EDF ENVIRONMENTAL DEFENSE FUND™
Finding the ways that work

ENERGY

Keys to smart grid success

LESSONS FROM TEXAS AND CALIFORNIA

The creation of a smart grid in your state presents an unprecedented opportunity to lower electric bills while meeting renewable portfolio standards and pollution regulations.

Smart grid deployments can boost local economic development and provide communities cleaner air and water. By giving consumers the power to manage their energy use and costs, they can also reduce peak energy demand, spur clean energy production and improve reliability.[1]

This is *not* pie-in-the-sky:

- A well-designed smart grid will enable big energy savings. Combined with a high penetration of renewable energy, which will also be facilitated by a smart grid, that could cut GHG emissions from the electric sector by as much as 50%.[2]
- The Federal Energy Regulatory Commission estimates that the installation of smart meters, programmable thermostats and other technologies, along with opt-out dynamic pricing and full use of potential demand response, could reduce the nation's peak demand by 150GW by 2020. That's equivalent to the output of 2000 average size peaking plants.[3]

These improvements won't happen automatically. The only way smart grids will deliver real benefits to customers is if utilities and states design them to do so from the start. As JD Power and Associates found in a recent consumer survey: "Utility providers that develop smart systems with customer satisfaction in mind may be able to get things right the first time, ultimately saving in long-term development and implementation costs."[4]

A smarter grid

Environmental Defense Fund (EDF) is at the forefront of harnessing smart grid technologies to speed the transition to clean, low carbon energy. EDF plays a lead role in the Pecan Street Project, collaborating with technology companies like Cisco, Dell, Gridpoint, IBM, Microsoft and others.[5] And we helped shape the California Public Utilities Commission's June 2010 decision to put environmental benefits at the forefront of smart grid planning.

A well-designed smart grid can significantly reduce the environmental costs of producing and delivering electric power, and save money doing so. EDF, working with the California PUC, helped define the key steps toward reaching those goals. Those steps, listed below, are adapted from the California commission's decision, which established that state as a model for smart grid development.[6]

Ten keys to successful smart grids

1. ***Set a high bar:*** Require a grid design that significantly reduces the total environmental footprint of the current electric generation and delivery system.

2. ***Use assets more efficiently:*** A smarter grid can make fuller use of capital assets while minimizing operating and maintenance costs. Optimized power flows reduce energy waste and maximize use of existing infrastructure. Make realizing these efficiencies a priority.

3. ***Empower consumers:*** Provide information and price incentives to help them make smarter choices about when, where, and how to use electricity.

4. ***Embrace diversity:*** By decade's end, renewable energy will be as cheap as fossil fuels.[7] Smart grids should accommodate all generation and storage options, emphasizing distributed resources, which create local economic development opportunities and promote system reliability and customer choice.

5. ***Employ open standards and reasonable privacy protections:*** This will enable entrepreneurs to provide new energy services and customers to safely share their usage information, promoting a flourishing new market for "energy apps" and efficiency. The model here is the Internet, which opened the door to Google, Amazon, EBay, etc.

6. ***Offer enough bandwidth:*** The system should support the sale of demand response, distributed generation and storage into wholesale energy markets as a resource on equal footing with traditional generation resources.

7. ***Support wholesale electricity markets:*** Grid design should encourage an open marketplace, in which supply and demand-side resources can be sold freely, and energy, capacity, and other services are transparently priced and fully valued.

8. ***Maximize renewable energy resources:*** Take full advantage of the smart grid's capacity to manage supply and demand, which is key to balancing variable power generation sources like wind and solar.[8]

9. ***Enable comprehensive metrics and monitoring:*** Smart grids can and should accurately measure their own performance, including overall efficiency, renewable energy use, demand response, energy storage, and air pollution. The groundwork has been laid by EPRI and the Gridwise Alliance, and the California PUC is currently developing metrics with stakeholder input.[9]

10. ***Link smart grid investments to overall planning:*** A smart grid can reduce the need for investments in new central station power plants and transmission lines, but only if the planning processes are linked. As the California PUC found, "the Smart Grid can decrease the need for other infrastructure investments and these benefits should be taken into account when planning infrastructure."[10]

The bottom line: Meeting the needs of customers and communities

A well-designed smart grid will help electricity customers meet their need for affordable, efficient power. It will equip communities to comply with air quality and toxics regulations, conserve water, protect public health and promote energy self-sufficiency and local economic development.

Over the long-term, an effective smart grid will maximize clean, low-carbon—and often local—energy production and reduce the industry's overall environmental footprint.

These are ambitious goals, but with careful planning and design now, we can achieve them.

1. Electric Power Research Institute (EPRI), Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects, Jan. 2010, p. 1-1 to 1-3, my.epri.com/portal/server.pt?Abstract_id=000000000001020342.
2. See, for instance, US Department of Energy, The Smart Grid, an Estimation of Energy and CO2 Benefits, Jan. 2010, p. v., pnl.gov/main/publications/external/technical_reports/PNNL-19112.pdf, Ahmad Faruqui and Sanem Sergici, Household Response to Dynamic Pricing of Electricity – A Survey of the Experimental Evidence, January 10, 2009 and Silver Spring Networks, Connecting Smart Grid & Climate Change, Michael Jung and Peter Yeung available at www.silverspringnet.com/pdfs/SSN_WP_ConnectingSmartGrid-1109.pdf
3. Federal Energy Regulatory Commission, A National Assessment of Demand Response Potential, June 2009, p. x, ferc.gov/legal/staff-reports/06-09-demand-response.pdf
4. JD Power and Associates, July 1, 2010, "Although Awareness of Smart Grid Technology Substantially Boosts Residential Customer Satisfactions with Electric Utility Providers, Awareness Tends to be Low," businesscenter.jdpower.com/news/pressrelease.aspx?ID=2010114.
5. The Pecan Street Partnership is a collaboration among EDF, Austin Energy, the Austin Chamber of Commerce, the University of Texas and the City of Austin, TX. We are deploying new technologies and business models to demonstrate how a smart grid can be green, and to enable the City of Austin to reach its environmental and renewable energy goals. PecanStreetProject.org.
6. California Public Utilities Commission, Decision Adopting Requirements for Smart Grid Deployment Plans Pursuant to Senate Bill 17 (Padilla), Chapter 327, Statutes of 1009, pages 30-34, docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/119902.htm.
7. See: www.bloomberg.com/news/2010-11-24/solar-power-cost-to-equal-fossil-fuel-expense-in-decade-bp-says.html
8. California Public Utilities Commission, op. cit., p. 30-34.
9. California Public Utilities Commission, op. cit., p. 84-85. Electric Power Research Institute (EPRI) has developed a methodology for DOE to evaluate Energy Independence and Security Act (EISA) projects; EPRI included detailed metrics on reduced damages from carbon, SOx, NOx, and PM emissions due to renewables and efficiency (see note 1). EDF was recruited by EPRI to refine its environmental metrics for smart grids, and is developing them out of the Pecan Street Partnership. To evaluate ARRA-funded projects, Gridwise Alliance has also provided metrics on facilitation of renewable energy, electric vehicle (EV) integration, DR management, system efficiency, and greenhouse gases (GridWise & KEMA, Handbook for Assessing Smart Grid Projects, p. 10-11), gridwise.org/documents/MetricsReportFinalEditionAllcomments11.30.09vFINALCOPYVERSION.pdf.
10. California Public Utilities Commission, op. cit., p.123.

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