Beyond Nuclear Fact Sheet

In Support of Renewable Energy: Storage, Distributed & "Smart Grid" Technology

INTRODUCTION

Given the enormous potential of renewable energy sources to replace both nuclear and fossil fuels, society must adjust the supporting systems, many of which are in disrepair, to be compatible with renewable energy generation. If society is to crawl out of the fossil and nuclear trap, it must establish efficient energy use, and transmission, storage and production of energy at or near the site of use in addition to more centralized production. Efficient appliances, distributed, "smart grid" and sufficient storage systems are not only renewable-friendly technologies, but encourage a stable and responsive energy supply; one less inviting of and susceptible to disruptions from accidents or terrorist attack.

1. "Smart" and distributed grid technology will allow freedom from Enron-like market manipulation and better control of which energy sources are chosen and how and when they are used.

- Distributed power generation is inherently modular, meaning power can be generated where and when it is needed, making this form of power generation mobile and much more flexible and efficient than the centralized system currently used.
- [1,2]
- Distributed energy systems are highly compatible with renewable energy such as wind, solar, biomass, fuel cells, and various battery storage systems as well as communication and control devices for efficient use and management of the system.[3]
- The intermittent nature of wind and solar energy is lessened by a distributed energy system.[4]
- Distributed energy systems can meet base load, peak, backup and remote power needs in addition to heating and cooling.[5]
- A distributed grid system could also make use of the thousands of car batteries available to meet energy storage and discharge needs while the cars are parked. This concept is called Vehicle to Grid or V2G.[6]
- At 10 kW per vehicle, 10 million vehicles would supply 100,000 megawatt capacity in standby power, the equivalent of 100 large nuclear power reactors. [7]
- Distributed power is much more robust against terrorist attack or accident since power loss to the full grid is less likely and could be more easily recovered.[8,9]
- Distributed power is surging in regions without electricity, such as those in Kenya and Zimbabwe, offering affordable power to rural communities and avoiding half-a-million premature deaths each year among mostly women and children by replacing health damaging energy with renewables.[10]
- Through use of computer microprocessor technology, a distributed grid becomes a "smart grid"-- efficient at energy production, storage and use[11,12]
- Renewable sources such as solar and wind, as well as people's individual power sources, will be able to feed the grid efficiently and when needed.[13]
- Smart grids will actively encourage renewable power while helping to prevent the type of blackouts that have plagued the United States in the last decades[14].

- If the smart grid is applied in the developing world, where there is no grid to speak of in many cases, it could bring entire regions into the 21st century, revolutionizing energy production, distribution and use much like the cell phone revolutionized communication for these same areas. [15]

2. Use of storage systems decouple energy production and end use, allowing energy where and when it is needed.[16]

- By acting as both an energy sink and a power source, storage systems can function as a shock absorber for the grid making it less vulnerable to energy spikes and dips.[17]
- Flywheel technology has the capability of providing rapid injections of energy or of handling deep or cyclic responses that might overwhelm a grid without storage capacity.
- Flywheels can recharge more quickly than batteries and are capable of tens of thousands of cycles rather than the 250-1000 recharges most current batteries can handle.[18]
- Lead-acid are not versatile enough to continually charge and discharge which makes them inappropriate for renewable energy storage.[19] Sodium-sulfur, lithium-ion and nickel-metal-hydride batteries are more promising, each offering different advantages.
- Sodium-sulfur batteries are utility-sized, long-lasting and efficient. They are expected to become widespread in a decade or so. [20]
- Nickel-metal-hydride (NiMH) batteries are small and lightweight but they are costly have limited capacity. These qualities make them good for hybrid cars. [21]
- Lithium-ion batteries are small, lightweight, with high storage and versatile charge capacity. Costs should come down to mass production levels within a decade or so. [22]
- A group of Iowa utilities are using compressed air storage to capture energy from wind in an underground cavern and discharge it when needed during peak use time to power about 200,000 homes[23].
- Compressed air has been used with conventional energy sources such as coal, but is now being used for renewable energy. [24]

ENDNOTES

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[20] Davidson, P. New battery packs powerful punch. USA Today. July 4, 2007 at http://www.usatoday.com/money/industries/energy/2007-07-04-sodium-battery_N.htm
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[23] Ibid. Davidson.
[24] Ibid. Makhijani. p 70