Synergistic SuperGrid for transporting energy moves closer to reality

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The concept of a high-capacity superconducting energy pipeline, or SuperGrid, moved closer to reality when experts from industry, government and academia attended a recent workshop at the University of Illinois at Urbana-Champaign.

“The SuperGrid could meet the nation’s growing energy demands well into the 21st century while reducing our consumption of fossil fuels,” said workshop organizer Thomas Overbye, a professor of electrical and computer engineering at Illinois. “An energy crisis is approaching, and we need to be looking at creative ways to generate and transport power.”

First proposed in 2001 by Chauncey Starr, the founder and president emeritus of the Electric Power Research Institute (EPRI), the SuperGrid would supplement the existing high-voltage electric power grid with a buried pipeline containing superconducting cables for power transmission and liquid hydrogen as the coolant. By transferring large amounts of electricity and supplying hydrogen as an alternative fuel, the SuperGrid could help the nation move away from increasingly expensive and problematic carbon-based fuels.

The idea of a continental SuperGrid was examined at the first National Energy SuperGrid Workshop, held Nov. 6-8, 2002, in Palo Alto, Calif. The concept was found to be technically feasible. To further investigate it, the University of Illinois, with support from the Richard Lounsbery Foundation and EPRI, sponsored another workshop, held Oct. 25–27, 2004, at the university. The workshop’s final report has just been

released.

“The purpose behind our second workshop was to develop a research roadmap for moving this concept forward,” Overbye said. “SuperGrid 2 brought together a large group of experts to prepare a specific research agenda for using superconducting cables to transfer energy over long distances.”

The SuperGrid is envisioned as an environmentally friendly energy infrastructure where electricity and hydrogen become synergistic elements, said Overbye, a power transmission expert. The SuperGrid concept addresses questions of where we will obtain our energy in the future, and how we will transport it.

“Changing our energy infrastructure to a hydrogen economy, for example, involves much more than just making hydrogen cars,” Overbye said. “Although hydrogen is the most common element in the universe, it is not a primary fuel source on Earth. We can’t mine for it like coal, and we can’t drill for it like oil.”

Wrestling hydrogen from the compounds in which it is locked requires energy. In the future, hydrogen could be produced from water at the SuperGrid’s power plants by electrolysis, and then transmitted through the energy pipeline to urban centers to fuel hydrogen cars. Alternatively, hydrogen could be produced and stored in urban centers from excess electricity transmitted through the superconducting cables.

Workshop participants agreed that no scientific breakthroughs are required to construct the SuperGrid. To move the project forward, they suggested studying the economic viability of plugging superconducting cables into the existing power grid. They also recommended that a prototype using hydrogen as a combined cryogen and form of energy transport be designed, built and tested at one of the national laboratories.

“It’s hard to beat gasoline as an energy source, and we won’t sharply curtail our usage until prices skyrocket,” Overbye said. “The problem is that the cost can increase much faster than we can technologically innovate. We currently have a window of opportunity, but it could close very quickly. If we don’t develop new energy technologies and mechanisms for moving energy over long distances now, we won’t be prepared.”

The recently published workshop report may be found on the Web.

Source: University of Illinois at Urbana-Champaign