

4. Nuclear Power and the Next Kyoto Protocol

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Dr. Gail H. Marcus is presently an independent consultant on nuclear power technology and policy. She recently completed a three-year term as Deputy Director-General of the OECD Nuclear Energy Agency (NEA) in Paris. In this position, she was responsible for the program of work and budget for the agency. From 1999 through 2004, Dr. Marcus served as Principal Deputy Director of the Office of Nuclear Energy, Science and Technology. There she provided technical leadership for DOE's nuclear energy programs and facilities, including the development of next-generation nuclear power systems. Other responsibilities included production and distribution of isotopes for medical treatment, diagnosis and research, and oversight of DOE test and research reactors and related facilities and activities. From 1998-1999, Dr. Marcus spent a year in Japan as Visiting Professor in the Research Laboratory for Nuclear Reactors, Tokyo Institute of Technology. She conducted research on comparative nuclear regulatory policy in Japan and the United States.

Previously, Dr. Marcus had been in the US Nuclear Regulatory Commission (NRC). She served in a variety of positions including Deputy Executive Director of the Advisory Committee on Reactor Safeguards/Advisory Committee on Nuclear Waste; Director of Project Directorate III-3, providing regulatory oversight of seven nuclear power plants in the Midwest; and Director of the Advanced Reactors Project Directorate, where she was responsible for technical reviews of advanced reactor designs.

She also served as technical assistant to Commissioner Kenneth Rogers at the NRC for over four years, providing advice and recommendations on a broad range of technical and policy issues of interest to the Commission. From this position she was detailed for five months to Japan's Ministry of International Trade and Industry, where she was NRC's first assignee to Japan, studying Japan's licensing of the Advanced Boiling Water Reactor.

Prior to her service at NRC, Dr. Marcus was Assistant Chief of the Science Policy Research Division at the Congressional Research Service (1980-1985). In this position, she was responsible for policy analysis in support of Congress covering all fields of science and technology, and played a lead role in policy analysis and development for energy, nuclear power, and risk assessment and management.

Organization:

From 2001-2002, Dr. Marcus served as President of the American Nuclear Society (ANS), an 11,000 member professional society. She is a Fellow of the ANS and of the American Association for the Advancement of Science (AAAS). She is a former member of the National Research Council Committee on the Future Needs of Nuclear Engineering Education, and served three terms on the MIT Corporation Visiting Committee for the Nuclear Engineering Department. She is just completing a term as the elected Chair of the Engineering Section of AAAS.

Publication:

Dr. Marcus has authored numerous technical papers and publications. Her research interests include nuclear regulatory policy, energy technology and policy, risk assessment and management, international nuclear policy, and advanced nuclear technologies.

Education:

Dr. Marcus has an S.B. and S.M. in Physics, and an Sc.D. in Nuclear Engineering from MIT. She is the first woman to earn a doctorate in nuclear engineering in the United States.

Introduction

As the world prepares to launch into negotiations on the successor to the Kyoto Protocol, it is useful to begin to discuss the successes and failures of the agreement to date, and possible directions in which it may evolve.

While the Kyoto Protocol was a groundbreaking agreement in its day, committing the nations that ratified it to substantial reductions in their emissions of several Greenhouse Gases (GHG), the reports to date on the outcome of the agreement are mixed. Some nations have met their goals while others have not, and it is unclear in some cases whether the changes in a nation's emissions are due to deliberate efforts or to economic or other factors. There have also been criticisms of the implementation of some of the mechanisms in the Kyoto Protocol (more on that below).

Nevertheless, the Kyoto Protocol has had its successes, and given the importance and global scope of the issue, these successes are important. Whether or not countries reach their goals, reductions in GHG emissions have been achieved. The Kyoto Protocol remains the primary tool we have for orchestrating multinational efforts to reduce GHG emissions, and thereby, for trying to stem the tide of global warming. Furthermore, the very existence of the Kyoto Protocol focuses the attention of both policymakers and the public on the concern about global warming and on the measures that might be taken. If anything, the public and the governments are more concerned about global warming than they were in the late 1990s, when the Kyoto Protocol was developed, and are therefore likely to expect even more results from a follow-up agreement among the world's nations.

It is interesting to consider what all of this means as countries begin to think about forging an agreement that looks beyond the period covered by the Kyoto Protocol. While the prospects for expanding and improving the Kyoto Protocol seem promising, the perceived shortcomings and concerns will need to be addressed. The world of international diplomacy is at least as complicated as the world of subatomic particle interactions, and further evolution of the Kyoto Protocol in productive directions will not be simple or easy.

It is therefore timely to review the major provisions of the Kyoto Protocol and to consider some of the issues that the negotiators will face in developing the next agreement. Such a discussion is likely to be of special interest to the nuclear community. Nuclear power was prohibited from use in certain mechanisms of the Kyoto Protocol, and the

nuclear community has long wished for that prohibition to be lifted. This may be the time.

Current Kyoto Protocol

As I am sure most readers know, the Kyoto Protocol is an international agreement, adopted in Kyoto, Japan, on 11 December 1997, which aims to try to reduce GHG emissions globally. It entered into force on 16 February 2005 and as of 14 January 2009, has been ratified by 183 countries and 1 regional economic integration organization (the European Union). (The United States signed the Protocol, but did not ratify it.) The Kyoto Protocol sets binding targets for GHG emissions reductions in 39 industrialized countries, including the European Union. Six GHGs are identified, including carbon dioxide. The targets vary by country, but average about a five per cent reduction to the 1990 levels of emissions by 2012. The focus on developed countries recognizes that they carry the main responsibility for the current levels of GHGs in the atmosphere as a result of their years of industrial activity and their current high levels of energy use. The detailed rules for the implementation of the Protocol were adopted in Marrakesh in 2001, and are called the Marrakesh Accords.

The goal is for countries to meet their targets primarily through national measures. However, the Kyoto Protocol offers additional means for countries to meet their targets through three market-based mechanisms: Emissions Trading, the Clean Development Mechanism (CDM), and Joint Implementation (JI). The latter two mechanisms give the developed countries credit for supporting projects in other countries. In the case of the CDM, the credit is intended for projects in countries **other** than those with specified targets; in the case of JI, the credit is intended for projects in other countries **with** specified targets (It should be noted that the list of countries that have binding targets is slightly different than the list of countries specified for the CDM and JI mechanisms). It has been a source of irritation to the nuclear community that, at the insistence of a small numbers of countries, explicit provisions to exclude nuclear projects were written into the CDM and JI requirements.

A very complete discussion of the Kyoto Protocol, including links to the Protocol itself and to other documentation governing its implementation, can be found at:

http://unfccc.int/kyoto_protocol/items/2830.php

An explanation of the differences between the list of countries with binding targets and the list of countries specified for the CDM and JI mechanisms can be found at:

http://unfccc.int/resource/docs/publications/08_unfc

[cc kp ref manual.pdf](#)

Looking Ahead

The first Kyoto Protocol took a number of years to develop. It is therefore time to begin the negotiations for an agreement to follow the Kyoto Protocol. The new agreement should draw on the experience gained with the Kyoto Protocol and should take into account some new realities in the world. These include the greater understanding we have of the impacts that mechanisms to increase clean energy supplies have on critical food and water supplies, the growing importance of the largest developing countries as significant emitters of GHGs, and the increased interest in the use of nuclear power to meet energy demands in many countries.

Some of the key issues that the negotiators will have to face in the next round of negotiations include the following:

- **Making realistic assessments of the successes and failures of the mechanisms currently in place:**

In recent years, there have been a number of reports questioning the effectiveness of some of the mechanisms of the Kyoto Protocol, such as the CDM. Based on the concerns expressed, it is clear that a very probing analysis of the effectiveness of these measures needs to be undertaken. This is not likely to be easy. Among the allegations are claims that some of the projects were already ongoing or would have been funded anyway. If that is true, these projects subvert the intent of the mechanism to fund projects that otherwise would not have been built. Other reports claim other shortcomings, both in the underlying requirements of the CDM and in the way it is operated and administered in some countries. Obviously, the existence of the CDM has been beneficial to some interests, and those interests will fight mightily against changes.

Nevertheless, even if there had been no criticism at all, good management demands a periodic review of the results and effectiveness of **any** major project or program. This is warranted even more if a decision is being made on the continuation of the project or program. In this case, given the concerns that have been raised, it is imperative that the review be thorough and objective.

- **Adopt a more holistic approach:** In a previous essay, I argued that we should have foreseen that increasing the use of cropland for ethanol would have an impact on food production. It does not matter now why we did not give this concern sufficient attention in the past. The fact is that,

today, we have graphic evidence of the interrelatedness of the major needs of human society—food, water, and energy. It would be too much to expect one single agreement to deal comprehensively with all the major needs of human society. Nevertheless, it is incumbent upon any energy use strategy to assure that the policies and practices promoted to address our energy needs are balanced against the other essential needs of human life.

This will clearly be a very difficult goal to achieve. Some kind of formula needs to be worked out that doesn't give full credit for carbon reductions made at the expense of food production or availability of water for human consumption. Such a formula will have to consider the specifics of any activity. For example, more advanced forms of ethanol production are being developed to exploit cellulose products that can be produced on land that is not suitable for most food crops. Such forms of ethanol should be "rated" differently than the current corn-based ethanol products that do displace food production.

- **Developing countries need to commit to participating in the next round of the Kyoto Protocol:**

Perhaps the most serious deficiency of the original Kyoto Protocol was the decision that developing countries did not need to have binding targets for GHG reductions. The argument these countries made was a powerful one—they had made and were making less of an impact on the environment than the developed countries, and they had far greater needs than developed countries for additional energy supplies to meet the basic needs of their populations. Their ability to "catch up" to the developed world should not be restrained or slowed. Nevertheless, even at that time, to some, it seemed counterproductive for the large developing countries to be **increasing** their production of carbon dioxide substantially at the same time the developed countries were working hard to decrease their production. Several of the largest and most populous of the developing countries have had enormous spurts of growth in the past decade or so, even beyond what was anticipated at the time the first Kyoto Protocol was developed. With that growth has come a large increase in their carbon footprint.

It is imperative that the next agreement be structured so that the developing countries can enjoy continued growth without undercutting the efforts of developed countries to reduce carbon emissions globally. Obviously, these countries cannot be subject to the same requirements as the most developed countries. A formula for

their carbon goal needs to be based on their current emissions and their expected growth, and on the cost and availability of low-emission technologies. Further, it should be designed mainly to limit their increases in emissions rather than, as is the case for most of the developed countries, to reduce their emissions. The precedent for this has already been set in the original Kyoto Protocol, where some developed countries had targets for emission cuts, while others were enjoined merely to stabilize emissions or were even allowed modest emission increases. Furthermore, it is clear that the developed countries will have to step in with some support for the additional costs the developing countries may incur in using more costly low-emission technologies instead of simply building new fossil fuel plants. Such support could, perhaps, replace or be integrated with the CDM/JI. Clearly, the critical factor is to involve only the largest and fastest growing developing countries in the group of countries with explicit goals. It would be far too complex, and would be minimally useful, to try to set goals for the smallest and poorest countries, as their impact on the total carbon emissions are still very small and are likely to remain so.

- **Individual country agendas should not drive the development of the next Kyoto Protocol:** One deficiency of the first Kyoto Protocol was that countries opposed to nuclear power sought to impose their viewpoint on the rest of the world by demanding the exclusion of nuclear power from technologies that could be used in certain Kyoto Protocol mechanisms, particularly the CDM and JI. Although a small number of countries held strongly anti-nuclear views, they were able to impose their views on the rest of the world. Since that time, the nuclear community and others have wanted to “level the playing field,” that is, to have all non-GHG-emitting technologies treated the same way.

(Of course, the developed countries remained free to use nuclear power within their own countries, as well as to provide support to other countries for nuclear projects. However, such support was not “credited” under the CDM and JI formulas. Therefore, the restriction has tended to create a disadvantage for nuclear power.)

The decision to exclude nuclear power from the CDM and JI should be overturned in the next agreement. It would appear that the international political environment should be favorable to making such a change. Several countries that were anti-nuclear at the time the Kyoto Protocol was developed have changed, or are changing,

their national policies. In addition, if my proposal that countries like China and India become signatories of the next Kyoto Protocol is adopted, they will likely add to the voices at the table that nuclear power be an option in all the provisions of a new protocol. Finally, a number of countries that did not have nuclear power before are now interested in acquiring nuclear power, and allowing nuclear projects to be funded by the CDM (or whatever replaces it) could be helpful to them. Of course, the host country for any project should make the ultimate decision on what projects it wishes to permit, and the countries providing funding should be free, on an individual basis, to limit their funding to certain types of projects.

Conclusion

The negotiations for the next Kyoto Protocol are just getting started. It is none too soon, as the present agreement is set to expire in 2012. This type of negotiation is likely to be long and difficult, as each country seeks to protect its own interests. These interests include minimizing the inconvenience to its own citizens and minimizing the possibility of adverse effects on its economy. The final shape of the agreement, as before, will require some compromises, and these are never easy.

Nevertheless, the timing is promising for a new agreement that builds on the first agreement and improves it. When the first agreement was being negotiated, there was still a significant degree of skepticism about the reality of global warming and the role of human activity in producing it. There is much less skepticism now. More scientific evidence of global warming and the role of human activity has been produced. In some countries, changes in weather patterns, in the virulence and spread of certain diseases, and in other factors, have provided concrete evidence of detrimental environmental changes. We also will have had more than a decade of experience with the first agreement, which should be a sufficient time period to allow us to assess what worked well and what didn't work as well. The largest of the developing countries have made great strides in their development and should be at a stage where it is more reasonable to expect them to participate in a global initiative such as the Kyoto Protocol. And finally, in a number of countries, the public attitudes and official policies towards nuclear power have changed significantly, and it is much more likely that nuclear power will be treated more equitably in the next round of negotiations.

Therefore, it is with cautious optimism that I await the unfolding of formal negotiations on the next Kyoto Protocol.

Thanks again for your attention. I welcome your reactions to this essay.

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