



Energy Policy Seminar Series, Spring 2013

Investing in Energy without a Crystal Ball: Postdoctoral Research Fellow Nidhi Santen on Power Sector Technology Investment Planning Under Uncertainty

How much should you invest in energy technology research and development (R&D), given that you can't be sure ahead of time whether this R&D will produce anything of significant value? In Monday, April 29's Energy Policy Seminar, Postdoctoral Research Fellow Nidhi Santen explained how new techniques in the computer analysis of making choices under uncertainty can be applied to improving policy analysis in the energy arena.

Currently, many models for energy policy decision making are structured as if policymakers face a single decision point in terms of what policies to pursue and what energy technologies to invest in. The reality, of course, Santen pointed out, is that policy makers make and revisit decisions repeatedly in the light of new information.

Does understanding this reality and incorporating it into decision optimization models make a difference? Santen's research project, which she is pursuing jointly with Laura Anadon, Associate Director of Belfer Center's Science, Technology, and Public Policy Program, has been focusing on the question of whether optimal energy investment strategies can be fine-tuned to reflect this ability to revisit decisions and change investment allocations over time.



Her work on this topic is focused on decisions related to the optimal distribution of investment among research and development in new electricity sector technologies and building new electricity infrastructure using existing technologies, building in uncertainties about the productivity of R&D investment and the ability to re-visit and change investment allocations over time

Using traditional computer modeling techniques, the attempt to optimize a path through repeated choices on multiple dimensions under uncertainty quickly becomes impractical. However, Santen has adapted a technique called "approximate dynamic programming" to reduce the complexity of these calculations to a manageable level.

Santen reported some of the preliminary results of her analysis using data on expected impacts of R&D investment found in the Energy Technology Innovation Policy research group's recent expert elicitation data collection effort, which gathered expert opinions on the likely impacts of additional R&D investments in many different energy technologies.

These early results suggest that optimal investment decisions may well be understood differently once the ability to change investment allocations over time is incorporated into

models, with results that might lead to higher initial R&D investments in some cases, and lower levels of initial investment in others. The complete analysis will be issued as a working paper in the next few months.

Santen spoke as part of the Energy Policy Seminar Series, which is jointly sponsored by the Energy Technology Innovation Policy research group of the Belfer Center on Science and International Affairs and the Consortium for Energy Policy Research at the Mossavar-Rahmani Center for Business and Government.