



Upgrading the US Electric Grid - Many pluses but some minuses too

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President-Elect Barack Obama talks about upgrading the US electric grid. He talks about making it a "smart grid", so that customers can be charged by their time-of-day use, fluctuations from wind and solar can be more easily handled, and it is easier to sell electricity back to the grid. One presumes that he is also talking about upgrading the physical structure of the grid, so that it has better long distance carrying capability and so that parts that are exceeding their normal lives are replaced.

Doing all these things has obvious advantages. Our current grid has been neglected for years, so that many of its parts are nearing the end of their useful lives. Currently, most customers have no incentive for using appliances and machinery at night, during times of excess capacity. This could reduce fuel usage during the day time. Also, as many have noted, to add more wind and solar capacity to the grid, upgrading the grid is a necessity.

In this post, I will offer a few thoughts on the upsides and downsides of the upgrade.

What are the advantages of an upgraded grid?

Clearly the big advantage of an upgraded grid would be that it would provide a possibility of continuing business as usual, in spite of declining resources. Nearly everything we have now runs on electricity. To keep everything going, including oil transportation by pipeline cross country, we need a grid that functions well. An upgraded grid would theoretically let resource-short areas borrow from areas with more resources. The cost of transporting electricity over the grid would be far less than the cost of transportation of the fuel for making the electricity.

Here are some quotes on what an upgraded grid could do:

[National U.S. Power-Grid Upgrade Would Cut Oil Use](#)

Oct. 14 (Bloomberg) -- A \$75 billion investment in a high-voltage "backbone" for the U.S. electric grid could cut oil consumption in half by powering plug-in hybrid cars and displacing the use of home heating oil, a study showed.

A 21,000-mile (33,788-kilometer) national grid could help move power across the U.S. and reduce prices, Peter Huber, senior fellow for the Manhattan Institute, a New York City-based policy research firm, wrote in his report entitled "The Million-Volt Answer to Oil."

U.S. Energy Secretary Samuel Bodman last month said a high- voltage transmission system could have ``extensive" benefits, including helping to bring wind and solar power from remote areas to serve major cities.

``It would be the electrical equivalent of the interstate highway system," Bodman said in a Sept. 24 speech. ``Today, by comparison, we have some high-voltage lines in some areas, but they are not integrated into a network."

``The more you electrify, the more you smooth out supply and demand, and you get downward pressure on prices," said Huber. ``Our grid weaned itself from oil almost 30 years ago" during the 1973-1974 Arab oil embargo.

According to a [presentation](#) on upgrading to a Smart Grid by Philip Bane, the advantages of the US upgrading to a smart grid would be as follows:

Characteristic	Today	Tomorrow
Motivates/Includes Consumer	No price visibility, time-of-day pricing rare, few choices	Full price info, time-of-use pricing, choose from many plans and prices
Accommodates Generation/Storage	Dominated by central generation. Little DG, DR, storage or renewables.	Many "plug and play" distributed energy resources complement central generation
Enables Markets	Limited wholesale markets, not well integrated	Mature, robust, well-integrated wholesale markets
Meets PQ Needs	Focus on outages not power quality	PQ a priority with a variety of quality/price options according to needs

Characteristic	Today	Tomorrow
Optimizes	Little integration with asset management	Deep integration of grid intelligence with asset management software
Self Heals	Protects assets following disruption (e.g. trip relay)	Prevents disruptions, minimizes impact
Resists Attack	Vulnerable to terrorists and natural disasters	Resilient with rapid restoration

According to Bane's presentation, the cost of the Smart Grid would be \$165 billion over 20 years. This likely includes more than the \$75 billion backbone discussed by Bodman.

What are the disadvantage of an upgraded electric grid?

1. Enhancing the grid is likely to enhance the perception that there is no need to cut back.

If it looks like business as usual will work, why should anyone cut back on their electricity usage? If the upgraded grid actually reduces costs (as some have suggested), this would further act to encourage electricity usage.

2. Cost.

Whatever is spent will be borrowed from future generations. Do we really have funds to do this?

3. Loss of local responsibility for production.

Producing electricity has a lot of negative externalities. It costs money to build a new plant. It generally takes a lot of water for cooling. If coal is used, there are both CO2 and pollution issues. If nuclear is used, there are safety issues. Wind turbines create noise and get in the way of the view.

If it is easy to buy electricity from the grid, why should any given area bother itself with any more production, given the negative externalities? In fact, why should they even continue to allow the coal fired plant next door to continue operating? As long as it is possible to buy electricity from the grid, there is no point in troubling the local community to build more capacity. Also, once it is built, it will only go into the general "pool", so the local area with all the externalities won't get any special benefit, so why bother?

4. High cost electricity sources may be priced out of the market.

The grid will tend to allow customers to buy electricity from the cheapest source, where ever it is. It seems like this means that there would be less and less demand for electricity from the less-

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cheap sources, unless there was a shortage overall. Wind capacity at night would probably have zero utility. When "merchant" gas plants were built after deregulation legislation was passed in some states, they discovered that they had a difficult time financially, because they were the high-cost power source. Doesn't this just exacerbate the problem?

5. We may not be able to maintain the upgraded grid for very long.

If it takes 20 years to accomplish, there are even questions as to whether we can fully complete it, before resource depletion becomes such a serious problem that we are unable to continue to make upgrades.



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