



Impact of renewables deployment on the power sector

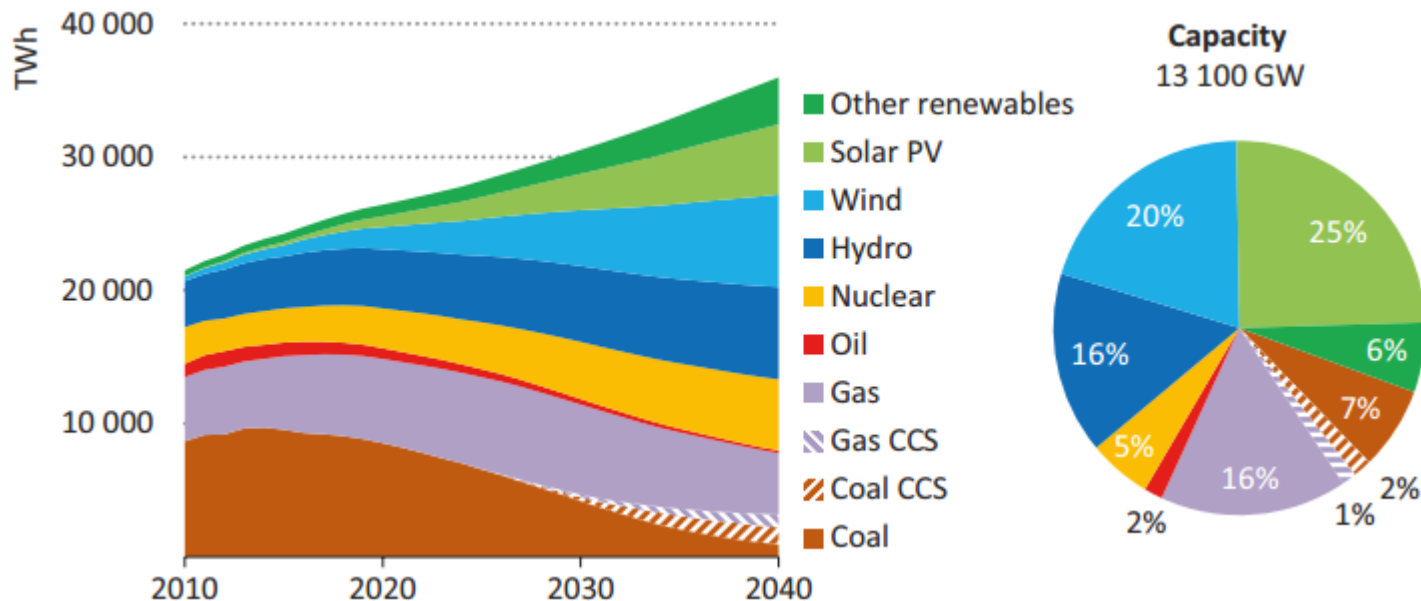
Matthew Wittenstein, Senior Electricity Analyst

10 April 2018



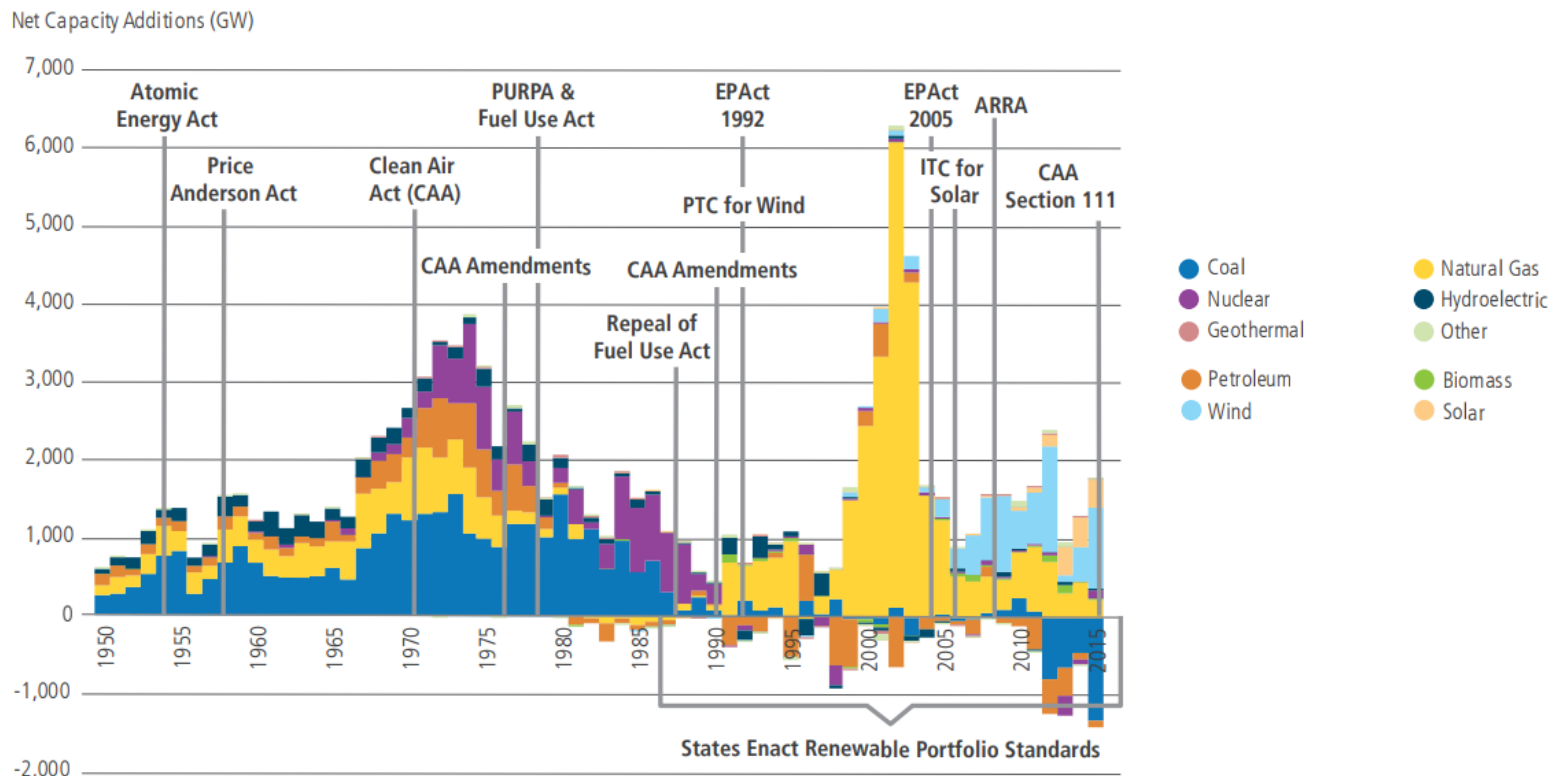
Transitioning to a high renewables future

Power generation by source (left) and installed capacity (right) in the Sustainable Development Scenario, 2040



Under the WEO's Sustainable Development Scenario, by 2040 power generation is almost completely decarbonised. Coal without CCS nearly vanishes, and natural gas plays a much stronger balancing role.

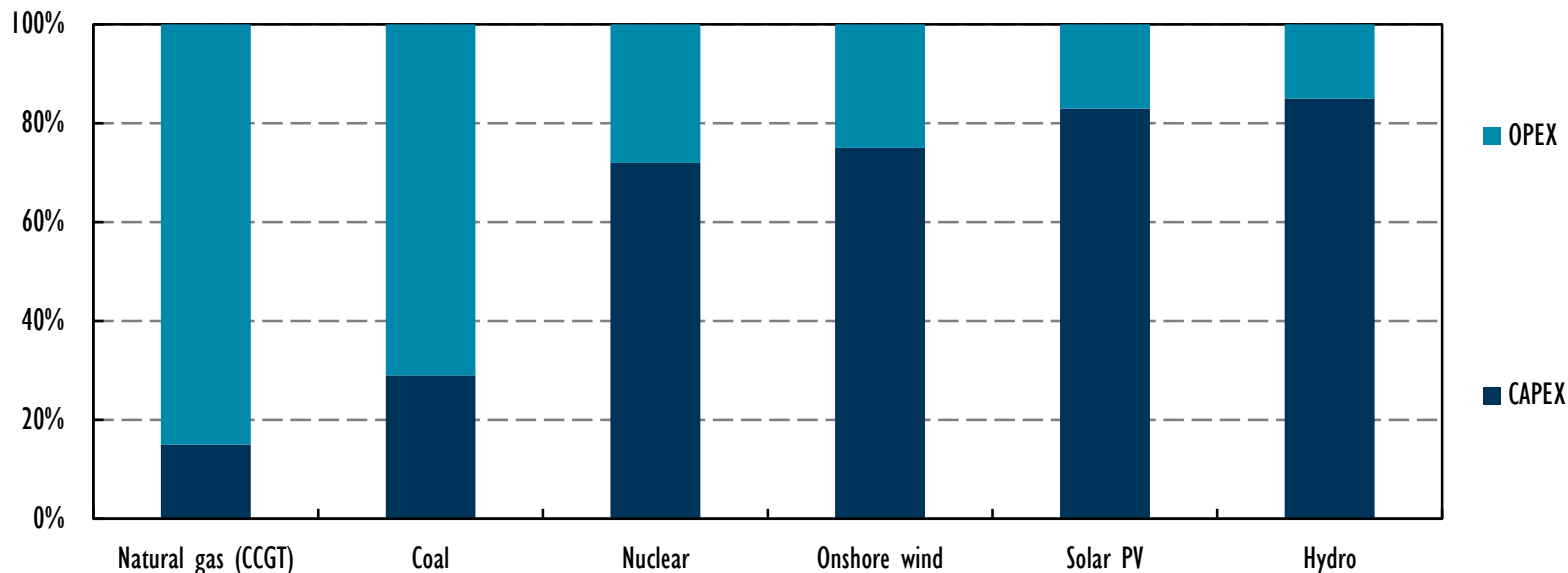
Market versus policy-driven investments



Competitive markets shift investments away from capital intensive technologies towards more flexible ones (in particular, natural gas). RE and nuclear investment have been driven by policy.

Low-carbon technologies are capital intensive

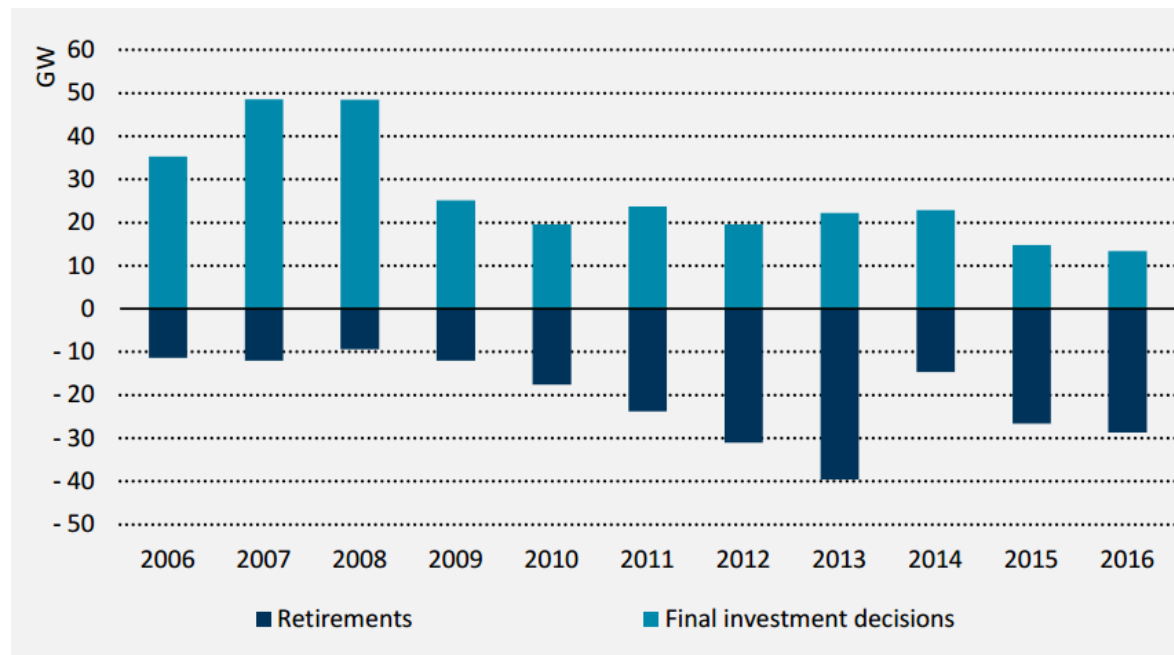
Ratio of Capital to Operating Expenditures by technology



Capital intensive technologies have higher upfront investment costs, but relatively lower operating costs. They are more sensitive to the cost of capital, but potentially more competitive when operating.

Reliability in wholesale market environments – a growing concern?

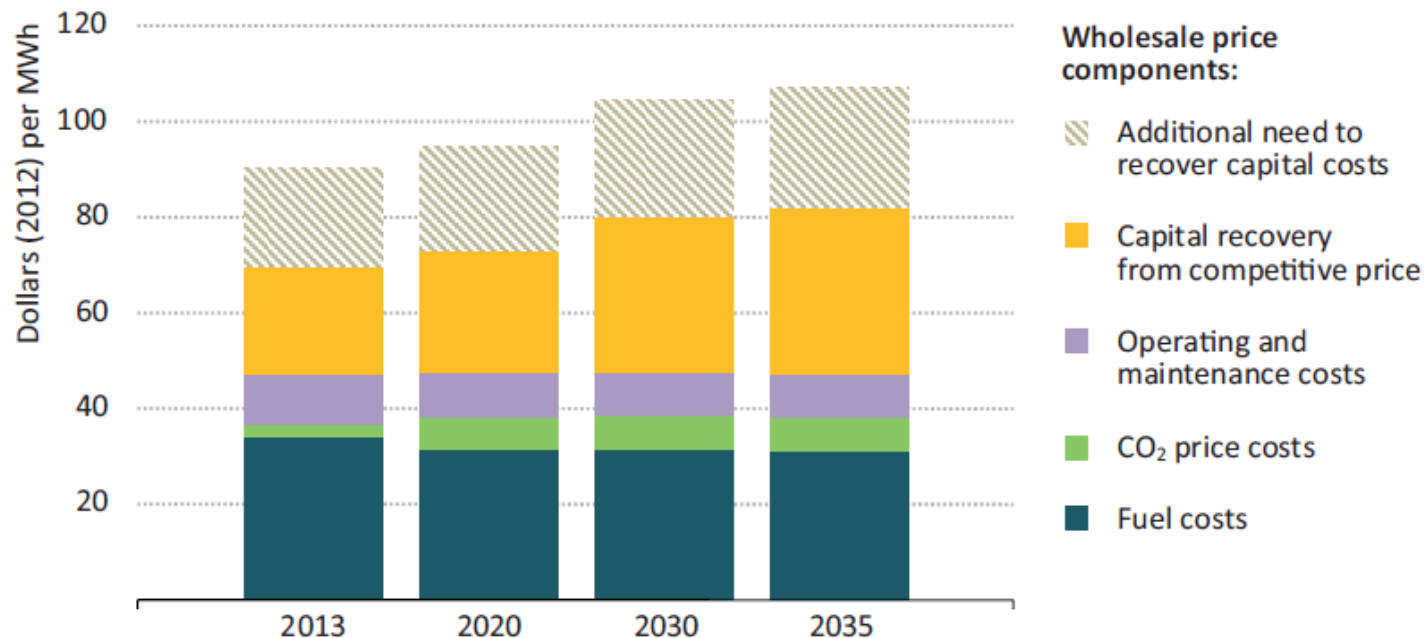
New large-scale dispatchable generating capacity and retirements in established wholesale markets



In established competitive wholesale power markets, the sanctioning of new large-scale dispatchable power capacity has been outpaced by retirements of existing plants in four of the past five years.

Are investors able to recover costs via wholesale markets alone?

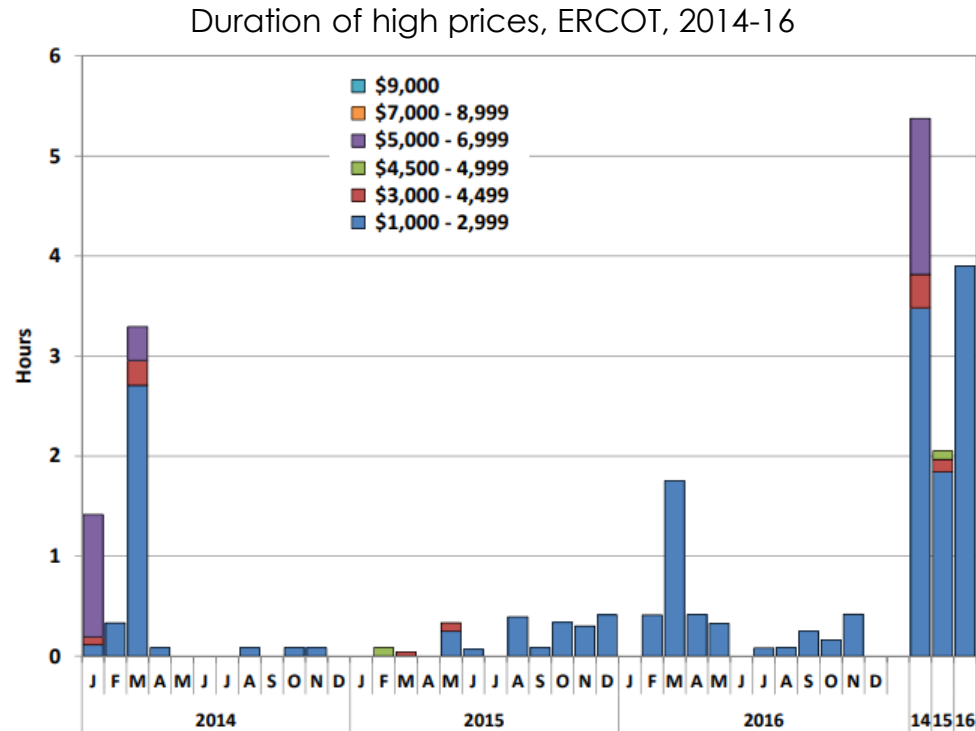
Revenue gap for hypothetical power plant in European power system, 2013-2035



Note: Prices are generation-weighted averages.

In the absence of wholesale market reform or additional revenue streams, a typical power plant will struggle to maintain profitability.

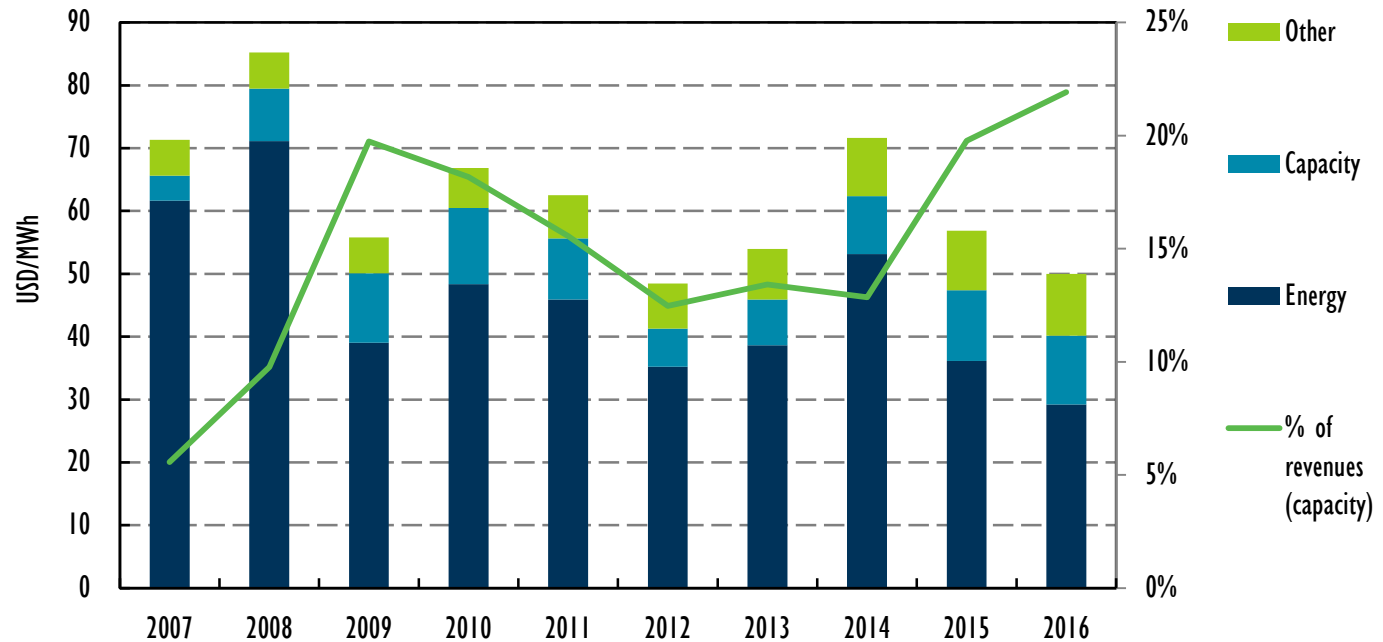
Making up the difference: relying on price volatility?



Even with a price cap of 9000 USD/MWh and the absence of a capacity market, the number of hours of high prices in the Texas wholesale electricity market (ERCOT) has been declining.

Making up the difference: capacity revenues to the rescue?

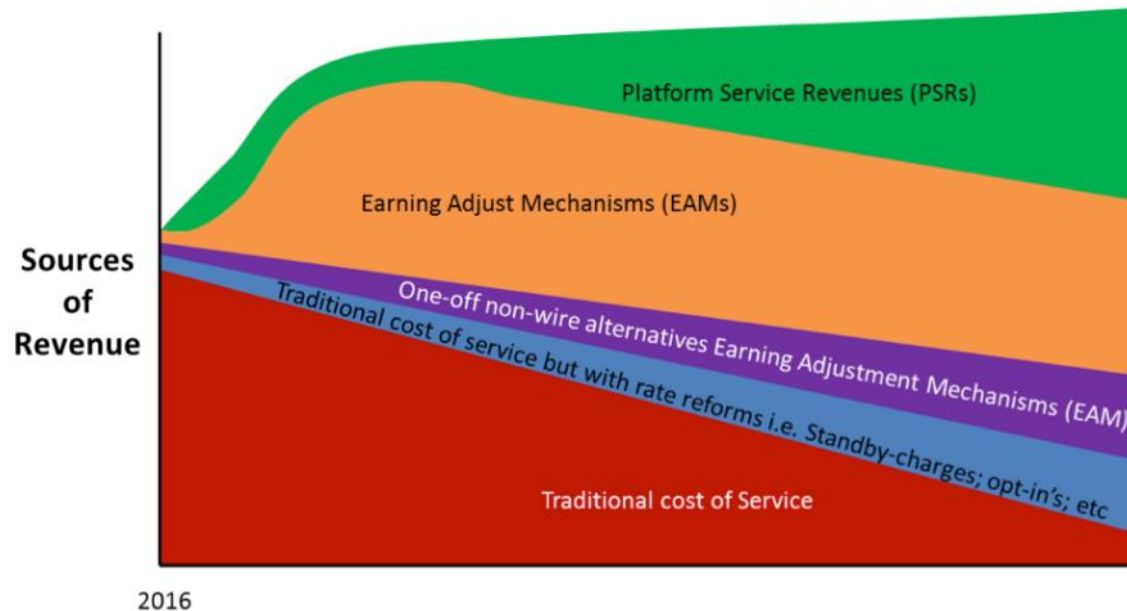
Components of the PJM wholesale price and ratio of capacity to total revenues



In PJM, revenues from capacity markets have remained relatively stable in absolute terms, but have been growing as a percentage of total revenues.

New revenue streams: distribution company as service platform?

Utility revenues under New York's Reforming the Energy Vision (REV)



The impact of distributed resources and the need for increased system flexibility is driving some jurisdictions to rethink the role of the distribution company.



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