Energy Transition in Europe:

An Update for New England

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Director
EU Power – some notes for context

- European Union includes 28 nations, more than 500 million citizens, GDPs total over $16 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; etc.
- 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:
    - 20% reduction in GHGs economy-wide
    - 20% delivery of renewable energy
    - 20% reduction of energy use via energy savings
Great Variation in Power Mix across European Nations

Source: IEA 2014
European Power Policy: 5 Challenges

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

There are lessons for New England in each area.
**Challenges: (1) High Prices (retail)**

<table>
<thead>
<tr>
<th></th>
<th>Gas price index</th>
<th>Electricity price index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU</td>
<td>35%</td>
<td>38%</td>
</tr>
<tr>
<td>US</td>
<td>-66%</td>
<td>-4%</td>
</tr>
<tr>
<td><strong>Households</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU</td>
<td>45%</td>
<td>22%</td>
</tr>
<tr>
<td>US</td>
<td>3%</td>
<td>8%</td>
</tr>
</tbody>
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*Source: European Commission/IEA*
German household electricity price components 2006-2013

Over $.35 – compares to Hawaii in the US

Energy solutions for a changing world

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
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 2. Carbon Prices Won’t Drive Power Shift
US shale gas makes EU COAL generation cheaper

Shale gas has increased US Coal exports pushing down European coal prices. Gas plants in EU being mothballed, coal running harder, and we ARE indeed shipping “coal to Newcastle”
“High cost tonnes” in EU power markets

<table>
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<tr>
<th>Scenario</th>
<th>Carbon price 20 Euros</th>
<th>Carbon price 40 Euros</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Event/Result</strong></td>
<td><strong>No demand response</strong></td>
<td><strong>Price-elasticity -.2</strong></td>
</tr>
<tr>
<td>(a) Power price increase</td>
<td>€ 10.9 /MWh</td>
<td>€ 23.2 /MWh</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 redispach)</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 & DR

Scenarios for an energy efficiency target for 2030*
Progress towards 2020 targets

- Reduce greenhouse gas emissions by 20% (Binding EU target: Estimate in 2020: -24%)
- Increase share of renewables to 20% (Binding national targets: Estimate in 2020: 21%)
- Reduce energy consumption by 20% (No binding target: Estimate in 2020: -17%)

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.
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

Energy solutions for a changing world
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
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: grew from 7% to 24% between 2000 and 2013
Germany 2014: slowing down new RES
2015: targeted shutdown of lignite

- April 2014 Germany slows down the rapid pace of RES additions: Quantity caps for wind, solar, offshore wind
- More competitive pricing for RES after 2017
- This has been structured to stay on track for 80% reduction by 2050
- 2015: strategic negotiations and regulations to accelerate shutdown of the highest emitting lignite plants
  - Current proposal: require worst plants to purchase extra carbon allowances in order to run
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
Thank You!

--- Questions?
About RAP

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

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