Why Intermittent Wind Power Can Never Match Power Dispatched On Demand

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There are 3 electricity essentials – that the power source and its delivery to homes and businesses be: 1) reliable; 2) secure; and 3) affordable. Which means that wind power – a wholly weather dependent power source, that can't be stored and costs 3-4 times the cost of conventional power – scores NIL on all three counts.

Over time, STT has sought to pull together fairly technical aspects of power generation in an effort to demonstrate the patent nonsense of wind power.

Here's a great effort to do just that by Mark Febrizio, who is a policy associate at the Institute for Energy Research in Washington, DC.

'Grid Parity' for Renewables: An Empty Concept (Part I)

Master Resource Mark Febrizio 21 March 2016

"Coal, natural gas, nuclear, and hydroelectric power are essential because they are predictable and dispatchable resources; conversely, renewables produce power intermittently and are less valuable as a generation resource. To reach true grid parity, an energy source should be able to produce affordable electricity as well as dependably meet electricity demand."

The idea of cost-competitiveness for renewable energy resources—called "grid parity"—is misleading and incomplete without considering reliability. Yet recent reports are pushing grid parity as an imminent reality. For example, a February 2016 study from GTM Research assessed that electricity from residential solar has attained grid parity in 20 states.

How an electricity source functions on the grid is more important than mere cost-competitiveness. To reach true grid parity, an electricity source should provide affordable, reliable power on a dependable basis.

The Concept of Grid Parity

The National Renewable Energy Laboratory describes grid parity as the "break-even" cost for electricity from a renewable energy source in relation to "electricity purchased from the grid."[**1**] In other words, grid parity is attained when an energy source, such as solar power or wind energy, reaches cost-competitiveness on the electric grid with conventional sources of generation such as coal and natural gas.

Nevertheless, strictly focusing on the cost of electricity ignores other important factors that affect an energy source's relative value on the power grid. For instance, electricity supply and demand must be continually balanced to provide consistent, stable, and reliable power for American households and businesses.

Consequently, most generation resources fulfill different roles on the grid, including baseload (for a continuous supply of electricity), intermediate (for following daily, predictable rises and falls in demand), or peaking capacity (for ramping up and down quickly to meet peak demand). Natural gas, coal, nuclear, and even hydroelectric generating units can effectively fill these various roles.

Conversely, wind and solar are intermittent and only produce electricity when the wind is blowing or the sun is shining. Due to their inherent limitations, renewables are less useful for electricity generation than conventional sources. As a result, true grid parity should go beyond prices and consider the comparative functionality of various energy sources.

The Challenge of Dispatchable Power

The issue of being able to "dispatch"—or turn on or off—energy when it is demanded is an essential aspect of electricity generation that grid parity hardly addresses. Focusing merely on price competition ignores the crucial way that an electricity source functions on the grid and relates to other sources.

Numerous experts emphasize the importance of on-demand power generation. The nonpartisan U.S. Energy Information Administration (EIA) distinguishes between dispatchable sources (e.g., coal, natural gas, and nuclear) and non-dispatchable ones (e.g., wind and solar) in its calculation of the levelized cost of electricity (LCOE) "because caution should be used when comparing them to one another."[**2**]

Another analysis from the Council on Foreign Relations also recognizes the problems posed by non-dispatchable, or intermittent, electricity sources. In essence, the analysis argues that the "unpredictability" of renewable generation makes other power plants less efficient because

coal and natural gas must back up solar and wind when the sun does not shine or the wind does not blow.[**3**] A report on Seeking Alpha concurs, arguing that it "makes very little sense to compare the relative costs of these intermittent sources of energy to a dispatchable source of energy."

Since renewables do not operate on the grid in an equivalent way to dispatchable electricity resources, true grid parity cannot functionally be achieved. As a result, grid parity is an empty concept because it ignores essential elements of energy generation: electricity sources should produce power predictably and reliably respond to demand.

Grid Parity Reports Are Incomplete

Plenty of research highlights the fundamental problems with renewable energy and casts doubt on its ability to achieve grid parity.

EIA uses the LCOE to make comparisons about the cost-effectiveness of different electricity sources. According to EIA, electricity from new conventional combined cycle natural gas will be $75.2 per megawatt hour (MWh) in 2020, while wind and solar PV will cost $73.6 MWh and $125.3 MWh, respectively. As previously noted, EIA emphasizes that researchers and energy analysts should be cautious when directly comparing dispatchable and non-dispatchable sources because they function differently on the grid:

*Since load must be balanced on a continuous basis, units whose output can be varied to follow demand (**dispatchable technologies**) **generally have more value to a system than less flexible units** (non-dispatchable technologies), or those whose operation is tied to the availability of an intermittent resource.*[**4**] [emphasis added]

Since EIA calculates only levelized electricity costs for new power plants, the Institute for Energy Research (IER) commissioned a study to facilitate more accurate comparisons between wind and other generation sources. The study found that electricity from existing coal-fired power plants is about three times less expensive than electricity from new wind facilities.[**5**] The following chart from the report contrasts the affordability of different generation resources and shows that existing sources produce power less expensively than new sources.[**6]**

Generator Type	LCOE EXISTING as found in FERC Form 1 (EIA fleet avg CF) 2012 $/MWh	LCOE NEW (EIA) as adjusted by this report (EIA best case CF) 2012 $/MWh	LCOE NEW (EIA) as adjusted by this report (EIA fleet avg CF) 2012 $/MWh
Dispatchable Full-Time-Capable Resources			
Conventional Coal[1, 3]	38.4	78.1	96.8
Conventional Combined Cycle Gas (CC gas)[3]	48.9	74.0	73.2
Nuclear[3]	29.6	93.8	90.2
Hydro (seasonal)	34.2	82.4	115.6
Dispatchable Peaking Resources			
Conventional Combustion Turbine Gas (CT gas)[2]	142.8	139.6	361.6
Intermittent Resources – as used in practice			
Wind including cost imposed on CC gas	N/A	88.3 + other costs*	106.8 + other costs*

Source: IER, http://instituteforenergyresearch.org/analysis/icymi-new-electricity-sources-still-more-expensive-than-existing-ones/

Additionally, the report calculated the "imposed costs" that wind power places on the grid. In essence, since intermittent generation forces dispatchable sources to operate less frequently and back down more often, existing power plants end up running fewer hours without any significant decrease in their fixed costs.[**7**]

The result is more expensive electricity. As previously economical power plants become more costly to operate, more of them will retire prematurely, potentially feeding a negative cycle of rising electricity prices. Generally, utilities pass on these higher costs to consumers.

As intermittent sources make electricity more expensive, grid parity becomes easier to achieve. For example, subsidies have increased the amount of installed solar capacity in Germany, even though the country has relatively poor insolation (i.e., Germany does not have an optimal—or even good—environment for solar power). After passing major renewable energy legislation in 2000, German electricity prices have doubled and are the second most expensive in Europe.

This "elevated electricity pricing" has made it easier for renewable technologies to reach grid parity where subsidies are high. But success of this nature is artificial; according to one commentator, "PV parity becomes a lot easier if the price of electricity is increased 50 to 100 percent by fiat."[8]

Conclusion

New studies and reports that assert renewable energy sources have reached grid parity are misleading because they ignore the fundamentals of operating the electric grid. In order for the grid to function properly, supply and demand must be continually balanced.

Coal, natural gas, nuclear, and hydroelectric power are essential because they are predictable and dispatchable resources; conversely, renewables produce power intermittently and are less valuable as a generation resource. Cost and function should not be evaluated separately when considering grid parity. To reach true grid parity, an energy source should be able to produce affordable electricity as well as dependably meet electricity demand.

Part II of this analysis will investigate government policies that have enabled renewables to attain grid parity and discuss why subsidizing renewables is mistaken.

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[1] Paul Denholm, Robert M. Margolis, Sean Ong, and Billy Roberts,*Break-Even Cost for Residential Photovoltaics in the United States: Key Drivers and Sensitivities*, National Renewable Energy Laboratory, NREL/TP-6A2-46909, December 2009, p. 1, http://www.nrel.gov/docs/fy10osti/46909.pdf.

[2] EIA, *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015*, June 3, 2015, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

[3] Varun Sivaram and Michael Levi, *Budget Deal Oil-for-Renewables Trade Would Substantially Reduce Carbon Emissions*, Council on Foreign Relations, December 18, 2015, http://blogs.cfr.org/levi/2015/12/18/budget-deal-oil-for-renewables-trade-would-substantially-reduce-carbon-emissions/.

[4] EIA, *Levelized Cost*, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

[5] Although IER's study did not assess the LCOE of new solar PV, that source is most likely even more expensive than new wind resources. In fact, this supposition is supported by a Deloitte MarketPoint report, which determined, "Onshore wind is more likely to reach grid parity before utility-scale solar PV, under a wide range of assumptions." *See*, *Journey to grid parity*, 2015, p. 1, http://www2.deloitte.com/us/en/pages/energy-and-resources/articles/journey-to-grid-parity.html.

[6] Institute for Energy Research, *New Electricity Sources Still More Expensive than Existing Ones*, July 15, 2015, http://instituteforenergyresearch.org/analysis/icymi-new-electricity-sources-still-more-expensive-than-existing-ones/.

[7] Thomas F. Stacy and George S. Taylor, Ph.D., *The Levelized Cost of Electricity from Existing Generation Resources*, Institute for Energy Research, June 2015, http://instituteforenergyresearch.org/wp-content/uploads/2015/06/ier_lcoe_2015.pdf.

[8] Rud Istvan and Planning Engineer, *Solar grid parity?*, Climate Etc., May 31, 2015, http://judithcurry.com/2015/05/31/solar-grid-parity/.

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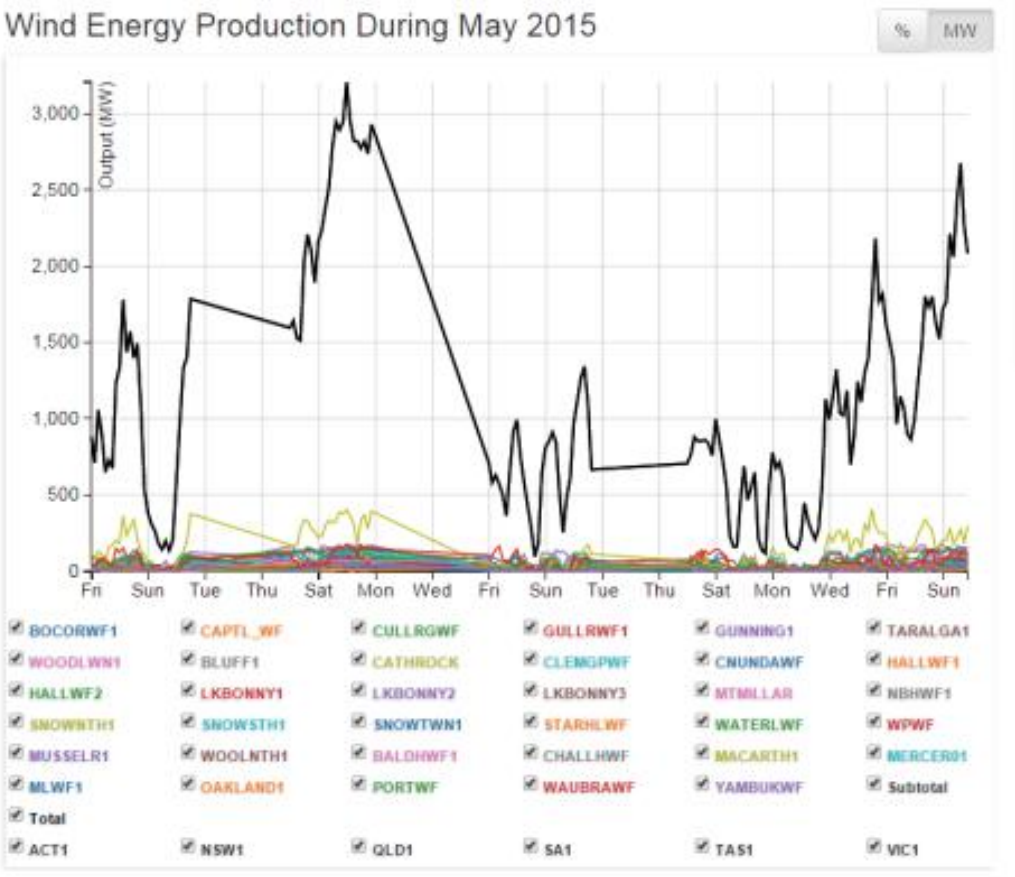

‘Grid Parity’ for Renewables: Why Subsidies? (Part II)

Master Resource Mark Febrizio 22 March 2016

“By focusing strictly on cost-competitiveness, grid parity fails to consider how dispatchability influences an energy source’s value on the grid. Moreover, renewable energy sources rely heavily on government funding to even reach cost-competitiveness. Continued subsidization of solar and wind to make them cost-competitive or accelerate their adoption is unjustified.”

As Part I of this analysis explained, grid parity for renewable energy is an empty concept because it fails to consider the functionality of renewable resources on the electric grid. Since grid operators must balance supply and demand to sustain grid stability and meet the power needs of Americans, dispatchable resources are extraordinarily valuable for electricity generation.

Resources such as coal, natural gas, nuclear, and hydropower can dispatch power on demand, but solar and wind energy are intermittent, making them undependable for electricity generation. In essence, true grid parity should also consider how an electricity source functions on the grid, not merely cost-competitiveness.

Nevertheless, renewable energy sources have not become competitive strictly based on their own merit. Instead, government assistance has been an important, even essential, component of lowering the cost of renewables enough to make them attractive in some locations. Despite receiving subsidies for decades, solar and wind remain unable to truly compete with conventional sources on the grid.

Renewable Subsidies: Nothing New

Solar and wind in power generation have existed since the 1800s and began receiving numerous subsidies from the federal government in the 1970s. Landmark pieces of legislation, including the Energy Tax Act of 1978 and Energy Policy Acts of 1992 and 2005, established financial incentives for investing in renewables. Furthermore, the federal government created agencies like the U.S. Department of Energy and government-funded research institutions like the Solar Energy Research Institute (now the National Renewable Energy Laboratory).[**1**]

Nevertheless, both the solar and wind industries continue to laud government funds as critical to renewable energy growth. Subsidies are a key part of the discussion of grid parity as their impact is commonly included in analyses of renewable energy cost-competitiveness. But continually funding such endeavors will not resolve the fundamental limitations of intermittent energy sources.

Unwarranted, Ongoing Subsidies

Giving even more money to renewable technologies as a way to bring them to grid parity is misguided. As discussed in Part I, attempting to make renewables competitive through subsidization is an artificial solution that also raises overall electricity prices: subsidies and renewable mandates in Germany “have distorted electricity pricing” so that solar PV has purportedly reached grid parity despite the country’s low insolation.[**2**]

In Europe, a result of this approach is over investment in renewable technologies in places where renewable energy is poorly situated. This “sub-optimal deployment of resources” has been costly for the European Union, which wasted $100 billion according to one report.[**3**]

A 2015 study from Deloitte MarketPoint even admitted that subsidies are critical for wind and solar to reach grid parity in some parts of the U.S. over the next 10–15 years.[**4**] If the tax credits for wind and solar expired, Deloitte found that the timeline for grid parity would be significantly longer in many regions.[**5**]

Despite highlighting technological improvements for wind and solar, Deloitte assessed, “the projected dates for reaching grid parity without subsidies appear to be much farther out than many predictions being featured in the media today.”[**6**]

Moreover, Deloitte found that even markets with very good “solar radiation potential” but low wholesale prices (e.g., Arizona and Southern Nevada) will not achieve grid parity for over two decades without subsidies, illustrating renewable energy’s reliance on government support.[**7**] As long as renewables are dependent on government subsidies to be successful, doling out more money will not make them truly competitive on the grid.

Furthermore, lower prices do not necessarily allow renewables to truly rival conventional energy sources. According to an analysis from *MIT Technology Review*, as solar energy’s role on the grid expands, its value lessens. Continually decreasing the price of solar energy—whether through subsidization or innovation—forces solar to compete with itself on the grid because it generates power only when the sun is shining. Without a large-scale and affordable way to store energy, solar cannot dispatch electricity when it is most needed, which limits its usefulness.[**8**]

Conclusion

By focusing strictly on cost-competitiveness, grid parity fails to consider how dispatchability influences an energy source's value on the grid. Moreover, renewable energy sources rely heavily on government funding to even reach cost-competitiveness. Continued subsidization of solar and wind to make them cost-competitive or accelerate their adoption is unjustified.

These technologies have existed for over a century, have received government support for decades, and cannot achieve true grid parity due to their inherent limitations. In the end, grid parity remains a misnomer and an empty concept because it ignores the importance of how energy sources function on the electric grid.

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[1] Matthew Sabas, *History of Solar Power*, Institute for Energy Research, February 18, 2016, http://instituteforenergyresearch.org/analysis/history-of-solar-power/.

[2] Rud Istvan and Planning Engineer, *Solar grid parity?*, Climate Etc., May 31, 2015, http://judithcurry.com/2015/05/31/solar-grid-parity/.

[3] Geert de Clercq, *Badly located renewable power plants cost Europe $100 billion: Davos report*, Reuters, January 20, 2015, http://www.reuters.com/article/us-utilities-europe-davos-idUSKBN0KT2BC20150120.

[4] Herman K. Trabish, *The factors driving wind and solar toward grid parity*, Utility Dive, December 10, 2015, http://www.utilitydive.com/news/the-factors-driving-wind-and-solar-toward-grid-parity/410304/.

[5] Jordan Blum, *Report says wind, solar can't compete for now without tax breaks*, Houston Chronicle, November 20, 2015, http://www.houstonchronicle.com/business/energy/article/Report-says-wind-solar-can-t-compete-for-now-6647983.php.

[6] Deloitte MarketPoint, *Journey to grid parity*, 2015, p. 16, http://www2.deloitte.com/us/en/pages/energy-and-resources/articles/journey-to-grid-parity.html.

[7] Deloitte, p. 16.

[8] Even the potential for widespread, affordable energy storage, which would undeniably be an important technological development, is not a justification for subsidization. Rather, if energy storage can be effectively commercialized, then the market should determine its value. As discussed previously, subsidizing renewables has allowed RE to reach parity only because overall electricity prices have artificially increased. Doing the same to make energy storage competitive would only hinder true commercialization and adoption.

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