THE ECONOMICS OF TECHNOLOGIES TO COMBAT GLOBAL WARMING

William Nordhaus Nebojsa Nakicenovic
Yale University IIASA & TU-Wien

Snowmass Workshop
on Technologies to Combat Global Warming

August 3-4, 2009

The Agenda for the Next Two Days

- A central problem in combating global warming will be the need to make a ***smooth transition*** from existing technologies to new low-carbon technologies in the coming decades.
- Historical changes of this kind, such as the transition from traditional energy forms to fossil energy, have been ***very disruptive.*** But they have also resulted in unprecedented economic development and ***improvements in human well being.***
- Understanding of the dynamics of technological change is the ***least understood part of the global warming nexus***. Scientists have focused on the geophysical aspects, but we have largely neglected the technological environment.
- Our focus will be on how to ***foster an economic environment*** that will help smooth the transition to the new low-carbon world. In doing this, it is critical to understand the ***policy instruments*** that will induce firms, entrepreneurs, governments, and not-for-profit participants to undertake the necessary research, development, and commercialization.

The Agenda for the Next Two Days

- Is decarbonization an incremental change or are radically different systems called for? Gradual or punctuated evolution?
- Can "Inputs" to the innovation process be measured by outlays for energy R&D? Complexity of the innovation "chain" is a challenge making "linear" approaches futile.
- How can we measure the "outputs"? Technological learning and performance improvements are a function of cumulative effort (not of timing), but the process is poorly understood (the "black-box" model)!
- Is there a way to identify the transition to emerging systems (in models & strategy)? Technology portfolios vs. winner dominance?
- How to model different roles of R&D and markets? R&D generates variety, market the selection; R&D diversity for various niches.

Ground rules:

speakers have 20 minutes
discussants have 15 minutes
let's have plenty of time for discussion!

Snowmass rules for attribution:

Any written material (papers or preliminary work on the workshop web page, handouts, or presentations) may be cited and used subject to the proviso that they should be described as "preliminary and unpublished." Furthermore, we would encourage reports on the discussions in the individual sessions. However, when there is a direct quotation of the discussions with attribution to a specific person, the quotation should be checked for accuracy with the person quoted.

The "responsible editor" role is to work with authors to prepare the manuscripts for publication. We have divided the papers among ourselves, and authors and discussants should work with their editor as we move forward.

Papers posted on:
http://www.iiasa.ac.at/Research/TNT/WEB/Workshops/tech09.html

We are most grateful for the support of the Kauffman Foundation:
http://www.kauffman.org/

Program				
Order	Presenting author	Title	Primary Discussant	Responsible Editor
1	Arent	The Status and Prospects of Renewable	Kreigler	Nakicenovic
2	Ahearne	Is there a nuclear renaissance?	Steinbruner	Nakicenovic
3	Herzog	Scaling-up Carbon Dioxide Capture and	Flannery	Nakicenovic
4	Nordhaus	Designing a Friendly Space for Technological Change	Romer	Nakicenovic
5	Weyant	Understanding, Modeling, and Accelerating Technologies	Noll	Nordhaus
6	Klepper	The Future of ETS and CDM in a post-Kyoto	Lempert	Nordhaus
7	Popp	Technology and the Diffusion of Renewable	Jaffe	Nordhaus
8	Greene	Uncertainty, Loss Aversion and Markets for	Goulder	Nordhaus
9	Wilbanks	Inducing Transformational: Energy Technological Change	Sweeney	Nakicenovic
10	Clarke	Technology Interactions for Low Carbon Energy Technologies	Bosetti	Nakicenovic
11	Nakicenovic	How much R&DD is enough?	Tavoni	Nordhaus
12	Pugh	Energy R&D Portfolio Analysis and	Van Vuureen	Nordhaus