Retos de la regulación frente al incierto futuro de los sistemas eléctricos

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Sunny Germany

Non-renewable power capacity

Complete power capacity

Sunny Germany

- May 8th, 2016: ~95% supplied from RES in a couple of hours
Sunny Germany

“Small and medium-size installations of less than 30 kV have dominated Germany's solar expansion in recent years, so that 70% to total PV capacity is now connected to the low-voltage grid. "In some low-voltage grids," they say, "the installed PV capacity can even exceed the peak load by a factor of ten."

IEEE's Power and Energy Magazine (March-April, 2013)
Learning cliff

Source: cleantechnica.com
ICTs integration

Source: The MIT Utility of the Future Study
Fashionable and wearable power
Fashionable and wearable power
Solar panels and home battery packs

Our commitment

We want to inspire and enable you to live a more sustainable life at home by offering products and services that will help you to save money, waste and energy.

Our work

IKEA is constantly investing in renewable energy and energy-efficient technology to help tackle climate change. We have installed more than 750,000 solar panels across the world!

Expertise & partnership

As one of the world’s largest and longest-established solar companies, Solarcentury have already helped over 25,000 UK homeowners to go solar. Founded in 1998, Solarcentury is not only one of the longest-standing solar companies – it’s also one of the most trusted and respected. Get a quote now online or visit one of our selected stores:

We’re currently rolling out nationally during 2016: Glasgow, Birmingham and Lakeside (from 25th April), Manchester (from 9th of May), Southampton (from 6th June).
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

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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Rooftop</th>
<th>Rooftop PLUS</th>
<th>Built-in PLUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of panels</td>
<td>12</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Panel</td>
<td>Canadian Solar 270W</td>
<td>JA Solar 280W</td>
<td>Sunstation 270W</td>
</tr>
<tr>
<td>Include battery storage</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Year one savings</td>
<td>£339</td>
<td>£340</td>
<td>£359</td>
</tr>
<tr>
<td>Savings over 20 years</td>
<td>£10,038</td>
<td>£10,208</td>
<td>£10,591</td>
</tr>
<tr>
<td>Cost of system</td>
<td>£4,040</td>
<td>£5,325</td>
<td>£6,500</td>
</tr>
</tbody>
</table>
Blockchain?

Welcome to the Token Generation Event

Decentralized and Trustless Trading Platform

AUD $34 000 000 Raised in Pre-Sale + Mainsale!
Business models for the rest…

Mobisol – plug in the world!

Mobisol combines solar energy with an affordable payment plan via mobile phone, comprehensive customer service and innovative remote monitoring technology. The Berlin-based company offers low-income customers in developing nations quality solar home systems that are a clean alternative to unhealthy, environmentally harmful, and expensive fossil fuels.

Systems come in varying sizes from 80 to 200 Wp to match the various energy needs of differing households. Mobisol solar home systems provide enough electricity to power bright efficient LED lights,
Is the future distributed?
The future is integrated
Improved network regulation

To enable the development of more efficient & innovative distribution utility business models
Regulatory tools to reduce information asymmetry & manage uncertainty

Incentive-compatible menu of contracts
• to induce accurate utility forecasts and minimize strategy behavior

Engineering-based reference network models
• to equip regulators for forward-looking benchmarks and analyze uncertainty scenarios

Automatic adjustment mechanisms
• to account for forecast errors

Cost-reflective prices and charges
The (old?) discussion

• Zonal versus nodal prices
The new reality

Source: The MIT Utility of the Future Study
Insights on the Economics of DERs

• Average locational value per MWh

Source: The MIT Utility of the Future Study
Insights on the Economics of DERs

• Average locational value per MWh

Source: The MIT Utility of the Future Study
Insights on the Economics of DERs

• Locational value: distribution network capacity

Source: Jenkins, Luke & Vargara (MIT), forthcoming
Insights on the Economics of DERs

• Drivers of locational value
  – Network losses
  – Network capacity constraints & upgrade costs
  – Local reliability costs
  – (User premium value?)

Source: Jenkins (MIT), forthcoming
Insights on the Economics of DERs (ii)

- **Economies of unit scale (fixed-tilt U.S. solar PV systems)**

  ![Bar chart showing incremental unit cost relative to 10-100 MW system]

  - **Capital annuity and fixed O&M ($1,000/MW-yr)**

  - **2015**
    - 10-100 MW
    - 1-2 MW
    - 1-kW

  - **2025**
    - (high cost estimate)
    - (medium cost estimate)
    - (low cost estimate)

  - Incremental unit cost relative to 10-100 MW system

Source: The MIT Utility of the Future Study
Granularity of price signals

- With respect to both time and location

**Spatial granularity**
- Distribution nodal LMPs (DLMPs, real & reactive)
- Intermediate DLMPs (substation/zonal/other)
- Wholesale LMPs + distribution losses
- Wholesale nodal LMPs
- Wholesale zonal LMPs

**Temporal granularity**
- Time-of-use pricing
- Critical peak pricing
- Day-ahead hourly price
- Real-time spot price

Source: The MIT Utility of the Future Study
Forward-looking peak-coincident network capacity charges...

... and scarcity-coincident generation capacity charges.
End-user price signals

- Individual injection & withdrawal profiles
  - Symmetrical
  - Avoiding going behind the meter

Source: The MIT Utility of the Future Study
End-user price signals

- Residual network & policy costs allocation without distorting efficient incentives

Source: The MIT Utility of the Future Study
End-user price signals

• Address distributional concerns without sacrificing efficient incentives
  – Efficient pricing would unwind cross-subsidies and result in greater variability in charges
  – Lump-sum bill credits or surcharges can restore desired cross-subsidies if desired
Revisit industry structure
Need to unlock the value of new services

Locational Services:
• Energy, network capacity margin, network constraint mitigation, reliability, etc.

Non-Locational Services:
• Firm capacity, operating reserves, CO₂ emissions reduction, etc.
Minimize conflicts of interest

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

Source: The MIT Utility of the Future Study
Update electricity markets
Improve wholesale market and RES subsidies design

• Reward **flexibility** improving bidding formats, time granularity and reserves pricing

• Evolve RES support mechanisms for a proper integration
Planning, Operation, Regulation

The need for a level playing field