Our Global Position at a Glance

70 countries

- €97 bn in 2012 revenues
- 116 GW of installed power-production capacity
- 10 GW of power-production capacity under construction

219,300 employees, including
- 61,300 in power and natural gas
- 78,400 in energy services
- 79,600 in environmental services

Revenues: €77.1 bn
189,850 employees
52.3 GW*
1.7 GW**

Revenues: €5.5 bn
6,200 employees
13.4 GW*
0.4 GW**

Revenues: €4.9 bn
4,900 employees
12.3 GW*
4.7 GW**

Revenues: €0.9 bn
6,300 employees
0.3 GW**

Revenues: €8.6 bn
12,050 employees
37.8 GW*
2.5 GW**

All figures are as of Dec. 31, 2012

* Installed. ** Under construction.
North American energy position

Canada
- Power Generation
- Renewables
- Gas Storage

Northeast
- Power Generation
- LNG Regas
- Gas Sales
- Retail Sales
- RECs

Texas
- North American HQ
- Power Generation
- Gas Storage
- Retail Sales

Mexico
- Power Generation
- Gas LDC
- Gas Pipelines
- Gas Sales

An integrated gas and power model spanning North America
Germany- A Case Study in Market Policy gone Astray

**Policy Environment**
- Phase out of nuclear
- Renewable push with generous subsidies (EU “20-20-20”)

**Market Environment**
- High natural gas prices
- Economic crisis and demand destruction
- Excess carbon credits → low carbon prices
- Falling prices of renewable technologies (solar)

**Renewable Build Out**
- Massive renewables overbuild (~60 GW)
- ~ €20 billion annual subsidies a year

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![Generation capacity by fuel/technology graph](image)
Germany- A Case Study in Market Policy gone Astray

Results

- Significant additional ancillary service capacity needed to balance renewables, but no payments for service
- "Green Paradox" – coal plants running more than gas due to merit dispatch, with many gas CCGTs being mothballed and decommissioned
- High retail prices induced by excessive subsidies make consumer self generation more attractive (Rooftop solar significantly above “socket parity”)
- Uncoordinated national renewable build out destabilizing “loop flows” into neighboring countries requiring significant infrastructures enhancements which must also be socialized (€20 billion new transmission needed to deliver existing renewables; over €600 billion for Europe)
- Utilities suffer: E.On: 75% reduction in share price; Europe utilities shed $650 billion in market cap

German Renewable Energy Act compensation and forecast through 2016

[Graph showing compensation and forecast data]

Source: Power; Economist; EEX; Citi Research; Business Spectator;
“Power produced in Germany by Solar panels in sunny days at noontime is equivalent to more than 20 nuclear power stations”
Peter Altmaier, German Energy Minister
Lower Wholesale Prices

Traditional merit order setting of price

Demand at time $t$

Merit order setting of price

With increasing RES:

1. Lower wholesale prices
2. Thermal assets pushed out of the game
   - Margins not sufficient to sustain thermal assets
   - RES, nuclear, and coal alone not sufficient to reliably maintain system
Higher Consumer Prices

Electricity Prices for Households in Germany (since Renewable Energy Act)

- Despite “Cheap” Renewable Energy, Residential Prices continue to rise
- Roof top solar significantly above “socket parity” encourages self build by consumers, reducing socialization pool for T&D costs and other subsidies, pushing household prices even higher

Source: Energy-Facts; Earth Techling
What American Markets Learn from Germany

Subsidies

- Subsidies can have unintended consequences
  - Unplanned system management/reliability issues
  - “True” environmental impact of different operating regimes can be different than expected
  - “Peanut Buttering” of costs makes true costs hard to determine and undermines an efficient system (What else is being subsidized/socialized? Transmission, Capacity, etc?)
- Higher “real” prices to consumers
- Inescapable socialization trap

Existing Resources

- Don’t underestimate the value of existing resources
  - Compensate for services/flexibility provided

Texas CREZ Line – A significant renewable subsidy