Committee on Natural Resources
Rob Bishop, Chairman
Hearing Memo

7/20/15

To: Natural Resource Committee Members

From: Majority Committee Staff

Subject: Full Committee Oversight Hearing: *"An Analysis of the Obama Administration's Social Cost of Carbon"*

The Committee on Natural Resources hearing will take place on **July 22, 2015 at 10:00 a.m. in room 1324 Longworth House Office Building**. The hearing will specifically focus on the Obama Administration's Social Cost of Carbon, with a focus on the appropriateness of the models, inputs to the models, and the manner in which the Social Cost of Carbon was inserted into the regulatory framework.

Policy Overview:

- On May 13, 2015, the Committee held an oversight hearing entitled, *The Obama Administration's CEQ Recently Revised Draft Guidance for GHG Emissions and the Effects of Climate Change*,[1] at which witnesses raised concerns about the lack of transparency of the Administration's Draft Guidance to give instructions to federal agencies on the inclusion of GHG emissions in their National Environmental Policy Act (NEPA) reviews.

- Several outside experts have raised concerns about the considerable uncertainty, arbitrary assumptions and questionable accuracy of the models used to develop the Social Cost of Carbon and the inputs for the models.[2] In short, the models require a variety of arbitrary assumptions, including estimates of temperature sensitivities (the science is not settled), discount rates, and a time horizon (which attempts to project climate effects out to the year 2300).

- The CEQ's sweeping NEPA application for the Social Cost of Carbon could lead to potentially enormous impacts. CEQ intends for it to be used anytime a federal agency determines it appropriate to monetize costs and benefits during the regulatory review

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[1] http://naturalresources.house.gov/calendar/eventsingle.aspx?EventID=398484
[2] p. 13, Testimony of Roger R. Martella, Jr., May 15, 2015 hearing on "*The Obama Administration's CEQ Recently Revised Draft Guidance for GHG Emissions and the Effects of Climate Change."*

process for any federal action requiring a NEPA analysis. With such a broad-sweeping application of the Social Cost of Carbon, it is appropriate to examine how the Social Cost of Carbon was developed.

- The process and substance behind the development of the Social Cost of Carbon estimates has been perhaps one of the Administration's least transparent environmental decisions. Beginning in early 2009, the Administration, operating behind closed doors, formed an informal interagency working group led by the Office of Management and Budget (OMB) with several participating agencies, to develop the Social Cost of Carbon, defined as the "monetized net effects (damages and benefits) associated with an incremental increase in carbon emissions in a given year."[3]

- A primary concern is the lack of public participation or peer review in this process. The public first learned of the concept developed by the interagency working group when the group's interim estimates appeared in the Department of Energy's (DOE) final rule on energy standards for vending machines.[4] The working group later finalized social cost of carbon estimates by first publicly releasing them as an appendix to DOE's final rule on energy standards for small electric motors.[5] The interagency working group updated its estimates in May 2013 as a technical document supporting DOE's final rule on energy standards for microwave ovens.[6]

The testimony presented at the hearing will examine these concerns, as well as the manner in which the Social Cost of Carbon has been incorporated into the regulatory framework of the federal government.

Witnesses

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[3] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[4] Energy Conservation Program: Energy Conservation Standards for Refrigerated Bottled or Canned Beverage Vending Machines, 74 Federal Register, 44, 914 (August 31, 2009).
[5] Energy Conservation Program: Energy Conservation Standards for Small Electric Motors, 75 Federal Register 10,874 (March 9, 2010).
[6] Energy Conservation Program: Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens, 78 Federal Register, 36,316 (June 17, 2013).

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Background

History of the Social Cost of Carbon and the Interagency Working Group

The Social Cost of Carbon is "an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year."[7] Federal agencies first began considering the inclusion of estimates of the cost of carbon emissions to society into regulatory impact analysis following a Ninth Circuit Court of Appeals decision.[8] In 2006, the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued a final rule wherein it concluded that there was a benefit from a significant reduction in carbon dioxide emissions, but that the dollar value could not be determined.[9] The Ninth Circuit ruled that, "[w]hile the record shows that there is a range of values, the value of carbon emissions reduction is certainly not zero."[10]

In 2009, the Office of Management and Budget's (OMB) Office of Information and Regulatory Affairs and the Council of Economic Advisers convened an informal working group, referred to as the Interagency Working Group (IWG), to work on defining the Social Cost of

[7] Ibid
[8] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates*. (Publication No. GAO-14-663).
[9] *Ibid.*
[10] *Ctr. For biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1203 (9th Cir. 2008).

Carbon. Its purpose was to "improve consistency in agencies' use of social cost of carbon estimates for regulatory impact analysis[.]"[11] Among other things, the IWG looked at the impacts that climate change may have on "net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services."[12]

The IWG was convened under the broad authority of Executive Order 12866, which directs federal agencies to assess the potential costs and benefits of their significant regulatory actions.[13] Executive Order 13563, which reaffirmed and supplemented Executive Order 12866, was signed in 2011 and directs agencies to conduct regulatory actions based on the best available science. OMB also relied on Circular A-4, which OMB issued in 2003 for the purpose of providing guidance to federal agencies on the development of regulatory analysis as directed by Executive Order 12866, which requires a benefits and cost analysis. The IWG was led by OMB and the Council of Economic Advisors and they decided which Executive Office of the President (EOP) offices and federal agencies to invite to participate.[14] The following EOP offices and federal agencies participated:

EOP

- Council on Economic Advisers
- Council on Environmental Quality
- National Economic Council
- Office of Energy and Climate Change
- Office of Management and Budget
- Office of Information and Regulatory Affairs
- Office of Science and technology Policy

Federal Agencies

- Department of Agriculture
  - Office of the Chief Economist
- Department of Commerce
  - International Trade Administration, Office of Competition and Economic Analysis (2010 Only)
  - National Oceanic and Atmospheric Administration, National Marine Fisheries Service (2013 only)

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[11] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[12] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[13] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[14] *Ibid.*

- Department of Energy
  - Office of Climate Change Policy and Technology
- Department of Transportation
  - Office of Secretary
  - Volpe, The National Transportation Systems Center (2010 only)
- Department of the Treasury
  - Office of Economic Policy (2010 only)
  - Office of International Affairs, Office of Environment and Energy
- Environmental Protection Agency
  - Office of Air and Radiation, Office of Atmospheric Programs
  - Office of Policy, National Center for Environmental Economics

Initially, the IWG developed interim estimates for the social cost of carbon. It based these on the averages of estimates the IWG hand-selected from the academic literature. The interim estimates did not have a comment period or follow any formal rule-making process. The public first discovered these estimates in August 2009, when they were included in the Department of Energy's final rule on energy standards for vending machines. The IWG provided a range of estimates, with a central estimate of $19 per metric ton of carbon dioxide emitted.[15]

After releasing the interim estimates, the IWG reassembled in October 2009 to develop the final Social Cost of Carbon estimates issued in the Technical Support Document.[16] The IWG did not accept public comment on the Social Cost of Carbon estimates and it did not go through any rule making process. The final estimates, similar to the interim estimates, were first released publically in an appendix to the Department of Energy's final rule on energy standards for small electric motors.[17] It was subsequently incorporated into dozens of regulatory actions.[18] In June 2013, the public learned of an update to the social cost of carbon. The revised estimates were released publically in the Department of Energy's final rule on energy standards for microwaves.[19] These revised estimates increased the Social Cost of Carbon by over 50%.

Initially OMB refused to accept public comment on the Social Cost of Carbon directly, although it did accept public comment on the rules that incorporated the Social Cost of Carbon. In November 2013, OMB finally published an opportunity for the public to comment on the Social Cost of Carbon directly, and it responded to those comments in July 2015.

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[15] *Ibid.*at 6.
[16] *Ibid*
[17] *Ibid*
[18] *Ibid*
[19] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).

Social Cost of Carbon Estimates and Methodology

In developing the Social Cost of carbon estimates, the Interagency Working Group used three Integrated Assessment Models (IAMs) that "integrate climate and economic data into a single modeling framework for estimating future economic effects resulting from climate change."[20] The three models "translate [carbon dioxide] emissions into changes in atmospheric greenhouse gas concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages. However, each model uses its own methods to estimate these effects."[21] The three models selected by the IWG were the Policy Analysis of the Greenhouse Effect (PAGE), the Climate Framework for Uncertainty, Negotiation and Distribution (FUND), and the Dynamic Integrated Climate-Economy model (DICE). Each model is given equal weight in the SCC estimates.[22]

There are several key parameters and assumptions upon which each model relies. Each model incorporates different socio-economic factors, including estimates for projected carbon emissions, population, and GDP. Projected emissions are translated into global CO2 concentrations and then each model translates the increase in global CO2 concentrations into warming using what is referred to as the Equilibrium Climate Sensitivity (ECS). The ESC is "defined as the long-term increase in… surface temperature from a doubling of atmospheric CO2 concentration…."[23] Each model then uses its own Damage Function, which translates warming, as projected by the Equilibrium Climate Sensitivity, into damages. The damages are then discounted to give the net present value, expressed in dollars per metric ton of carbon dioxide emissions.

Equilibrium Climate Sensitivity

One of the key inputs that the PAGE, FUND, and DICE models rely on is the Equilibrium Climate Sensitivity (ECS). The Technical Support Document defines the ECS as "the long-term increase in the annual global-average surface temperature from a doubling of atmospheric CO2 concentration relative to pre-industrial levels…."[24] In other words, the ECS attempts to forecast or extrapolate how much the temperature would rise if the concentration of

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[20] *Ibid.*
[21] *Ibid.*
[22] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[23] *Ibid.* at 12.
[24] *Ibid.* at 12.

CO2 in the atmosphere were to double. While this is a highly speculative estimate filled with uncertainty, the IWG relies on the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) from 2007 and, after considering several candidates, the IWG selected an ECS derived by Roe and Baker (2007).[25] Despite major advances in the scientific literature regarding our understanding of the ECS and Executive order 13563 directing agencies to conduct regulatory actions based on the best available science, the IWG elected to continue to use Roe and Baker (2007) when they updated the SCC in 2013.[26]

Damage Function

Incorporated into each IAM is a unique Damage Function, which is the IAM modelers' best judgment of how to represent the impacts of an increase in global temperature on global GDP.[27] The damage function is not based on any underlying physical science, and there is "no theory and no data… [to] draw from[.]"[28] The IWG explains that each IAM Damage Function is a reflection of the modeler's best judgment of the relationship between GDP and global temperatures.[29] The IWG recognizes that "these representations are incomplete and highly uncertain." However, they explain that they simply are "[un]able to identify a better way to translate changes in climate into net economic damages…"[30]

Discount rate

The discount rate is a very critical part of the social cost of carbon and is the means by which future costs are reflected in present day costs. The Interagency Working Group explained that, after they determined the impacts that an additional unit of carbon dioxide emitted would have in terms of reduced consumption due to the impacts of elevated temperatures, it then discounted the stream of future damages to its present value using different discount rates."[31] The IWG noted that there is "no consensus about what rates to use in this context."[32] The

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[25] *Ibid.* at 13.
[26] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[27] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[28] Pindyck, Robert S. *The Use and Misuse of Models for Climate Policy*: *Working Paper 21097*. National Bureau of Economic Research. (April 2015). http://www.nber.org/papers/w21097.
[29] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[30] *Ibid.*
[31] *Ibid.*
[32] *Ibid.* at 18.

discount rate selected is incredibly important because "different discount rates will yield wildly different estimates of the SCC."[33]

OMB Guidance Circular A-4 Discount Rates

To assist in its analysis of discount rates, the IWG relied on OMB's guidance Circular A-4, which addresses discount rates specifically. IWG wanted to select discount rates that "best reflect[ed] the most current academic literature, while also comporting with OMB's guidance in Circular A-4."[34] The working group participants "recognized the importance of using OMB guidance, including Circular A-4, in developing [the SCC]."[35]

Circular A-4 states that, for regulatory analysis, agencies should provide estimates of net benefits using both 3 percent and 7 percent.[36] For intergenerational benefits and costs, however, Circular A-4 explains that lower discount rates might also be appropriate.[37] It states "[i]f your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate *in addition* to calculating net benefits using discount rates of 3 and 7 percent." (emphasis added)[38] However, the working group decided to forgo using the 7% discount rate and instead elected to use the discount rates of 2.5%, 3%, and 5% percent because "the academic literature shows that the social cost of carbon is highly sensitive to the discount rate chosen, and because no consensus exists on the appropriate rate."[39]

In other words, because the SCC is highly sensitive to the discount rate (a 7% discount rate would have yielded a significantly lower Social Cost of Carbon, and quite possibly show a benefit of carbon) and because there is no consensus, IWG reached the conclusion that the discount rates of 2.5%, 3% and 5% were "not inconsistent"[40] with OMB's guidance Circular A-4 requiring discount rates of 3% and 7% be used. The IWG provided an inadequate explanation for ignoring the 7% discount rate as required by OMB.

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[33] Pindyck, Robert S. *The Use and Misuse of Models for Climate Policy*: *Working Paper 21097*. National Bureau of Economic Research. (April 2015). http://www.nber.org/papers/w21097.
[34] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[35] *Ibid.*
[36] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[37] *Ibid* at 18.
[38] *Ibid*.
[39] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[40] *Ibid.*

Domestic vs. Global SCC

According to OMB guidance contained in Circular A-4, "analysis of economically significant proposed and final regulations from the domestic perspective is *required*, while analysis from the international perspective is *optional*."(Emphasis added)[41] However, the working group makes two arguments for using only the global value rather than the reporting domestic and global value separately as Circular A-4 requires. First, it argues that "greenhouse gases contribute to damages around the world even when they are emitted in the United States." Second, "climate change presents a problem that the United States alone cannot solve." These two considerations led the working group to conclude that, rather than giving the domestic cost as required by Circular A-4 in addition to the global costs, using only the global value was the appropriate approach.[42]

*SCC value*s

Once the models, factors, discount rates, and inputs had been decided, on behalf of the working group, EPA ran the models and weighted each model equally. It also selected a time horizon for each model. Since most of the damages predicted by the IAMs occur far in the future, the working group had to select a time frame that extended far into the future so as to avoid "miss[ing] a significant fraction of damages" predicted by the IAMs. Therefore, they ran each model through the year 2300, roughly three centuries into the future.

The end result was a total of 4 values for the cost to society of a unit of carbon emission in any given year. The first three values were based on the average of the estimates of all three IAMs at the discount rates of 2.5%, 3%, and 5%. The fourth was "included to represent higher-than-expected economic impacts from climate change." For this value, the working group combined the values appearing at the furthest reaches of the distributions produced by each IAM, using values produced from all three models for the 95th percentile at a 3 percent discount rate.[43]

The following table shows the SCC values in dollars:

Discount Rate:	5% (avg.)	3% (avg.)	2.5% (avg.)	3% (95 percentile)
Year 2010	4.7	21.4	35.1	64.9
Year 2015	5.7	23.8	38.4	72.8

[41] Interagency Working Group on Social Cost of Carbon, United States Government, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866* (Washington, D.C.: February 2010).
[42] *Ibid.*
[43] *Ibid.*

In 2013, the IWG reassembled to discuss updating the SCC. By 2013, the underlying IAMs had been updated. These updates included changes to reflect new information of sea level rise and associated damages. The only changes made to the models were "those that the model developers incorporated in the latest versions of the models."[44] The IWG did not update the ECS to reflect the latest scientific literature and they did not change any of the inputs.[45] The revised SCC increased the cost in some cases by over 50%:

Discount Rate:	5% (avg.)	3% (avg.)	2.5% (avg.)	3% (95 percentile)
Year 2010	11	33	52	90
Year 2015	12	38	58	109

[44] U.S Government Accountability Office. (2014, July). *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* (Publication No. GAO-14-663).
[45] *Ibid.* at 19.