
M. HOFFERT

Governments must pay for clean-energy innovation

The current obsession with nuclear power is a red herring, says ***Marty Hoffert****. The United States and others should instead invest in a clean-energy revolution.*

There has been much debate about the future of nuclear power following the crisis in Japan. Yet present-day fission reactors are, at best, transition technology. Instead, we should use the current high profile of energy to refocus the debate on what the long-term solution to our problems must be: innovation.

As a scientist working on energy and climate change, I was inspired by President Barack Obama's call for US researchers to put a million electric cars on the road by 2015, and to generate 80% of our electricity from carbon-neutral sources by 2035. In this journal in 1998, colleagues and I concluded that engineering projects on the scale of the Apollo moonshots might be needed to transform the world's energy system (M. I. Hoffert *et al. Nature* **395,** 881–884; 1998). We should now be debating not whether but how to do this.

Some assert that government investment in transformative energy technology is code for tax and spend, and that suitable technologies already exist, or will be delivered by market forces. Others argue that government incentives such as feed-in tariffs for solar and wind energy are unnecessary, and that clean energy should compete in the market from the beginning. But the idea that private-sector entrepreneurship can do the job alone is based on a myth. It took 30 years of government funding of the Internet by the military research agency DARPA and the National Science Foundation before Wall Street discovered that there was money to be made out of it.

The private-sector-alone approach is a prescription for disaster, and displays abysmal ignorance of how the United States ended up with its current energy system. The US government made crucial investments in energy technology in the post-war years. Consider Hyman Rickover's light-water reactor, developed for *Nautilus,* the world's first nuclear submarine, which became the prototype for 85% of the world's nuclear power plants. We still use the term 'reactor fleet'.

Today, a poster child for carbon capture and storage (CCS) schemes is carbon dioxide collection at the Dakota Gasification Company's plant in Beulah, North Dakota. This facility was paid for initially by the US Department of Energy as a synfuel plant under President Jimmy Carter's Energy Independence Program. It would not have happened without massive government underwriting of the risk. CCS in the North Sea by the Norwegian Statoil Company is likewise heavily state subsidized.

No money? US debt now is a comparable per cent of gross domestic product (GDP) to what it was in the Great Depression before the Second World War. By massively borrowing from ourselves to finance President Franklin D. Roosevelt's miracles of war production and technology development, we saw aircraft morph from biplanes to jets, and nuclear power become a reality, even as the US debt-to-GDP ratio increased to more than 100% by the end of the war. We bet the farm on a stimulus package on steroids — and we won. The United States emerged as the strongest economy on the planet.

One can only hope that we're not so distracted by ideological battles about government versus private-sector funding that the real energy and global-change problems defeat us because of a failure of imagination — particularly a failure to fund research, development and demonstration in sustainable energy, at least with the initial US$15 billion a year recommended by industry leaders and academic researchers. If the president asked Congress for this sum, which could even be paid for by eliminating perverse subsidies for fossil fuels, it would still be only one-tenth of 1% of the present US GDP of $15 trillion. We can afford the investment needed to induce a revolutionary transformation of the world energy system away from fossil fuels. China is planning to invest $75 billion a year to do just that.

In the latter part of the 'American century', the United States somehow lost its way. No longer 'makers', we became a nation of rustbelts, Ponzi schemes and subprime mortgage risk, myopically focused on quarterly earnings and consumerism. What a tragedy it would be to lose America's talent for innovation after 200 years.

Mr President and Congress: open your minds to a civilization powered by wind turbines in harmony with our landscape and continental shelves; solar electricity from deserts and Earth orbit powering our cites; safe, proliferation-resistant nuclear reactors; coal gasifiers driving efficient electric power plants with CO_2 stored underground; along with energy-efficient homes and public buildings, smart power grids, high-speed rail, electric and biofuelled cars, even carbon-neutral fuels made from sunlight, water and CO_2 in the atmosphere more efficiently than nature does by photosynthesis. These are no longer impossible dreams, but realities of new US industries revitalized by American entrepreneurs and a high-tech workforce, much like the one Roosevelt created to fight the Second World War.

This is a dream worth rededicating the American experiment to: visionary, and yet science-based, that goal will lift the spirit of our children and grandchildren with passion and the tenacity to make it so. Say it, Barack, shout it from the rooftops, dedicate your presidency to it, and you will stand immortal in the pantheon of American leaders who changed everything. ■

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