Judith M. Greenwald Discusses Keeping the Nuclear Power Option Open

Introduction

Addressing the challenge of global climate change will require a sustained and comprehensive commitment to climate-friendly policies and investments throughout the world. Such policies and investments must be focused on enabling a transition to a low-carbon economy through a significant reduction in annual greenhouse gas (GHG) emissions by 2050. A commonly stated goal is to stabilize the atmospheric concentration of carbon dioxide (CO_2) at twice its pre-industrial level— that is 550 parts per million or less. Such a "decarbonization" in the context of increasing global demand for energy would necessitate an increase of roughly 100 to 300 percent of present-day worldwide "primary power" consumption from non-CO_2-emitting sources such as renewables, nuclear power, the use of fossil fuels with carbon capture and sequestration, and energy efficiency improvements.

Achieving this transition depends on both near-term and long-term actions. In the near term, it will be necessary to take advantage of current technologies and opportunities, and to make substantial investments in promising technologies for the future. Considering the magnitude of the long-term challenge, differences in the current cost and level of commercial maturity of various low-carbon energy technologies, and variation in the low-carbon resource and technology availability worldwide, it is likely that a portfolio of options will be required, and these investments will need to be sustained for many decades.

Accordingly, it is important to consider any and all low-carbon technology options, including nuclear power, as potential contributors to a low-carbon future. Due to the long-lived nature of capital stock in the energy sector and the effect that early choices have on future GHG emissions, it is important to focus serious policy and investment attention on low-carbon energy sources as soon as possible. Nuclear power provides an example of the urgent need to assess the ability of this technology to play an important role in meeting the long-term climate and energy challenges facing the world.

Opportunities and Barriers

Nuclear power potentially offers a virtual greenhouse gas (GHG)-free source of energy for the electric sector. In addition, nuclear power could enable a future decarbonization of the transport sector – either through electric vehicles or through the use of electrolytic hydrogen in hydrogen internal combustion or fuel cell vehicles. Despite nuclear power's potential to contribute to a low-carbon future, its further development is hampered by many problems, and further deployment of nuclear power is essentially "on hold" in many developed countries - a situation well illustrated in the United States.

Nuclear power currently provides approximately 20 percent of U.S. electricity supply from 104 operating reactors. Despite its significant role in the U.S. electricity mix, the last new nuclear plant was ordered in 1979, and there are no current plans to build

more in the United States. Furthermore, approximately 10 percent of U.S. nuclear plant licenses will expire at the end of 2010, and more than 40 percent will expire by 2015. Any significant ramp-up of nuclear capacity would likely be a lengthy process, due in large part to the significant time required to license and build a new nuclear plant. Thus, the ability of nuclear power to contribute to avoiding significant GHG emissions by 2050 will be determined by whether a major deployment of nuclear power in the United States starts in the next 10 to 15 years.

Under current conditions, such a near-term deployment seems unlikely, as it depends on the degree to which the nuclear industry can overcome serious barriers, including:

• cost;
• technical, political, and social concerns about nuclear waste disposal;
• increased proliferation risk; and
• public concern about the continued and expanded use of nuclear power.

Each of these represents a significant barrier alone, and in combination has stymied the U.S. nuclear industry for over the last two decades. Of particular concern to many in the international community right now is the threat of increased proliferation risk caused by continued and expanded production of certain types of nuclear materials.

Grounds for Keeping the Option Open

Despite the obstacles facing an increased deployment of nuclear power, the imperative to decarbonize the future world energy economy to mitigate climate change provides strong motivation to keep the nuclear power option open. This requires stakeholders and policy makers to be frank about the challenges as well as the potential benefits of this technology, and to make the best informed policy and investment decisions with regard to nuclear power in this context in the near term.

In the past, the nuclear debate in the United States has been characterized by two well-entrenched ideological positions. On one side are those who do not consider nuclear power a viable alternative to fossil fuels – mostly on the grounds of safety and waste disposal issues – contending that these problems are insurmountable. The other side argues that nuclear power would be economically and technologically viable if it weren't for misguided public opposition.

As in many other countries, signs are emerging that the nuclear debate in the U.S. is changing. Some are now asking: "despite its significant risks and challenges, how can nuclear power be made to work in the context of a carbon-constrained world?" This is mostly due to the recognition that in order to effectively address climate change, all low-GHG emitting options have seriously explored. Recognition of the potential value of nuclear power has started to emerge among some of those advocating for near-term action on climate change, and many in the U.S. nuclear industry are touting nuclear power as an option for addressing global warming.

The Path Forward: International Cooperation and Domestic Action

Many questions and challenges remain to be addressed before nuclear power could contribute significantly to climate change mitigation in a way that is acceptable domestically and internationally. Most pressing is the need to minimize the risk of proliferation of weapons-grade nuclear material. Power reactors are not themselves the major proliferation threat; enrichment and reprocessing plants are. Thus one option is to reorient the Nuclear Nonproliferation Treaty (NPT) framework to establish two paths for countries to take: "reactor only" and "full fuel-cycle." States with fuel cycle facilities would be subject to stringent safeguards, but states choosing the reactor-only path could avoid fuel cycle investments, intrusive safeguards, and nuclear waste challenges.

Even if the international community is able to adequately resolve concerns related to international waste disposal and proliferation, cost, domestic waste disposal, safety, and public perception concerns are still likely to hinder the development of nuclear power in many countries. Accordingly, nuclear power is likely to require a near-term policy "push" in many individual countries in order to be in a position over the long term to contribute to significant GHG reductions.

Recognizing both the significant challenges facing the nuclear industry, and the potential for nuclear power to play a critical role in enabling a low-carbon future, a study led by a group of M.I.T. and Harvard professors completed a report in 2003 entitled *The Future of Nuclear Power*. Although acknowledging the significant problems associated with this technology, the study group concluded that considering a "global growth scenario" for nuclear power in the near term was prudent in light of the role that it could play in the challenge of addressing global climate change. Furthermore, the group concluded that enabling such a growth scenario would likely require an explicit near-term policy focus. Listed below are some of the near-term policy options that could address the barriers to nuclear generation and that could increase the likelihood of a large-scale deployment scenario in the United States:

- Electricity production tax credits for a new generation of "first mover" nuclear plants up to 10 gigawatts electric (Gwe) at a level similar to the U.S. wind production tax credit (currently 1.8 cents/kWh)
- Significant expansion in size and scope of the U.S. DOE's nuclear waste management R&D
- Strengthening and reorientation of the current international safeguards regime to meet the non-proliferation challenges of globally expanded nuclear power
- Re-ordering of the priorities of the U.S. DOE nuclear fuel cycle R&D to focus on the "once-through" fuel cycle, as opposed to fuel reprocessing with its inherent proliferation risks (the once-through mode means removing the spent nuclear fuel for geologic disposal. Closed fuel cycles are those in which the irradiated fuel is chemically processed to separate and recycle in the reactor components that have energy value, principally plutonium)
- Public dialogue and education on the costs and benefits of nuclear power, especially in the context of climate change

Thus, clearly governments – working together internationally, and individually in their own countries –have a key near-term role to play in helping to determine the long-term

role of nuclear power in addressing climate change. However, even with the adoption of a comprehensive suite of policies to promote nuclear power, the MIT study group concluded that the role of this technology in the future will ultimately be determined by the willingness and ability of the electric power industry to increase deployment of nuclear plants. Most importantly, governments and industry need to act in the near term to enable an informed decision on whether nuclear power can play a significant role in addressing climate change.

Conclusion

Global climate change presents a daunting challenge for the global community. Yet it can be addressed through a "decarbonization" of the global energy economy over the next 50-100 years with a portfolio of low-carbon energy and resource technology options. Accordingly, it is important to seriously consider all low-carbon energy options – including nuclear power. If the international community, domestic governments, and the nuclear industry can overcome the significant barriers facing an expansion of nuclear power, it could play an important role in meeting the climate change challenge. Nuclear power can be part of the solution to climate change, but only if it can solve its own problems.

(This article relies heavily on material previously published in the following publications: 'The Future of Nuclear Power' (J Deutch and E Moniz, co-chairs), Pew Center on Global Climate Change and National Commission on Energy Policy Workshop Proceedings – the 10-50 Solution; and E Moniz 'Nuclear Power and Climate Change' – Overview paper in Workshop Proceedings—the 10-50 Solution, Technologies and Policies for a Low-Carbon Future. This article does not necessarily reflect the views of the MIT 'Future of Nuclear Power' study group or the National Commission on Energy Policy.