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September 25, 2009

VIA ELECTRONIC SUBMISSION

Hon. Lisa P. Jackson, Administrator
United States Environmental Protection Agency
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Subject: Comments on Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 74 Fed. Reg. 24,903 (proposed May 26, 2009), Docket ID No. EPA–HQ–OAR–2005–0161

Dear Administrator Jackson:

The Institute for Policy Integrity strongly supports EPA's efforts to finalize new regulations for the national Renewable Fuel Standard program. In particular, we find EPA's estimation of the net impact of renewable fuels on greenhouse gas emissions to be thorough and valid. Furthermore, we believe it represents an important departure from incomplete evaluations in the past that ignored the indirect impacts of agency actions. The following comments express our support for EPA's proposed approach to assessing net GHG emissions, and also call EPA's attention to key methodological considerations for calculating the benefits of reduced GHG emissions.[1]

The Institute for Policy Integrity (IPI) at New York University School of Law is a non-partisan advocacy organization and think-tank dedicated to improving the quality of government decisionmaking in the areas of environmental, public health, and safety regulation. IPI advocates using rational economic analysis as a tool to advance socially-beneficial regulation. IPI believes that rational economic analysis must fully consider all ancillary costs and benefits of a policy proposal, such as those arising in this case from fuel processing and land use changes. As discussed below, this is especially true when considering how an action effects net GHG emissions.

Background on EPA's Proposed Renewable Fuel Standard Regulations

On May 26, 2009, EPA proposed changes to the Renewable Fuel Standard program, in response to statutory directives from the Energy Independence and Security Act of 2007 (EISA).[2] The revised statutory language requires EPA to ensure that transportation fuel sold in the United States contains a minimum volume derived from renewable sources, such as corn-based ethanol or biomass-based diesel. Compared to petroleum-based fuels, burning renewable fuels generally emits fewer greenhouse gases (GHGs)—the pollutants responsible for climate change. However,

[1] The Institute for Policy Integrity does not currently express any opinion on any aspect of the proposed regulations not discussed in these comments. For example, while IPI generally supports EPA's proposed regulations, we do not at this time take a stance on any of the alternatives to "grandfathering" proposed by the agency.

[2] Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 74 Fed. Reg. 24,903 (proposed May 26, 2009) (to be codified at 40 CFR pt. 80) [hereinafter RFS Rule]; *see also* Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Extension of Comment Period, 74 Fed. Reg. 32,091 (proposed July 7, 2009) (extending comment period until Sept. 25, 2009).

certain agricultural changes associated with the production of renewable fuelstock, as well as other indirect impacts, could generate additional GHG emissions.

To be eligible to count as "renewable," fuels must pass certain thresholds set by EISA for their lifecycle GHG reductions, compared to petroleum-based fuels (for example, 20%, 50%, or 60% fewer GHG emissions).[3] EISA defines "lifecycle greenhouse gas emissions" as:

> the aggregate quantity of greenhouse gas emissions (*including direct emissions and significant indirect emissions such as significant emissions from land use changes*), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.[4]

In its proposed rulemaking, EPA interpreted this definition to mean that all domestic and international emissions, direct or indirect, related to the fuel lifecycle should factor into whether a renewable fuel meets the threshold for eligibility.[5] Some have criticized this decision, believing that indirect impacts—especially international land use impacts—are too uncertain and should not be counted;[6] a few legislative proposals now pending before Congress would prevent EPA from considering certain international land use changes.[7] Recently, EPA has reaffirmed the need to account for all significant indirect emissions, even while committing to a quantitative uncertainty analysis of the international land use impacts.[8] As explained below, IPI believes that EPA's decision to include international impacts is required by legal standards and by best economic practices.

Also according to best practices, as well as EPA's internal guidelines and Executive Order 12,866, EPA must analyze the potential costs and benefits of its proposed regulation, and must quantify those impacts to the extent possible.[9] In both its proposed regulation and its draft regulatory impact analysis, EPA has estimated the benefits of reducing GHG emissions by employing a range of

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[3] *See* RFS Rule, *supra* note 2, at 24,912.

[4] Energy Independence and Security Act of 2007, 42 U.S.C. § 7545(o)(1)(H) (2008).

[5] *See* RFS Rule, *supra* note 2, at 25,023.

[6] *See* Ben Geman, *EPA Rule Release Sparks New Round in Emissions Fight*, E&E DAILY NEWS, May 5, 2009.

[7] *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 551 (2009) (preventing EPA from considering "emissions from indirect land use changes outside the renewable fuel's feedstock's country of origin" unless a National Academies of Science report has been completed and a determination has been made by EPA and USDA). More recently, Senator Tom Harkin proposed an amendment to the 2010 Fiscal Year appropriations bill that covers the EPA, which would have prevented EPA from expending funds in "activities relating to the inclusion of international indirect land use change emissions in the implementation of the renewable fuel program." *See* Robin Bravender et al., *Vitter Amendments Would Limit EPA Regulatory Power*, GREENWIRE, Sept. 22, 2009 (attaching Harkin's amendment). While Harkin has now agreed to drop his amendment, after receiving word from EPA that the agency will commit to a quantitative uncertainty analysis of international land use impacts, this agreement does not impact the language already added to the pending climate legislation (H.R. 2454), nor does it prevent future legislative efforts to block EPA's consideration of international land use impacts. *See* Ben Geman, *EPA Rule Will Reflect "Uncertainty" on Indirect Emissions, Fending Off Amendments*, E&E DAILY NEWS, Sept. 24, 2009.

[8] Letter from Lisa P. Jackson, EPA Admin., to Sen. Tom Harkin (Sept. 23, 2009).

[9] *See* EPA, NO. 240-R-00-003, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 66-67 (2000) (explaining that "it is desirable to quantify and monetize" the benefits associated with environmental policies); Exec. Order No. 12,866 § 6(3)(C), 58 Fed. Reg. 51,735, 51,741 (Oct. 4, 1993) (codified at 45 C.F.R. pt. 88) (instructing agencies to quantify costs and benefits "to the extent feasible" when conducting economic analysis of significant regulatory actions).

figures known as "the social cost of carbon."[10] These comments will highlight some methodological considerations for the estimation and application of the social cost of carbon.

Legal Standards Require Inclusion of All Significant Indirect Impacts

EPA notes that EISA used broad and undefined terms like "full" and "indirect" to identify which GHG emissions should be counted toward the eligibility thresholds for renewable fuels. EISA also gives EPA discretion to determine which GHG emissions are "related to" the fuel lifecycle. Nevertheless, EPA concluded that it would be arbitrary to ignore any significant indirect or international impacts when calculating either the baseline emissions of petroleum-based fuels or the emissions profiles of renewable fuels.[11] We agree.

A court will find an agency action to be illegally arbitrary and capricious if an agency "entirely failed to consider an important aspect of the problem."[12] International GHG emissions from land use changes are clearly an important aspect of the lifecycle GHG calculation. As EPA notes, "a large variety of different activities outside the U.S. play a major part of the full fuel lifecycle of baseline and renewable fuels."[13] Excluding international land use changes would arbitrarily ignore an important aspect of the regulatory issues put before EPA by Congress. Indeed, because a key goal of EISA is to reduce GHG emissions,[14] it would be arbitrary and in contravention of congressional intent to ignore any significant source of GHG emissions, such as international land use changes.

Moreover, EPA cannot articulate a rational justification for excluding international impacts: "Drawing a distinction between GHG emissions that occur inside the U.S. as compared to emissions that occur outside the U.S. would dramatically alter the lifecycle analysis in a way that bears no apparent relationship to the purpose of this provision."[15] Permitting an agency to ignore significant indirect effects would leave open the possibility that an agency's choice will reflect inadvertent tunnel vision or the cherry-picking of data—in either case inviting decisions that are uninformed and potentially unlawful.[16] Agencies cannot pick and choose their data, but rather must conduct analysis consistent with the principles of reasoned decisionmaking.[17]

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[10] *See* RFS Rule, *supra* note 2, at 25,094; EPA, 420-D-09-001, DRAFT REGULATORY IMPACT ANALYSIS: CHANGES TO RENEWABLE FUEL STANDARD PROGRAM 689 (2009).

[11] *See* RFS Rule, *supra* note 2, at 25,023-24.

[12] *Owner-Operator Indep. Drivers Ass'n, Inc. v. Federal Motor Carrier Safety Admin.,* 494 F.3d 188, 203 (D.C. Cir. 2007) (citing *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29, 43 (1983) (construing the "arbitrary and capricious" standard under the Administrative Procedure Act, 5 U.S.C. § 706(2)(A))).

[13] RFS Rule, *supra* note 2, at 25,023; *see also* Letter from Jackson to Harkin, *supra* note 8 (explaining that both public comments and a thorough peer review "indicate that it is important to take into account indirect emissions from biofuels when looking at the lifecycle emissions as required by EISA").

[14] *See* RFS Rule, *supra* note 2, at 25,021 ("[EISA's] thresholds, in combination with [EISA's] renewable fuel volume mandates, are designed to ensure significant GHG emission reductions from the use of renewable fuels and encourage the use of GHG-reducing renewable fuels.").

[15] *Id.* at 25,023.

[16] *See Ctr. for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1217 (2007) (remanding a rule after finding that an agency "must provide the necessary contextual information about the cumulative and incremental environmental impacts," including net effects on GHG emissions).

[17] *See Owner-Operator Indep. Drivers Ass'n*, 494 F.3d at 205-06 (finding that ignoring the cumulative and potentially compounding nature of costs in a regulatory impact analysis is an arbitrary and capricious failure to address a significant aspect of the rulemaking problem).

While EPA admits some of the data on indirect and international impacts is uncertain,[18] neither lack of information nor uncertainty will permit an agency to shirk its statutory duty to consider all significant indirect impacts. As courts have warned:

> The agency's job is to exercise its expertise to make tough choices about which of the competing estimates is most plausible, and to hazard a guess as to which is correct . . . . Regulators by nature work under conditions of serious uncertainty, and *regulation would be at an end if uncertainty alone were an excuse to ignore a congressional command* . . . . [19]

When there is uncertainty about a significant factor, its transparent inclusion is preferable to its outright exclusion. This is the approach EPA has followed,[20] and this is the approach the agency should continue to follow. As EPA recently affirmed, conducting a quantitative uncertainty analysis is a transparent way to include significant but uncertain factors in a regulatory determination.[21]

As for the concern that indirect impacts are linked too tenuously to agency action to require examination, the causal link between land use changes and incentives to produce renewable fuels is clear.[22] The nature and extent of land use changes likely to result remains contentious,[23] but potentially significant effects cannot be ignored just because their magnitude is difficult to specify.[24] EPA has appropriately limited the land use changes considered to those "related to" the full fuel lifecycle by application of a model that captures the appropriate relationship.[25]

In short, EPA has clear instructions from Congress to consider all "significant indirect emissions," and more generally to design regulations that will help curtail overall GHG emissions. Failing to count international land use changes or any other significant indirect impact simply because some uncertainty exists would be arbitrary and capricious. In its final rule, EPA should continue to count all significant indirect impacts, including international land use changes, when applying the eligibility thresholds.

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[18] RFS Rule, *supra* note 2, at 24,912 (explaining EPA's treatment of uncertainty in the lifecycle analysis).

[19] *Pub. Citizen, Inc. v. Fed. Motor Carrier Safety Admin.*, 374 F.3d 1209, 1221 (D.C. Cir. 2004) (emphasis added); *see also Chamber of Commerce of U.S. v. Securities and Exchange Comm'n*, 412 F.3d 133, 144 (D.C. Cir. 2005) ("Uncertainty may limit what an agency can do, but it does not excuse an agency from its statutory obligation to do what it can to apprise itself—and hence the public and the Congress—of the economic consequences of a proposed regulation before it decides whether to adopt the measure.").

[20] *See* RFS Rule, *supra* note 2, at 25,022 ("Because this lifecycle GHG emissions analysis is complex and requires the use of sophisticated computer models, we have taken several steps to increase the transparency associated with our analysis.").

[21] *See* Letter from Jackson to Harkin, *supra* note 8 (committing EPA to conducting a quantitative uncertainty analysis, presenting those estimates in the final rule, and incorporating those estimates in regulatory decisions).

[22] *See* BRENT D. YACOBUCCI & RANDY SCHNEPF, CONG. RESEARCH SERV., ETHANOL AND BIOFUELS: AGRICULTURE, INFRASTRUCTURE, AND MARKET CONSTRAINTS RELATED TO EXPANDED PRODUCTION 4-6 (2007) (discussing "food vs. fuel" implications of ethanol incentives, including changes in U.S. land use); Andrew Martin, *Food and Fuel Compete for Land*, N.Y. TIMES, Dec. 18, 2007, *available at* http://www.nytimes.com/2007/12/18/business/18food.html.

[23] *See* Timothy Searchinger et al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases through Emissions from Land-Use Change*, 319 SCIENCE 1238–1240 (2008) (predicting significant expansion of cropland acreage in response to biofuels policies); *see also* Timothy D. Searchinger & R.A. Houghton, *Response*, 322 SCIENCE 372 (2009) (addressing critical points raised in Vinod Khosla, *Biofuels Clarifying Assumptions*, 322 SCIENCE 371 (2009)).

[24] *See Ctr. for Biological Diversity*, 538 F.3d at 1217.

[25] *See* RFS Rule, *supra* note 2, at 25,024.

Best Practices in Economics and Science Require Inclusion of All Significant Indirect Impacts

GHG emissions provide a quintessential example of why a thorough and valid regulatory assessment must consider indirect impacts. As EPA has repeatedly explained, GHGs are inescapably international, such that the costs arising from the atmospheric accumulation of GHG emissions, as well as the benefits of reducing GHG emissions, will be felt across the entire globe and cannot be captured by one individual country.[26] This internationality also means that any effort to assess the scope of a given regulation's net effect on GHG emissions must consider activity both within and beyond U.S. borders. To do otherwise ignores what basic science has to say about GHG emissions.

In the context of the proposed Renewable Fuel Standard regulations, this reasoning carries particular force, because land use changes have the potential to increase GHG emissions from some sectors, offsetting some of the GHG reductions achieved by using the cleaner biofuels in the first place.[27] While the relationship between incentivizing renewable fuel production and GHG emissions from resulting land use changes remains uncertain,[28] this imprecise understanding does not reduce the need to consider indirect impacts when analyzing the proposed Renewable Fuel Standard. In the past, some federal agencies have chosen to ignore uncertain international effects: for example, consider the Department of Transportation's 2008 analysis of the new vehicle efficiency standards, which purposefully excluded GHG emissions from overseas phases of the fuel production cycle.[29] Yet as EPA rightly notes, such an approach would be at odds with basic "economic principles."[30] EPA should be commended for rejecting a technically deficient approach in favor of a fuller accounting of the Renewable Fuel Standard's effects on GHG emissions.

A final source of authority also confirms that all significant indirect impacts must be included. While Executive Order 12,866 does not create any legally enforceable standards,[31] the Order is

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[26] *See* EPA, TECHNICAL SUPPORT DOCUMENT ON BENEFITS OF REDUCING GHG EMISSIONS 1 (2008) [hereinafter TSD ON BENEFITS]; EPA, TECHNICAL SUPPORT DOCUMENT FOR ENDANGERMENT FINDING FOR GREENHOUSE GASES UNDER § 202(A) OF THE CLEAN AIR ACT 1-2 (2009) ("[GHGs], once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the U.S."); RFS Rule, *supra* note 2, at 25,096.

[27] *See* INTERAGENCY AGRICULTURAL PROJECTIONS COMMITTEE, USDA AGRICULTURAL PROJECTIONS TO 2018, at 71-72 (2009) (anticipating strong demand for biofuel feedstocks and expansion of cropland in Brazil, Russia, Ukraine, and other countries in South America and Eastern Europe), *available at* http://www.usda.gov/oce/commodity/archive_projections/USDAAgriculturalProjections2018.pdf; ED GALLAGHER ET AL., UK RENEWABLE FUELS AGENCY, THE GALLAGHER REVIEW OF THE INDIRECT EFFECTS OF BIOFUEL PRODUCTION 9 (2008), *available at* http://www.renewablefuelsagency.org/_db/_documents/Report_of_the_Gallagher_review.pdf ("The balance of evidence shows a significant risk that current [biofuel] policies will lead to net greenhouse gas emissions."); Giovanni De Santi et al., JOINT RESEARCH CENTRE, EUROPEAN COMMISSION, BIOFUELS IN THE EUROPEAN CONTEXT: FACTS AND UNCERTAINTIES 11 (2008), *available at* http://ec.europa.eu/dgs/jrc/downloads/jrc_biofuels_report.pdf ("Indirect land use change could potentially release enough greenhouse gas to negate the savings from conventional EU biofuels."); J. Fargione et al., *Land Clearing and the Biofuel Carbon Debt*, 319 SCIENCE 1235-36 (2008), *abstract available at* http://www.sciencemag.org/cgi/content/abstract/319/5867/1235 (finding that the net effect of biofuel production on GHG emissions will be negative only if the type of land used is limited).

[28] *Compare* Searchinger et al., *supra* note 23, at 1238-40 (predicting net GHG emissions increases will result from biofuel incentives' spur to major land use changes in Asia and elsewhere), *with* Hyungtae Kim et al., *Biofuels, Land Use Change, and Greenhouse Gas Emissions: Some Unexplored Variables*, 43 ENVTL. SCI. & TECH. 961 (2009) (characterizing Searchinger et al.'s assumptions about land use changes as simple and observing that net emissions from biofuel production will be highly sensitive to differences in cropland management).

[29] *See* Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015, 73 Fed. Reg. 24,352, 24,414 (May 2, 2008).

[30] RFS Rule, *supra* note 2, at 25,096.

[31] Exec. Order No. 12,866 § 10, 58 Fed. Reg. 51,735, 51,741 (Oct. 4, 1993) (codified at 45 C.F.R. pt. 88).

instructive as to the usual requirements and methodology of sound economic analysis. As instructed by the White House Office of Management and Budget's *Circular A-4* on the implementation of the Order, agencies should always "look beyond the direct benefits and direct costs of [a] regulation,"[32] in order to ensure a thorough and valid analysis of that regulation. Similarly, *Circular A-4* tells agencies to consider any significant international impacts.[33] EPA's own guidelines on economic analysis contain analogous instructions on the inclusion of indirect and international effects.[34]

Such directives build on the consensus among academics and, increasingly, among jurists about the importance of considering risk-risk tradeoffs and indirect effects when evaluating regulations.[35] By expanding the scope of regulatory analysis to consider more than just direct effects, an agency gives itself access to information that is potentially significant. Consider, for instance, that the Acid Rain Program created by 1990 amendments to the Clean Air Act was focused on eliminating acid rain, but that its ancillary benefits included tremendous smog reductions and improvements to human health in affected regions.[36]

Thus, sound scientific and economic principles dictate that EPA must include all significant indirect impacts in its analysis, even if those impacts may be uncertain. EPA's final rule should follow its proposed rule in considering international land use changes during the determination of a fuel's compliance with the thresholds for eligibility. For similar reasons, EPA should, to the extent possible, fully model, quantify, and monetize all indirect impacts, not just the GHG emissions from international land use change. For example, we strongly encourage EPA to follow through on its promise to include a full economic analysis of ancillary health benefits in its final rulemaking.[37]

These comments will not address at length other methodological considerations surrounding the calculation of indirect GHG emissions, such as EPA's choices on timeframe and discount rate. However, we do wish to generally express appreciation for EPA's cautious approach to discounting and for its preference of appropriately low discount rates, like 2% and 0%.[38] We encourage EPA to continue to explore alternative discounting methods, such as non-constant or declining rates, as well as alternative ethical frameworks for considering obligations to future generations.

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[32] OFFICE OF MGMT. & BUDGET, CIRCULAR A-4, REGULATORY ANALYSIS 26 (2003), *available at* http://www.whitehouse.gov/OMB/Circulars/a004/a-4.pdf.

[33] *Id.* at 15 ("When you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects *should be reported* separately.") (emphasis added).

[34] *See* EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES, *supra* note 9, at 70 (discussing non-market, indirect, and non-use benefits).

[35] *See, e.g.*, Samuel J. Rascoff & Richard L. Revesz, *The Biases of Risk Tradeoff Analysis: Towards Parity in Environmental and Health-and-Safety Regulation*, 69 U. CHI. L. REV. 1763 (2002); Cass Sunstein, *Health-Health Tradeoffs*, 63 U. CHI. L. REV. 1533 (1996); JOHN D. GRAHAM & JONATHAN B. WEINER, RISK VERSUS RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT (1995); *Whitman v. American Trucking Ass'ns*, 531 U.S. 457, 490 (2001) (Breyer, J., concurring).

[36] *See* NAT'L SCI. & TECH. COUNCIL, NAPAP REPORT TO CONGRESS: AN INTEGRATED ASSESSMENT 36, 64 (2005); CLEAN AIR MARKET PROGRAMS, U.S. ENVTL. PROT. AGENCY, ACID RAIN PROGRAM BENEFITS EXCEED EXPECTATIONS 1 (2006), *available at* http://www.epa.gov/airmarkt/cap-trade/docs/benefits.pdf.

[37] *See* RFS Rule, *supra* note 2, at 25,097.

[38] *Id.* at 25,037-39.

Methodological Considerations for Calculating the Benefits of GHG Reductions

According to best practices, and as required by EPA's internal guidelines and Executive Order 12,866,[39] EPA must analyze the potential costs and benefits of its proposed regulation, and must quantify those impacts to the extent possible. To estimate the projected benefits of reducing GHG emissions, EPA must calculate the reductions achieved by switching to renewable fuels,[40] multiplied by the monetary measure of incremental damage resulting from each additional ton of GHG emissions, often called "the social cost of carbon" (SCC).[41]

EPA does employ a range of SCC estimates in both its proposed rule on the Renewable Fuel Standard program and in its draft regulatory impact analysis.[42] IPI largely supports EPA's approach to the use of SCC estimates.[43] However, as EPA readily admits, its SCC figures are preliminary and uncertain.[44] More recently, a collection of federal agencies has been working on a more refined methodology to calculate the SCC. In a separate rulemaking released this month, EPA used these newer interagency figures to calculate the benefits of reducing GHG emissions from motor vehicles.[45] These comments do not promote the use of any specific range of SCC figures over another. Instead, these comments seek to remind EPA of certain methodological considerations that must be taken into account no matter what SCC range is selected.

Background on the Social Cost of Carbon

Until recently, the SCC has been estimated by federal agencies on a rather ad hoc and inconsistent basis. Over the past few years, various federal agencies have selected a wide range of SCC estimates when calculating the benefits of proposed regulations. For example, in 2008, the Department of Transportation assumed a value of $7 per ton of carbon dioxide for emissions reductions achieved by a proposed vehicle efficiency standard.[46] But by the following year, the agency was instead using a mean value of $33 for essentially the same regulation (and was also analyzing possible values at

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[39] *See* EPA, NO. 240-R-00-003, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 66-67 (2000) (explaining that "it is desirable to quantify and monetize" the benefits associated with environmental policies); Exec. Order No. 12,866 § 6(3)(C), 58 Fed. Reg. 51,735, 51,741 (Oct. 4, 1993) (codified at 45 C.F.R. pt. 88) (instructing agencies to quantify costs and benefits "to the extent feasible" when conducting economic analysis of significant regulatory actions).

[40] Regardless of whether all indirect GHG emissions are counted when EPA determines a fuel's compliance with eligibility thresholds, they must be counted in the benefits calculation. Note that the legislative proposals that would restrict inclusion of international land use changes in the threshold calculations, *see supra* note 7, would not restrict EPA from conducting broader economic analysis.

[41] *See* Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Docket ID No. EPA–HQ–OAR–2009–0472, Sept. 15, 2009, at 104 [hereinafter EPA-NHTSA Proposed Fuel Standard] ("The SCC is intended to measure the monetary value society places on impacts resulting from increased GHGs, such as property damage from sea level rise, forced migration due to dry land loss, and mortality changes associated with vector-borne diseases.").

[42] *See* RFS Rule, *supra* note 2, at 25,094; EPA, 420-D-09-001, DRAFT REGULATORY IMPACT ANALYSIS: CHANGES TO RENEWABLE FUEL STANDARD PROGRAM 689 (2009).

[43] For example, IPI appreciates that EPA has recognized the limits of the integrated assessment models, which will likely caused SCC values to be underestimated. *See* RFS Rule, *supra* note 2, at 25,095.

[44] *Id.* (acknowledging likelihood that models underestimate impacts—perhaps significantly—and indicating plans "to develop a full assessment of what is not currently being captured in [EPA's SCC model] for the final rule.").

[45] *See* EPA-NHTSA Proposed Fuel Standard, *supra* note 41, at 104.

[46] Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015, 73 Fed. Reg. 24351, 24414 (proposed May 2, 2008) (selecting $7 as the midpoint of a possible $0-$14 range).

$2 and $80).[47] The Department of Energy has at times used a range of $0-$20, but in other rulemakings has copied the Department of Transportation's figures.[48] In 2008, EPA developed a technical support document on the SCC, which set out a wide range of SCC estimates (-$6 to $695) based on a meta-analysis of existing literature and a specific economic model.[49] Though EPA stated that these estimates are "highly preliminary, under evaluation, and likely to be revised," these are the figured used in the proposed Renewable Fuel Standard regulations.[50] Even though the valuations ranged widely, these applications of an SCC represent an exciting and laudable departure from the historic tendency of some federal agencies not to quantify the benefits of reducing GHG emissions at all.[51]

Most recently, in a separate proposed rulemaking released this month, EPA took the step of applying the interim SCC figures developed by the federal interagency review process.[52] This is a potentially encouraging development. By remedying inconsistencies and promoting use of a standard SCC range across the entire federal government, the interagency review process provides an invaluable decisionmaking tool for regulators, and will help to advance sound climate change policy, grounded in rigorous economic and scientific analysis. Without such a tool, it is impossible to make a rational and educated decision among policy alternatives, based upon the full range of consequences—both positive and negative—that a rule will have on the economy, the environment, and public health. And, perhaps most importantly, the existence of a standardized range of peer-reviewed SCC estimates will prevent policymakers from continuing to ignore the benefits of reducing GHG emissions.

Nevertheless, there are some persistent concerns even about the interagency SCC numbers. For example, EPA has recently noted that there is "significant uncertainty in the potential range of values that could be assigned to the social cost of carbon,"[53] due to two basic factors: first, scientific understanding of climate change is still nascent, and it is difficult to describe particular effects of climate change with certainty or great precision; and second, because many harmful effects of climate change resist quantification, the quantitative estimate supplied by the SCC is "very likely" to reflect an underestimation of the real costs of climate change.[54] IPI agrees on both points and urges EPA to be guided by these concerns when refining how to apply the SCC in the final Renewable Fuel Standard rule. Uncertainty does not justify underestimating the benefits of reducing GHG

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[47] Average Fuel Economy Standards, Passenger Cards and Light Trucks Model Year 2011, 74 Fed. Reg. 14195, 14350 (Mar. 30, 2009) (to be codified at 49 C.F.R. pts. 523, 531-37) (revising SCC calculations, in light of substantial public comments).

[48] *Compare, e.g.*, Energy Conservation Program for Commercial and Industrial Equipment, 74 Fed. Reg. 1091, 1133 (Jan. 9, 2009) (to be codified at 10 C.F.R. pt. 431) (presenting independent SCC calculations by the Department of Energy), *with, e.g.*, Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards and Test Procedures for Commercial Heating, Air-Conditioning, and Water-Heating Equipment 74 Fed. Reg. 36312, 36342 (July 22, 2009) (to be codified at 10 C.F.R. pt. 431) (using Department of Transportation's calculations in Department of Energy rulemaking).

[49] TSD ON BENEFITS, *supra* note 26 (developing a range of SCC estimates, for the agency's own use and as possible guidance for other federal agencies).

[50] EPA, DRAFT REGULATORY IMPACT ANALYSIS, *supra* note 10, at 682, 695-96.

[51] *See* MARTHA G. ROBERTS & NANCY SPENCER, ENVIRONMENTAL DEFENSE FUND, CARBON COUNTS: INCORPORATING THE BENEFITS OF CLIMATE PROTECTION INTO FEDERAL RULEMAKING 12-15 (2008) (detailing various federal rulemakings that omitted the benefits of GHG reductions); *Ctr. for Biological Diversity v. NHTSA*, 538 F.3d 1172 (9th Cir. 2008) (holding that the Department of Transportation's failure to calculate the social cost of carbon when promulgating vehicle fuel efficiency standards was arbitrary and capricious and in violation of the Administrative Procedure Act).

[52] EPA-NHTSA Proposed Fuel Standard, *supra* note 41, at 319.

[53] *Id.* at 33.

[54] TSD ON BENEFITS, *supra* note 26, at 15 (citing INTERNATIONAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE IPCC, SUMMARY FOR POLICYMAKERS 17 (2007)).

emissions—indeed, it is reasonable to assume that a more complete characterization of the effects of climate change will reveal that GHG reductions have greater benefits than currently estimated. Therefore, in its final rule on the Renewable Fuel Standard program, EPA should give due consideration to the following five points.

Un-Quantified and Omitted Impacts

The full range of environmental, social, and economic impacts of greenhouse gas emissions should be taken into account when estimating the social cost of carbon; where impacts cannot be quantified or monetized, analysts should acknowledge the limitation and should present a balanced qualitative analysis. EPA's proposed Renewable Fuel Standard regulation takes an encouraging first step by providing a detailed list of the impacts of climate change that are not typically accounted for in the economic models used to calculate the SCC.[55]

But to whatever extent possible, such variables not included in the economic models should still be quantified, even if they cannot be fully monetized. Executive Order 12,866 instructs federal agencies to quantify costs and benefits "to the extent feasible" when conducting economic analysis of significant regulatory actions.[56] Quantification greatly facilitates the weighing of costs and benefits and improves the quality of the rulemaking. In its *Circular A-4*, the White House Office of Management and Budget admits that some costs and benefits will be difficult to monetize, but directs agencies to consider other means of quantification.[57] Where quantification proves impossible, an in-depth qualitative discussion—more than just a listing—is necessary to ensure that important impacts are not ignored by decisionmakers.

In addition to properly accounting for direct benefits of reducing GHG emissions, it should also be noted that most climate policies will generate ancillary benefits, wholly apart from any effect tied to climate change. These ancillary benefits, which are not captured in SCC estimates, could be very large and will mostly accrue to current generations.[58] For example, measures that increase energy efficiency or encourage clean energy generation will also lead to reductions in local air pollutants, with attendant benefits for human health and ecosystems.[59] Other ancillary benefits include reduced ocean acidification and increased forest preservation.[60] Because the ancillary benefits of greenhouse gas reductions could represent an important component of total benefits, it is essential for rulemakings that use various SCC estimates not to omit significant ancillary benefits, but rather

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[55] EPA, DRAFT REGULATORY IMPACT ANALYSIS, *supra* note 10, at 691 tbl. 5.3-4.

[56] Exec. Order No. 12,866 § 6(3)(C), 58 Fed. Reg. 51,735, 51,741 (Oct. 4, 1993) (codified at 45 C.F.R. pt. 88).

[57] *See* CIRCULAR A-4, *supra* note 32, at 26.

[58] For example, some past attempts to quantify ancillary benefits of various climate policies have estimated the indirect benefits at anywhere from 30% to over 100% of total compliance costs. *See* ENV'T POL'Y COMM., ORG. FOR ECON. COOPERATION & DEV. (OECD), ENV/EPOC/GSP(2001)13/Final, ANCILLARY BENEFITS AND COSTS OF GHG MITIGATION: POLICY CONCLUSIONS 6 (2001), *available at* http://www.olis.oecd.org/olis/2001doc.nsf/LinkTo/NT00000ABA/$FILE/JT00124610.pdf

[59] A forthcoming working paper estimates that representative federal climate legislation would result in health-related co-benefits of $3 to $9 per ton of carbon dioxide avoided (due to reductions in conventional air pollutants). Britt Groosman et al., *The Ancillary Benefits from Reductions of Greenhouse Gas Emissions from Mobile and Electric Power Sources in the United States* (Middlebury College Dept. of Economics Working Paper, forthcoming 2009). Other studies, using different methodologies, have found similarly large benefits. *See* John Balbus et al., *A Wedge-Based Approach to Estimating Health Co-Benefits of Climate Change Mitigation Activities in the United States: Health Co-Benefits of Specific US Climate Activities* (estimating co-benefits for the year 2020 in the range of $29 and $68 per ton of carbon ($8 to $19 per ton of avoided CO2-equivalent ton)).

[60] For a more complete discussion of possible ancillary benefits, see ENV'T POL'Y COMM., ORG. FOR ECON. COOPERATION & DEV. (OECD), ENV/EPOC/GSP(2001)13/Final, ANCILLARY BENEFITS AND COSTS OF GHG MITIGATION: POLICY CONCLUSIONS 6 (2001), *available at* http://www.olis.oecd.org/olis/2001doc.nsf/LinkTo/NT00000ABA/$FILE/JT00124610.pdf

to identify and quantify them separately. In its proposed Renewable Fuel Standard, EPA has noted, for example, that switching to lower-carbon fuels will carry significant ancillary health benefits.[61] We encourage EPA to follow through on its promise to fully model, quantify, and monetize such benefits in its final rule.

Catastrophic Events and Irreversible Changes

Certain climatic events, even though they carry a very low probability chance of occurring, would impose catastrophic costs if they come to pass. For example, the planet may experience temperature "tipping points," when the environmental consequences of global warming will themselves begin to reinforce climatic changes. Polar ice currently reflects heat away from the planet's surface; if that ice melts as temperatures rise, more heat will be absorbed by newly exposed land and water, thereby dramatically speeding up global warming.[62] Similarly, if the oceanic heat and salinity dynamics change enough that entire ocean currents shift, the impact on worldwide weather patterns could be unprecedented and unpredictable.[63]

Besides carrying enormous costs, such changes would be irreversible over relevant timeframes. EPA noted several examples of such catastrophic, irreversible events in its proposed regulation, but indicated no affirmative plan to incorporate them into the SCC it applies in the final regulation.[64]

Because there is no consensus regarding how to value such high-impact/low-probability damages, they have been excluded from past SCC calculations. This failure to account appropriately for irreversible catastrophic risk skews SCC estimates, however, because some of the most economically relevant rationales for moving forward with greenhouse gas controls will be ignored. As EPA acknowledges in its proposed Renewable Fuel Standard regulations, the same rationale that encourages individuals and firms to pay a premium to purchase insurance (i.e., risk aversion) justifies additional expenditures in the face of uncertainty, especially uncertainty about catastrophic losses.[65] In addition to their willingness to pay risk premiums, rational actors also place a value on preserving options in the face of uncertainty, and are willing to pay a further premium to preserve the option of avoiding an irreversible mistake.[66]

Economic tools do exist to account for irreversibility (such as option value methodology[67]) and for risk aversion to extreme catastrophic events.[68] The uncertainty and controversy surrounding such

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[61] *See* RFS Rule, *supra* note 2, at 25,097.

[62] *See* Timothy M. Lenton et al., *Tipping Elements in the Earth's Climate System*, 105 PROC. OF THE NAT'L ACAD. OF SCI. 1786 (2008).

[63] *See id.*

[64] *See* EPA, DRAFT REGULATORY IMPACT ANALYSIS, *supra* note 10, at 693-94; RFS Rule, *supra* note 2, at 25,094-95 (noting that "global meta-model" SCC yielded estimates "consistent with characterizations of the low probability high impact damages") EPA also noted in the proposed regulation and in its TSD ON BENEFITS, *supra* note 26, that it is aware of the analytical gap left by not accounting for catastrophic climate events.

[65] *See* RFS Rule, *supra* note 2, at 25,095; *see also* Nicholas Stern, *The Economics of Climate Change*, AM. ECON. REV., May 2008, at 1, 17, *available at* http://www.atypon-link.com/AEAP/doi/pdf/10.1257/aer.98.2.1 (explaining attitudes to risk).

[66] *See* Letter from Michael Livermore, Exec. Dir. of IPI, to Minerals Management Service, U.S. Dep't of Interior (Apr. 6, 2009) (discussing the problems of irreversibility and uncertainty with respect to valuing offshore natural resources, and the need to incorporate an options value framework into the federal oil and gas leasing program).

[67] *See id*; Jon Anda et al., *Economics of Climate Change under Uncertainty: Benefits of Flexibility*, 37 ENERGY POL'Y 1345 (2009); Andrea Baranzini et al., *The Impact of Possible Climate Catastrophes on Global Warming Policy*, 31 ENERGY POL'Y 691 (2003) (applying an options approach to cost-benefit analysis of climate policy, to account for uncertainty, irreversibility, and catastrophes).

methodologies are no greater than for other core elements of the SCC calculation, including the relationship between GHG concentrations and temperature rise. Though uncertainty can complicate economic analysis, uncertainty does not justify ignoring a significant element of a regulatory issue. Courts have repeatedly declared that "[t]he agency's job is to exercise its expertise to make tough choices about which of the competing estimates is most plausible, and to hazard a guess as to which is correct."[69] It is encouraging to see EPA's stated intent to explore modeling approaches to uncertainty valuation,[70] as well as EPA's request in more recent rulemakings for comments on the topic of catastrophic risks.[71] It is critical that EPA continue to move toward integration of the potentially catastrophic aspects of climate change risk into its SCC estimations. Merely acknowledging the limitation of current SCC methodologies is insufficient.

International and Domestic Valuations

Laudably, both EPA and the interagency SCC review emphasized that global estimates of the SCC—that is, global valuations of the benefits of reducing GHG emissions—are the appropriate and preferred figures to use. The indelible internationality of GHG emissions, their costs, and their consequences makes it critically important for EPA and other federal agencies to maintain this global orientation to SCC values.

EPA's proposed Renewable Fuel Standard regulations also present an estimate of the ratio of the domestic to the international SCC, which EPA puts at between four and seven percent, depending on factors such as discount rates.[72] EPA acknowledges that "it is difficult to estimate the actual ratio of total domestic benefits to total global benefits," and notes that the ratio it developed does not take account of the domestic benefits that will accrue as a result of fewer and less intensive military engagements abroad.[73] The decision to exclude this category of costs and benefits from the SCC is based primarily on the sheer unpredictability of where the United States might involve itself in resolving conflicts whose root cause can be traced to, for instance, famines or refugee swells arising from severe weather.[74]

This methodological decision is understandable, but does not trump the need for the domestic share of the value of GHG reductions to reflect all pathways through which international climate change events can affect the United States, including not just national security risks, but the

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[68] *See* Martin L. Weitzman, *On Modeling and Interpreting the Economics of Catastrophic Climate Change* (Harvard Univ. Working Paper, Feb. 2008), *available at* http://www.economics.harvard.edu/faculty/weitzman/files/modeling.pdf; Gary W. Yohe, *Lessons for Mitigation from the Foundations of Monetary Policy in the United States* in HUMAN INDUCED CLIMATE CHANGE: AN INTERDISCIPLINARY ASSESSMENT 294 (2007, Michael E. Schlensinger et al. eds.).

[69] *Pub. Citizen, Inc.*, 374 F.3d at 1221.

[70] RFS Rule, *supra* note 2, at 25,095.

[71] EPA-NHTSA Proposed Fuel Standard, *supra* note 41, at 327.

[72] RFS Rule, *supra* note 2, at 25,094.

[73] *Id.* at 25,095.

[74] For discussion of how climate change is expected to multiply bases for international conflict, see, for example, John M. Broder, *Climate Change Seen as Threat to U.S. Security*, N.Y. TIMES, Aug. 8, 2009; *Climate Change and Global Security: Challenges, Threats, and Global Opportunities: Hearing Before the S. Comm. on Foreign Relations*, 111th Cong. (2009) (statement of Vice Admiral Dennis McGinn), *available at* http://foreign.senate.gov/testimony/2009/McGinnTestimony090721p.pdf; U.S. GOV'T ACCOUNTABILITY OFFICE, KEY CHALLENGES REMAIN FOR DEVELOPING AND DEPLOYING ADVANCED ENERGY TECHNOLOGIES TO MEET FUTURE NEEDS (2006), *available at* http://www.gao.gov/new.items/d07106.pdf; GEN. CHARLES F. "CHUCK" WALD ET AL., CAN MILITARY ADVISORY BOARD, POWERING AMERICA'S DEFENSE: ENERGY AND THE RISKS TO NATIONAL SECURITY, at i, vii, x (2009), *available at* http://www.cna.org/documents/PoweringAmericasDefense.pdf; PETER SCHWARTZ & DOUG RANDALL, AN ABRUPT CLIMATE CHANGE SCENARIO AND ITS IMPLICATIONS FOR UNITED STATES NATIONAL SECURITY (2003).

transnational spread of infectious diseases, the worldwide disruption of agricultural production and water resources, the widespread loss of biodiversity, and market disruptions in agriculture, oil, or other commodities.[75]

Discounting

Discounting benefits to future generations is ethically problematic, and applying high discount rates is not economically justified in the case of climate change. The interagency SCC considers a range of discount rates, with three percent as a lower bound and five or seven percent as an upper bound.[76] Whereas a "3% rate is consistent with what a typical consumer might expect in the way of a risk free market return," EPA has explained that appropriate ranges for long-term, intergenerational discounting should make three percent an upper bound.[77] Thus, EPA's recent application of the interagency SCC figures in a separate rulemaking strains some of EPA's own premises for long-term and inter-generational discounting, namely incorporation of long-run economic uncertainty and the risk of high-impact climate damages (which could reduce or reverse economic growth). If EPA decides to make use of the interagency SCC figures in its final Renewable Fuel Standard rule, EPA should consider appropriate adjustments such that the range of discount rates—consistent with EPA and OMB methodological guidance—lies somewhere between zero and three percent.[78] In addition, EPA should also investigate non-constant rate discounting methodologies, such as hyperbolic discounting rates, as well as alternative ethical frameworks for understanding obligations to future generations.

Selecting the Proper Range of Estimates

Finally, EPA should exercise caution when selecting what range of SCC estimates to apply. The interagency review process developed a range of four estimates, representing mean, model-weighted valued, calculated under four different assumptions about discount rates. In recent rulemakings, some agencies have also used a fifth figure, averaging two of those previous four estimates.[79] We have two separate concerns with such an approach.

First, taking a straight arithmetic mean of two model-weighted SCC values (one based on a 3% discount rate, the other on a 5% discount rate) is problematic. Given the compelling arguments for choosing a lower discount rate, an equal weighting of these discount rates may not be justified, and analysts should consider putting more weight on SCC estimates that rely on lower discount rates. Even setting aside such judgments, however, the arithmetic mean is the wrong number to use. As the economics literature on this subject has made clear, in the presence of uncertainty over discount rates, the correct approach is to average discount *factors* rather than discount *rates*.[80] Thus the correct average of a 3% and 5% discount rate, for benefits accruing a century from now, is 3.6%—not 4%. By extension, it is incorrect to take the simple average of two SCC estimates based on different discount rates. We would advise EPA against taking such an approach in its final

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[75] *See* Jody Freeman & Andrew Guzman, *Seawalls Are Not Enough: Climate Change and U.S. Interests* 7 (U.C. Berkeley Pub. L. Res. Paper No. 1357690, 2009).

[76] EPA-NHTSA Proposed Fuel Standard, *supra* note 41, at 51 n.57.

[77] TSD ON BENEFITS, *supra* note 26, at 9.

[78] *See* RFS Rule, *supra* note2, at 25,096, *referencing* CIRCULAR A-4, *supra* note 32 & TSD ON BENEFITS, *supra* note 26, at 9.

[79] *See* Energy Conservation Program: Energy Conservation Standards for Refrigerated Bottled or Canned Beverage Vending Machines, 74 Fed. Reg. 44913, 44947 (Aug. 31, 2009) (to be codified at 10 C.F.R. pt. 431) (selecting $19 as the Department of Energy's preferred SCC figure).

[80] *See* Martin Weitzman, *Review of the Stern Review on the Economics of Climate Change,* J. ECON. LIT. 45(2007), at 709.

Renewable Fuel Standard rule.

Second, by focusing on means, the interagency review process has produced a relatively narrow and seemingly consistent range: from $5 to $55 for year 2007 emissions.[81] By comparison, EPA previously looked at the 5th percentile and 95th percentile figures as well as means, and found a possible range of -$6 to $695 for year 2007 emissions (with a mean of around $17 to $88).[82] EPA's earlier figures suggest a very wide dispersion, with at least a few estimates falling significantly above the mean. By focusing only on the means, the interagency review process obscures the wide dispersion in estimates of the social cost of carbon, and overlooks the possibility that estimates could be much higher.

Given how uncertain the SCC estimates are, and given how likely the SCC estimates are to be understated, it is important for analysts using the interagency review process to consider whether a focus on model-weighted means is most appropriate and useful. A more rigorous approach might consider conducting a sensitivity analysis to capture the implications of SCC values throughout a wider range, including much higher values. Another potentially useful technique is to calculate the "breakeven SCC" (the SCC at which estimated benefits of the policy would exactly equate with estimated costs) and analyze where that value falls compared to the selected range of SCC estimates.

Conclusion

EPA notes that, "to [its] knowledge, the GHG reduction thresholds presented in EISA are the first lifecycle GHG performance requirements included in federal law."[83] Similarly, the Renewable Fuel Standard regulations will be one of the first times EPA has used the social cost of carbon in a final rulemaking. Because the Renewable Fuel Standard regulations are sure to serve as precedent both for future EPA rulemakings and, more generally, for future actions by the federal government on GHG reductions, it is crucial for EPA to follow best practices of law and economics. When EPA finalizes its Renewable Fuel Standard rule, we hope the agency will continue to address all significant indirect impacts and will continue to demonstrate sound judgment when calculating the full benefits of GHG reductions.

Sincerely,

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[81] *See* EPA-NHTSA Proposed Fuel Standard, *supra* note 41, at 51

[82] *See* TSD ON BENEFITS, *supra* note 26, at 11.

[83] RFS Rule, *supra* note 2, at 25,021.