Brainstorming with Chauncey Starr

Meet the SuperGrid

BY STUART F. BROWN ■ Wouldn't it be great if in 30 years or so America could have a reliable supply of electricity generated by methods that don't contribute to global warming? And that use no imported fuels? For several years this thought has loomed large in the mind of Chauncey Starr, a physicist who has been pondering energy problems for seven decades. He was present at the birth of nuclear power when he worked on the Manhattan Project during World War II. Now 93, Starr is president emeritus of the Electric Power Research Institute in Palo Alto, the electric industry's collaborative R&D operation, which he founded in 1973. His big idea is a power-generating and distribution system called SuperGrid, which he thinks we should get to work on soon so all the pieces will be in place when they are needed.

The SuperGrid concept revolves around building a network of air-cooled nuclear power plants—today's nukes are water-cooled—that would be located underground for safety and security reasons. With even some environmentalists now concluding that nuclear power looks rather green compared with the CO_2-spewing coal that currently fuels more than half of the nation's appetite for electricity, building new nukes no longer seems a total pipe dream. (Critics point out that, unless heavily subsidized by taxpayer dollars, nukes remain prohibitively expensive.) Here's the really audacious part of SuperGrid: Its power plants would be spaced about every 100 miles along a transcontinental "spine" of long-distance superconducting cables routed through tunnels. Unlike today's electrical grid, which evolved haphazardly as the nation grew, these cables would allow large dollops of juice to be moved efficiently around the U.S. as needed. And air-cooling eliminates the need to locate nukes near rivers or the sea. "The whole nuclear plant, including the permanent storage of its spent fuel, can be kept in an underground vault," says Starr.

Superconductivity is a wondrous property that allows certain materials to conduct electricity without resistance or losses, which are the major shortcomings of conventional copper or aluminum cables. The bad news is that the materials need to be chilled to ultralow temperatures in order to superconduct; we're talking temperatures ranging all the way down to liquid hydrogen, which at –423° F is only 36 degrees above absolute zero. But Starr sees a way to make all this happen. By using some of the electricity from the nuke plants to electrolyze water into its hydrogen and oxygen constituents, and then compressing the hydrogen into liquid form, the SuperGrid could produce the chilling agent its cables need to superconduct.

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And speaking of hydrogen, some people think we could build an entire economy that runs on the stuff. At the points along the grid where the superconducting cables offload electricity into local distribution systems, hydrogen would be available to run fuel cells that power vehicles, or whatever. Thus SuperGrid would create a hydrogen infrastructure that is now lacking.

Starr thinks it would take three decades or so to ready SuperGrid to take over from the existing patchwork grid—by then, if the current 2% annual growth rate in electricity demand continues, as it's expected to, the nation's electricity needs will have nearly doubled. "SuperGrid packages together things that have already been demonstrated on a small scale," he says. "It pushes the limits of our engineering experience, but not our science." A massive transcontinental power grid would be a daunting construction project, to put it mildly. But Starr really believes it is possible, comparing it to another big infrastructure project he remembers: the construction of the Interstate Highway System. F

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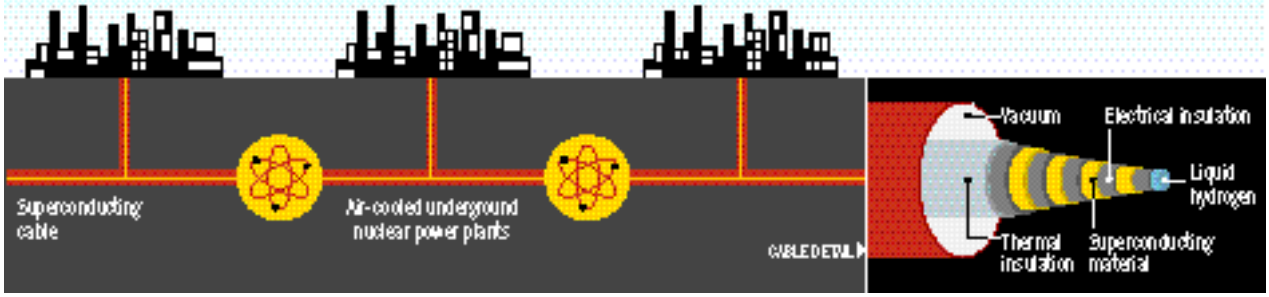
Look Ma, no foreign energy dependency

The SuperGrid would connect a coast-to-coast "spine" of underground nuclear power plants with cryogenic cables, which waste no power.



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