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The Social Cost of Carbon in Federal Rulemaking

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What is the cost to the world economy, now and in the future, of each additional ton of carbon dioxide emissions? “It’s a very complicated problem,” Elizabeth Kopits of EPA said in describing efforts to come up with a number for the “social cost of carbon,” a measure of the marginal damage from CO₂ emissions, including impacts like changes in agricultural productivity, changes in energy demand, impacts on human health, the cost of increased flood risk, impacts on ecosystem services, etc.

Many federal agencies, Kopits explained, are required by Executive Order to do benefit-cost analyses of the impact of regulations. Prior to 2008, federal agencies did not include a social cost of carbon in their analyses, effectively assuming the impact of carbon emissions on the economy was zero. Around 2008-2009, some federal agencies began including estimates in their analyses, but estimates varied substantially among agencies. Accordingly, Kopits said, an executive branch working group was formed to improve the accuracy and consistency of how agencies value reductions in CO₂ emissions in federal benefit-cost analyses.

Developing an estimate of the social cost of carbon required the working group to agree on how to handle a number of thorny issues. Key decisions included the choice of three “integrated assessment models” of the world economy, each with different projections related to how carbon emissions impact the economy; the choice to calculate the social cost of carbon based on global damages from carbon emissions, not just U.S. domestic damages; the decision to use five different reference paths for representing possible alternative future emissions, GDP, and population levels; and the decision to use three different discount rates, ranging from 2.5% to 5%. Each of these decisions represented an attempt to deal with key uncertainties that could result in a large difference in the value of the social cost of carbon.

The result of including all these different inputs was an initial collection of 45 separate distributions for the social cost of carbon. In order to pare the results down to a manageable number of estimates, government analysts selected the average social cost of carbon across models and socio-economic and emissions scenarios for each of the three discount rates and added a fourth value, the 95th percentile of the 3% discount rate distribution, to represent the high end of the range. Originally, the four values for 2020 emissions ranged from \$7 per ton of CO₂ to \$81 per ton (2007\$). A 2013 update to incorporate changes in the underlying economic models (including, notably, calculation of damages related to sea level rise), led to a new range of estimates for 2020 from \$12 - \$128 per ton.

Kopits noted that all potential costs associated with carbon emissions may still not be fully addressed (for example, costs associated with ocean acidification, or costs associated with potential climate feedback loops like melting permafrost), and also that the EPA is supporting further work on understanding appropriate rates of intergenerational discounting.

Kopits spoke as part of the Kennedy School’s 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 by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.

