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Social Cost of Greenhouse Gases: Background and Recent Developments

On January 20, 2025, President Trump issued Executive Order (E.O.) 14154, “Unleashing American Energy.” This order includes several directives to agencies regarding the use of the social cost of greenhouse gases (SC-GHG), an analytical tool that agencies have used in rulemakings to estimate the benefits of GHG reductions. Federal agencies, including the Environmental Protection Agency (EPA), have used SC-GHG estimates to inform their analyses of proposed federal actions since 2008. Members of Congress have taken divergent views on the adequacy and use of the SC-GHG. Some have questioned whether the SC-GHG methodology is consistent with federal guidance. Others have raised concerns that the estimates are outdated, underestimating climate benefits.

E.O. 14154 raises a number of questions regarding (1) the use of SC-GHG estimates in both existing and future federal rulemakings and (2) how agencies may implement the E.O. directives and potentially affect existing and future rulemakings.

What Is the SC-GHG?

The social cost of a specific greenhouse gas (GHG), such as carbon dioxide, is a monetary estimate of the economic impacts associated with emitting an additional (marginal) ton of that GHG. Conversely, this dollar figure represents the benefit of a one-ton reduction in emissions of that GHG. For example, the social cost of carbon dioxide (SCC) includes effects regarding agricultural productivity, property damage from natural disasters, and energy costs, such as heating and air conditioning. Similarly, the social cost of methane (SCM) and the social cost of nitrous oxide (SCN) estimate the monetary value of impacts from marginal changes in methane and nitrous oxide, respectively. Each SC-GHG value is typically presented as dollars per metric ton of a GHG in a given year. In this In Focus, “SC-GHG” refers collectively to estimates of the SCC, SCM, and SCN.

How Is the SC-GHG Calculated?

SC-GHG values are calculated using economic models that translate changes in emissions into economic impacts. As with any scientific or economic analysis, the SC-GHG estimates include both limitations and uncertainties. For example, estimates are limited because underlying models may not include all potentially significant climate change impacts. Uncertainties include the quantification of the physical effects of GHG emissions, socioeconomic factors, projected GHG emissions, translation of physical and climate impacts into economic impacts, and the role of climate change adaptation. Another source of uncertainty is “discounting,” discussed below.

Discount Rate

As many impacts of GHG emissions will occur in the future, policy analysts often consider society’s willingness to pay in the near term to reduce GHG emissions that would cause damages in the future. *Discounting* is the analytical process by which costs and benefits in future years are made comparable with costs and benefits experienced today. The *discount rate* refers to a reduction (i.e., discount) in value that economists apply to estimated future costs or benefits. This application results in a “present value” estimate of these costs or benefits. The choice of discount rate can significantly increase or decrease values of the SC-GHG. A lower discount rate would give greater value today to future impacts than would a higher discount rate. A high discount rate would recommend applying fewer of today’s resources to address GHG emissions impacts in the future. Often, SC-GHG estimates include a range of discount rates for comparison purposes.

Geographic Scope

Another methodological consideration is whether the SC-GHG should measure global or domestic impacts. Most published estimates of the SC-GHG have measured global impacts; however, some policymakers have called on federal agencies to use domestic values in benefit-cost analysis. Those recommending use of global SC-GHG values have concluded that no clear distinction exists between domestic and global climate change impacts and that a domestic SC-GHG understates the benefits to the United States, because climate impacts that occur outside U.S. borders may affect the welfare of U.S. citizens and residents. Reciprocity—whether U.S. mitigation policies motivate other countries to likewise reduce GHGs—may also justify use of global values, given that reductions by other countries may benefit people within U.S. borders, just as increases can lead to harm. Others disagree with a focus on global values, expressing a view that federal analyses should focus on domestic impacts and skepticism about the likelihood of complete reciprocity.

How Is the SC-GHG Used?

Federal agencies, namely EPA and the Department of Energy, have primarily used the SC-GHG to estimate the climate impacts of GHG reductions from agency rulemakings. The social cost of each GHG is applied to estimated changes in that gas (e.g., the SCC is applied to projected changes in carbon dioxide emissions). The SC-GHG estimates have been used to measure climate impacts in other federal actions, including oil and gas leasing decisions. In addition, state governments and other organizations have used the SC-GHG in rulemakings and other applications.

History of SC-GHG Estimates

SC-GHG estimates have appeared in academic studies since the early 1990s. A comparison of SC-GHG estimates from different sources and time periods is challenging, because the sources use different methodologies, scopes, and discount rates. EPA began to use SCC in its regulatory impact analyses following a 2008 federal court ruling on motor vehicle fuel efficiency standards. In 2009, the Obama Administration convened an interagency working group (IWG) to develop a consistent set of estimates. The IWG developed a methodology and, in 2010, published a set of SCC estimates, which measured the global value of carbon dioxide reductions, for use in regulatory analysis. The IWG estimated an SCC value of \$50 for emissions in 2030 at a 2.5% discount rate (in 2007 dollars).

The IWG requested that the National Academies of Sciences, Engineering, and Medicine (NASEM) provide advice on future updates to SCC estimates. In a 2017 report, NASEM recommended a different modeling framework, research needs for each calculation step, and criteria for future SCC updates. NASEM also recommended development of a new approach to calculate discount rates, noting that guidance in Office of Management and Budget (OMB) Circular A-4 (issued in 2003) did not adequately address discounting over long time periods or the effect of uncertainty on discount rates. The 2003 OMB A-4 guidance identified default discount rates of 3% and 7% for agencies to use in their analyses. The 2003 OMB guidance also stated that a regulatory analysis should focus on domestic effects rather than global effects.

In 2017, President Trump's E.O. 13783 disbanded the IWG, withdrew the IWG's SC-GHG estimates, and directed agencies to ensure that any new SC-GHG estimates were consistent with guidance for regulatory analysis in OMB Circular A-4. The Trump EPA developed a new set of estimates using similar models and assumptions as the IWG but limited them to domestic measures and included estimates discounted at rates of 3% and 7%. These estimated values were lower than those of the IWG. For example, in a 2019 rule on power plant emissions, EPA's SCC estimates ranged from \$1 to \$8, with discount rates of 7% and 3%, respectively (in 2016 dollars). The lower estimates played a role in a number of rulemakings that repealed or revised rules promulgated during prior administrations.

In 2021, the Biden Administration issued E.O. 13990, which, among other provisions, reestablished the IWG. The IWG reinstated its SC-GHG estimates with adjustments for inflation. The IWG estimated an SCC value of \$89 for emissions in 2030 at a 2.5% discount rate (in 2020 dollars).

In 2023, OMB revised its Circular A-4 guidance. The 2023 guidance recommended using a discount rate of 2% for evaluating long-term effects (compared to default rates of 3% and 7% in the 2003 guidance). In addition, in its 2023 guidance, OMB recommended the use of global estimates of SC-GHG, rather than domestic estimates.

In 2023, EPA prepared new SC-GHG estimates based on advances in scientific literature, recommendations from the

2017 NASEM report, and a revised approach to discounting, including the use of lower discount rates (1.5%, 2.0%, and 2.5%). This approach resulted in SCC estimates ranging from \$140 (at 2.5%) to \$380 (at 1.5%) for emissions in 2030 (in 2020 dollars).

President Trump's E.O. 14154 (2025)

The 2025 order disbands the IWG, stating that "any guidance, instruction, recommendation, or document issued by the IWG is withdrawn as no longer representative of governmental policy," including "estimates of the [SC-GHG] ... based, in whole or in part, on the IWG's work or guidance." The order directs EPA to issue guidance (by March 20, 2025) to address the "harmful and detrimental inadequacies" of the SC-GHG, including "consideration of eliminating the [SC-GHG] calculation from any Federal permitting or regulatory decision." In addition, the order directs agencies to ensure SC-GHG estimates are "to the extent permitted by law, consistent with the guidance contained in OMB Circular A-4 of September 17, 2003," including "with respect to the consideration of domestic versus international effects and evaluating appropriate discount rates." The order also directs that "the head of each agency shall, as appropriate and consistent with applicable law, initiate a process to make such changes to any rule, regulation, policy or action as may be necessary to ensure consistency with [the 2003 OMB Circular A-4]."

Issues for Congress

President Trump's E.O. 14154 may have implications regarding the role of SC-GHG estimates in both existing and future federal rules. This could raise questions regarding the rulemakings that employed this tool in cost-benefit analyses. Following are some examples:

- To what extent will agencies reexamine existing regulations based on the E.O. directives? If so, what might be the scope of rules subject to this reexamination?
- Will agencies revise or eliminate the SC-GHG estimates used in their decisions and rules, and if so, what would be potential consequences of this action?
- If SC-GHG estimates are not used going forward, what alternative measure might agencies employ to assess effects of emissions, and how might this affect assessment of costs and benefits?

Members may support engaging in oversight of agency decisionmaking as the E.O. directives are implemented to assess their impacts. Some Members may assert that the role of SC-GHG estimates in policymaking should be diminished or eliminated and that the uncertainty and potential outcomes are warranted. Other Members may wish to retain the role of SC-GHG as a mechanism to assess changes in emissions, including by directing the use of SC-GHG estimates in rulemaking decisions or specific SC-GHG estimates, methodologies, or discount rates in rulemakings.

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