BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Create a Consistent Regulatory Framework for the Guidance, Planning, and Evaluation of Integrated Distributed Energy Resources.	Rulemaking 14-10-003 (Filed Oct. 2, 2014)

COMMENTS OF THE INSTITUTE FOR POLICY INTEGRITY ON STAFF PROPOSAL RECOMMENDING A SOCIETAL COST TEST

Denise Grab
Senior Attorney
Burcin Unel
Senior Economist
Institute for Policy Integrity
139 MacDougal Street, Third Floor
New York, NY 10012
Tel: (212) 992-8932
E-mail: denise.grab@nyu.edu

March 23, 2017

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Create a Consistent Regulatory Framework for the Guidance, Planning, and Evaluation of Integrated Distributed Energy Resources.	Rulemaking 14-10-003 (Filed Oct. 2, 2014)

COMMENTS OF THE INSTITUTE FOR POLICY INTEGRITY ON STAFF PROPOSAL RECOMMENDING A SOCIETAL COST TEST

I. Introduction

In accordance with the February 9, 2017 ruling by Administrative Law Judge Hymes, the Institute for Policy Integrity at New York University School of Law[1] ("Policy Integrity") respectfully submits comments on the Staff's proposed societal cost test issued in the above captioned proceeding. Policy Integrity is a nonpartisan think tank dedicated to improving the quality of government decisionmaking through encouraging a rational approach to environmental and regulatory policymaking that makes use of the best available economic tools. Policy Integrity advocates for sound cost-benefit analysis at every level of government and argues for an unbiased approach to measuring the costs and benefits of environmental, public health, and safety policy. Policy Integrity has previously filed public comments and written reports and articles on issues pertaining to economic analysis of grid modernization and distributed energy resources. Policy Integrity seeks to apply its economic, legal, and policy expertise to help advise the Public Utilities Commission on how to ensure that its societal cost test reflects the best available economic analysis.

[1] These comments do not purport to represent the views of New York University School of Law, if any.

II. Comments

Policy Integrity applauds Staff's proposal to re-institute a societal cost test (SCT) to evaluate the cost-effectiveness of distributed energy resources (DERs). Use of the SCT will allow the Commission to make investments that provide the greatest benefit to society as a whole. Until now, the Commission has not had a consistent method for valuing the societal benefits of avoided pollution from DERs. In order for the Commission to most effectively use the Social Cost Test to maximize social welfare, Policy Integrity recommends:

- To determine the cost-effectiveness of DERs, the Commission should use the SCT as its primary test for all needs, while considering the other metrics for other goals (such as equity and the financial stability of utilities).
- The Commission should use the damage cost approach in determining the value of greenhouse gas abatement, instead of Staff's proposed marginal abatement cost. The Commission should use the federal government's social cost of carbon as its measure of the damage of greenhouse gas emissions, as well as the federal government's social cost of methane and other relevant emissions.
- The Commission should include air quality impacts in the SCT, using the best available model that accounts for air quality impacts most accurately. The Commission should endeavor to include as many externalities in the SCT as possible, provided they can be quantified with a reasonable degree of certainty.
- The Commission should adopt a societal discount rate for the SCT, and 3% is a reasonable discount rate for this purpose.

A. The Commission Should Use the Societal Cost Test as the Primary Test for Evaluating and Funding DER Programs.

Staff's proposal to develop and implement a Societal Cost Test is a sensible one that will better enable the Commission to make resource allocation decisions that maximize social welfare. As Staff notes in its proposal, a number of California statutes support using a SCT that includes externalities in the analysis. Cal. Public Utilities Code § 701.1(a) directs the Commission to "minimize the cost to society of the reliable energy services that are provided by natural gas and electricity, and to improve the environment" as well as "encourage the diversity of energy resources . . . ." This language indicates that the legislature wants the Commission to pursue policies that maximize net social benefits, not just keep costs low for consumers. Likewise, section 701.1(c) directs the Commission to include environmental costs when analyzing energy resources: "In calculating the cost-effectiveness of energy resources, including conservation and load management options, the commission shall include, in addition to other ratepayer protection objectives, a value for any costs and benefits to the environment, including air quality." Similarly, Cal. Public Utilities Code § 400 tells the Commission to "[t]ake into account the opportunities to decrease costs and increase benefits, including pollution reduction and grid integration, using renewable and nonrenewable technologies with zero or lowest feasible emissions of greenhouse gases, criteria pollutants, and toxic air contaminants onsite in proceedings associated with meeting the objectives." Instructing the Commission to decrease costs and increase benefits suggests that the legislature wants the Commission to maximize net benefits in its decisionmaking. Additionally, a number of statutory sections discussing "smart grid" deployment plans instruct the Commission to prioritize "efficiency."[2] In economics, "efficiency" is defined as maximizing net social welfare—the goal of a societally focused cost-benefit test.[3]

In order to achieve an economically efficient allocation of society's resources among different demand- and supply-side energy sources by choosing the most socially beneficial investments, the Commission must employ societal cost-benefit analysis. Thus, the Commission's primary tool for decisionmaking in the DER context should be a cost-benefit analysis that uses a societal perspective, including applying a comprehensive version of the Societal Cost Test. Focusing instead on the results of narrowly defined tests such as the Utility Cost Test (UCT) or the Ratepayer Impact Measure (RIM), or even a Total Resource Cost (TRC) test that does not consider externalities, would be incomplete and misleading. The UCT focuses on the utility sector, and hence is only an approximation of the net benefits that accrue directly to the supply side of the market, while the RIM focuses on the ratepayer, and thus serves only as an

[2] See, e.g., Cal. Public Utilities Code § 8362 ("The smart grid technologies and services shall improve overall efficiency, reliability, and cost-effectiveness of electrical system operations, planning, and maintenance.").
[3] *See*, *e.g.*, N. GREGORY MANKIW, PRINCIPLES OF ECONOMICS 5 (2008) ("[E]fficiency: the property of society getting the most it can from its scarce resources.").

approximation of the net benefits that accrue directly to the demand side.[4] For overall social efficiency, both sides of the market, as well as externalities should be considered at the same time and a full cost-benefit analysis should be carried out with the goal of maximizing net social welfare.

The framework should clearly explain what the results of the analysis would be compared to. In a resource-constrained world, having benefits greater than costs is a necessary but not a sufficient condition for a project to be undertaken. The alternatives and the counterfactual scenarios must be clearly identified so that the net benefits of the project could be compared against the net benefits of the alternatives. The project should be undertaken only if it leads to higher net benefits than the alternatives or the net benefits that would be attained in the business-as-usual scenario.

Further, Staff should clearly state that the decision rule should be based on the present value of the net benefits (benefits minus costs) rather than a cost-benefit ratio. In a resource-constrained context where a choice is required among mutually exclusive alternatives, a ratio-based technique cannot help decisionmakers select the policy option that will deliver the most net benefits to society, especially when the scales of the projects differ. To take a very simplified example, spending $1 to get $10 in benefits has a much higher benefit-to-cost ratio (10:1) than spending $1 million to get $3 million in benefits (3:1); yet from the perspective of net benefits, the $2 million netted by the second project is clearly a much better deal than the $9 total offered by the first alternative. A ratio-based test could mask scale differences, leading to misleading results.

Ensuring that the analysis is undertaken from a societal perspective will satisfy the Commission's statutory requirements and will help to select the projects that will best maximize social welfare.

---

[4] *See* TIM WOOLF ET AL., ADVANCED ENERGY ECONOMY INSTITUTE, BENEFIT-COST ANALYSIS FOR DISTRIBUTED ENERGY RESOURCES: A FRAMEWORK FOR ACCOUNTING FOR ALL RELEVANT COSTS AND BENEFITS 15-17 (2014), *available at* http://www.synapse-energy.com/sites/default/files/Final%20Report (providing a thorough and clear analysis of why the RIM test, as currently used, is inaccurate and misleading).

B. The Commission Should Use the Damage Cost Approach to Value Greenhouse Gas Reductions.

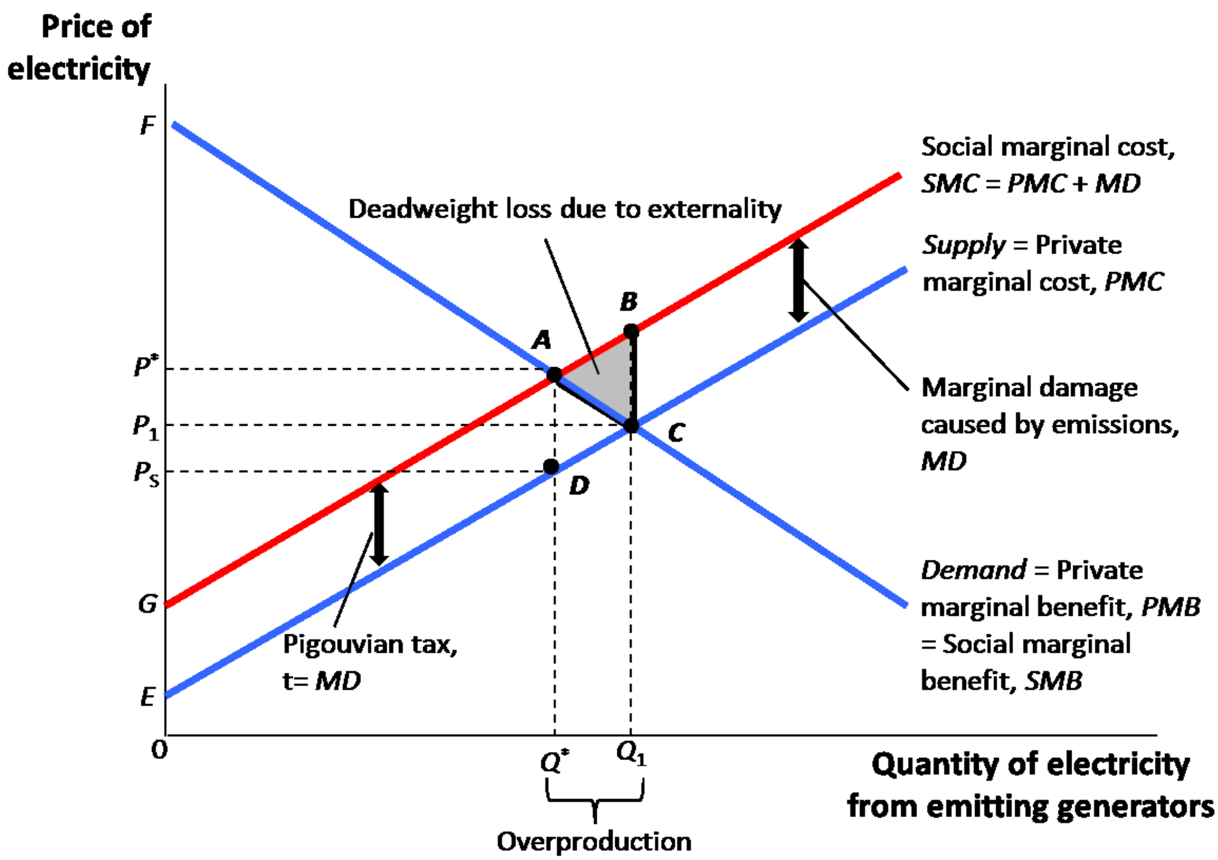
Question 12 from the Administrative Law Judge's February 9 Ruling asks: "The Staff SCT Proposal provided two options for determining the greenhouse gas adder: damage cost and marginal abatement cost, recommending the greenhouse gas abatement cost. Explain why you support or oppose this recommendation. . . . " In order to most accurately reflect the values of the greenhouse gas reductions, the Commission should use the damage cost approach, rather than the marginal abatement cost approach.

Cost-benefit analyses for proposed DER projects should use the full marginal damage value of each unit of avoided emissions as the value multiplier. Using other metrics, such as marginal abatement cost—as the Proposal suggests—would result in distortions in the analysis. A discussion of the economic theory will help explain why.

Economics defines an externality as the uncompensated benefit or cost imposed on third parties by a transaction: in other words, an effect whose cost or benefit is not borne by a party to the transaction. Emissions of greenhouse gases and of other pollutants associated with the production of electricity are textbook examples of negative externalities.[5] The existence of such externalities leads to market failures, producing a market outcome that does not maximize efficiency.[6] For example, in the presence of such negative externalities, the free market will lead to an overproduction of electricity as shown in Figure 1.[7] The free market outcome will be Point C—where the social marginal benefit of electricity consumption equals the private marginal cost of electricity production—while the socially efficient output level would instead be Point A—where the social marginal benefit of electricity consumption equals the social marginal cost of electricity production including the external marginal damage.

[5] JONATHAN GRUBER, PUBLIC FINANCE AND PUBLIC POLICY 138-142 (4th ed. 2013).
[6] *Id.* at 124-125.
[7] Please note that this graph is not intended to capture all the complexities of the electricity market. It is intended as a simple illustration that can be used to explain these concepts.

Figure 1. Market Failure Due to Negative Production Externality.



This simple graph can also be used to calculate the net social welfare. The net social welfare at a given level of market output is the difference between the social benefits of consumption at that level—the area below the demand curve—and the social costs of producing at that level—the area below the social marginal cost curve. For example, if the market outcome is point C, the total societal benefit would be given by the area $0FCQ_{11}$. The net social welfare is the difference between these two areas. As can be seen from this graph, the existence of a negative externality leads to an area of deadweight loss—loss of economic efficiency—as the social marginal cost of producing electricity for quantities beyond Q* exceeds the social marginal benefit of consuming them. In other words, since the market participants are not directly paying for any of the costs associated with the pollution, too much of it is produced. In this graph, if the output level could be brought down to Q*, the deadweight loss—the triangle ABC—would be eliminated and the net social welfare would be maximized.

The goal of a cost-benefit analysis is essentially to calculate the net social welfare given alternative policies and choose the one that maximizes the net social welfare, i.e., to choose a policy that would bring the market outcome as close to Point A as possible. Thus, correctly identifying and monetizing the drivers that can change the *net* social welfare is essential to the success of using this type of economic analysis to select an optimal policy alternative. Therefore, it is crucial that the Commission chooses the right approach to value the resource benefits and externalities.

1. Cost-benefit analysis should use the full value of marginal damage estimates to value emission reductions, even if cap-and-trade, or other greenhouse gas reduction programs, exist

Figure 1 can help illustrate the correct parameter for monetizing the benefits associated with avoided emissions. The graph demonstrates two important points. First, the supply curve in the graph, by definition, reflects the marginal private cost of production. That is, this curve reflects only the resource costs of producing electricity, and does not show any of the "internalized" costs associated with compliance with any emission pricing programs. Second, given the market demand and supply, the location of the socially optimal Point A relative to the free market outcome depends on the size of the external damage caused by each additional unit of pollution. The size of this marginal external damage is independent of what policies are already in effect. Therefore, regardless of whether other emissions pricing policies, such as the Air Resources Board's cap and trade program or other reduction measures, are already in place, the analysis should use the full value of the marginal damage to estimate the socially optimal outcome, Point A.

Understanding this insight is crucial to the proper application of a cost-benefit analysis in valuing DER resources. Figure 1 shows that, to the extent that a proposed project leads to net avoided emissions, those net avoided emissions should be monetized using the full value of the monetized damages. This will lead to an approach that can be used to estimate the social marginal cost curve, which can then be used to estimate the true impact of any policy change on the net social welfare. This social marginal cost curve reflects the external damage associated with a marginal unit of pollution, which is independent of other policies that may currently be in effect. Because the effects of each marginal unit of pollution are independent of other policies, using the full value of marginal damages to monetize their effect will lead to a more accurate assessment of external benefits than an abatement cost approach that reflects the cost of other policies.

An abatement cost approach is not designed to internalize the greenhouse gas externalities and maximize social welfare. Instead, an abatement cost approach is based on the costs of other policy options undertaken to reduce greenhouse gases, which reflect political and technological factors, rather than the benefits to be achieved by reducing greenhouse gas emissions. A greenhouse gas adder based upon these abatement costs will not serve to correct the externality market failure and could distort the market even further.

In recommending against the use of a damage cost approach, Staff raises the concern that "Developing a separate damage-based cost of carbon specifically for evaluating DERs only for IOU customers could result in an inefficient carbon mitigation outcome in which the same reductions could have been achieved at a lower cost, with IOU customers shouldering the cost of this inefficiency."[8] However, the risk of IOU customers "shouldering the cost of [an] inefficiency" is higher with an abatement cost approach than with a damage cost approach. Indeed, the current abatement cost estimates in the staff report are higher than the federal social cost of carbon.[9] In order to avoid any sector shouldering a disproportionate burden for greenhouse gas reductions, all sectors should use a consistent damage cost approach in policy setting, in order to internalize the externality commensurately in all sectors. And, indeed, the California Air Resources Board is proposing to use the federal social cost of carbon consistently across resource type to evaluate proposed projects under its post-2030 greenhouse gas reduction scoping plan.[10]

---

[8] California Public Utilities Commission, Distributed Energy Resources Cost Effectiveness Evaluation: Societal Cost Test, Greenhouse Gas Adder, and Greenhouse Gas Co-Benefits: An Energy Division Staff Proposal**,** at 22-23 (Jan. 12, 2017) [hereinafter "Staff Proposal"].

[9] *See* Staff Proposal at 21 (estimating abatement costs in 2050 to be between $90/tonne of CO_2 and $500/tonne of CO_2). In contrast, the central estimate of the social cost of carbon in 2050 is $81. INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, UNITED STATES GOVERNMENT, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 at 4 tbl. ES-1 (2016) (updated to reflect 2016 dollars using the Bureau of Labor Statistics' CPI Inflation Calculator, https://data.bls.gov/cgi-bin/cpicalc.pl).

[10] California Air Resources Board, The 2017 Climate Change Scoping Plan Update: The Proposed Strategy for Achieving California's 2040 Greenhouse Gas Target at 60-62 (2017), https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf.

2. The Commission should use the Social Cost of Carbon as an estimate of the marginal damages associated with carbon dioxide emissions

Assuming that the Commission chooses to apply the damage cost approach to valuing greenhouse gas reduction benefits, the question becomes precisely what value to use in the analysis. The Commission should choose a value that reflects the best available science and economics and has been developed through a transparent process. The August 2016 updated federal Interagency Working Group on Social Cost of Greenhouse Gases ("IWG") reports[11] reflect the best available estimates of the damages associated with the emission of each additional ton of carbon dioxide, methane, and nitrous oxide, through the federal social cost of carbon ("SC-CO_2"), federal social cost of methane ("SC-CH_4"), and federal social cost of nitrous oxide ("SC-N_2O").[12] Using the federal numbers will allow the Commission to save money and resources developing its own model for the marginal damage of these greenhouse gases, and instead take advantage of the federal government's extensive time and resources spent developing these robust models. Moreover, using the SC-CO_2 will allow the Commission to act consistently with the Air Resources Board, which has proposed to use the federal Social Cost of Carbon in evaluating policy approaches under its greenhouse gas reduction Scoping Plan.

In response to a Ninth Circuit Court of Appeals decision that required the government to account for the economic effects of climate change in a regulatory impact analysis of fuel

---

[11] INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, UNITED STATES GOVERNMENT, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (2016) [hereinafter "2016 TSD"], *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf; INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, UNITED STATES GOVERNMENT, ADDENDUM TO TECHNICAL SUPPORT DOCUMENT ON SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866: APPLICATION OF THE METHODOLOGY TO ESTIMATE THE SOCIAL COST OF METHANE AND THE SOCIAL COST OF NITROUS OXIDE (2016) [hereinafter "2016 TSD ADDENDUM"], *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf.

[12] These comments will use the terms "SC-CO_2," "SC-CH_4," and "SC-N_2O" to refer to the general concept of the valuation of a social cost of a ton of emission of the specified greenhouse gas, and will use the terms "federal SC-CO_2," "federal SC-CH_4," and "federal SC-N_2O" to refer to the specific sets of consensus valuations developed by the Interagency Working Group.

efficiency standards,[13] the federal government convened the IWG to develop a SC-CO_2 value for use in federal regulatory analysis. Prior to the formation of the IWG, agencies used a range of values for the economic harm caused by one additional metric ton of carbon dioxide emissions.[14] The consistent use of the IWG estimates in federal rulemaking allows agencies to harmonize their approach to conducting regulatory impact analyses and conserve agency resources to avoid duplication of modeling effort. The IWG has met several times to update its modeling based on updated scientific literature, with the most recent update in 2016, reflecting recommendations on SC-CO_2 from the National Academy of Sciences and expanding the analysis to include additional greenhouse gases, specifically methane and nitrous oxide.[15]

The IWG's August 2016 central estimate[16] of $41 in 2016 dollars per ton of carbon dioxide emissions is based on the best available science.[17] This value is likely an underestimate because some forms of damage, like catastrophic risks, are omitted from present calculations due to data limitations and scientific uncertainty.[18] The National Academies of Sciences completed a

---

[13] Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172 (9th Cir. 2008).

[14] INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, UNITED STATES GOVERNMENT, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866, at II-3 (2010) [hereinafter "2010 TSD"], *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf.

[15] *See* 2016 TSD, *supra* note 22; INTERAGENCY WORKING GROUP ON SOCIAL COST OF CARBON, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (2015), *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf; INTERAGENCY WORKING GROUP ON THE SOCIAL COST OF CARBON, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (2013) [hereinafter "2013 TSD"], *available at* https://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf; 2010 TSD, *supra* note 25.

[16] As discussed further in Section I.C, the IWG produced a range of social cost of carbon estimates, reflecting a 5-percent discount rate, a 3-percent discount rate, a 2.5-percent discount rate, and a 95th percentile estimate. This $41 per ton figure corresponds to the "central" 3-percent discount rate.

[17] 2016 TSD, *supra* note 22, at 4, tbl.ES-1 (showing a value of $36 in 2007 dollars, which yields $41 in 2016 dollars when updated using a Consumer Price Index Inflation Calculator, http://data.bls.gov/cgi-bin/cpicalc.pl).

[18] *See* Richard L. Revesz et al., *Improve Economic Models of Climate Change*, 508 NATURE 173 (2014)

robust review of the federal SC-CO_2 calculation in 2017, lending additional credibility to the metric and endorsing several updates that would likely lead to a higher SCC estimate.[19] Because of these factors, the federal SC-CO_2 should be considered a lower bound on the marginal damage cost. Nonetheless, the federal SC-CO_2 is the best available estimate of climate damages and has been used in almost one hundred federal regulations and a number of state proceedings.[20] Additionally, the Seventh Circuit Court of Appeals recently approved the federal SC-CO_2's use by a federal agency.[21] The federal SC-CH_4 and federal SC-N_2O have been developed more recently, but are also based upon a similarly rigorous IWG process.[22]

These federal SC-CO_2, SC-CH_4, and SC-N_2O estimates are firmly grounded in peer-reviewed science and economics. Furthermore, they have been developed through a transparent and ongoing process coordinated by experts and incorporating public comment. In order to reflect the best available science and economics and not duplicate efforts, the Commission should use these values in its cost-effectiveness analysis, subject to updates over time to continue reflecting the best available science and economics.

The federal social cost of carbon is based on rigorous and peer-reviewed science and economics[23]

The SC-CO_2 was developed with robust academic rigor, including peer review of the estimates underlying the models and other inputs used by the IWG. The SC-CO_2 values were developed using the three most widely cited climate economic impact models that link physical impacts to the economic damages of CO_2 emissions. All of these integrated assessment models—

(co-authored with Nobel Laureate Kenneth Arrow, among others); 2010 TSD, *supra* note 25; PETER HOWARD, OMITTED DAMAGES: WHAT'S MISSING FROM THE SOCIAL COST OF CARBON (2014); Peter Howard, Flammable Planet: Wildfires and the Social Cost of Carbon (2014); The Cost of Carbon Pollution, http://costofcarbon.org/.

[19] *See* THE NATIONAL ACADEMIES OF SCIENCES, VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE (2017); Chelsea Harvey, *Scientists have a new way to calculate what global warming costs. Trump's team isn't going to like It*, THE WASHINGTON POST (Jan. 12, 2017).

[20] JANE A. LEGGETT, CONGRESSIONAL RESEARCH SERVICE, FEDERAL CITATIONS TO THE SOCIAL COST OF GREENHOUSE GASES (2016); see discussion of state proceedings in Section I.D below.

[21] Zero Zone, Inc. v. U.S. Dep't of Energy, Case No. 14-2147 (slip op. at 39-45) (7th Cir. Aug. 8, 2016).

[22] *See* 2016 TSD ADDENDUM, *supra* note 22.

[23] This subsection and the following subsection are based on Policy Integrity's amicus brief to the Seventh Circuit Court of Appeals in Zero Zone, Inc. v. U.S. Dep't of Energy, Case No. 14-2147 (7th Cir. July 29, 2016).

known as DICE, FUND, and PAGE[24]—have been extensively peer reviewed in the economic literature.[25] The newest versions of the models were also published in peer-reviewed literature.[26] Each model translates emissions into changes in atmospheric carbon concentrations, atmospheric concentrations into temperature changes, and temperature changes into economic damages.[27] The IWG gives each model equal weight in developing the SC-CO_2 values.[28] The IWG also used peer-reviewed inputs to run these models.[29] The IWG conducted an "extensive review of the literature . . . to select three sets of input parameters for these models: climate sensitivity, socio-economic and emissions trajectories, and discount rates."[30] For example, to derive socioeconomic and emissions pathways, the IWG used results from the Stanford Energy Modeling Forum, all of which were peer-reviewed, published, and publicly available.[31] For each parameter, the IWG documented the inputs it used, all of which are based on peer-reviewed literature.[32] The analytical methods that the IWG applied to its inputs were also peer-reviewed, and the IWG's methods have been extensively discussed in academic journals.[33]

Throughout their development process, the federal SC-CO_2 estimates have been based on rigorous and peer-reviewed science and economics, making these values a good basis for

---

[24] More specifically: DICE (Dynamic Integrated Climate and Economy), developed by William Nordhaus (more information available at http://www.econ.yale.edu/~nordhaus/); PAGE (Policy Analysis of the Greenhouse Effect), developed by Chris Hope; and FUND (Climate Framework for Uncertainty, Negotiation, and Distribution), developed by Richard Tol (more information available at http://www.fund-model.org/). *See* 2010 TSD, *supra* note 25, at 5 n.2.
[25] *See* 2010 TSD, *supra* note 25, at 4-5.
[26] *See* 2016 TSD, *supra* note 22, at 6; *see also* William Nordhaus, *Estimates of the Social Cost of Carbon: Concepts and Results from the DICE-2013R Model and Alternative Approaches*, 1 J. ASS'N ENVTL. & RESOURCE ECONOMISTS 273 (2014).
[27] 2010 TSD, *supra* note 25, at 5.
[28] *Id* at 5.
[29] *Id.* at 5-29.
[30] *Id*. at 6.
[31] *Id*. at 15; *see also* Symposium, *International, U.S. and E.U. Climate Change Control Scenarios: Results from EMF 22*, 31 ENERGY ECON. S63 (2009).
[32] *See* 2010 TSD, *supra* note 25, at 12 to 23.
[33] *See, e.g.*, Michael Greenstone et al., *Developing a Social Cost of Carbon for U.S. Regulatory Analysis: A Methodology and Interpretation*, 7 REV. ENVTL. ECON. & POL'Y 23 (2013); Frank Ackerman & Elizabeth Stanton, *Climate Risks and Carbon Prices: Revising the Social Cost of Carbon*, ECON.: THE OPEN-ACCESS, OPEN-ASSESSMENT E-JOURNAL, Apr. 2012, at 6 (reviewing the IWG's methods and stating, "[T]he Working Group analysis is impressively thorough.").

thoughtful policy analysis, and indeed, the best available estimates of the economic costs of carbon dioxide emissions.

The social cost of carbon values were derived through a transparent and open interagency process that is designed to be updated over time to reflect new information

The IWG's analytical process in developing the SC-CO_2 was transparent and open, designed to solicit public comment and incorporate the most recent scientific analysis.

First, the process was transparent. Beginning in 2009, the Office of Management and Budget and the Council of Economic Advisers established the IWG, composed of scientific and economic experts from the White House, Environmental Protection Agency, and Departments of Agriculture, Commerce, Energy, Transportation, and Treasury, to develop a rigorous method of valuing carbon dioxide reductions resulting from regulations.[34] In February 2010, the IWG released estimated SC-CO_2 values, developed using the three most widely cited climate economic impact models (known as integrated assessment models). These models were each developed by outside experts, and published and extensively discussed in peer-reviewed literature.[35] An accompanying Technical Support Document released by the IWG discussed the models, their inputs, and the assumptions used in generating the SC-CO_2 estimates.[36] In May 2013, after all three underlying models had been updated and used in peer-reviewed literature, the IWG released revised SC-CO_2 values, with an accompanying Technical Support Document.[37] The U.S. Government Accountability Office examined the IWG's 2010 and 2013 processes, and found that these processes were consensus-based, relied on academic literature and modeling, disclosed relevant limitations, and incorporated new information via public comments and updated research.[38]

The IWG requested that the National Academies of Sciences undertake a review of the latest research on modeling the economic aspects of climate change to help the IWG assess the technical merits and challenges of potential approaches for future updates to the SC-CO_2.[39] In mid-2016, the National Academies of Sciences issued an interim report to the IWG that

---

[34] 2010 TSD, *supra* note 25, at 2-3.
[35] *See id.* at 12 to 23.
[36] *See generally id.*
[37] *See* 2013 TSD, *supra* note 26.
[38] GOV'T ACCOUNTABILITY OFFICE, REGULATORY IMPACT ANALYSIS: DEVELOPMENT OF SOCIAL COST OF CARBON ESTIMATES (2014).
[39] *See* 2016 TSD, *supra* note 22, at 2.

recommended against conducting an update to the SC-CO_2 estimates in the near-term, but which included recommendations about enhancing the presentation and discussion of uncertainty regarding particular estimates.[40] The IWG responded to these recommendations in its most recent Technical Support Document from 2016,[41] which included an addendum on the SC-CH_4 and SC-N_2O.[42] The National Academies of Sciences are expected to issue a report sometime between December 2016 and February 2017 that will contain a roadmap for how SC-CO_2 estimates should be updated.[43]

The SC-CO_2 estimates will need to be updated over time to reflect the best-available science and changing economic conditions. ARB properly anticipates this possibility in its Discussion Draft, noting, "The State shall continue to monitor and engage in discussions related to any updates to U.S. EPA's SC-CO_2 methods and values."[44] If the federal government's estimates continue to reflect the best available science and economics, California should continue to use those values.

If the federal government's numbers are no longer updated to reflect the best available research, are no longer calculated based on a sound, transparent methodology that can be widely endorsed by economists, or are no longer consistent with other countries' estimates, California should undertake to update its own SC-CO_2 over time. In so doing, ARB should create an open and transparent process that involves reviewing the forthcoming National Academies of Sciences roadmap document, consulting with economists, considering peer-reviewed studies, and opening the process for public comment. The factors that California should consider in such an effort include the appropriate discount rate (discussed in section I.C. below), the extent of omitted

---

[40] NATIONAL ACADEMIES OF SCIENCES, ENGINEERING AND MEDICINE, ASSESSMENT OF APPROACHES TO UPDATING THE SOCIAL COST OF CARBON: PHASE 1 REPORT ON A NEAR-TERM UPDATE (2016).
[41] 2016 TSD, *supra* note 22.
[42] 2016 TSD ADDENDUM, *supra* note 22.
[43] The National Academies of Sciences accepted public comment during its review process. Policy Integrity submitted comments during that process. Institute for Policy Integrity, Recommendations for Changes to the Final Phase 1 Report on the Social Cost of Carbon, and Recommendations in Anticipation of the Phase 2 Report on the Social Cost of Carbon (Apr. 29, 2016) [hereinafter "Policy Integrity NAS comments"].
[44] Discussion Draft, *supra* note 3, at 114.

damages (discussed in section I.C.), and the global nature of the damages associated with climate change.[45]

At present, however, the federal SC-CO_2 values have been developed through an open and transparent process, with significant public input, using the best science and economic methods available. It is sensible for ARB to use the federal SC-CO_2, rather than developing its own social-cost values from the ground up. Furthermore, the California Air Resources Board has proposed to use the federal SC-CO_2 in evaluating policy approaches under its greenhouse gas reduction Scoping Plan, so using the federal number would promote interagency consistency.

C. The Commission Should Include as Many Externalities as Possible.

It is essential for a cost-benefit analysis to quantify and monetize as many significant societal externalities as possible in order to accurately reflect the true costs and benefits of a project. Many states have already expanded their screening tests to consider externalities other than greenhouse gases in their cost-benefit analyses. For example, for energy efficiency projects, Rhode Island monetizes various externalities, including health and safety benefits, improved comfort (thermal and noise reduction), property value benefits, and other societal impacts in its

[45] The IWG and other commentators have concluded that the SC-CO_2 should reflect global climate damages for numerous reasons, including the global nature of the harm and the need to encourage international coordination to address climate change. *E.g.*, Peter Howard & Jason Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon* (Institute for Policy Integrity at NYU School of Law Working Paper, 2016) (forthcoming in COLUMBIA J. ENVTL. L.); Michael Greenstone et al., *Developing a Social Cost of Carbon for U.S. Regulatory Analysis: A Methodology and Interpretation*, 7 REV. ENVTL. ECON. & POL'Y 23 (2013) (reviewing the policy justifications for a global value and the practical complications of a domestic-only value); Frank Ackerman & Elizabeth A. Stanton, *Climate Risks and Carbon Prices: Revising the Social Cost of Carbon,* 6 ECONOMICS E-JOURNAL 1 (2012) ("The analysis by the federal Interagency Working Group is significant . . . for its recognition that policy should be based on global, rather than domestic, impacts."); Laurie Johnson & Chris Hope, *The Social Cost of Carbon in U.S. Regulatory Impact Analyses: an Introduction and Critique*, 2 J. ENVTL. STUD. SCI. 205, 208 (2012) ("Empirical, theoretical, and ethical arguments strongly support the use of a global value."); William Pizer et al., *Using and Improving the Social Cost of Carbon*, 346 SCIENCE 1189, 1190 (2014) ("[T]he moral, ethical, and security issues . . . [and the] strategic foreign relations question . . . are compelling reasons to focus on a global SCC [social cost of carbon]."); Robert Kopp & Bryan Mignone, *Circumspection, Reciprocity, and Optimal Carbon Prices*, 120 CLIMATIC CHANGE 831, 831 (2013) ("[T]he domestically optimal price approaches the global cooperative optimum linearly with increasing circumspection and reciprocity"); Celine Guivarch, et al., *Letter: Social Cost of Carbon: Global Duty*, 351 SCIENCE 1160 (2016).

project assessments.[46] Massachusetts, the highest ranking state for energy efficiency according to ACEEE,[47] also applies an expansive cost test for energy efficiency and has considered adopting a similar test for resiliency. The state's test uses a societal discount rate and monetizes various health, safety, and environmental benefits in its analyses[48] —both hallmarks of cost-benefit methodology.[49] These practices of forward-thinking states demonstrate that it is appropriate and possible to monetize many non-energy benefits in a cost-benefit analysis.

The Commission should note that the categories of quantified and unquantified benefits are not absolute. Instead, they are highly permeable.[50] Empirical and analytical methods of quantification as well as computational technologies are rapidly advancing, allowing us to quantify and monetize value components that were once thought unquantifiable. Further, given the fast changing pace of the industry, there may be some value components that we cannot yet foresee. For example, if improved energy storage allows solar and wind energy to be more easily dispatchable, the cost and benefit of distributed energy resources as well as any other infrastructure investment would change significantly. Thus, it is important that the Commission and Staff review these value components and evaluation methods periodically to ensure that all relevant components are included in the cost-benefit analysis and that the quantification methods are state-of-the-art.

D. The Proposed 3% Societal Discount Rate Is Reasonable.

Staff proposes that the societal cost test uses a 3% real discount rate.[51] This is consistent with best practices. Guidance on cost-benefit analysis best practices from the federal Office of Management and Budget indicates, "The effects of regulation do not always fall exclusively or primarily on the allocation of capital. When regulation primarily and directly affects private

---

[46] TIM WOOLF ET AL, SYNAPSE ENERGY ECONOMICS, INC., ENERGY EFFICIENCY COST-EFFECTIVENESS SCREENING IN THE NORTHEAST AND MID-ATLANTIC STATES, 57-58 (Oct. 2013) *available at* http://www.neep.org/sites/default/files/resources/EMV_Forum_C-E-Testing_Report_Synapse_2013%2010%2002%20Final.pdf.

[47] *See Executive Summary, 2014 State Energy Efficiency Scorecard*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. 4, http://aceee.org/files/pdf/summary/u1408-summary.pdf (last visited Aug. 20, 2015).

[48] WOOLF ET AL., *supra* note 46 at 43; ELIZABETH DAYKIN, ET AL., PICKING A STANDARD: IMPLICATIONS OF DIFFERING TRC REQUIREMENTS, THE CADMUS GROUP 2 (Dec. 15, 2010).

[49] *See generally*, OFFICE OF MGMT. & BUDGET. CIRCULAR A-4 at 33 (2004).

[50] Richard L. Revesz, Quantifying Regulatory Benefits, 102 *CAL. L. REV.* 1423, 1436 (2014).

[51] Staff Proposal at 13.

consumption (e.g., through higher consumer prices for goods and services), a lower discount rate is appropriate."[52] The project proposals for DERs will be financed primarily through electricity rates for consumers, meaning that a lower, societal discount rate (the Office of Management and Budget recommends 3%) is appropriate.[53] It is particularly important that the societal discount rate be used for societal benefits, such as the long-term climate benefits.

For example, when the federal government conducts life-cycle cost analyses for prospective energy efficiency investments in federal buildings, it uses a discount rate based upon the interest rate on U.S. Treasury bonds.[54] Currently, the Department of Energy uses a 3% discount rate for investments in federal energy efficiency, which is the mandated floor for the discount rate, whereas the actual interest rate on Treasury bonds would result in an even lower discount rate.[55] Just as the federal investments in energy efficiency are borne by—and ultimately benefit—federal taxpayers, the California investments in modernizing the grid edge will be borne by—and ultimately benefit—California ratepayers. So the Commission should follow the guidance of the federal Office of Management and Budget and Department of Energy and use the proposed 3% discount rate.

The use of a lower, societal discount rate is especially important in the context of project decisions that have projected climate benefits that will accrue over many decades. As Staff acknowledges, economists especially support the use of a lower discount rate in the intergenerational context, due to equity concerns.[56] The Interagency Working Group that

---

[52] OFFICE OF MGMT. & BUDGET. CIRCULAR A-4 at 33 (2004) [hereinafter CIRCULAR A-4].
[53] *See id.* at 33-34.
[54] 10 C.F.R. § 436.14(a); *see also* Federal Energy Management and Planning Programs; Life Cycle Cost Methodology and Procedures, 55 Fed. Reg. 48,217, 48,217 (Nov. 20, 1990) ("[M]easuring the interest rate on U.S. Treasury bonds and removing the effects of inflation is the appropriate procedure for setting a market-based discount rate to be used in performing life cycle cost analyses for purposes of estimating and comparing the cost effects of investing in greater energy efficiency in Federal buildings.").
[55] AMY S. RUSHING ET AL., NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, ENERGY PRICE INDICES AND DISCOUNT FACTORS FOR LIFE-CYCLE COST ANALYSIS—2014, NISTIR 85-3273-29, at 1 (2014), *available at* http://www.nist.gov/customcf/get_pdf.cfm?pub_id=917494.
[56] *See* Staff Proposal at 14 (discussing Stern Review); *see also* Richard L. Revesz & Matthew R. Shahabian, *Climate Change and Future Generations*, 84 S. CAL. L. REV. 1097, 1099-1101 (2011) (discussing the economic and moral implications of discounting in the intergenerational context); CIRCULAR A-4 at 35-36 (indicating that a discount rate lower than 3%, typically in the range of 1-3%, may be appropriate for intergenerational discounting).

developed the federal Social Cost of Carbon used a range of lowered discount rates, specifically 2.5 percent, 3 percent, and 5 percent, in calculating the Social Cost of Carbon.[57]

Recent research has shown that the appropriate discount rate for intergenerational analysis may be even lower than that reflected in the Social Cost of Carbon analysis.[58] For example, a recent study found that economics experts believe that the discount rates used for the federal Social Cost of Carbon should be equal to or lower than that used in the analysis so far.[59] Additionally, the Counsel of Economic Advisers recently released an issue brief indicating that, due to lower real interest rates around the world, even 3% may be too high of a social discount rate, and a 2% discount rate might be more appropriate.[60]

Because of the many concerns surrounding intergenerational discounting of long-lasting societal effects, if the Commission does decide to use a higher discount rate to reflect infrastructure investment in the near-term, it should use a separate, lower discount rate to reflect long-term climate benefits of DER investments. Further, this lower discount rate used for societal benefits should be equal to the discount rate that is used to calculate the Commission's

---

[57] 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 at 23 (2010), *available at* http://www.epa.gov/oms/climate/regulations/scc-tsd.pdf.

[58] *See* Martin L. Weitzman, *Gamma Discounting*, 91 AM. ECON. REV. 260, 270 (2001); Kenneth J. Arrow et al., *Determining Benefits and Costs for Future Generations*, 341 SCIENCE 349 (2013); Kenneth J. Arrow et al., *Should Governments Use a Declining Discount Rate in Project Analysis?*, 8 REV ENVTL. ECON. & POLICY 1 (2014); Maureen L. Cropper et al., *Declining Discount Rates*, 104 AM. ECON. REV. 538 (2014); Christian Gollier & Martin L. Weitzman, *How Should the Distant Future Be Discounted When Discount Rates Are Uncertain?* 107 ECONOMICS LETTERS 3 (2010). Policy Integrity further explores the use of declining discount rates in its recent comments to the National Academies of Sciences. Policy Integrity NAS Comments, *supra* note 54, at 13-16.

[59] PETER H. HOWARD & DEREK SYLVAN, THE ECONOMIC CLIMATE: ESTABLISHING CONSENSUS ON THE ECONOMICS OF CLIMATE CHANGE 32 (2015), *available at* http://ageconsearch.umn.edu/bitstream/205761/2/AAEA_ HowardSylvan_2015_Update.pdf. Other studies have recommended lower discount rates, as well. *See, e.g.*, Moritz Drupp et al., *Discounting Disentangled: An Expert Survey on the Determinants of the Long-Term Social Discount Rate* 3 (Ctr. for Climate Change Econ. & Policy Working Paper No. 195, 2015), *available at* http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/06/Working-Paper-172-Drupp-et-al.pdf (recommending a long-term social discount rate of 2.25 percent).

[60] COUNSEL OF ECONOMIC ADVISERS ISSUE BRIEF, DISCOUNTING FOR PUBLIC POLICY: THEORY AND RECENT EVIDENCE ON THE MERITS OF UPDATING THE DISCOUNT RATE (2017), https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf.

chosen Social Cost of Carbon. If the Commission uses a SCC calculated at 3% to monetize the avoided emission benefits in a given year, but then discounts it using a different rate while calculating the net present value of the net societal welfare, it would confound the results of the analysis.

Especially because recent research has shown that the appropriate discount rate for intergenerational analysis may be even lower than that reflected in the SC-CO_2 analysis, a jurisdiction might decide that the uncertainty associated with climate damages warrants using a discount rate that declines over time, which would increase the SC-CO_2.

III. Conclusion

For the foregoing reasons, the Commission should: (1) use the SCT as its primary test for all applications; (2) use the damage cost approach—applying the federal government's social cost of carbon—to determine the value of greenhouse gas abatement, rather than Staff's proposed marginal abatement cost approach; (3) include the full range of reasonably quantifiable externalities in the analysis, not just climate damages; and (4) apply a societal discount rate to the analysis.

Dated: March 23, 2017

Respectfully submitted,

/s/ Denise Grab

Denise Grab
Senior Attorney
Burcin Unel
Senior Economist
Institute for Policy Integrity
139 MacDougal Street, Third Floor
New York, NY 10012
Tel: (212) 992-8932
E-mail: denise.grab@nyu.edu