US Climate Change Science Program:
Planning Workshop for Scientists and Stakeholders
Marriott Wardman Park Hotel, Washington, DC
December 3-5, 2002

Breakout Group 2: Climate Change Science Program Elements
December 4, 8:30-10:30
Session 11: Scenario Development to Support National Scope Decisions

Moderator: Dr. Robert O'Connor (National Science Foundation)
Presenter: Dr. James E. Edmonds (Pacific Northwest National Laboratory and University of Maryland)

Panel:
Dr. Russell Jones (American Petroleum Institute)
Franklin W. Nutter, JD (Reinsurance Association of America)
Dr. Edward A. Parson (Harvard University)
Dr. William Pizer (Resources for the Future)

Rapporteurs:
Dr. Robert C. Worrest (Columbia University)
Dr. Stephanie Harrington (National Oceanic and Atmospheric Administration)

Bob O'Connor opened the session at 8:30 with guidance on the structure, process and purpose of the breakout session. He encouraged those who wished to make comments to back up any verbal comments that they might make at the session with written comments submitted to <comments@climatescience.gov>. [The format for submitting comments can be found at http://www.climatescience.gov/Library/stratplan2003/comments.htm] Bob O'Connor then turned the floor over to Jae Edmonds to present an overview of the session topic from the CCRP Strategic Plan.

Jae Edmonds opened by stating that the purpose of his presentation was to review Chapter 4 [http://www.climatescience.gov/Library/stratplan2003/ccspstratplan2003-chap4-nov2002b.pdf] of the draft Strategic Plan. He reiterated the need to submit written comments to comments@climatescience.gov if one wanted to ensure that the comments were fully reviewed and archived.

Jae began by describing the goal of the scenario activities in the Climate Change Research Initiative (CCRI), which was to develop, maintain, and enhance the capability to answer "If...,then..." questions relevant to the full range of climate change decision making. This is a range that extends beyond what we conventionally think of as scenarios. It goes into management of resources, formation of national and international policy, and it seeks to ensure that a balanced approach is taken that maintains objectivity and avoids focusing on worst-case scenarios alone. We need to define a scenario in this instance. Here, it refers to any description of the world as it might evolve or it might be made to evolve in response to decisions, it includes potentially formal models, it includes

story lines, and expert elicitation, and a variety of other techniques to generate descriptions of the world. The breadth of scenarios extends from regional impacts all the way to greenhouse gas emissions.

If you don't have scenarios when you face making decisions today that affect the future, you're driven back into a worst-case assessment or into assuming climate change occurs today -- and both of these are clearly wrong -- it's very easy to do better than that. Don't we already have an adequate set of climate change scenarios? In 2001, there was a report that came out from the Intergovernmental Panel on Climate Change, the "Special Report on Emissions Scenarios." That special report issued a set of six marker scenarios and there were at least 50 scenarios in the suite of scenarios that were partitioned into sets. However, they don't appear to take evolving climate policy into consideration. Also, they were developed in 1997 and the regionalization was broken out at a higher level. It doesn't break out the United States explicitly; however, you can go back to the models and break it out. One thing when you do break out the United States, one of the models assumed that the US economic growth ceases in the year 2030 -- one would want to go back and revisit that parameter. Also, most of the models don't address impacts or consequences. They were emissions scenarios.

In addition, there were many scenarios, but they don't give a sense of probability. The result in the utilization of the scenarios was that the probability of each scenario was 1/n.

Finally, there doesn't appear to be stakeholder involvement in defining the appropriate questions.

CCRI proposes in Chapter 4 to define scenarios based on "what if" questions. They will involve stakeholders (environmental NGOs, industrial representatives, natural resource managers, government agencies, policy makers and other stakeholders). The scenarios will be internally consistent and maintained using the most current information regarding the science and the policy questions. The goal is to answer "what if" questions that will address relevant policy and resource management questions at the national, regional, and sectoral levels. A first pass will be developed over the course of the next two years.

The models will span the range from energy, to economic, to land use, to atmospheric chemistry, to climate, to hydrology, to agriculture -- the full range of climate-related models. A particular set of models -- the integrated assessment models -- will be improved both in skill and breadth of coverage to realistically represent the increased number of actions and consequences that are important to the decision-making process and to provide other insights that would not be able to obtain if you were to use the disciplinary models independently.

Models and assumptions must be relevant to the questions you are addressing. Assumptions will range from demographics to economics and resources (fossil fuels, renewable resources, land use / land cover) and technology, policy goals, **etc**.

In moving from the strategic vision -- this is a strategic plan -- to implementation, it is important to realize that there are tools and capabilities that have been developed in the US Global Change Research Program.

Russell Jones asked "To what does 'If...,then...' apply?" [Most of this presentation alluded to what was shown on slides.]

- Climate history (which climate history & how stable?
- Human activity
  - multiple carbon scenarios
  - multiple outcomes ---> multiple policy options
- What is in the climate models?
  - solar, volcano
- What is in solar?

"If...,then...": What about different future activities/multiple paths?
Can you sort through multiple paths?

- probabilities
- sensitivities
- range of results

Must avoid arbitrary choices and infeasible demands on computer time.
Climate -- impacts -- mitigation and adaptation
twenty-five years equals one-half of a business cycle.

Frank Nutter (Reinsurance Association)

Reinsurance industry/actuarial science
Insurance industry must make accurate predictions of future events.
31 greater than $1B; 29 involved extreme weather events
Number of events three times greater in 1990s compared to 1960s
Past is NOT prologue
Industry/government partnership top cover natural disasters
Build capacity
1. Place more emphasis on catastrophe modeling (future)
2. More monitoring of extreme events dynamics (especially over land)
3. Global climate change needs regionalization(?)
4. Historical record of extreme weather events is good
5. Determine climate "normals" - benchmarks
6. Business/government partnerships
7. Energy efficiency -- look at energy efficiency in terms of safety

Ted Parson (Harvard University)

Chapter 4 is critical to strategic plan.
The current draft contains much of great insight and value.
However, it is extremely hard to find out what it proposes to do. There is obscurity, contradiction, too-high level of abstraction and generality.

Fundamentally ambitious regarding status of decision support for bridging science to policy.
Doesn't address uncertainty.
What if you do nothing? What is the cost of making a decision to do nothing versus to do something? There is a systematic bias to status quo.
Need collective judgment for worst-case and best-case scenarios.
"Scenario" has many definitions. They can't be all-purpose -- must be specific. Must use multiple scenarios.
Use "What would it take?" (sensitivity analysis) -- not "What if...?"
Can't wait to resolve all major uncertainties -- height of irresponsibility.
Must include consultation with stakeholders.
Build on the "Foundation Report" of the National Assessment.

Billy Pizer started by stating that scientists need not only to respond to policymaker questions; they need to push back and tell them when they are asking the wrong questions. Interaction between scientists and decision makers has led to improvements in our thinking about the climate change problem:
1. The view of the problem that focuses on risk management. This is not about affecting relatively well-known outcomes associated with current activity, but is about influencing the risk of adverse and poorly understood consequences.
2. A recognition of the role of irreversibilities both in the environment and in our investments in human and physical capital, and how that affects the timing of decisions -- especially as new information becomes available.
3. Understanding that significant uncertainty exists regarding mitigation costs, as well as climate change consequences. This has important relevance for the design of policies.

While there is a tendency to want to move on to new and interesting things, nailing down the basics should remain a priority. The main concern is that decision support efforts highlight for policymakers not only what is known and not known well, but also what is likely to be known in a timely manner. (analogy of cholesterol leading to heart attack -- when you find out you have high cholesterol, your immediate response SHOULD NOT be to try and get better information about the timing and intensity of the upcoming heart attack -- it SHOULD be to reduce the risk) Decisions about mitigation are imperative. Decisions about adaptation can wait.

The climate-related decision research has focused too much on pathways to various concentration targets, leading policymakers to focus on questions of long-run stabilization -- emission pathways, technologies, international burden-sharing -- that we may never be able to agree upon. We are trying to manage the exact time and severity of our "heart attack" rather than starting to reduce the risk.

He believes that one of the most valuable contributions of a decision-support program could be to elaborate on the kinds of uncertainties that are likely to remain for some time and the consequences for decision makers. The policymaker might be encouraged to ask whether, absent a concentration target, science can inform an alternative kind of goal to

get things started. Absent a roadmap of the ultimate goal, how do we calibrate the first step?

Scenario development might be supplemented by an analysis of how gradual, incremental policy could be reformed over time as the true scenario unfolds -- not only based on increased knowledge about climate change, but based on increased knowledge about the policy's own efficacy in reducing emissions as time passes. Will a policy that initially addresses a subset of emission sources in a differential manner -- e.g., power plants and passenger vehicles through cap-and-trade and CAFE -- create institutional obstacles to future improvements? Are there some institutions, such as project-based crediting system for the capture of fugitive greenhouse gas emissions, which will be useful regardless of the future policy design?

His main concern is that decision support not be viewed as a way to simply make science more responsive to policymaker questions. He believes this ignores the fact that the scientific discourse over climate change is what has led to policymaker questions in the first place, and that a failure to grasp the limitations of scientific analysis can lead to a dead-end in policy development. The science program should continue to work on communicating the basics of risk management and decisions in the face of uncertainty and learning, but should also keep policymakers focused by showing them why some decisions are less important than others now; which decisions must be made before uncertainty is resolved; and what lines of questioning are unlikely to help resolve policy debate.

Audience Comments:

Paul Craig (Sierra Club Global Warming and Energy Committee)

Continue to involve stakeholders.
Read "The Next 100 Years" (1893) -- take a long-term perspective.
Don't just focus on 25 years (half the business cycle).
Connections and synergies matter -- too little coupling.
History, e.g., gasoline consumption, Middle East, 9/11, fast policy responses, should be considered -- think about scenarios that take those types of events into account.

Richard Moss (CCSP/USGCRP)

[Hard to hear -- not at microphone]

Bob Friedman (The Heinz Center)

[Hard to hear -- not at microphone at beginning of comments]
How is it going to be done?
How much is going to be done -- an implementation issue?
Crosscheck with real decisions -- with national policy, regional decision making.
Need to work backwards -- what are the decisions?

Beth Raps (Involved Citizen)

Involve citizens, communities.
Commends the use of democratic policymaking.
Citizens can be experts.
Need to involve all sectors of society -- persons of color, immune-suppressed individuals, women, children, elderly, etc.
Repeat the National Assessment.
Angry that the National Assessment not mentioned in the plan.
Implement no-regrets policy when addressing the previously mentioned sectors of society.

Jennifer Morgan (WWF)

What is dangerous climate change (objective of UNFCCC)?
Don't go for current concentration focus.
Go for lower emission scenario impacts.
Impacts are important.
Link various temperature scenarios with impacts.
Address lower concentration scenarios, e.g., less than 450ppm.
How much risk do you want to take?

Blair Henry (Attorney and University of North Dakota)

Translate scientific output into terms that policymakers can understand.
Rewrite in simpler terms.
Complicated stuff should go in the endnotes.
If it's not understandable, it hasn't been designed for decision makers.
Policymakers will tell you that they don't have time to think.
Put report together in a format that's very easy to assimilate.

Tina Kaarsberg (US House Committee on Science)

We're not connecting the dots between science and policy.
Use techniques of risk management to address this.
Address risk policies that help our economy.
Others may be gaming the system.
Must consider risks of policies of doing something as well as not doing something.
If we don't use that information, other people will.

Janine Bloomfield (Environmental Defense)

We're making decision during the implementation of the plan to not aggressively reduce emissions or increase sequestration capacity.
What is cost of delay? ...in dollars and in risk?

There are thresholds.
National Assessment stakeholder groups still exist -- Use them.
Years of work have been invested in developing the "what if" questions by the stakeholder groups.

Ken Green (Fraser Institute)

In this discussion, the worst case becomes the only case. Where is the discussion of the best-case scenario as the most likely?
Investment in uncertainty is likely to be wasted.
What are the "side effects" of climate change policy?
Push for discussion of data quality.
How should you address uncertainty?

Kris Ebi (Electric Power Research Institute)

Need good models to go from scenarios to impacts -- both qualitative and quantitative.
Information needs are required in the plan.
Use scenarios to feed back to research-agenda questions.
Need to go back to stakeholders and identify needs.

Diana Wilkins (Department for Environment, Food and Rural Affairs, UK)

Scenarios are just one element of risk management and decision-making.
Policy makers want to explore a range of scenarios and the relationship between socioeconomic drivers and feedbacks.
Need to include international feedback in US scenarios.

Tony Janetos (The Heinz Center)

In the scenario development, be cognizant of what the global issues are, e.g., economic or land-use issues.
Clarify difference between research into how to do scenario development better and when it is about producing better scenarios -- these are quite different.
One of many influences that decision makers have to consider is the importance of looking at scenarios or responses to changes in the climate system -- either greenhouse gas mitigation decisions or adaptation decisions.
Climate isn't the most important consideration in decision-making -- it is only one of several.

Robert Socolow (Princeton University)

Technology contribution is absent.
A major source of uncertainty is the ready source of technology-- its cost, its feasibility.
Think about the arrival of new information.
Are these considerations being integrated into the strategy?

Rafe Sagarin (US Congresswoman Hilda Solis)

Economic scenarios are vitally important.
We don't really know what the true costs of shifting away from a carbon economy -- this is a fundamental question.

Mike MacCracken (International Commission on Climate)

It's hard to get impacts into an integrated assessment model.
Need more effort on impact analyses.
Uncertainties not defined in this report.
Work on metrics for defining uncertainties.
Chaining uncertainties produces huge uncertainties -- chaining from economics, to emissions, to forcing, to climate change, to everything else.
Think about beyond 2100.
Consider very large effects that will occur if we don't start doing something sooner.

Carl Husker (sp?) (PA Consulting Group)

Must link strategic plan with budget process.
Invest primarily in decision support rather than consuming the budget in reducing uncertainties.

Arthur Alexiou (IOC/UNESCO)

Look at other countries (e.g., France) and how they have attacked the climate change issue -- the energy and the carbon dioxide problem.

Richard Moss (CCSP/USGCRP)

Richard gave a little background on the genesis of this chapter.
Much has not been specified in this chapter due to the relatively short period of time involved in its production.

Virginia Dale (Oak Ridge National Laboratory)

Bracket conditions of various scenarios -- worst-case, best-case, business-as-usual, etc.
The land-use issue is the other "global change."
Incorporate land-use feedbacks in scenarios.
Natural disturbances influence scenarios.