



GRID AUTOMATION

Apr 15, 2006

What Denmark Teaches Us About the Smart Grid

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By Peter Asmus

TO UNDERSTAND WHY THE GRID NEEDS TO BE MODERNIZED, WE NEED TO LOOK AT THOSE FEW COUNTRIES WHERE THE INTELLIGENT GRID HAS ALREADY BEEN UNDERWAY. Consider Denmark, which currently receives about 40 percent of its electricity from wind turbines of various sizes distributed throughout this country's grid. A government policy of mandatory access to the grid and subsidies covering 30 percent of capital investments helped spur the wind boom. Utilities even had to pay for any retrofits to accommodate all wind energy systems. If indeed we are to shift to renewable sources that are intermittent in nature, then Denmark offers some fascinating lessons about how best to manage large amounts of distributed generation, a key trend likely as the grid becomes more sophisticated.

No other country relies more on dispersed power sources as Denmark. "They had all of these tiny turbines, many only producing 50 kW of electricity, that were invisible to the system. This was quite difficult to manage," observed Jayson Antonoff, a sustainable energy consultant with International Sustainable Solutions. "Even in Denmark, people began to say, 'This is crazy, because wind turbines were everywhere.'" So, ten years ago, this country shifted toward centralized wind systems, primarily located off-shore. There are now only three pockets in the country where wind development is allowed on land. The activity on land is now focused on re-powering — replacing the small, existing turbines with fewer but larger ones, that are more efficient and have less impact. All of the new development is off-shore with multi-megawatt turbines. The largest machines on the market today are 5 MW, specifically designed for off-shore installations.

Back in the mid-90s, in order to increase system efficiencies and decrease greenhouse gas emissions associated with global climate change, Denmark required all non-wind electricity generators to not only produce electricity, but heat. Denmark has since developed new policies creating a market for thermal energy. Through public policies, Denmark is seeking the right balance between thermal and electrical energy. It is really a matter of the greatest efficiency. Today, if you are an owner of a cement plant or waste incinerator, and you generate excess heat, you can sell it. Planning and construction of distribution networks for thermal and electric resources are handled by the public domain in Denmark.

Of course, Denmark, a small peninsula country with scarce power sources save the wind, is not an island when it comes to electricity. Because of an advanced international grid, it can access hydropower in Norway to the north and coal and wind in Germany to the south, so that is one way Denmark's grid operators manage the ebb and flow of wind.

Compare this to Texas, where power generated by wind turbines in the west is being dumped because there is no room on the Lone Star State's antiquated transmission lines to move it east to Dallas and other urban consumers.

In the ideal world, just as with computers and telecommunications, efforts to upgrade and revolutionize our contemporary power transport system would mimic what happened with the Internet: There will be smaller, cleaner and smarter solutions, such as those pioneered in Denmark.

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