gt;[Logos]**</td>
</tr>
<tr>
<td><strong>Edison Energy</strong>&lt;br&gt;Distributed Energy Resources</td>
<td><strong>SoCore Energy</strong>&lt;br&gt;Rooftop solar installations I&amp;C</td>
<td><strong>Minority Investments</strong>&lt;br&gt;Clean Power / Finance</td>
</tr>
<tr>
<td><strong>Iberdrola Servicios Energéticos</strong>&lt;br&gt;Products and services for energy saving and efficiency</td>
<td></td>
<td><strong>PERSEO</strong>&lt;br&gt;[Logos]**</td>
</tr>
</tbody>
</table>

... requiring adaptation to new business opportunities
Leading companies in other contexts are entering the energy sector, taking advantage of emerging business opportunities like distributed generation, smart homes and electric vehicle, among others.

In addition, several of them are committed to service aggregation.

<table>
<thead>
<tr>
<th>Company</th>
<th>Sector</th>
<th>New Energy Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telefónica</td>
<td>Telco</td>
<td>• Through its subsidiary (Telefónica Soluciones de Informática y Comunicaciones de España), approved an extension of its corporate purposes to include electricity retail to large clients</td>
</tr>
<tr>
<td>Vodafone</td>
<td>Telco</td>
<td>• E-mobility, Smart meters, Grid management, Energy management</td>
</tr>
</tbody>
</table>
| Google           | ICT          | • $915M investment in renewable energy  
• Smart thermostats: Nest Labs’ acquisition for $3.2b                                                                                       |
| Chevron          | Fuels        | • Energy saving systems in buildings  
• Design of efficient plants  
• Energy management: Smart meters, analysis systems  
• Development of renewable energy projects (solar, geothermal, biomass)                                                                 |
| Volkswagen       | Automotive   | • Agreement with LichtBlick in Germany for selling micro-CHP to residential and commercial clients                                                      |
| Pepephone        | Telephony    | • PepeEnergy: electricity retailer, fair and tailored rates to end users’ needs                                                                   |
| Grupo Villar Mir | Infrastructures | • Electricity and gas retailer  
• Energy efficiency services and representation of special-regime producers                                                               |
Two complementary approaches to the energy business

**Traditional Utility**
- Strategy based on ASSETS
- Resources focused on core business
- Bigger regulatory pressure
- High entry barriers
- Electricity as the main business driver
- High structural costs
- Rooted and traditional corporate culture and values
- Sector under social pressure

**New Utility**
- Strategy based on the CUSTOMERS
- Flexibility towards facing new business opportunities and approaches
- Less regulatory pressure
- Few entry barriers
- New businesses: diversity of products and services
- New work environment
- Dynamic and adaptive internal culture
- Perception of innovative company
Business models based on new products and services applicable and adaptable to any geography

Change Agents...

New resources in the energy sector
- Distributed Generation (PV, micro CHP, heat generation, …)
- Distributed storage
- Loads (Demand)
- Data

Information and Communication Technologies (ICT)
- Smart meters
- Smart grids
- Connectivity
- Mobility
- Cloud computing
- Big data
- Analytics
- Machine learning
- Social Networks
- Gamification
- E-Business …

Regulation, policies and support schemes
- Unbundling
- Climate change
- Security of supply
- Net metering
- Self-supply
- Efficiency
- ICT
- Feed-in tariffs
…

Business models based on new products and services applicable and adaptable to any geography
### Generation and storage distributed assets
- Installation, management, O&M and/or financing of distributed generation and/or assets management for residential, commercial and industrial customers

### Energy demand management and optimization
- Use of smart appliances to optimize and generate demand and cost efficiency in electrical and thermal loads

### New products & services portfolio (customer data)
- Follow-up and excellence services in distributed energy systems. Engagement through exhaustive customer intelligence towards a more costly and efficient use of energy

### Distributed assets’ aggregation
- Building of micro-grids, VPPs, zonal aggregated systems and Community Choice Aggregations. Decentralized energy systems design and operation
Solar PV

2012 Cost ~ 2€/Wp (LCOE ~ 150-100 €/MWh)
2020 Cost ~ 1€/Wp (LCOE ~ 100-60 €/MWh)
World capacity (2012 → 100GW; 2020 → 350GW?)

Source: Mckinsey
Distributed solar: SolarCity

Every 5 Minutes
Someone Switches to Clean, More Affordable Energy With SolarCity

Take Control of Your Energy Costs
Save $250
by signing up in May

Business & Government
See why Walmart, eBay, the U.S. Military and more than 1,000 other organizations partner with SolarCity

Old Bill
18¢/kWh

New Bill
15¢/kWh

Our Vision
Create the most compelling energy company of the 21st century by delivering clean energy to everyone through distributed generation
Demand response

Chart 1.1  DR Capacity by Region, World Markets: 2014-2023

(Source: Navigant Research)
Demand response: Enernoc

Connecting Enterprises, Utilities, and Grid Operators

Powerful Energy Intelligence Software

Commercial Buildings and Institutions
Unlock smart solutions to use less energy, identify waste, and optimize your portfolio.

Industrial and Manufacturing Facilities
Gain visibility into your energy use and take control of costly peak demand charges.

Utilities and Grid Operators
Are you a utility, system operator, or energy retailer? We can help you meet your demand-side management goals.

$879,188,192
Dollars Saved

19,315,671
Tonnes of CO₂ Saved

85,411,426 MB
Data Streaming into Our NOC

$15,100,000,000
Energy Spend Under Management

24,000-27,000MW
Peak Load Under Management
Virtual Power Plants

*Total Annual VPP Power Capacity by Region, Base Scenario, World Markets: 2014-2023*
Virtual Power Plants

SIEMENS

Load

Grid Operator (e.g., PJM, NYISO)

Generation

Control

Power

VCHARGE

Turn It On

Generation

Load

Control

Power

External Information sources

Meteorological service

Energy exchange

Network control system

Biomass power plant

CHP plant

Fuel cell

Photovoltaic system

DEMS

Generation units
Data: New ways to engage with the client
Future Utility Models based on Distributed Energy Resources