CHEAP FOSSIL FUELS’ IMPACT ON RENEWABLE ENERGY
Where we are today

Impact on wind and solar

What’s next?

How Can FTI Consulting help?
Renewable energy has experienced significant growth over the past five years; but the question investors are asking today is whether lower fossil fuel prices are likely to slow or reverse the renewables’ growth trend in favor of fossil fuels: More generally, what does cheap oil for the renewable generation sector mean?

The oil price decline explained
A confluence of separate but related factors – massive new supplies from the U.S.; OPEC’s unwillingness to reduce output; and, a slowing of global oil demand (especially in OECD countries) – has had profound effects on the global price of crude. In June 2014, WTI crude peaked at $115/bbl. By January 2015, it had dropped to below $46/bbl and was at $50/bbl WTI Crude in early August. In many markets, the oil price decline has led to cheaper natural gas prices.

Historic Oil and Natural Gas Prices:

Source - FTI Analysis of EIA Data
Globally, less than 5% of all electricity is generated by oil, so solar and wind are not in direct competition with oil in most countries.
Impact on wind and solar

Wind and solar do compete with coal and natural gas in electricity generation - the latter is often a by-product of oil production and its price is linked to that of oil in many markets outside the U.S. In the U.S., however, the explosion in shale gas production at the end of the last decade, and the resultant strong supply of cheap gas, has caused the historic correlation between U.S. oil and natural gas prices to decouple dramatically. From January 2002 through July 2009, 57 percent of the variation in natural gas prices was determined by the price of oil. Since then, that correlation ($R^2$) has dropped to zero percent, a pattern reflected in the graph on page 1.

2015 Global Electricity Generation by Fuel Type (EIA Estimated):

![Graph showing electricity generation by fuel type for 2015. Coal at 40%, Natural gas at 21%, Hydropower at 16%, Nuclear at 13%, Nonhydro Renewables at 6%, Liquids (including oil) at 4%.]

Source - U.S. Energy Information Administration

The reduced correlation between oil and natural gas prices in the U.S. coincided with both the arrival of plentiful shale gas in the U.S. and a tightening in the supply/demand balance for oil globally (caused in turn by strong growth in Asian demand and a muted economic recovery in the EU and the U.S. since the financial crisis). For now, U.S. natural gas prices will remain driven by the regional supply/demand balance for gas because of difficulties in transporting it beyond existing pipeline systems, and a lack of significant LNG capacity to export gas.
The cost of electricity from wind and solar has become dramatically cheaper in recent years.

Outside of North America, natural gas prices are more closely linked to oil prices. While natural gas prices have declined, wind and solar prices have remained relatively competitive. Economies of scale, improvements in technology and manufacturing, excess manufacturing capacity in wind and (especially) solar, have led to a drop in the capital cost per megawatt (MW) for both renewable technologies. More importantly, these trends have led to a reduction in the levelized cost of energy (LCOE) – the cost per MWh for electricity generated from wind and solar. The cost of electricity from wind and solar is strongly influenced by local meteorological conditions. That said, according to analysis by FTI Intelligence, the cost of onshore wind, in appropriately windy locations, is in the range of $45-70/MWh without subsidies. This makes the price of electricity generated by wind at or below the wholesale grid parity point in many locations.

As a result, onshore wind has consistently emerged as the cheapest new-build technology to replace aging and carbon intensive generation assets. It is cheaper than gas (at $65-120/MWh), coal (in the range of $80-120/MWh), and nuclear, (which, including decommissioning costs, has a cost of well over $100/MWh).
Any initiatives to limit carbon emissions (like Obama’s Clean Power Plan in the U.S.) may well increase the cost of fossil generation technologies, rendering wind and solar more competitive.

Offshore wind, with a LCOE of $130-150/MWh, remains comparatively expensive and thus requires significant subsidies in its main markets in Europe, although the LCOE of offshore wind is expected to drop below $110/MWh in the next five to seven years.

The LCOE for solar photovoltaics (PV) remains higher than onshore wind and most fossil technologies – despite a significant reduction in the cost of solar that has more than halved the LCOE for PV in the last three years – at $100-150/MWh (exceptional locations with high insolation rates can deliver a LCOE as low as $50-70/MWh range, but these are unusual).

In spite of solar’s more elevated LCOE, it is actually quite competitive in one of its main applications: small scale roof-top residential or commercial installations, where the cost comparison point for such systems is the retail electricity price.

In the U.S., the retail electricity price averages nearly $130/MWh (range $90-200/MWh), and in the EU, the average retail electricity price is even higher – at $220/MWh. Therefore, in many parts of the U.S. and the EU solar PV is at or below the retail grid parity point, which continues to drive significant installations.
What’s next?

In a sustained low oil price environment, the outlook for renewable electricity generation is optimistic, as the future of wind and solar will mostly be determined by other factors:

**Cost competitive technologies**
As long as the LCOE remains below the grid parity point for wholesale electricity for wind, and the LCOE for solar stays below the retail electricity grid parity point, installation growth should continue. FTI Intelligence is forecasting that wind installations globally should experience a one percent CAGR between 2015 and 2019, and accelerate to six percent CAGR between 2020-2024. Growth in solar PV installations is forecasted to exhibit a CAGR of approximately 10 percent until 2020. Further improvements in the LCOE are forecasted for wind and solar driven principally by efficiency and technology improvements, a lower cost of capital, as well as a reduction in equipment costs in the case of solar.

**Average U.S. Prices for Residential and Utility-Scale PV Systems**

Onshore wind’s position as one of the cheapest new-build technologies will continue to put it in a strong position to replace aging carbon-intensive fossil technologies such as coal, as well as nuclear capacity where political pressure is forcing the shut-down of the nuclear fleet (as in Germany and Japan), continuing a trend that in the last decade saw renewables comprise two-thirds of new generation capacity in the EU, and over half of new capacity in the U.S.

Efforts to retrofit Carbon Capture and Storage (CCS) to any fossil generation technologies – or at a minimum to ensure that new-build fossil generation capacity (including gas) has CCS which climate change scientists suggest is necessary to limit the impact of temperature change – will further increase the LCOE for gas by 15-20 percent and for coal by over 40 percent, further favoring renewables.

Regulations, such as installation targets, subsidies and emission rules – generally continue to be supportive, but are gradually being withdrawn. Although Obama’s Clean Power Plan seems to buck this trend, outside the U.S., this is a trend that will continue in the future as the relative cost position of renewables continues to improve, and grid parity is reached, allowing renewables to begin to compete strictly based on economics in an increasing number of locations. Continued reductions in the cost of installed systems are expected to drive growth increasingly over time, even in the U.S. which has some of the lowest commercial natural gas prices in the world. Market pricing mechanisms will continue to evolve as subsidized feed-in tariffs are phased out. The market is moving towards the merchant model, with greater usage of more market-risk based models, including the use of feed-in premia; but the increasingly cost competitive nature of renewable technologies leads FTI Intelligence to predict that renewables will continue to thrive.

Storage is on the cusp of further revolutionizing demand for renewables. Advances in cost-effective storage technologies will allow intermittent renewable generation sources to become quasi-baseload and improve power quality, providing a significant boost in installations. Utilities and network operators currently use gas generation

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**2014 US New Electric Generation Capacity by Type**

![Chart showing 2014 US New Electric Generation Capacity by Type]

- **Solar**: 32%
- **Natural Gas**: 42%
- **Wind**: 23%
- **Other**: 3%

Source - FERC, GTM Research

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capacity to smooth fluctuations in supply and peaks in electricity consumption caused in part by large amounts of variable renewable electricity on grid. With the commercialization of cost-effective storage, generators will be able to further reduce the usage of natural gas generation capacity (which has already rendered uneconomical in some cases by underutilization due to the growth in renewable generation with priority grid access).

**Co-locating solar and wind** assets can also improve predictability/certainty of generation in some parts of the world as it helps smooth the generation profile of the twin assets as well as offering a cost competitive way to share grid or transmission connections. In the short, medium and longer term, the price of oil is unlikely to have a significant impact on the competitiveness of wind and solar.

**Further shale gas production outside North America:** The long term threat for renewables from fossil fuels is not from oil but further shale gas exploration and production in EU and Asia (especially China), which may lead to the widespread availability of cheap natural gas. However, both exploration and production economics for shale gas in these regions as well as the high cost of required new pipelines and/or LNG infrastructure to import shale gas makes this quite remote in the short term.

**Fossil fuel prices will rise again:** Of course if coal and gas prices go up, wind and solar will become more competitive. Even natural gas prices in the U.S. are expected to rise, given that these are already substantially below their long term average, and especially because many new shale gas assets are not economical, at least in the short run. Henry Hub natural gas future contracts are at $2.88/mmBTU for August 2015, increasing to $4.20/mmBTU for April 2022. According to the Financial Times, outside the United States, gas prices tend to closely track oil prices, which are eventually expected to recover somewhat from the current global average breakeven oil price of $50/barrel, with the non-OPEC average at $60/barrel.

The future for wind and solar is in the industry’s hands with further advances in technology and increasing competitiveness expected to drive demand, whether oil and gas prices remain low or recover somewhat; and regardless of whether government support programs continue at current levels, or decline significantly.
How can FTI Consulting help?

Whether low oil prices are impacting your business in the clean energy or renewables space, FTI Consulting brings unparalleled expertise and innovative and critical thought leadership, both event or strategically driven:

• Strategic options review and execution
• Corporate finance: restructuring, interim management, transaction advisory
• Financial or operational restructuring
• Financial, commercial and regulatory due diligence
• Contract renegotiations
• Public policy (e.g., EPA regulations) analysis
• Litigation support/expert witness services
• Price and market forecasts
• M&A and asset dispositions
• Valuation
• Intelligence gathering on overseas sources of potential supply and demand
• Strategic stakeholder communications
• Merger Integration

About FTI Consulting’s Clean Energy Team

The FTI Consulting Clean Energy team provides a wide array of advisory services that address the strategic, financial, operational, technical, reputational, regulatory and capital needs of companies involved in clean energy generation — particularly solar, wind and biomass, among other emerging low-carbon clean technologies, including energy storage. The suite of services provides a one-stop solution to the needs of clean energy companies, their investors and other parties of interest.
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