



**U.S. CHAMBER OF COMMERCE**

September 4, 2013

Data Quality Coordinator  
Assistant Director for Administration  
Office of Management & Budget  
Washington, D.C. 20503  
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Fax: 202.395.3888

Re: Petition for Correction: Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866 (February 2010) and Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866 (May 2013).

Dear Sir/Madam:

America's Natural Gas Alliance, the American Chemistry Council, the American Petroleum Institute, the National Association of Home Builders, the National Association of Manufacturers, the Portland Cement Association, and the U.S. Chamber of Commerce respectfully submit to the Office of Management and Budget ("OMB"), pursuant to the

Information Quality Act<sup>1</sup> (IQA), this Petition for Correction of the Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (February 2010) (“2010 Estimate”) and Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (May 2013) (“2013 Estimate”) (collectively, the “SCC Estimates”).<sup>2</sup> As described in this petition, the Technical Support Documents and SCC Estimates should be withdrawn and not used in rule-making and policy-making for the following reasons:

1. The SCC Estimates fail in terms of process and transparency. The SCC Estimates fail to comply with OMB guidance for developing influential policy-relevant information under the Information Quality Act. The SCC Estimates are the product of an opaque process and any pretensions to their supposed accuracy (and therefore usefulness in policy-making) are unsupported.
2. The models with inputs (hereafter referred to as “the modeling systems”) used for the SCC Estimates and the subsequent analyses were not subject to peer review as appropriate.
3. Moreover, even if the SCC Estimate development process was transparent, rigorous, and peer-reviewed, the modeling conducted in this effort does not offer a reasonably acceptable range of accuracy for use in policy-making.
4. The Interagency Workgroup (“IWG”) has failed to disclose and quantify key uncertainties to inform decision makers and the public about the effects and uncertainties of alternative regulatory actions as required by OMB.
5. By presenting only global SCC estimates and downplaying domestic SCC estimates in 2013, the IWG has severely limited the utility of the SCC for use in benefit cost analysis and policy-making.

Given these significant issues described herein, we are submitting this Petition for Correction to urge OMB and the IWG to withdraw the 2010 and 2013 Technical Support Documents, pending correction through a transparent, public process. Furthermore, we ask OMB to not utilize either the 2010 or 2013 SCC Estimates and to publicly direct other executive branch agencies not to utilize the 2010 and 2013 SCC Estimates for any regulatory action or policy-making.

## **I. INTEREST OF PETITIONERS**

Representing North America’s largest independent natural gas exploration and production companies, America’s Natural Gas Alliance (ANGA) works with industry, government and customer stakeholders to promote increased demand for our nation’s abundant

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<sup>1</sup> P.L. 106-554, §515, 144 Stat. 2763 (2001).

<sup>2</sup> As the SCC Estimates were developed in conjunction with the Interagency Working Group on the Social Cost of Carbon (“IWG”), we are simultaneously providing copies of this Petition for Correction to the Data Quality Coordinators for each agency and entity that participated in the IWG.

natural gas resource for a cleaner and more secure energy future and to ensure its continued availability.

The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a \$770 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for twelve percent of all U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

The American Petroleum Institute (API) is a national trade association representing over 500 member companies involved in all aspects of the oil and natural gas industry. API's members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. API and its members are dedicated to meeting environmental requirements, while economically developing and supplying energy resources for consumers.

The National Association of Home Builders (NAHB) is a nationwide federation of more than 850 state and local home builder associations representing more than 140,000 members including individuals and firms engaged in land development, single and multifamily construction, multifamily ownership, building material trades, and commercial and industrial projects. More than 80 percent of NAHB members are classified as "small businesses" and meet the federal definition of a "small entity," as defined by the U.S. Small Business Administration. The use of the Social Cost of Carbon (SCC) report as a basis for future rulemakings will have a profound impact on the way homes and communities of the future will be built.

The National Association of Manufacturers (NAM) is the largest industrial trade association in the U.S., representing over 12,000 small, medium and large manufacturers in all 50 states. NAM is the leading voice in Washington, D.C., for the manufacturing economy, which provides millions of high wage jobs in the U.S. and generates more than \$1.6 trillion in GDP. In addition, two-thirds of NAM members are small businesses, which serve as the engine for job growth. NAM's mission is to enhance the competitiveness of manufacturers and improve American living standards by shaping a legislative and regulatory environment conducive to U.S. economic growth.

The Portland Cement Association (PCA) is the national trade association for the United States cement manufacturing industry. PCA's 26 member companies operate 79 manufacturing plants in 34 states, accounting for almost 80 percent of domestic cement manufacturing capacity. In 2011, the cement manufacturing and related industries generated nearly \$44 billion in annual revenues and supported more than 150,000 high quality manufacturing jobs in the U.S.

The U.S. Chamber of Commerce is the world's largest business federation representing the interests of more than 3 million businesses of all sizes, sectors, and regions, as well as state and local chambers and industry associations. The Chamber is dedicated to promoting, protecting, and defending America's free enterprise system.

Our members may be impacted by this proposal because many of them manufacture products that, when combusted, result in greenhouse gas ("GHG") emissions (including carbon dioxide ("CO<sub>2</sub>")), and because, in the course of their business, they emit CO<sub>2</sub>. Should this Administration, or any subsequent one, promulgate further regulation of these products or emissions, such proposals and rules could potentially be based, in large part, on the SCC Estimates. Our members, therefore, have a direct and meaningful interest in ensuring that any SCC Estimates are based on transparent processes, accurate information, rational assumptions, and are within the reach of the current scientific understanding and impact models. To be clear, we are not herein discussing the existence or potential causes of climate change. Instead, we are questioning the IWG's estimates of the social cost of carbon, based on complex economic impacts hundreds of years in the future, which in turn are based on present day understanding of current and future carbon emissions.

## **II. GOALS AND IMPORTANCE OF INFORMATION QUALITY ACT GUIDELINES**

The IQA requires that federal agencies take steps to maximize the quality, objectivity, and integrity of the information they disseminate, and to provide a mode of redress to correct flawed or incomplete information. Consistent with its directive to other agencies and entities, OMB developed its own guidelines ("IQA Guidelines") that require that the information it disseminates meets standards for objectivity, utility, and integrity.<sup>3</sup> The "objectivity standard" focuses on whether the information is "accurate, reliable, and unbiased and whether the information is presented in an accurate, clear, complete, and unbiased manner."<sup>4</sup> The "integrity standard" refers to information security, such as protection of information from unauthorized access or revision, while the "utility standard" refers to the usefulness of the information for the intended audience's anticipated purposes.<sup>5</sup>

OMB's Guidelines require it to maximize the quality of disseminated information that it classifies as influential. "Influential information" generally refers to information that "will have a clear and substantial impact on important public policies or important private sector decisions."<sup>6</sup> Without question, the SCC Estimates, upon which numerous agencies may base billions, if not trillions, of dollars of regulation, are influential information that will have a clear and substantial impact on important public policies and important private sector decisions.<sup>7</sup>

Further, under OMB Guidelines, such influential information must meet a higher level of "transparency."<sup>8</sup> According to OMB, transparency requires that its findings be reproducible,

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<sup>3</sup> Office of Management & Budget Information Quality Guidelines (Oct. 1, 2002).

<sup>4</sup> *Id.* at 8.

<sup>5</sup> *Id.* at 1.

<sup>6</sup> *Id.* at 8.

<sup>7</sup> *Id.*

<sup>8</sup> *Id.* at 2.

within an acceptable range of imprecision, by third parties.<sup>9</sup> Influential information must also be transparent with respect to: (1) the source of the utilized data; (2) the various assumptions employed; (3) the analytic methods applied; and (4) the statistical assumptions employed.<sup>10</sup> All these transparency elements are important considerations in any objective, third-party review and analysis of Agency information.

OMB imposes these guidelines on itself as well as on the information on which it relies. It requires OMB staff, and the working groups it oversees, to acquire relevant information by acceptable and unbiased methods.<sup>11</sup> Further, information collected must generally display indicia of reliability such as being subjected to peer review or being founded on transparent and reproducible methods.

OMB's obligations under the IQA are significant. These obligations were put in place by Congress and are supported by an Administration-wide effort to make informed and transparent decisions based on sound science.<sup>12</sup> The IQA guidelines, peer review guidelines, and internal protocols that OMB uses to ensure the Administration's disseminations are objective, unbiased, and robust. Importantly, OMB, as the entity that developed and oversees the IQA's guidelines to agencies, has a profound and unique interest in ensuring those guidelines are followed to the greatest extent possible in its own regulatory decision-making. As discussed below, OMB failed to follow these guidelines.

### **III. REQUEST FOR CORRECTION**

#### **1. The IWG Estimation Process was Not Transparent**

In his March 9, 2009 "Memorandum for the Heads of Executive Departments and Agencies" on "Scientific Integrity" ("Scientific Integrity Memo"), President Obama called on his Administration to commit to procedures and a code of conduct that ensures scientific integrity and builds public trust. President Obama's opening line of that memorandum could not be more relevant and directly applicable to the SCC Estimates and the processes which underlie them:

Science and the scientific process must inform and guide decisions of my Administration on a wide range of issues, including improvement of public health, protection of the environment, increased efficiency in the use of energy and other resources, mitigation, and protection of national security. The public must be able to trust the science and the scientific process informing public policy decisions.

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<sup>9</sup> *Id.*

<sup>10</sup> 67 Fed. Reg. 369, 374 (Jan 3, 2002).

<sup>11</sup> *Id.* at 23.

<sup>12</sup> See President Obama's Memorandum for the Heads of Executive Department and Agencies: Transparency and Open Government (74 Fed. Reg. 4685 (Jan. 21, 2009) ("My Administration is committed to creating an unprecedented level of openness in Government."); see also President Obama's Memorandum for the Heads of Executive Department and Agencies: Scientific Integrity. ("Science and scientific processes must inform and guide decisions of my Administration on a wide range of issues.")

In furtherance of important goals, President Obama instructed “[t]o the extent permitted by law, there should be transparency in the preparation, identification, and use of scientific and technological information in policymaking.” These transparency issues are at the core of the OMB’s IQA reproducibility standards required for influential information.

Under OMB’s IQA Rule, such influential information must meet a higher level of “transparency.”<sup>13</sup> According to OMB, transparency requires that the OMB/IWG findings be reproducible, within an acceptable range of imprecision, by third parties.<sup>14</sup> Influential information must also be transparent with respect to: (1) the source of the utilized data; (2) the various assumptions employed; (3) the analytic methods applied; and (4) the statistical assumptions employed. All these transparency elements are important considerations in any objective, third-party review and analysis of the SCC Estimate.<sup>15</sup>

According to OMB in the IQA Rule:

[t]he primary benefit of public transparency is not necessarily that errors in analytic results will be detected, although error correction is clearly valuable. The more important benefit of transparency is that the public will be able to assess how much an agency’s analytic results hinge on the specific analytic choices made by the agency. Concreteness about analytic choices allows, for example, the implications of alternative technical choices to be readily assessed. This type of sensitivity analysis is widely regarded as an essential feature of high-quality analysis, yet sensitivity analysis cannot be undertaken by outside parties unless a high degree of transparency is achieved.<sup>16</sup>

OMB, as the disseminator of the SCC Estimates, and the overseer of the IWG, has a duty to shed light on the IWG estimation process. That duty has not been met. The public knows nothing about the IWG other than the identity of the agencies and entities that make up the IWG and the fact that they estimated the SCC in 2010 and 2013.

OMB has not revealed the identity of the participants or any information from which to make an assessment as to the participants’ expertise or their qualification to participate in a group tasked to estimate the SCC. According to OMB Circular A-4’s directive to agencies and presumably OMB itself, “You should also disclose the use of outside consultants, their qualifications, and history of contracts and employment . . . .”<sup>17</sup> The public does not even know whether all the IWG’s listed agencies and entities provided personnel or what levels of engagement each of the agencies actually had in the development of the SCC Estimate. The public does not know whether or how government contractors were used in the development

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<sup>13</sup> OMB IQA Guidelines at 2.

<sup>14</sup> 67 Fed. Reg. at 378.

<sup>15</sup> 67 Fed. Reg. at 374.

<sup>16</sup> 67 Fed. Reg. at 374.

<sup>17</sup> OMB Circular A-4, p. 17 (2003).

process. Further, OMB has not revealed how these unidentified individuals collaborated. The public does not know whether, or how often, they met, what was discussed, what information was considered, what information was rejected, or how decisions were made.

OMB has failed to comply with the transparency policies that it drafted for developing influential policy-relevant information under the Information Quality Act and imposes on other agencies and executive offices. The SCC Estimates are the product of an opaque process, are fraught with uncertainties, and any pretensions to their supposed accuracy (and therefore usefulness in policy-making) are unsupported.

## **2. The Modeling Systems (Models with Inputs) and the Subsequent Analyses were Not Subject to Peer Review as Appropriate**

OMB and the IWG masked the inherent flaws and limitations of the SCC Estimates by shielding the modeling systems (the models with the inputs with which they were run), and the SCC Estimates themselves from peer review. As OMB's Final Information Quality Bulletin for Peer Review ("Peer Review Bulletin") states, "[p]eer review is one of the most important procedures to ensure that the quality of published information meets the standards of the scientific and technical community."<sup>18</sup> Further, President Obama's 2009 Scientific Integrity Memo states that "[w]hen scientific or technical information is considered in policy decisions, the information should be subject to well established scientific processes, including peer review . . ."

OMB's IQA Guidelines recognize the critical importance of peer review in government decision-making, and point to the existence of peer review as providing a presumption of objectivity.<sup>19</sup> Similarly, EPA, which will likely utilize the SCC Estimates more than most agencies, recognizes that the hallmark of scientific integrity is a robust and independent peer review process.<sup>20</sup> According to EPA guidance, "[p]eer review is conducted by qualified individuals (or organizations) who are independent of those who performed the work, and who are collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. Peer review is conducted to ensure that activities are technically supportable, competently performed, properly documented, and consistent with established quality criteria."<sup>21</sup>

Further, EPA has recognized in its peer review guidance that, particularly when reviewing influential findings such as the SCC Estimates, a peer reviewer must be independent in order to be credible, defensible, and unbiased.<sup>22</sup> Indeed, peer review and adherence to sound scientific methods are required by EPA's guidelines implementing the IQA.<sup>23</sup>

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<sup>18</sup> Memorandum for Heads of Departments and Agencies from Josh B. Bolton, Director, OMB "Issuance of OMB's 'Final Information Quality Bulletin for Peer Review'" (Dec. 16, 2004) p. 2.

<sup>19</sup> 67 Fed. Reg. at 377.

<sup>20</sup> *Peer Review Handbook, 3<sup>rd</sup> Edition, Prepared for the U.S. Environmental Protection Agency by Members of the Peer Review Advisory Group for EPA's Science Policy Council*, EPA/100/B-06/002.

<sup>21</sup> *Id.* at 12.

<sup>22</sup> *Id.* at 13.

<sup>23</sup> *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency*, EPA/260R-02-008 (Oct. 2002).

Despite the fact that OMB's IQA Rule and Guidelines, as well as its Peer Review Bulletin, recognize the critical need for peer review in administrative decision-making and in support of administrative findings, neither OMB nor the IWG subjected the final SCC Estimates, or their key foundations, to peer review. This failure is a critical flaw and undermines the credibility of this estimate.

Significantly, that the IWG utilized models that are generally available to the public does not sufficiently demystify the IWG process. There is no discussion, for example, of the limitations of each of the models used. The class of models from which the three that the IWG used were selected is still in its infancy, from a developmental standpoint. While such models attempt to predict the near and far future, they all rely on numerous assumptions – including many that are decades old, and others that simply cannot be calibrated or verified. Yet one of the models used supposedly has the capacity to predict climate impacts till the year 2595.<sup>24</sup> Further, it is not clear if and/or how modest changes to the inputs to the FUND, DICE, and PAGE models could drastically change the SCC Estimates (*i.e.*, the sensitivity of inputs to model outcomes is not transparent). Without any information as to the hundreds of model inputs (or the people or processes that selected and/or developed them), and their sensitivities, expertise, or biases, it is impossible to call the SCC Estimates rational or supportable. On July 18, 2013, Administrator Howard Shelanski of OMB's Office of Information and Regulatory Affairs ("OIRA") suggested in testimony before the House Committee on Oversight and Government Reform Subcommittee on Energy Policy, Healthcare, and Entitlements that peer review was unnecessary because the FUND, DICE, and PAGE models were all peer reviewed. This suggestion is incorrect, or at least misleading, for several reasons as will be described below. The SCC Estimates are not just the product of the models (flawed or limited as they may be) – they are the product of the data (and/or policy choices) that were inherent in the model input data selection. Other than for a few of the hundreds of variables that comprise the input data set for the three models used, the public has no idea of what the inputs are or how they were determined. This critical data gap – or black box – includes not only the deterministic inputs (*i.e.*, assumed values for those inputs held constant), but also, importantly, the stochastic inputs (*i.e.*, those inputs that were selected to be variable) that supported the Monte-Carlo analysis.<sup>25</sup> Model inputs, and the judgments, principles, and processes that generated them, are critical to the model output. As the developer of the FUND model prominently and candidly disclaims on the website for accessing the FUND model:

It is the developer's firm belief that most researchers should be locked away in an ivory tower. Models are often quite useless in unexperienced hands, and sometimes misleading. No one is smart enough to master in a short period what took someone else years to

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<sup>24</sup> For context, consider the technological and societal changes that occurred in the last 582 years and question whether and to what extent those changes were predictable. A technology expert in 1950 probably could not have predicted the internet or the iPhone, much less someone who lived before Christopher Columbus sailed to America.

<sup>25</sup> Consider, for instance, the selection of discount rates for one of the few model inputs that was disclosed. If a discount rate of 7% were utilized, per OMB Circular A-4 (p. 12), the SCC Estimate could be closer to zero and even demonstrate benefits. We raise this issue, not to advocate for a particular discount rate, but to highlight that even a single model input of the hundreds can materially affect the outcomes of the models.



develop. Not-understood models are irrelevant, half-understood models treacherous, and mis-understood models dangerous.<sup>26</sup>

The SCC Estimates are as much a product of the inputs to the models as they are the product of the models themselves. The inputs that drive both the 2010 and 2013 SCC Estimates were never peer reviewed – nor are the majority of them even known. Further, the final 2010 and 2013 Estimates (*i.e.*, the products of these opaque models and these inputs) were never peer reviewed. This fact is critical, as the output of these models was further manipulated by IWG through averaging that may be inappropriate and misleading (discussed below). That versions of the models were peer reviewed does not absolve OMB and the IWG from the need to subject the current SCC Estimate to peer review. Indeed, it reinforces the need to conduct peer review on all subsequent model changes and inputs, which alter the estimates coming out of the models. After all, ***the 2013 SCC Estimate is 60% higher than even the one developed just three years ago.*** Unfortunately, OMB and the IWG have sheltered the model choices, models, data inputs, and analyses from peer review.

### **3. The SCC Estimate Modeling Systems Do Not Demonstrate an Acceptable Range of Accuracy**

Predicting the future, as one might expect, is a massively imprecise exercise reliant on assumptions, hypotheses, and judgments about future technological advances, principles, and decisions that directly impact emissions scenarios, mitigation, and adaptation. While the Petitioners support the use of economic modeling and often rely on models for our own analyses, there are limits to the effectiveness of certain modeling techniques. For instance, the imprecision inherent in modeling assumptions, hypotheses, and judgments are significantly magnified when impacts (and costs) are projected over a long time period. While certainty is not a characteristic of any modeling effort, OMB and the IWG cannot push prognostications so far beyond the capabilities of current science and economic modeling that the estimates become little more than indefensible guesses. There is a threshold beyond which uncertainties become so profound, widespread, and compounded that, when further undermined by data limitations and the models' lack of complexity, render the ultimate estimate flawed and unusable. Even the IPCC limits its future climate predictions and presents a range of possible scenarios (more on that below). That the 2013 SCC Estimate changed by 60% the 2010 SCC Estimate developed just a few years ago using the same set of models demonstrates that this exercise is massively uncertain and not robust enough for policy-making. Such variability over such a short term should have given OMB and the IWG pause and a heightened concern that estimating the SCC with accuracy is perhaps beyond the capabilities of the model systems utilized.

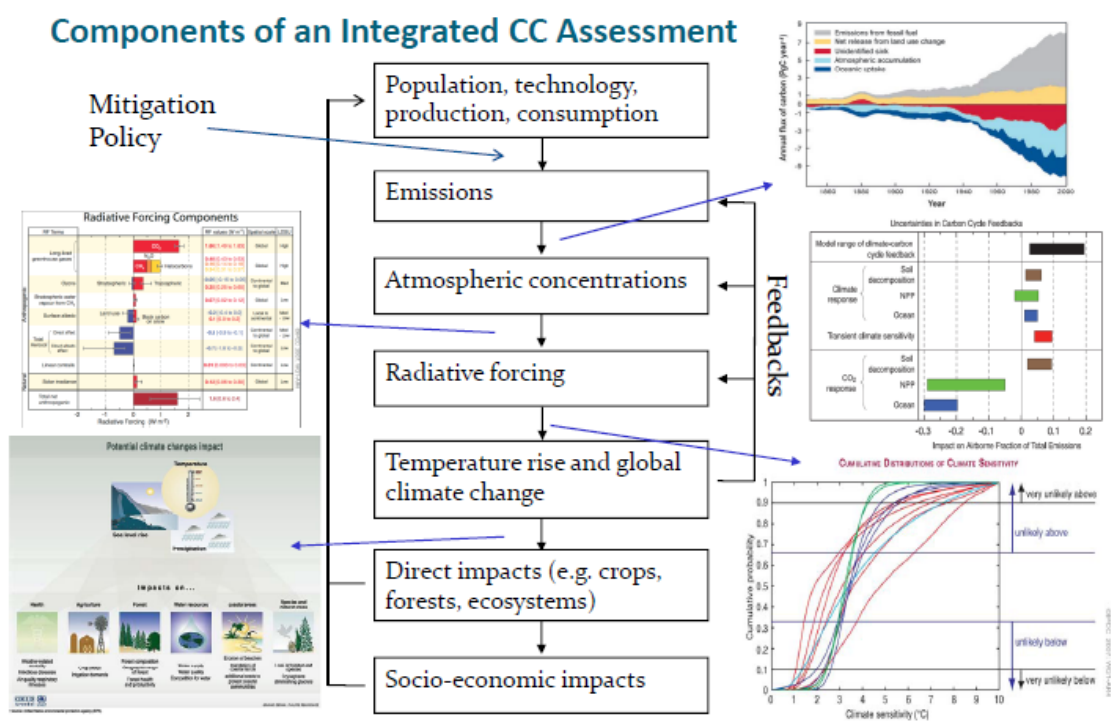
OMB and the IWG rely on three models which purport to predict the ultimate costs of a long chain of impacts stemming from the emission of GHGs (*i.e.*, the impact of temperature on sea-level rise, the impact of sea-level rise on a waterside cities, the monetization of the impacts on the waterside cities, *etc.*). The following subsections provide a nonexclusive list of the uncertainties that demonstrate the modeling conducted does not offer a reasonably acceptable range of accuracy for use in policy-making.

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<sup>26</sup> <http://www.fund-model.org/> (accessed 7/26/2013)

### i. Model(s) Structure

Both the 2010 and 2013 SCC Estimates rely on three Integrated [Climate Change] Assessment Models (“IAMs”) in order to develop its estimates – DICE (Dynamic Integrated model of Climate and Economy), FUND (Framework Uncertainty, Negotiation and Distribution), and PAGE (Policy Analysis for the Greenhouse Effect).<sup>27</sup> These models have a similar “stacked” structure, shown in the figure below.<sup>28</sup> The final socio-economic impact prediction at the end relies on the cascading series of inputs in the prior steps. Model uncertainty, at any stage, is affected by all of the uncertainties in the prior steps (including model input uncertainties, as well as model structure uncertainties), and the uncertainties associated with that particular step. This is especially true if such socio-economic outputs are predicted over very long time periods, as they are in the SCC Estimates.



Based in part on these compounded uncertainties, in the 2010 Estimate the authors noted that the IWG offered the new SCC values “with all due humility” about the uncertainties embedded in them and with a “sincere promise to continue work to improve them.”<sup>29</sup> In contrast, the 2013 SCC Estimate has scant discussion of uncertainties. Only a small paragraph on “research gaps” is provided on the last page of the 2013 SCC Estimate. Other than a brief reference back to the 2010 SCC Estimate, the “humility” with which the estimates were originally provided seems to have been lost. It is our belief that modeling science has not made any quantum leaps in the intervening three years to merit this loss of humility. The meager

<sup>27</sup> DICE (W. Nordhaus, Yale University), PAGE (C. Hope, University of Cambridge UK ), and FUND (R. Tol, Ireland Economic and Social Institute and Carnegie Mellon University.).

<sup>28</sup> Taken from a presentation by Traeger, C., The Economics of Climate Change.

<sup>29</sup> 2010 Estimate at 29.

discussion of uncertainty in most recent SCC Estimates promotes the unsupported and misleading idea that the updated SCC values are highly accurate figures.

That there are key and substantial differences in the IAMs is not in dispute. Consider, for example, the degree to which catastrophic events, i.e. temperature changes of, for example, 4.5° to 6° C due to climate change, are included in the various models. FUND does not consider this possibility, whereas the other two models do. Or, consider adaptation. Again, FUND assumes a higher degree of adaptation than the other two models. Whether and to what extent these key variables are considered matters to the outcome of the model. These key differences in the data that the models consider further evince the uncertainty inherent in climate modeling.

*ii. Model Time Horizons*

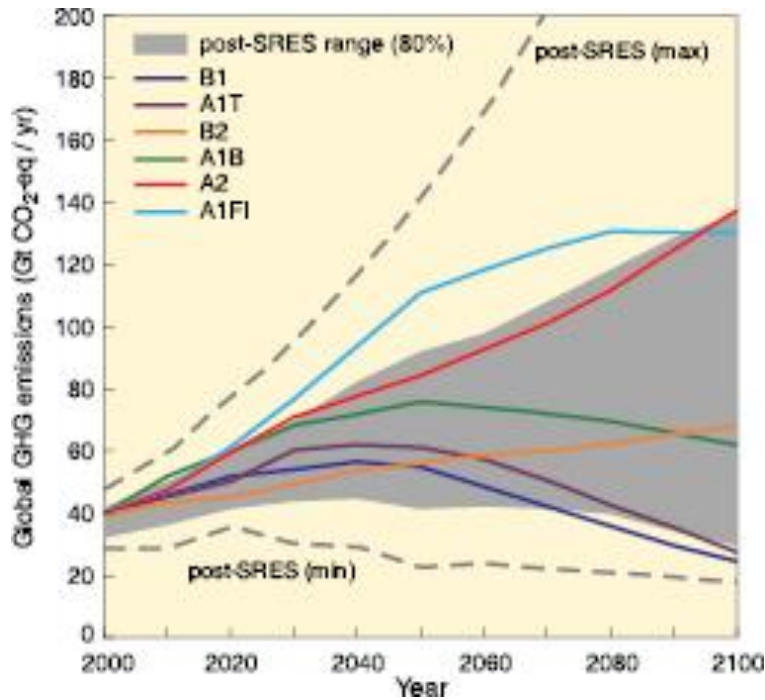
The 2010 and 2013 SCC Estimates are ambitiously projected for very long time horizons – namely until 2300.<sup>30</sup> The 2013 Estimate notes that the DICE model, for example, can be run for an even longer time horizon – until 2595. The ability of any of these models (and their input assumptions) to hold over even the 2300 time horizon is not clear and certainly not verifiable. The fact that the SCC estimates increased 60% in three years provides sufficient evidence to question the viability and usefulness of modeling that purports to render predictions 300+ years into the future. Incorporation of climate-affecting inputs such as populations, economic development, consumption patterns (regionally and globally), technological advancements (including role of innovation, including disruptive technologies) for mitigation, as well as material stochastic variables such as volcanic eruptions that can affect the underlying climate forcing functions such as GHG concentrations and temperature rise over these time frames rely on empirical relationships imbued with significant uncertainties.

Based on these key variables and uncertainties, the Intergovernmental Panel on Climate Change (“IPCC”) does not attempt predictions beyond the year 2100, even in its long-term predictions.<sup>31</sup> Among other reasons, this constraint is due to the widely predicted variances in critical inputs such as predicted model emissions. For example, the figure below, taken from the most recent IPCC work, shows just how wide the emissions from the various scenarios are, just through the year 2100. Clearly, attempting to further extrapolate this (and many other similar critical inputs) to 2300 is simply too speculative and uncertain for use in policy-making.

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<sup>30</sup> 2013 Estimate at 7.

<sup>31</sup> [http://www.ipcc.ch/publications\\_and\\_data/ar4/syr/en/mains3.html](http://www.ipcc.ch/publications_and_data/ar4/syr/en/mains3.html). The petitioners have large and diverse memberships, including members that do not endorse IPCC’s conclusions. As such, this reference should not be viewed as an endorsement of the IPCC’s conclusions. It is merely a reference point from which to compare the three models used in the SCC Estimates.



### iii. Damage Functions

Consider, for example, the critical role played by “damage functions” in these IAMs. These damage functions translate variables, such as projected sea level rise, to estimated economic damages. By their nature, we know very little about the correct functional form of damage functions. According to a well-known economist, “...developers of IAMs can do little more than make up functional forms and corresponding parameter values. And that is pretty much what they have done.”<sup>32</sup> Furthermore, “The bottom line here is that the damage function used in most IAMs are completely made up, with no theoretical or empirical foundation.”<sup>33</sup> The author of the DICE model similarly stated: “Equation (5) involves the economic impacts of climate change, which is the thorniest issue in climate-change economics. These estimates are indispensable for making sensible decisions about the appropriate balance between costly emissions reductions and climate damages. However, providing reliable estimates of the damages from climate change over the long run has proven extremely difficult.”<sup>34</sup>

<sup>32</sup> Pindyck, R.S., “Climate Change Policy: What Do the Models Tell Us?,” NBER Working Paper Series, WP 19244, July 2013, p 11.

<sup>33</sup> Id., p 13.

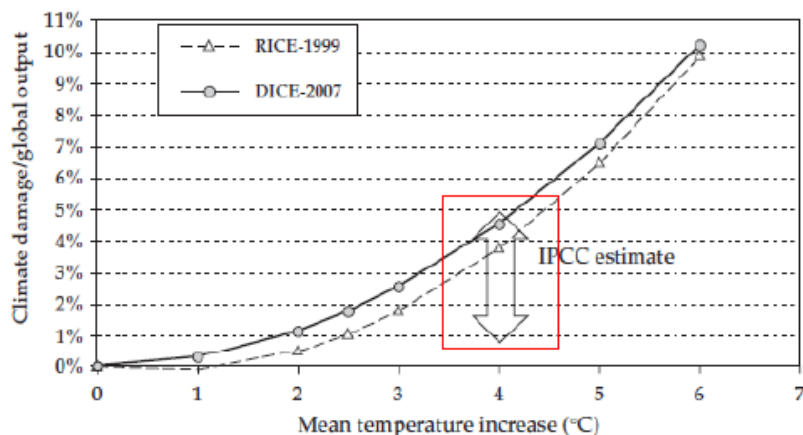
<sup>34</sup> Nordhaus, W, et. al., “DICE 2013: Introduction and User’s Manual,” May 2013. p. 10. Equation 5 refers to the damage function in the DICE model.

The arbitrariness of damage functions are clearly demonstrated by the following example. In the DICE model, discussed above, a quadratic damage function<sup>35</sup> is specified in which the socioeconomic damage is related to the extent of climate change in a non-linear manner such that this damage is assumed to accelerate much faster as the extent of predicted climate change increases. In doing so, DICE relies on estimates of monetized damages from the Tol (2009) survey as the starting point for its damage function. It then enhances the damage function, however, to account for factors such as biodiversity loss, ocean acidification, sea-level rise, changes in ocean circulation, and even political reactions to climate change by adding a further 25 percent upward adjustment, recognizing that this adjustment is purely “judgmental.”

Such subjective (i.e., arbitrary) “adjustments” in monetary value (made by William Nordhaus) are troubling because those adjustments have significant impacts on the output from the models. Even expert judgments have to be supported. For example, compare the DICE damage function with that estimated by the IPCC, as shown in the figure below.<sup>36</sup>

### Aggregate Damage Estimates DICE-2007

- Adding estimates for catastrophic damages and
- Aggregating over Regions and
- Extrapolating for temperature changes other than 2.5°C yields Damage



Source: Nordhaus (2007), Figure 3-3, Damage function in DICE-2007 versus earlier model (RICE-1999) and estimated range from IPCC AR4, which reports that “global mean losses could be 1–5% GDP for 4°C of warming”.

For an assumed 4° C increase in global mean temperature rise, as the figure shows, DICE predicts “damage” at the very high-end of the range that the IPCC projects. Therefore, the inputs from DICE into the predicted SCC Estimates are biased extremely high relative to the IPCC range of damages.

<sup>35</sup> Traeger, C. (2009). The Economics of Climate Change. Presented at UC Berkeley; Part 6.

<sup>36</sup> Id.

#### 4. Uncertainty is not Addressed Appropriately

While there is no requirement that the SCC Estimates be absolutely precise and accurate, OMB's Circular A-4 requires key uncertainties to be disclosed and quantified to the extent possible "to inform decision makers and the public about the effects and uncertainties of alternative regulatory actions."<sup>37</sup> Circular A-4 requires uncertainties to be analyzed qualitatively and quantitatively, delineated, and disclaimed.<sup>38</sup> Further, OMB's Circular A-4 admonishes agencies and presumably itself that:

Your estimates cannot be more precise than their most uncertain component. Thus, your analysis should report estimates in a way that reflects the degree of uncertainty and not create a false sense of precision. Worst-case or conservative analysis are [sic] not usually adequate because they do not convey the complete probability distribution of the outcomes, and they do not permit calculation of an expected value of net benefits.<sup>39</sup>

Far from appropriately quantifying and disclaiming the profound speculative nature of the SCC Estimates, the IWG downplays the wide variability in the three models' outputs through averaging. Similar to the 2010 Estimates, the 2013 Estimates are based on the average outputs of the three models. Individual model predictions, however, vary significantly. For example, at the 3% discount rate, the cost per ton varies from a high of \$71/ton for PAGE to \$21/ton for FUND, with the DICE estimate in between at \$38/ton. This is shown in the table below, taken from page 21 of the 2013 Technical Support Document.

Table A5: Additional Summary Statistics of 2020 Global SCC Estimates

Discount rate:	5.0%				3.0%				2.5%			
	Mean	Variance	Skewness	Kurtosis	Mean	Variance	Skewness	Kurtosis	Mean	Variance	Skewness	Kurtosis
DICE	12	26	2	15	38	409	3	24	57	1097	3	30
PAGE	22	1616	5	32	71	14953	4	22	101	29312	4	23
FUND	3	560	-170	35222	21	22487	-85	18842	36	68055	-46	13105

While the differences in the "average" values between the models (almost a factor of 3.5 between the \$21/ton from the FUND model to the \$71/ton from the PAGE model) are problematic enough, the predicted model variances are even more striking as shown in the table above. For example, it is simply meaningless to predict a "mean" of \$21/ton based on FUND, when the corresponding variance is predicted to be \$22,487. The same can be said for each of the other predictions as summarized in the table above.

This broad range reflects not only the effects of the various inputs and model structure uncertainties, but also the impact of taking the *average* of the three models for the five climate change scenarios at the four discount rates used in the SCC development analysis. The average values are much higher than the 50<sup>th</sup> percentiles for all three models, but are particularly higher than the 50<sup>th</sup> percentile figure in the case of the PAGE model.

<sup>37</sup> OMB Circular A-4 at 38.

<sup>38</sup> Id. at 40.

<sup>39</sup> Id. at 40.

Using the 3% discount rate as an example, the average values versus the 50<sup>th</sup> percentile values per ton for the PAGE, DICE, and FUND models are \$71/\$27, \$38/\$34, and \$21/\$17, respectively. Therefore, for the PAGE, DICE, and FUND models, the value used to derive the final SCC figure of \$43/ton at the 3% discount rate is the 75<sup>th</sup> percentile value for the PAGE model and the overall SCC value of \$43.1 per ton corresponds to the 68<sup>th</sup> percentile. Thus, the high end tail of the distribution of the PAGE model has an important influence on the final SCC Estimates. These final SCC Estimates should not be viewed as central figures, but rather skewed toward the upper tail of the distribution of SCC values.

OMB must adhere to the directives it imposes on other agencies and executive offices with respect to providing accurate information in its disseminations. They have not done so here. The IWG has failed to disclose and quantify key uncertainties and to fully inform decision-makers and the public of those uncertainties as required by OMB. Given these uncertainties, OMB and the IWG should grant this petition for correction before the SCC Estimates are utilized for any regulatory action or policy-making.

**5. By Presenting Only Global SCC Estimates and Excluding Domestic SCC Estimates Altogether in 2013, the IWG has Severely Limited the Utility of the SCC for Use in Benefit-Cost Analysis and Policy-making by Executive Branch Agencies**

OMB's IQA Guidelines require that information disseminated by Agencies meet the standard of utility. This part of the IQA requires Agencies to assess the usefulness of the information to its intended users, which includes the public. In 2013, by presenting only global SCC estimates and excluding domestic SCC estimates altogether, the IWG has severely limited the utility of the 2013 SCC recommended for use in benefit cost analysis.

The manner in which the final SCC values are presented in Table 2 of 2013 TSD is also misleading to risk managers and the public, further limiting the utility of the SCC. The table does not mention the global nature of the values or note that the domestic SCC is a small fraction (7-23%) of the global SCC. Thus, policy-makers who apply the SCC values from this table and have not read the previous 2010 TSD may be unaware that a large percentage of the economic benefits they are estimating from their rule will occur outside the United States.

The recommendation to use only the global SCC in benefit cost analysis results in a significant misalignment of costs and benefits. For this reason, *if and when reliable estimates of the SCC become available*, we strongly recommend presenting both the domestic and global SCC figures separately.

This approach, while recognizing the global nature of climate change, would allow risk managers to align the domestic costs with the domestic benefits. Consistent with OMB guidance, the costs of a rule for entities in United States would be presented in comparison with the benefits occurring in the United States. The benefits using the global SCC would be presented separately.

#### IV. ADMINISTRATIVE PROCEDURE ACT

Use of the 2010 and 2013 SCC Estimates in rulemaking will subsequently cause agencies that rely on the SCC Estimates to violate the Administrative Procedure Act (“APA”).<sup>40</sup> The APA requires a court to set aside agency actions, findings, and conclusions that are found to be arbitrary, capricious, abuses of discretion, not in accordance with law, or without observance of procedure required by law.<sup>41</sup> In determining the SCC Estimates’ legal sufficiency, a court will require that the processes by which information is collected are lawful and reasonably coherent and that the ultimate agency action which results from use of that information is not arbitrary and capricious.<sup>42</sup>

From a substantive perspective, an agency engaged in rulemaking must examine the relevant data and articulate a satisfactory explanation for its action including a “rational connection between the facts found and the choice made.”<sup>43</sup> Agency action is arbitrary and capricious “if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.”<sup>44</sup>

Use of the SCC Estimates in rulemaking will not meet the requirements of the APA as interpreted and developed by the courts. For instance, it is not clear what roles each of the participating agencies in the IWG that developed these estimates actually played in developing the estimates. It is not clear which staff from these agencies participated in the process. It is not clear how the three models that underlie these estimates were selected (from the universe of similar models). It is not clear who ran the models (agency staff? contractors?) or their qualifications or level of expertise. It is not clear who developed the inputs for the model runs, including both policy as well as technical choices, and it is not clear how such inputs were developed. It is not clear how the various statistical Monte-Carlo analyses were actually implemented (which inputs were held constant and why, which inputs were selected to be variable and why, and the assumptions regarding the assumed distribution functions for the latter variable inputs, *etc.*). These are but a few of the flaws, uncertainties, and unknowns that should preclude the use of both the 2010 and 2013 SCC Estimates. Each of these failures violates fundamental precepts of administrative procedure and the scientific method – and none can be credibly stated to be the result of a difference of opinion, interpretation, or Agency expertise. To the contrary, these are examples where the Administration drove its conclusions far beyond the capacity of sound science and modeling. Even if the three models themselves were entirely sound, the inputs into those models most certainly render the model output (*i.e.*, the SCC Estimates) arbitrary and capricious.

APA’s decision-making standards also demand compliance with the information quality procedures of the IQA, including IQA requirements for complete, unbiased analysis grounded in accepted methods. “Determination of whether the agency complied with prescribed procedures

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<sup>40</sup> 5 U.S.C. § 706.

<sup>41</sup> *Id.*

<sup>42</sup> See *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402 (1971).

<sup>43</sup> *Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

<sup>44</sup> *Id.*



requires a plenary review of the record and consideration of applicable law.”<sup>45</sup> More specifically, the APA requires that agencies relying on SCC Estimates in rulemaking review all credible relevant information, utilize unbiased peer review, and make Agency assumptions, methods, and models transparent and reasonably reproducible and understandable in response to an appropriate request for information. If OMB does not direct other agencies to not use the 2010 and 2013 SCC Estimates, any agency that bases a rule on these estimates would violate the IQA and the APA, and the ultimate rationality of such regulation would be called into question. The ultimate rationality of subsequent agency action depends in part on whether it has thoroughly complied with applicable procedural requirements, including those set forth in the IQA.<sup>46</sup>

Further, while it is not an issue we are raising within this Petition for Correction, we believe the 2010 and 2013 SCC Estimates violate the APA for failure to provide stakeholders notice and an opportunity to comment on proposed SCC Estimates and because they are arbitrary, capricious, and not in accordance with the law. While we hope that OMB complies with the requests contained in this petition, we specifically reserve the right to bring legal action under the APA, and other authorities, to enforce mandated procedures.

## V. CONCLUSION

Given the significant process shortcomings, lack of peer review, and weaknesses and uncertainties in the modeling systems highlighted in this petition, the undersigned associations urge OMB and the IWG to withdraw the 2010 and 2013 Technical Support Documents, pending correction through a transparent, public process. Furthermore, we ask OMB to refrain from using both the 2010 and 2013 SCC Estimates and to publicly direct other executive branch agencies to refrain from utilizing both the 2010 and 2013 SCC Estimates as part of any regulatory action or policy-making.

**America's Natural Gas Alliance**

**The American Chemistry Council**

**The American Petroleum Institute**

**The National Association of Home Builders**

**The National Association of Manufacturers**

**The Portland Cement Association**

**The U.S. Chamber of Commerce**

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<sup>45</sup> See *Olenhouse v. Commodity Credit Corp.*, 42 F.3d 1560, 1574 (10th Cir. 1994).

<sup>46</sup> Even if a particular statute, such as the IQA, may not provide for—or even withholds—judicial review, “the agency’s decision may still be overturned because of an analysis so defective as to render its final decisions unenforceable, or, in the absence of any analysis, because of a failure to respond to public comment concerning” the legal infirmities identified pursuant to that statute. *Michigan v. Thomas*, 805 F.2d 176, 188 (6<sup>th</sup> Circuit 1986); *Thompson v. Clark*, 741 F.2d 401, 405 (D.C. Circuit 1984.) (The flawed rule “is set aside, ... not because the regulatory flexibility analysis [not subject to direct judicial review] was defective, but because the mistaken premise reflected in the regulatory flexibility analysis deprives the rule of its required rational support ....”)