Energy Transition in Europe:

Challenging –
But Less Fractured Than You Think

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What we’re seeing:
Meanwhile... in Brussels

“Energy Union” and Clean Energy for All (aka “Winter Package” for 2030)

• Energy Efficiency Directive
• EPBD - Energy Performance of Buildings Directive
• Renewable Energy Directive
• IEM - Internal Energy Market Directive
• Reforms to the ETS (Carbon Cap & Trade)
• Governance Regulation – for Energy and Climate planning, progress reviews
EU Power – some notes for context

- European Union includes 28 (or 27) nations, more than 500 million citizens, GDPs total $14 Trillion, 20% of global GDP -- it’s a big and complex place.

- Wide range in national power supplies: Poland is 90% coal and lignite; France is largely nuclear; Scandinavia largely hydro; Germany is >50% coal;

- Legacy of divisions (Spain/France; Germany/Poland; Eastern bloc/the West, and more): a lack of underbuilt interconnections, regional markets and resource sharing.

- Ambitious goals for energy and climate progress:
  - 80 to 95% GHG reduction economy-wide by 2050
  - The Climate and Energy Package officially created 3 goals for 2020:
    - Easy to remember 20/20/20 for 2020
  - What will the Winter Package do?

  Debating now: 30% EE; 27% RES; 40% CO2 for 2030
European Power Policy: 5 Challenges

- High prices (retail) & Low prices (wholesale)
- Carbon prices ineffective
- Steep learning curve on EE & DR
- Renewables integration
- Weak regional markets and governance gap

There are lessons for New England in each area.
1. Energy Efficiency Directive

“I'm particularly proud of the binding 30% energy efficiency target, as it will reduce our dependency on energy imports, create jobs and cut more emissions.”

Arias Cañete, EU-Energie- und Klimakommissar
EEOs in Europe – from 5 MS (2013) to 16

16 countries now

(58% of the EU final energy consumption)

- In place for more than 7 years
- In place for more than 3 years
- In place for less than 3 years
- To be started soon
- Still under discussion

- Poland
- Spain
- UK
- France
- Estonia
- Latvia
- Lithuania
- Bulgaria
- Ireland
- Italia
- Slovenia
- Croatia
- Denmark
- Luxembourg
- Malta
- Luxembourg
- Malta

Energy solutions
for a changing world
2. Germany’s “Energy Transition”

- Germany’s Energiewende (2011) Main goals:
  - GHG reductions 40% by 2020, 55% by 2030, 80-95% by 2050
  - Renewable electricity: 35% by 2020, 50% by 2030, 80% by 2050
  - Efficiency: 25% power, 50% overall by 2050
  - Renewable power (energy): grew from 7% to 29% between 2000 and 2016
  - Still 40% coal
  - Recent RES auctions: zero subsidy offshore; 5.7 Eurocents onshore
Share of energy sources in gross German power production in 2016.
3. ETS Woes: Carbon Prices Won’t Drive Power Shift
Thank You!

---  Questions?
Is a capacity market needed? What is the real problem?

- Incumbents profits and stock prices are dropping
- Conventional generators see fewer operating hours and lower prices as more (renewable) capacity is added to an already over-supplied market.
- Is the low marginal cost and variability of many renewable technologies the cause of all this?
- No. There’s another explanation: Too much supply, not enough transmission, no locational price signals, inflexible generation
Challenge 1: High prices (retail)

Electricity Prices, European Countries plus the United States

- US 10 cents
- Germany 30 cents

(Source: Pike Research)
German household electricity price components 2006-2013

Over $.35 – compares to Hawaii in the US

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Source: BNetzA
Low Prices (Wholesale): Generation overhang, RES inroads

Source: E.ON Capital market day 2013
Wide range of capacity mechanisms & proposals

Source: Fortum Industrial Intelligence, May 2012
“High cost tonnes” in EU power markets

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Carbon price 20 Euros</th>
<th>Carbon price 40 Euros</th>
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</thead>
<tbody>
<tr>
<td>Event/Result</td>
<td>No demand response</td>
<td>Price-elasticity -.2</td>
</tr>
<tr>
<td>(a) Power price increase</td>
<td>€ 10.9 /MWh</td>
<td>€ 23.2 /MHz</td>
</tr>
<tr>
<td>(b) Total sales</td>
<td>3016 TWh</td>
<td>2881 TWh</td>
</tr>
<tr>
<td>(c) Total Cost increase</td>
<td>€ 33 Billion</td>
<td>€ 66.8 Billion</td>
</tr>
<tr>
<td>(d) Emission reduction</td>
<td>133 Mt (all due to redispatch)</td>
<td>363 Mt (165 Mt from dispatch, 198 Mt from demand response)</td>
</tr>
<tr>
<td>(e) Consumer cost per tonne reduced</td>
<td>€ 248 per tonne</td>
<td>€ 184 per tonne</td>
</tr>
</tbody>
</table>

Source: Sijm, et al, The Impact of the EU ETS on Electricity Prices, Final Report to DG Environment, December 2008 (ECN-E-08-007) [Row (e) is a RAP calculation based on Tables in the report, as shown.]
Challenge 3: Steep learning curve on EE and DR

Reduce greenhouse gas emissions by 20%

Increase share of renewables to 20%

Reduce energy consumption by 20%

<table>
<thead>
<tr>
<th>Target</th>
<th>EU Estimate 2020</th>
<th>National Estimate 2020</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding EU target</td>
<td>-24%</td>
<td>-21%</td>
<td>Positive</td>
</tr>
<tr>
<td>Binding national targets</td>
<td></td>
<td>-17%</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Energy solutions for a changing world
Article 7 – Energy Efficiency Obligation Schemes

• “Each Member State shall set up an energy **efficiency obligation scheme**…[to] ensure that **energy distributors and/or retail energy sales companies** … achieve a cumulative **end-use energy savings target** … by 2020”

• “That target shall be at least equivalent to achieving **new savings each year from 2014 to 2020 of 1.5% of the annual energy sales to final customers**…”

• Phase-in and “alternative measures” are OK, but the total reduction required by 2020 is the same.

• This law was based to a large extent, on the experience of New England and other US states.
UK concern over high prices turns into attack on EE and Renewables costs

2013 --Labour Party campaign issue on high utility costs is deflected by Conservatives into attack on costs of efficiency and renewables
Under UK’s new “green deal” scheme, insulation installs drop 90%

loft: -90%, cavity: -62%, solid: -57% (average per year 2013-2015 compared to 2012)

Source: Climate Change Committee 2014 and DECC 2015
Challenge 4: Integrating Renewables

New Capacity EU, 2000-2013

Source: EWEA 2014
Challenge 5: Weak regional markets and governance limitations

• Current EU “Constitution” (Lisbon Treaty) gives each MS competence to determine its energy mix

• Historic “hard” borders leaves legacy transmission grid with limited transfer capability

• There is no FERC – wholesale market regulation is (mostly) in the hands of national TSOs and regulators, subject to the goal of greater integration

• Many look enviously at the US model of stronger ISOs/RTOs and adequate interstate regulation
About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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