



Climate and Energy Decision Making

Sponsored Seminar

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Environment
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Presenting on:

“The Cost of a Sustainable Energy Future”

November 9th, 2010
12 noon
(Lunch served at 11:50 am)

129 Baker Conference Room
Department of Engineering and Public Policy

See following page for Seminar Abstract and Speaker Bio

Carnegie Mellon University

Seminar Abstract: As in all steady-state systems, humanity must attain a sustainable energy mix sometime in the future. If renewables and nuclear are not a considerable part of that mix, humanity will experience periods of environmental and economic upheaval. If energy growth estimates are even marginally correct, world consumption will approach 40 trillion kilowatt-hours per year by mid-century. Because most of this growth is occurring in developing countries, changes within the United States will have little effect unless it is to lead the world in new designs for alternative energy systems and strategies. Coupled with this growth is the ethical need to provide each person in the world with about 3,000 kW-hrs/year of energy, the amount needed to lift a person out of poverty. Along with this change comes increased life span, decreased population growth, and decreased terrorism and war. This work presents a lower annual energy requirement for the world, 30 tkWhrs/yr, that can be achieved by 2040, and proposes a sustainable mix of a third fossil fuels, a third renewables and a third nuclear (1/3, 1/3, 1/3), each source generating over 10 tkWhrs/yr, the amount generated by all fossil fuels in the world today. The total energy produced ramping up to this mix from 2010 to 2040, then leveling until 2060, is 1,260 tkWhrs. It will cost \$62.3 trillion in 2009 dollars, or about 2% of global GDP annually, about 20% lower than the \$75.4 trillion to produce the same amount of energy from the more anticipated distributions. As we have seen recently, how a nation decides to finance these costs is quite separate from the costs themselves, and is the most critical factor in long-term planning. Costs include construction (figure below), operation and maintenance (O&M), fuel, decommissioning and a possible carbon tax. Costs not included involve electrical grid upgrade and connectivity, transportation issues, and externalities such as carbon footprints, physical footprints, scarcity of key materials, pollution and health care costs associated with energy sources such as coal and solar. Comparing apples to apples, wind, hydro and nuclear turn out to be the most cost-effective sources over the next 50 years, almost identical per kWhr produced. All decommissioning costs are relatively small. Costs for a carbon tax @\$15/ton of CO₂ emitted are significant for the fossil fuels over this entire time period (\$4.4 trillion combined) but relatively small for all alternatives (less than \$0.5 trillion combined). However, C-taxes, or Cap&Trade equivalents, greater than about \$40/ton are needed to force any substantial change in fossil fuel use by themselves. Without a comprehensive push for both renewables and nuclear, we will not avert environmental and economic catastrophe by 2040, and we will not be able to prevent world-wide weapons proliferation. This 1/3, 1/3, 1/3 mix requires committed leadership amongst the nations of the world, with an understanding that failure will result in developed nations losing their high standards of living and developing nations losing the opportunity to achieve such standards, while the planetary ecosystem teeters on the brink of collapse.

Speaker Bio: Dr. JAMES L. CONCA is the Senior Scientist for the Institute for Energy and the Environment at New Mexico State University, dedicated to environmental monitoring and mitigation of radioactive materials, and the development of sustainable energy distributions. Conca obtained a Ph.D. in Geochemistry in 1985, and a Masters in Planetary Science, from the California Institute of Technology, and a BS in Geology and Biochemistry from Brown University in 1979. Conca has been developing and testing laboratory and field technologies for disposal of radioactive waste, mitigation of dirty bomb effects, and remediation of metal contamination in groundwater and soil. He came to NMSU from Los Alamos National Laboratory. Before that, Conca was on the faculty at Washington State University, was President of UFA Ventures, Inc, and a consultant to government and private industry. He is going to talk today about the cost of achieving a sustainable energy future, based on his recent book with co-author Dr. Judith Wright, titled *The GeoPolitics of Energy: Achieving a Just and Sustainable Energy Distribution by 2040*, written in part to integrate all energy sources into a rational global energy strategy.