

The True Costs of Electrification: The Future of Nuclear Power Following the Recent Events in Japan

**By Edward Blandford
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In 2000, Neil Armstrong, on behalf of the National Academies of Engineering, announced the 20 engineering achievements of the 20th century that have had the greatest impact on quality of life[1]. At the top of the list: the electrification of the United States, which, he noted, “changed the country’s economic development and gave rural populations the same opportunities and amenities as people in the cities.” “If anything shines as an example of how engineering has changed the world during the 20th century,” he observed, “it is clearly the power that we use in our homes and businesses.”

Much attention will be paid to electricity generation in the days and weeks to come, and in particular to its relationship to the future role of commercial nuclear energy. The unfolding crisis at the Fukushima Daiichi nuclear station in northern Japan has raised critical questions about the use of nuclear energy, the potential alternatives, and the costs and benefits to maintaining current plants and building new ones. More specifically, the disaster at Fukushima will highlight what may well be the most adverse unintended consequence of the electrification of the United States: palpable widespread consumer ignorance about the true cost of electricity.

Let’s look at the figures: According to the U.S. Energy Information Administration, the average annual electricity consumption in 2008 for a U.S. residential utility customer was slightly more than 11,000 kilowatt hours (kWh). The average consumer price per kWh was around 8 cents. Assuming a median annual household income of roughly \$50,000[2], the typical American household allocates slightly less than 2 percent of their annual income to all residential electricity demands. But as Massachusetts Institute of Technology Professor Richard Lester[3] has noted, “from the customer’s perspective, a nuclear kilowatt hour is indistinguishable from a solar or a coal kilowatt hour.”

Therein lays one of the fundamental problems. Since the inception of power generation and distribution, the use of various fuel sources has resulted in substantial environmental, political, national security, and public health consequences that are not internalized in that 8 cents per kWh figure. Hidden in the cost at the meter are the human health impacts and the irreversible environmental degradation[4] that come from the use of fossil fuels such as coal and natural gas. According to a 2010 United States National Research Council (NRC) report[5], the hidden health and environmental costs of all U.S. energy production and consumption totaled a staggering \$120 billion in 2005, with nearly half coming from coal-generated electricity. “Life-cycle CO2 emissions from nuclear, wind, biomass and solar power appear to be negligible when compared with fossil fuels,” the report says. It goes on to say that the fuel cycle of nuclear power “does pose some risks,” mostly from the health impacts from uranium mining activities.

In the wake of Japan's nuclear crisis, it is time for this country to be honest and confront the true cost of generating electricity. Indeed, as we reflect upon the ongoing situation in Japan, and attempt to answer the many questions about the future of nuclear energy, here's to hoping that the post- Fukushima societal calculus involves a much better understanding of the hidden costs associated with delivering cheap and reliable electricity.

If it does, nuclear energy will likely continue to be a vital component of the global energy generation portfolio. If it does not, we will all be reminded that merely hoping for a careful consideration of the costs and benefits is not enough, and there is a reason why hope was all that remained in Pandora's jar.

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[1] Armstrong made the announcement during National Engineers Week 2000 at a National Press Club luncheon.

[2] From U.S. Census Bureau.

[3] This quote came from a speech for the 2003 conference titled "Atoms for Peace: A Future After Fifty Years?" organized by the Woodrow Wilson Center and Los Alamos National Laboratory.

[4] Renewable options such as wind and solar as well as energy efficiency campaigns are trying to help mitigate these risks but displacement of fossil fuels for electricity production requires proven baseload and dispatchable electricity generation.

[5] The title of the NRC report is "Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use."