State of West Virginia
Office of the Attorney General
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Ann Carlson
Acting Administrator, National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Submitted Electronically via Regulations.gov

Re: Comments on Proposed Rulemaking, "Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027–2032 and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030–2035" by West Virginia and 25 other States (Docket No. NHTSA-2023-0022)

Dear Acting Administrator Carlson:

We appreciate the opportunity to comment on NHTSA's newest fuel economy standards proposal. *See Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027–2032 and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030–2035*, 88 Fed. Reg. 56,128 (Aug. 17, 2023) (Proposed Rule). Like its previous iterations, the Proposed Rule violates multiple statutes and is arbitrary and capricious. NHTSA should not issue this version. We urge the Administration to revise the proposal to reflect real-world realities and the constraints and priorities that Congress set.

BACKGROUND

Since 1975, Congress has tasked the Secretary of Transportation with setting "average fuel economy standards for automobiles" under the Energy Policy and Conservation Act (EPCA). 49 U.S.C. § 32902(a). The Secretary delegated that task to NHTSA, 49 C.F.R. § 1.95, so for years the Administration has set the "maximum feasible average fuel economy level" that "manufacturers can achieve" for various vehicle categories each model year. 49 U.S.C. § 32902(a); *see also id.* § 32902(b)(1). NHTSA gets to the formula for these "CAFE standards" by weighing factors such as technological feasibility, economic practicability, other regulatory standards, and energy conservation. *Id.* § 32902(f) (factors for passenger cars and light trucks (PCLTs)); *see also id.* § 32902(k) (similar for heavy-duty pickups and vans (HDPUVs)).

Congress put several limits on NHTSA's analysis. NHTSA "*may not* consider the fuel economy of dedicated automobiles," 49 U.S.C. § 32902(h)(1) (emphasis added), including electric

vehicles (EVs), *id.* § 32901(a)(1)(J), (a)(8). It "shall consider dual fueled automobiles"—like hybrid vehicles, *id.* § 32901(a)(9)—"to be operated *only* on gasoline or diesel fuel." *Id.* § 32902(h)(2) (emphasis added). And it *may not* consider "the trading, transferring, or availability of credits under section 32903." *Id.* § 32902(h)(3). Together, these limits mean that NHTSA must act "without regard to the penetration of alternative fuel vehicles in any manufacturer's fleet." 134 CONG. REC. H8089-02, 25124 (1988) (statement of Rep. Dingell).

Though NHTSA and EPA issued fuel economy and tailpipe emissions rules together for many years, the agencies recently split the rulemakings apart—evidently because EPA didn't want to be weighed down by Section 32902(h). From all appearances, this decision seems motivated by a desire from both agencies to push vehicle fleet electrification more aggressively. The result has been several improper EPA and NHTSA rules that remain tied up in legal challenges.

Unfortunately, the Proposed Rule appears destined for the same end. Designed to cover model years 2027 to 2032, the proposal follows the "same general"—and flawed—"framework" as recent CAFE standards rules. 88 Fed. Reg. at 56,138. It uses extensive modelling (the "CAFE model") to first establish a "regulatory baseline"—a picture of the world without CAFE standards. It then considers several regulatory alternatives with varying levels of severity and predicts how manufacturers and consumers would react to them. The model uses "input files" to measure things like economic and environmental data, technology options, and market conditions. It then picks the regulatory alternative for each category of vehicle that it believes best satisfies the statutory factors. Here, every input file NHTSA used included EVs, total fuel economy for dual-fuel vehicles, and CAFE fuel economy credits—in other words, everything Section 32902(h) forbids. At every phase of its analysis, NHTSA also incorporated various zero-emission-vehicle (ZEV) mandates from California and other States. And it wrapped up the Proposed Rule with a cost-benefit analysis focused largely on the social cost of greenhouse gases and the benefits of increased electrification. None of this will pass muster.[1]

DISCUSSION

I. The Proposed Rule Violates 49 U.S.C. § 32902(h).

When Congress forbids "an agency from taking an action, the agency cannot so act." *Judge Rotenberg Educ. Ctr., Inc. v. FDA*, 3 F.4th 390, 399 (D.C. Cir. 2021). An agency also can't "circumvent specific statutory limits on its actions by relying on separate, general rulemaking authority." *Air All. Hous. v. EPA*, 906 F.3d 1049, 1061 (D.C. Cir. 2018). So whenever NHTSA sets CAFE standards, it must comply with the strict limits in Section 32902(h): It cannot consider

[1] The undersigned States also object to NHTSA's 15-page limit for comments pursuant to 49 C.F.R. § 553.21. 88 Fed. Reg. at 56,374. None of the statutes that rule cites as authority allows for arbitrarily limiting public participation in this way. To the contrary, this action is subject to 5 U.S.C. § 553(c)'s mandatory opportunity for public comment, 49 U.S.C. § 32902(c) —and Section 553 allows for no page limits on its face. Because judicial review is usually limited to concerns raised during the comment period and arbitrary-and-capricious review often turns on how agencies respond to public comments, *City of Portland v. EPA*, 507 F.3d 706, 713 (D.C. Cir. 2007), limiting submissions may unlawfully restrict the public's right to meaningfully participate and lower NHTSA's burden to justify its decision.

electric vehicles' fuel economy. Nor can it consider hybrid vehicles' non-traditional fuel operations, nor CAFE fuel economy credits. *Id.* Yet the Proposed Rule does all three.

A. *The Proposed Rule wrongly considers EVs' fuel economy.*

NHTSA "may not consider the fuel economy of dedicated automobiles." 49 U.S.C. § 32902(h)(1). Dedicated automobiles mean those operating on alternative fuels—including electricity. *Id.* § 32901(a)(1)(j), (a)(8). This straightforward directive means NHTSA may not use EVs' fuel economy as part of its CAFE standards analysis.

Start with Section (h)(1)'s verb phrase, "may not consider." Those words are broad. "May not" is "mandatory language." *United States v. Palomar-Santiago*, 141 S. Ct. 1615, 1620-21 (2021). The phrase leaves NHTSA with "no discretion." *Ass'n of Civilian Technicians, Mont. Air Chapter No. 29 v. FLRA*, 22 F.3d 1150, 1153 (D.C. Cir. 1994). Moving to "consider," courts use "ordinary, contemporary, common meaning" for undefined statutory terms like this. *Guedes v. ATF*, 45 F.4th 306, 315 n.3 (D.C. Cir. 2022). And the average person uses "consider" to mean "think about," no matter how dispositive (or not) that consideration ultimately proves. Case law is the same: The Supreme Court says that to take consideration of something is to take "heed[]" of it, *Sec'y of Agric. v. Cent. Roig Ref. Co.*, 338 U.S. 604, 611-12 (1950), and that something considered is "taken into account" or "included," *Neb. Dep't of Rev. v. Loewenstein*, 513 U.S. 123, 128 (1994). Similarly, the Fifth Circuit defined "consider" as "to think over, meditate or reflect on, bestow attentive thought upon, give heed to, take note of." *ExxonMobil Pipeline Co. v. U.S. Dep't of Transp.*, 867 F.3d 564, 573 (5th Cir. 2017) (using the Oxford English Dictionary and Merriam-Webster's College Dictionary); *accord MK Hillside Partners v. Comm'r of Internal Rev.*, 826 F.3d 1200, 1205 (9th Cir. 2016). So the plain meaning of "may not consider" is that in setting CAFE standards, NHTSA cannot account for EV fuel economy—period.

Yet EVs permeate NHTSA's analysis from beginning to end. Every one of the input files the Proposed Rule used to inform the CAFE model takes note of EVs. *E.g.*, 88 Fed. Reg. at 56,206, 56,158, 56,179, 56,279. For example, EV penetration is a significant part of NHTSA's baseline analysis—by 2032, NHTSA assumes, one third of the fleet will be "zero" in the fuel-economy ledger. *Id.* at 56,279. NHTSA contemplated a dozen plug-in and battery options for PCLTs and HDPUVs. *Id.* at 56,156 (explicitly including "electrification" in the technology options); *accord id.* at 56,158-59. And it assumed Inflation Reduction Act tax credits for EVs and the "Petroleum Equivalency Factor," which measures "EV fuel economy values." *Id.* at 56,155.

See, too, the large role that "state ZEV requirements" play in the Proposed Rule's analysis. 88 Fed. Reg. at 56,176. Set aside for a moment that NHTSA arbitrarily ignored any possibility that legal challenges to the 2022 CAFE standards for improperly considering ZEV programs will succeed. *Id.* at 56,176. The analysis here doubles down, incorporating three ZEV programs, *e.g.*, *id.* at 56,162, because NHTSA is "confident that manufacturers will comply with the ZEV programs because they have … in the past" and they have shown "an intent to comply" going forward. *Id.* at 56,176; *see also id.* at 56,260 (reiterating these assumptions). NHTSA also considered the fact that other States are adopting their own ZEV programs or signing onto California's. *Id.* at 56,176. The proposal discusses for several pages ZEV programs and their

likely effects on America's vehicle fleet. *E.g.*, *id.* at 56,176-79. And it admits that to meet the Proposed Rule's standards, manufacturers will have to ask: "What new [EVs] do I need to build in order to satisfy anticipated manufacturer compliance with state ZEV mandates?" *Id.* at 56,260.

Beyond state ZEV mandates, NHTSA also incorporates EPA's tailpipe emissions standards. The CAFE Model, NHTSA says, will "estimate manufacturers' potential responses to new … GHG standards." 88 Fed. Reg. at 56,145; *accord id.* at 56,146 n.54, 56,148-49. And it defines fuel-economy-improving technologies to include tailpipe-emission standards for various categories of vehicles. *Id.* at 56,156 & n.84. Because "NHTSA coordinated with EPA in developing" the Proposed Rule "to avoid inconsistencies," *id.* at 56,139, it assumes the Proposed Rule will "complement and align with the" tailpipe emissions standards, Press Release, NHTSA, USDOT Proposes Updated Fuel Economy Standards to Strengthen Energy Security, Save Americans Hundreds of Dollars at the Gas Pump (July 28, 2023), https://tinyurl.com/3rm3hfrs.

The problems don't stop with how often NHTSA considered EVs generally, but also spread to how much *weight* it gave to predictions about EVs' effects on average fuel economy. NHTSA programmed the CAFE model to assume that manufacturers will turn every internal combustion engine vehicle into a ZEV at the "first redesign opportunity." 88 Fed. Reg. at 56,162. And NHTSA isn't assuming redesigns to plug-in vehicles—it went straight to battery-operated vehicles "as ZEV conversions." *Id.* at 56,177. It also refused to "consider the potential that other technologies could be applied toward compliance with CAFE" or HDPUV standards until after converting all possible vehicles to a ZEV. *Id.* at 56,148. In other words, everything in the CAFE model assumes the fastest possible adoption of electrification: "[N]early all of [NHTSA's] inputs are set at levels that *do not limit the simulation at all*." *Id.* at 56,183 (emphasis added).

So the result is the same whichever synonym of "consider" a reviewing court picks: The Proposed Rule improperly considers EVs' fuel economy. It includes EV fuel economy in its baseline. It contemplates EVs as a technology compliance option. It reflects on the effects of EV-fuel-economy-related tax credits. It leans heavily on state ZEV programs and manufacturers' predicted compliance. And it takes account of EPA's tailpipe emissions rules that incorporate EV fuel economy, even though EPA decoupled that rulemaking from this one precisely because NHTSA faces statutory constraints on that same score. NHTSA is plainly *considering* EV fuel economy. This statutory violation is reason enough to reconsider the Proposed Rule.

The Proposed Rule's attempts to get around the statutory text fail. Most of them boil down to this: Including EV fuel economy in the baseline "is crucial" because doing so paints "a more realistic picture of the state of fuel economy" for its "starting point for determining what further efficiency gains will be feasible during the rulemaking timeframe." 88 Fed. Reg. at 56,140, 56,201. Yet this explanation isn't a textual argument so much as a (purportedly) pragmatic one: NHTSA *has* to consider EVs because anything else would ignore the real world. *See, e.g.*, *id.* at 56,201 (insisting it must consider EVs "in the analysis"), 56,319 (declining to "pretend[]" that EVs "do not exist" because it cannot "fulfill [its] statutory mandate … without understanding these real-world baseline effects"). But Congress said otherwise—it told NHTSA to remove EVs and their fuel economy from the analysis in this specific rulemaking endeavor.

NHTSA also tries to reinterpret Section (h)(1) to mean only that EVs "are not a *compliance option* during the standard setting years." 88 Fed. Reg. at 56,278 (emphasis added). The Proposed Rule insists, however, that including EVs at every step of the *modeling process* is "consistent with statutory constraints." *Id.* at 56,156. It's difficult to square focusing on EVs throughout the analysis with the statutory command not to "consider" the factor. The analysis faces internal hurdles, too. During the "standard setting years" where NHTSA agrees EVs are out-of-bounds, it still considers them in material ways; it includes battery-operated vehicles in its baselines and "account[s] for manufacturers' expected response to state ZEV mandates." *Id.* at 56,279. And even when NHTSA properly acknowledges that it lacks the "ability to consider the possibility that manufacturers would comply with CAFE standards by implementing some electrification technologies," it contradictorily includes those electrification technologies anyway because it thinks it "must" "appropriately represent the diversity of current and anticipated future technology options." *Id.* at 56,156. In other words, this internally inconsistent reasoning lets the Proposed Rule read Section (h)(1) just to prevent "NHTSA from setting CAFE standards that effectively require *additional* application of" EVs. *Id.* at 56,319.

These approaches to Section (h)(1) are variations on a theme. And none stands up to fair statutory scrutiny.

Generally, of course, agency "model assumptions must have a rational relationship to the real world." *Appalachian Power Co. v. EPA*, 249 F.3d 1032, 1053 (D.C. Cir. 2001) (cleaned up). And "Congress rarely explicitly forbids an agency from considering a decisional factor that is logically relevant to a decision or class of decisions." Richard J. Pierce, Jr., *What Factors Can an Agency Consider in Making A Decision?*, 2009 MICH. ST. L. REV. 67, 71 (2009). But the default changes when Congress does "explicitly forbid[]" considering an otherwise "logically relevant decisional factor." *Id.* Indeed, the Supreme Court has repeatedly held that it's unlawful for an agency to rely "on factors which Congress has not intended it to consider." *Motor Vehicle Ass'n v. State Farm Mut. Auto. Ins.*, 463 U.S. 29, 43 (1983). The Court takes the issue of adhering to an agency's authorizing statutes so seriously that it has even held agency regulations invalid when they consider factors Congress has forbidden *implicitly*. *See*, *e.g.*, *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 472 (2001).

These concerns are all the more pressing where disregarding the text's limits would thwart Congress's other goals. Here, one major reason for excluding EV fuel economy was protecting Congress's incentives for alternative-fuel vehicles. Section 32902(h)'s language first appeared in a bill intended to "facilitate the development and use of alternative fuels." H.R. REP. NO. 100-929, at 15 (1988) (Conf. Rep.). Congress was concerned that "manufacturers taking advantage of the [bill's] incentives" would face "commensurate increases in the [fuel-economy] standard." 134 CONG. REC. H8089-02, 25124 (1988) (statement of Rep. Dingell). So it crafted the precursor to Section 32902(h) to ensure that the "incentives provided by [alternative-fuel legislation] are not erased" by setting "CAFE standard for cars or trucks at a level that assumes a certain penetration of alternative fueled vehicles." *Id.*

Similarly, the Proposed Rule frustrates the Renewable Fuel Standards program. Congress intended that program to act as "market forcing policy," increasing renewable fuels' use across the

country. *Growth Energy v. EPA*, 5 F.4th 1, 33 (D.C. Cir. 2021). And it's worked: The program has reduced air pollution and oil imports and created American jobs. *See Renewable Fuel Standard*, RENEWABLE FUELS ASS'N, https://bit.ly/3TWyRxa (last visited Oct. 13, 2023). But considering EVs as the chief compliance option in NHTSA's analysis is at odds with promoting renewable fuels. When two regulatory systems apply to the same "subject matter, they are to be reconciled and, to the extent possible, both given effect." *Pennsylvania v. ICC*, 561 F.2d 278, 292 (D.C. Cir. 1977). Not "considering" EVs' fuel economy, as Congress directed, does just that. Yet NHTSA does not even mention the damage it does to the Renewable Fuel Standards program along the way toward leaving its own statutory limits behind.

Further, Congress knew how to create exceptions in this area of the law because the first version of Section (h)(1) did just that. *See* Pub. L. No. 100-494, sec. 4(a), § 400AA(a)(2), 102 Stat. 2441, 2442 (codified at 42 U.S.C. § 6374(a)(2)). But Congress didn't keep that exception in EPCA. Agencies can't "add words to the law to produce" their preferred result. *EEOC v. Abercrombie & Fitch Stores, Inc.*, 575 U.S. 768, 774 (2015); ANTONIN SCALIA & BRYAN GARNER, READING LAW: THE INTERPRETATION OF LEGAL TEXTS 93 (2012) (saying agencies can't "supply" words Congress "omitted"). Much less where Congress amends a statute to make the agency's read even less plausible: Courts "presume [Congress] intends its amendment to have real and substantial effect." *Pierce Cnty. v. Guillen*, 537 U.S. 129, 145 (2003) (cleaned up). Here, Congress's plain, unqualified language shows it wants EV fuel economy playing no role in the CAFE-standard-setting process—not in the baseline, not in technology options, and not in compliance paths.

And lastly, the Proposed Rule ignores that NHTSA needs more than a "plausible textual basis" to issue rules that, as here, implicate significant political and economic issues. *West Virginia v. EPA*, 142 S. Ct. 2587, 2609 (2022). The Proposed Rule appears to be NHTSA's latest attempt to come in line with President Biden's "whole of government" approach to his administration's aggressive climate goals. White House Climate Adviser Ali Zaidi proclaimed that NHTSA's CAFE Standards are in part responsible for the United States "becoming the literal number one destination for private investment on EVs." Riley Beggin, DETROIT NEWS, *NHTSA proposes cutting fuel use almost in half by 2035* (July 28, 2023, 7:34 p.m.), https://tinyurl.com/mvfhn6wd. Indeed, the White House sees the Proposed Rule's central purpose as "accelerat[ing] EV investments in the United States." *Id.* NHTSA thinks that the Proposed Rule will do that by increasing hybrid EVs' market penetration by nearly 20%. 88 Fed. Reg. at 56,278-79. And it even admits that massive EV increases are *necessary* to comply with the Proposed Rule—after all, "manufacturers will find it difficult to improve fuel economy with [internal combustion] engine technologies." *Id.* at 56,259.

In short, this proposal is about transforming the American auto markets to lead with EVs. It aims to morph a longstanding scheme to regulate internal combustion engine vehicles into one that erases them from the market. So it's part of a broader federal plan to "substantially restructure" a crucial sector of our economy. *West Virginia*, 142 S. Ct. at 2610. Yet the Proposed Rule does not reckon with the Supreme Court's recent rebukes of similarly transformative regulatory power grabs in any of its 263 Federal Register pages. *E.g.*, *Utility Air Regul. Grp. v.*

EPA, 573 U.S. 302, 324 (2014). In reality, major questions often follow "transformative expansion[s]" of agency power like this. *West Virginia*, 142 S. Ct. at 2610 (cleaned up).

Some of the other indicators that made *West Virginia* "a relatively easy case for the [major questions] doctrine's application" are present here, too. 142 S. Ct. at 2621 (Gorsuch, J., concurring). The "serious[ness] [of] the problem"—in both cases, climate-change policy—doesn't excuse an attempt to exert authority in a way "that is inconsistent with the administrative structure that Congress enacted into law." *FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120, 125 (2000) (cleaned up). Rather, regulating in an area that remains "the subject of an earnest and profound" national debate should counsel more restraint, not less. *West Virginia*, 142 S. Ct at 2614 (cleaned up). The Proposed Rule also implicates "question[s] of deep economic and political significance." *King v. Burwell*, 576 U.S. 473, 486 (2015) (cleaned up). Over 90% of American households own cars, so a rule affecting so many people is bound to collide with "a significant portion of the American economy." *West Virginia*, 142 S. Ct. at 2608 (cleaned up). A reviewing court would thus likely hold that forcing electrification is a major question. Because the Proposed Rule doesn't explain how Congress made it "clea[r]" that the CAA "authoriz[es] [the] agency to exercise powers of [such] vast economic and political significance," *Ala. Ass'n of Realtors v. HHS*, 141 S. Ct. 2485, 2489 (2021) (cleaned up), finalizing it would put NHTSA on thin ice.

All of these factors show how the Proposed Rule is likely to see the same end as other rules that ignored what Congress did and did not direct the agency to consider. When NHTSA tried to manufacture an exception to the Odometer Act for older vehicles, for example, the Seventh Circuit held the rule unlawful because it, "in effect, repeal[ed] a portion of the statute." *Diersen v. Chi. Car Exch.*, 110 F.3d 481, 487 (7th Cir. 1997). Despite perhaps "good policy reasons for exempting older vehicles from the requirements of the Act," "that determination is *legislative* in nature." *Id.* (emphasis added). The Ninth Circuit also rebuked EPA when it tried a similar gambit to get around strict language in 21 U.S.C. § 348(c)(3) that says EPA cannot deem an additive safe if it finds it "induce[s] cancer." EPA had fashioned an extra-textual exception allowing it to permit "the use of carcinogenic food additives which [EPA] finds to present only a de minimis or negligible risk of causing cancer"—it argued that interpretation was "necessary in order to bring about a more sensible application of the regulatory scheme." *Les v. Reilly*, 968 F.2d 985, 988, 990 (9th Cir. 1992). The Court disagreed: An agency may think it has a "more enlightened system than that which Congress established," *id.* at 990, but "clear and mandatory" statutory language leaves it "no discretion," *id*. at 988 (citing *Pub. Citizen v. Young*, 831 F.2d 1108, 1123 (D.C. Cir. 1987)).

So too here. NHTSA may dislike the statutory bar on considering EV fuel economy. But "right or wrong," the choice was Congress's—and "that is the end of the matter." *Orca Bay Seafoods v. Nw. Truck Sales, Inc.*, 32 F.3d 433, 436-37 (9th Cir. 1994) (rejecting NHTSA's purported policy "wisdom" and invalidating rule that was "contrary to the will of Congress as expressed in the governing statute"). Policy disagreement is no "license" to "rewrite [Section (h)(1)]." *Mova Pharm. Corp. v. Shalala*, 140 F.3d 1060, 1068 (D.C. Cir. 1998). Nor can agencies "expand [their] power in the face of a congressional limitation." *La. Pub. Serv. Comm'n v. FCC*, 476 U.S. 355, 357 (1986); *see also, e.g.*, *Mozilla Corp. v. FCC*, 940 F.3d 1, 83 (D.C. Cir. 2019) ("No matter how desirous of protecting their policy judgments, agency officials cannot invest themselves with power that Congress has not conferred."). If NHTSA truly believes "it would be

remiss" if it "fail[ed] to account for" EVs throughout the CAFE model, 88 Fed. Reg. at 56,330 n.578, then it should "take its concerns to Congress." *Nat. Res. Def. Council v. EPA*, 643 F.3d 311, 323 (D.C. Cir. 2011) (cleaned up). Until then—even if it thinks applying the law Congress wrote comes at the expense of considering "real world" data—NHTSA must consider *only* the factors Congress set. *Pub. Citizen, Inc. v. NHTSA*, 374 F.3d 1251, 1258-59 (D.C. Cir. 2004). The Proposed Rule does not.

B. *The Proposed Rule wrongly considers dual-fueled vehicles and CAFE credits.*

Beyond not considering electric vehicles in its analysis, NHTSA also must "consider dual fueled automobiles to be operated *only on gasoline or diesel fuel*," 49 U.S.C. § 32902(h)(2) (emphasis added). And NHTSA "may not consider, when prescribing a fuel economy standard, the trading, transferring, or availability of credits under section 32903." *Id.* § 32902(h)(3). But as with the limit on EVs, NHTSA notes these commands, but ultimately ignores them. Its mistakes under Sections (h)(2)-(3) closely track its errors under Section (h)(1), so we will not repeat all that analysis here. But a few additional facts highlight where the Proposed Rule goes wrong.

Dual-fueled vehicles. NHTSA uses two "technology effectiveness charts" to handle the dual-fuel question: the "Unconstrained" and the "Standard Setting" charts. 88 Fed. Reg. at 56,184. "The 'Unconstrained' charts show the effectiveness values modeled for the technologies without the 49 U.S.C. 32902(h) constraints; for example, PHEV [plug-in hybrid electric vehicle] technologies show effectiveness for their full dual fuel use functionality." *Id.* NHTSA uses this chart "for all" years outside the model years it assesses in the Proposed Rule. *Id.* It uses similar reasoning to justify including total fuel economy for PHEVs in its initial calculation, too. *Id.* In other words, though Congress instructed the agency to *ignore* non-gasoline and -diesel capabilities, the Proposed Rule bends over backwards to include them in multiple parts of its model. A rule that rejects express statutory constraints cannot stand.

CAFE Credits. NHTSA acknowledges, as it must, that Section (h)(3) says it can't use "CAFE credits," 88 Fed. Reg. at 56,321—that is, offsets manufacturers can use to help their compliance in one area based on exceeding average fuel economy standards in another. This restriction helps ensure that NHTSA focuses on realistic and achievable standards in each part of its analysis, rather than relying on some fleet efficiency gains to justify impossible-to-meet standards. But as with EVs and dual-fuel vehicles, NHTSA claims that Congress's prohibition applies only during the model years "for which NHTSA is issuing new standards." *Id.* So the Proposed Rule explicitly includes CAFE credits in its "Unconstrained" modeling to cover non-standard-setting years. *Id.* And it surreptitiously includes CAFE credits in various places of its baseline and other analyses, too. *See, e.g., id.* at 56,155 (noting that the input file includes "data about how fuel economy credits … are simulated in the model"). As with EVs, NHTSA ultimately explains that it ignores Section (h)(3) because it needs to consider "the real-world environmental consequences of the Proposed" Rule. *Id.* at 56,321. But for all the reasons already explained, NHTSA has no leeway to ignore Congress's judgments and chart its own course.

At bottom, NHTSA makes all the same mistakes with Sections (h)(2)-(3) that it made with Section (h)(1). But the language in the latter subdivisions is just as strong as in the first: Section

(h)(2) says NHTSA "shall" make the calculation as Congress has demanded; and Section (h)(3) uses the same "may not consider" formula as Section (h)(1). Especially given the importance of dual-fuel vehicle's total fuel economy and CAFE credits to the Proposed Rule, *see*, *e.g.*, 88 Fed. Reg. at 56,176, these errors are fatal. A "model is only as good as the data and assumptions that go into it." *Id.* at 56,155. NHTSA's modeling here—taking into account precisely what Congress said it could not—is no good at all.

II. Incorporating State ZEV Programs Into The Proposed Rule Violates EPCA's Preemption Provision.

Under EPCA, States may not adopt or enforce any "law or regulation related to fuel economy standards." 49 U.S.C. § 32919(a). In the preemption context, "related to" is "deliberately expansive." *Morales v. Trans World Airlines, Inc.*, 504 U.S. 374, 384 (1992) (collecting cases). A state law is therefore "related to" fuel economy standards "if it has a connection with, or reference to" it. *Id.* (citation omitted). NHTSA has previously applied that standard to say that state regulations limiting CO_2 are "related to" fuel economy standards. 84 Fed. Reg. 51,310, 51,314 (Sept. 27, 2019); 71 Fed. Reg. 17,566, 17,654 (Apr. 6, 2006). And California's ZEV program is designed to do exactly that. *Zero-Emission Vehicle Program*, CAL. AIR RES. BD., http://bit.ly/3ArCT9R (last visited Oct. 13, 2023). So one would think that California's program and others like it are "related to" fuel economy standards. But the agency refuses to "tak[e] a position on whether" ZEV "programs are preempted" here. 88 Fed. Reg. at 56,316. NHTSA is wrong. ZEV programs relate to fuel economy standards, so incorporating them into the Proposed Rule turns Congress's preemption judgment upside down.

And make no mistake: NHTSA isn't just refusing to weigh in on a separate issue whether California and other States can enforce ZEV programs. The Proposed Rule uses the results of those efforts to set "the state of the world." 88 Fed. Reg. at 56,140. In other words, Congress can sometimes "impose its will on the States" through preemption. *Gregory v. Ashcroft*, 501 U.S. 452, 460 (1991). It did so here. But NHTSA excuses state-level intrusions when they serve the agency's overall ends: It *welcomes* programs like California's because they are not constrained by the statutes NHTSA is, so they can be more aggressive. And then, rather than regulating within the limits Congress set under EPCA, NHTSA can co-opt state ZEV programs into its baseline "state of the world" to set standards more stringent than it could without that "status quo."

NHTSA can't interpret Section (h)(1) to give it the "power to do indirectly what it cannot do directly." *Civ. Aeronautics Bd. v. Delta Air Lines, Inc.*, 367 U.S. 316, 328 (1961). A California-centric notion of "reverse preemption" does just that. *See, e.g., In re Grand Jury Proc.*, 450 F. Supp. 2d 115, 116 (D. Me. 2006) (describing "a kind of reverse preemption" in which "stricter" state standards prevail over federal ones). It effectively writes California's preferences into the Federal Register at the expense of Congress's. So as some States impose stricter and stricter regulations, federal law becomes less careful balancing exercise, more rubberstamp for extreme regulatory positions.

This deference to certain State's policy preferences is contrary to Section 32919(a). *See Nat'l Ass'n of Regul. Util. Comm'rs v. FERC*, 964 F.3d 1177, 1187 (D.C. Cir. 2020). And it

ignores the equal sovereignty doctrine too. *See, e.g.*, *Shelby Cnty., Ala. v. Holder*, 570 U.S. 529, 544 (2013) (cleaned up). Preemption, by definition, limits powers that the States would otherwise keep. But when it's done lawfully, Congress makes the call what policy should govern *nationwide*. Giving ZEV programs a special carveout from EPCA preemption provisions lets certain States' policy preferences control instead. The federal government can't play favorites among the States in this way. With no special "showing" that this disparate treatment is necessary (a question for Congress, in any event, not NHTSA), *Nw. Austin Mun. Util. Dist. No. One v. Holder*, 557 U.S. 193, 203 (2009), the Proposed Rule fails for this reason as well.

III. The Proposed Rule Is Arbitrary And Capricious.

The APA requires NHTSA "to engage in reasoned decisionmaking, and directs that agency actions be set aside if they are arbitrary or capricious." *Dep't of Homeland Sec. v. Regents of the Univ. of Cal.*, 140 S. Ct. 1891, 1905 (2020) (cleaned up). Courts ask whether the Proposed Rule "was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Id.* (cleaned up). NHTSA must therefore show that it "examined the relevant data and articulated a satisfactory explanation for [its] decision, including a rational connection between the facts found and the choice made." *Dep't of Com. v. New York*, 139 S. Ct. 2551, 2569 (2019) (cleaned up). "Unsubstantiated or bare assumptions" won't do. *Nat. Res. Def. Council v. EPA*, 31 F.4th 1203, 1207 (9th Cir. 2022) (cleaned up). The Proposed Rule fails this review: NHTSA built it on faulty premises and inaccurate cost-benefit projections, and it ignored critical aspects of the problem that make the Proposed Rule's world unrealistic and dangerous.[2]

A. *NHTSA's cost-benefit analysis is flawed.*

Over the next three decades, NHTSA says, the Proposed Rule's PCLT provisions will save 88 billion gallons of fuel, and its HDPUV provisions 2.6 billion gallons. 88 Fed. Reg. at 56,132. At the OMB-approved discount rate of 7%, NHTSA estimates that the Proposed Rule will save a net $9.8 billion by 2050. *Id.* at 56,139 ($8.4 billion from PCLT, and $1.4 billion from HDPUV). With PCLTs, NHTSA's analysis suggests consumers will save $100 in fuel costs over vehicle lifetime; and with HDPUVs, they'll save $300. *Id.* at 56,132. This all leads to projected average savings of $350 million per year. But NHTSA's cost-benefit analysis fails because it is shot through with uncertainties and overemphasizes the social costs of greenhouse gases (GHGs). (NHTSA also gives this analysis too little weight, calling it just one "data point" of many to consider. 88 Fed. Reg. at 56, 141.)

Uncertainty. Rules require some prediction and guesswork. But the Proposed Rule's cost-benefit analysis is unjustifiably weak when it comes to empirical support. As NHTSA admits, its success "ultimately depends on manufacturers' and consumers' responses to standards, technology

[2] The undersigned are aware of NHTSA's rule that "[i]ncorporation by reference should be avoided." 49 C.F.R. § 553.21. But given the same rule's page limit for comments, *id.*, we incorporate the more detailed discussions of the points below found in the Amicus Brief of West Virginia and 5 Other States in Support of Petitioners, *Texas v. EPA*, No. 22-1031 (D.C. Cir. Nov. 15, 2022), Doc. No. 1973638, and in the comment letter on the Tailpipe Emissions Rule, Dkt. No. EPA-HQ-OAR-2022-0829-0649 (May 5, 2023), submitted by West Virginia, Kentucky, and 23 other States on July 5, 2023, *available at* https://tinyurl.com/25veeswf; *see also* Brief for Appellees (Louisiana and 9 other States), *Louisiana v. Biden*, No. 23-30087 (5th Cir. June 16, 2022), Dkt. No. 101.

developments, economic conditions, fuel prices, and other factors." 88 Fed. Reg. at 56,138. But most of NHTSA's cost-benefit calculations seem to flow from sources like informal conversations with manufacturers and unnamed "literature." *See, e.g.*, *id.* at 56,164. This loose approach to evidence is a problem because, as NHTSA admits, the literature shows "considerable uncertainty" about "how much fuel economy consumers are willing to pay for and how consumers value other vehicle attributes." *Id.* at 56,183 n.187. Yet even according to NHTSA, everything depends on consumer response. *Id.* at 56,138. NHTSA also lacks good data at other crucial points in the analysis—such as financing and supply chain issues. *Id.* at 56,179 (noting that it has no "reliable method or source to estimate" how many EVs will justify IRA tax credits, so it makes "the simplifying assumption for modeling purposes that all" EVs will qualify); *id.* at 56,215 (admitting that "actual production data for specific battery manufacturing plants are extremely hard to obtain"). If there's less consumer demand because EVs prove to be more expensive, or less supply to meet demand because of supply constraints, then NHTSA's assumptions here would prove false. Finally, nowhere in the Proposed Rule does NHTSA explain how it considers life-cycle efficiency costs. And given that EVs tend to have more complicated powertrains than internal combustion vehicles—often leading to higher repair/replacement costs, Jim Henry, *Repairing An Electric Vehicle Could Cost More Than Gasoline Cars: A New Kind Of Sticker Shock*, FORBES (July 25, 2022), https://tinyurl.com/mr3eywnr—the life-cycle assessment is a crucial variable.

Social costs of GHGs. The Proposed Rule's climate benefits analysis is based in large part on "estimates of the social cost of each greenhouse gas." 88 Fed. Reg. at 56,141 n.40; *see also id.* at 56,142 n.42 & n.44, 56,143 n.46, 56,251. Yet despite being unable to better quantify climate damages, NHTSA gives these social cost projections a "considerably greater" role here than in previous CAFE standard rules. *Id.* at 56,150. As the undersigned States have also made plain in many challenges to these flawed calculations, the problems in using them "are legion." Benjamin Zycher, *The magic of the EPA's benefit/cost analysis*, HILL (June 3, 2016, 7:00 a.m.) https://tinyurl.com/zdkaeuva. Indeed, Dr. Anne E. Smith, an expert in economic and cost-benefit analysis, has opined that the social cost of carbon numbers "suffer from uncertainty, speculation, and lack of information"—especially the estimates NHTSA uses here, 88 Fed. Reg. at 56,251. Ex. A, Decl. of Anne E. Smith, Ph.D, in *Louisiana v. Biden*, No. 2:21-cv-01074 (W.D. La. July 27, 2021), Dkt. 56. We focus on two of those issues.

First, the Proposed Rule repeatedly strays from OMB Circular A-4's 7% discount rate for GHG emission reduction gains—despite acknowledging that it is bound by that same Circular. 88 Fed. Reg. at 56,145. Sometimes NHTSA waffles between discount rates, but for purported social costs benefits, it discounts them at only "a 3 percent rate." *Id.* at 56,252. Yet OMB recently confirmed that its 7% discount rate "remains in effect." WHITE HOUSE, DRAFT OMB CIRCULAR A-4 (Apr. 6, 2023), *available at* https://tinyurl.com/3ss6p5u6. So using a 3% rate isn't economically justified—NHTSA certainly does not explain how its decision is more than a ruse to help make its cost-benefit conclusion more palatable. Indeed, social costs of GHGs analyses are hyper-sensitive to discount rates—the costs piece can change from 30% to 80% with a new discount rate. Nicholas Lewis & Judith A. Curry, *The implications for climate sensitivity of AR5 forcing and heat uptake estimates*, 45 CLIMATE DYNAMICS 1009-23 (2015).

Second, the Proposed Rule inordinately focuses on global over domestic benefits. *See* 88 Fed. Reg. at 56,251 (training its climate benefits analysis on "changes in the global climate and resulting economic damages," and saying climate benefits "are best captured within global measures"); *accord id.* at 56,149, 56,292, 56,298, 56,322, 56,325-28. But nothing in EPCA authorizes NHTSA to take its CAFE standards cost-benefit analysis worldwide. And courts generally apply a presumption against extra-territoriality—meaning they generally limit statutes' application domestically. *See RJR Nabisco, Inc. v. Eur. Cmty.*, 579 U.S. 325, 335 (2016).

In short, NHTSA's cost-benefit analysis isn't "scientifically robust" or justified. Patrick J. Michaels & Paul C. Knappenberger, *You Ought to Have a Look: The Hows and Whys of the Social Cost of Carbon*, CATO INST. (June 13, 2016, 10:58 a.m.) https://tinyurl.com/5n6t5fe3; *see also* Kevin D. Dayaratna, et al., *Climate sensitivity, agricultural productivity and the social cost of carbon in FUND*, 22 ENV'T ECON. & POL'Y STUD. 433 (2020). It has serious legal issues, too. *See Louisiana v. Biden*, 585 F. Supp. 3d 840 (W.D. La. 2022), *vacated for lack of standing*, *Louisiana ex rel. Landry v. Biden*, 64 F.4th 674 (5th Cir. 2023) (listing many legal flaws in social cost metrics). NHTSA should stop using it.

B. *The Proposed Rule overlooks the long-term consequences from increasing EVs' footprint too fast and too far.*

The Proposed Rule is designed to significantly increase EV manufacturing. By its own terms, it estimates it will increase hybrid EVs' market penetration by nearly 20%. 88 Fed. Reg. at 56,278-79. NHTSA even admits that if automakers want to comply with the Proposed Rule, they will *have to* build many more EVs: They "will find it difficult," if not impossible, "to improve fuel economy with [internal combustion engine] technologies." *Id.* at 56,259. And that's why NHTSA expects CAFE standards to "cut vehicle fuel consumption almost in half by 2035." Beggin, *supra*.

Aggressively pushing more EV manufacturing is fraught for several reasons. Our power grid—already stretched thin by increasing electrification across all sectors and other governmental action—could not handle the massive predicted uptick in EVs. And even if it could, we don't have the supply chains to make that manufacturing increase feasible. At a minimum, U.S. manufacturers will have no option but to become embroiled with geopolitically troubling suppliers. The Proposed Rule cannot explain how our energy and manufacturing infrastructures will handle the EV wave it wants to create.

i. The power grids aren't ready for increased electrification.

America's grids are "overloaded and running on an antiquated delivery system established several decades ago." Gina S. Warren, *Hotboxing the Polar Bear: The Energy and Climate Impacts of Indoor Marijuana Cultivation*, 101 B.U. L. REV. 979, 982 (2021); *see also* Luis Avelar, *The Road to An EV Future Still Has a Few Potholes. Here's How To Fix Them*, WORLD ECON. FORUM (Jan. 31, 2022), https://bit.ly/3M0ZpvJ. Regional grids around the country show more signs of stress every day. *Belmont Mun. Light Dep't v. FERC*, 38 F.4th 173, 177 (D.C. Cir. 2022).

The "[i]ncreasing adoption" of EVs is already "add[ing] further electricity load" to our overstrained grid. Avelar, *supra*. Many States foresee painful energy shortages on the horizon because of increasing EV market penetration. *See* F. Todd Davidson et al., *Is America's Power*

Grid Ready For Electric Cars?, CITYLAB (Dec. 7, 2018), https://perma.cc/N3BZ-F9K4. Utilities and federal and state governments haven't invested enough into infrastructure to avoid problems from the current pace of electrification. Nichola Groom & Tina Bellon, *EV Rollout Will Require Huge Investments In Strained U.S. Power Grids*, REUTERS (Mar. 5, 2021, 7:07 AM), http://bit.ly/3szNQ4x. And not only is grid load a challenge, but distribution is, too. Because many Americans share similar rhythms in their daily life, huge numbers of EV drivers plug in their vehicles at the same time—right when they get home from work—and therefore create peak demand at the same. *See* Alex Brown, *Electric Cars Will Challenge State Power Grids*, STATELINE (Jan. 9, 2020, 12:00 a.m.), http://bit.ly/3sFjn53.

Worse, other aspects of the present administration's energy policy are compounding these issues. President Biden promised to "end fossil fuel," Steve Peoples, *In Intimate Moment, Biden Vows To 'End Fossil Fuel'*, AP NEWS (Sept. 6, 2019, 6:49 p.m.), http://bit.ly/3sx9YN8—mainly by smothering conventional fuel production through regulatory and executive actions, *see* Jakob Puckett, *Joe Biden's War On Fossil Fuels*, REAL CLEAR ENERGY (July 18, 2022), http://bit.ly/3TZCMcD. This war on fossil fuels will only weaken the grids more by gutting the baseload energy that currently keeps them online. *See* Zachary Robock, *Economic Solutions to Nuclear Energy's Financial Challenges*, 5 MICH. J. ENV'T & ADMIN. L. 501, 504 (2016). And renewable fuels can't make up this fossil-fuel gap. Katy Liebel, *International Oil Companies: Largest Carbon Emitters Turned Low-Carbon Leaders*, 59 HOUS. L. REV. 175, 178 (2021).

NHTSA recognizes that its proposal will necessarily lead to "greater use of electricity" for plug-in and battery-operated vehicles. 88 Fed. Reg. at 56,292. But its analysis focuses mostly on the consequences for overall emissions. *Id.*; *see also*, *e.g.*, *id.* at 56,245. Problem is, the proposal doesn't ask whether the grids can sustain this increased demand in the first place. And it ignores that, however optimistic the agency may be about other executive branch actions when it comes to dealing with overall emissions in the power-generation sector, *e.g. id.* at 56,292 n.494, 56,298 n.497, those "other actions" make *this* aspect of the problem worse. They take fossil-fuel-fired sources off the grids at the same time NHTSA proposes taxing the grids even more. It's arbitrary and capricious to "fail[] to consider an important aspect of the problem" like this. *State Farm*, 463 U.S. at 29. And to the extent NHTSA assumes that some (unstated) factors will avoid pushing the grids to the brink, it's also arbitrary and capricious to assume a "fact" with "absolutely no evidence to back it up." *Safe Extensions, Inc. v. FAA*, 509 F.3d 593, 605 (D.C. Cir. 2007).

ii. America's automotive supply chain can't take increased electrification.

Our manufacturing supply chains can't handle the explosion in EVs the Proposed Rule would create, either. NHTSA admits that EV penetration "is largely limited by" supply chain and logistics issues like "battery material acquisition and manufacturing." 88 Fed. Reg. at 56,209. Scarce materials include everything that goes into EV batteries and motors—like lithium, cobalt, copper, and nickel, as well as rare earths like neodymium. *See* Jessica Alcott Xylem, *Electrification and Critical Minerals*, AM. SEC. PROJECT (Apr. 7, 2022), https://bit.ly/3FXkbu3. And NHTSA knows, too, that the "supply constraints" surrounding these scarce materials are real. 88 Fed. Reg. at 56,217 n.324, 56,222, 56,240. Indeed, "battery producers and automakers are scrambling to secure access to key metals such as lithium and nickel, battling high prices and tight

supply." *Id.* at 56,219 (quoting *The Race to Net Zero: The Pressures of the Battery Boom in Five Charts*, BLOOMBERGNEF (July 21, 2022), https://tinyurl.com/2cwb5ft9).

Take cobalt as one example. In 2021, global cobalt demand jumped 22%—almost entirely due to "strong sales of electric vehicles"—and this demand is expected to keep growing. COBALT INST., COBALT MARKET REPORT 2021 (2022), https://bit.ly/cobalt2021. But the United States hasn't had an active cobalt mine for almost 30 years. Kirk Siegler & Eric Whitney, *In Idaho, America's First, and Only, Cobalt Mine in Decades is Opening*, NPR (Oct. 8, 2022, 5:02 a.m.), http://bit.ly/3W8yIbW. And even the one planned reboot will satisfy just 10% of total U.S. demand. *Id.* Lithium supply is weak, too: We have one lithium mine, and it meets a tiny fraction of our total demand. Oliver Milman, *There's Lithium in Them Thar Hills*, GUARDIAN (Oct. 18, 2022, 9:34 p.m.), http://bit.ly/3SI8iuN.

What's worse, even if American manufacturers had the raw materials, they don't have the factories to turn materials into batteries and motors. Jakob Fieischmann et al., *Unlocking Growth in Battery Cell Manufacturing for Electric Vehicles*, MCKINSEY & CO. (Oct. 25, 2021), https://mck.co/3tbFd0x. New manufacturing plants coming online are rare, and some within that small universe are owned by Chinese companies. Christoph Steitz & Ken Klayman, *CATL planning EV battery production in United States, vetting sites*, REUTERS (May 6, 2022, 5:00 a.m.), https://reut.rs/3TfJn1O. Domestic sources for magnet manufacturing face similar high demand and intense supply constraints. *The Effect of Imports*, *supra*, at 95-97.

Yet the Proposed Rule creates much greater need for these minerals through forced EV production—again, without addressing this glaring aspect of the problem. NHTSA admits that there is significant "uncertainty in critical minerals prices," 88 Fed. Reg. at 56,220, that these "critical minerals are also highly concentrated in a few countries," *id.* at 56,254, that reliance on critical minerals makes ZEV manufacturers "susceptible to disruptions to critical mineral markets," *id.*, and that "minerals extraction and refining can also have significant downsides," *id.* at 56,318. But it refuses to "include costs or benefits related to these emerging energy security considerations in its analysis." *Id.* at 56,254. (Though it does promise to continue "monitoring" the problem. *Id.*) An agency decision may be arbitrary and capricious when it refuses to consider important, relevant factors. *See State Farm*, 463 U.S. at 42-43. And there's no question that costs, including energy-security costs, are a "centrally relevant factor" in NHTSA's determination. *Michigan v. E.P.A.*, 576 U.S. 743, 752-53 (2015). NHTSA's "failure fully to consider" the "significant cost impact" is therefore arbitrary and capricious. *D.C. v. U.S. Dep't of Agric.*, 496 F. Supp. 3d 213, 227 (D.D.C. 2020); *see also Columbia Falls Aluminum Co. v. EPA.*, 139 F.3d 914, 923 (D.C. Cir. 1998) ("An agency's use of a model is arbitrary if that model bears no rational relationship to the reality it purports to represent." (cleaned up)).

iii. Pushing manufacturers to reach NHTSA's preferred EV goals would devastate our energy independence.

Congress passed the Energy Independence and Security Act of 2007, in part, to "move the United States toward greater energy independence and security." Pub. L. No. 110-140, 121 Stat. 1492. It's one of many statutes reflecting how highly we value energy security. *See, e.g.*, 42 U.S.C. §§ 13401(1), 13571, 15927(b)(1), 17285(4); *accord* Michael Burger, *Recovering from the Recovery Narrative: On Glocalism, Green Jobs and Cyborg Civilization*, 46 AKRON L. REV.

909, 919 (2013). After all, "the assurance of reliable supplies of energy, the ability to protect those supplies, and the ability to deliver enough energy to meet operational needs" is "critical for national security." Becky Norton Dunlop, *Economic Markets and Technological Advancements*, 7 FIU L. REV. 29, 35 (2011). So Congress has been clear that agency actions touching energy policy must be sensitive to energy security and independence.

The Proposed Rule pays lip service to security concerns, admitting that energy security "is the original purpose behind the CAFE standards." 88 Fed. Reg. at 56,318. But the CAFE model NHTSA deploys here gives them short shrift. *Id.* at 56,253-54. Mainly it just says that better fuel economy would let us buy less fossil fuels from other countries. *See, e.g.*, *id.* at 56,138, 56,318. Even if this were true, it ignores the *different* security concerns around acquiring EV-critical materials like certain minerals and magnets and, thus, it presents a fraction of the total security and independence analysis. NHTSA must account for every aspect of the "multi-faceted" energy-security issue. *See* Justin W. Evans, *A New Energy Paradigm for the Twenty-First Century: China, Russia, and America's Triangular Security Strategy*, 39 IND. L. REV. 627, 627 (2006). Whatever benefits may or may not flow from less dependence on foreign oil, it's arbitrary and capricious to claim those benefits without counting the costs that come from the Proposed Rule's replacement.

Take cobalt again first. Most cobalt comes from the Democratic Republic of Congo—a country plagued by political instability and bad infrastructure. Aaron Schwabach, *A Hole in the Bottom of the Sea: Does the Unclos Part Xi Regulatory Framework for Deep Seabed Mining Provide Adequate Protection Against Strip-Mining the Ocean Floor?*, 40 VA. ENV'T L.J. 39, 47 (2022). And 84% of these reserves flow through China—a dominance that allows China to control global supply. Major Gen. John Wharton, *Why Electric Vehicle Manufacturing is a National Security Imperative*, INT'L BUS. TIMES (July 10, 2022, 3:38 PM), https://bit.ly/3fIM0vr. This foreign dependency puts us in a highly tenuous position, creating a serious "national security vulnerability." Sean Carberry, *United States Seeking Alternatives to Chinese Cobalt*, NAT'L DEF. MAG. (Aug. 3, 2022), https://bit.ly/3Ug8OSo.

Lithium, nickel, copper, and rare earths face similar supply chain concerns. *See, e.g.*, Joshua S. Hill, *EVs May Face Production Delays from 2027 as Lithium Mining Lags*, DRIVEN (Apr. 16, 2021), https://perma.cc/5PXS-NUSG; *accord* Sam Kalen, *Mining Our Future Critical Minerals: Does Darkness Await Us?*, 51 ENV'T L. REP. 11,006, 11,007 (2021). And the U.S. Department of Commerce has flagged similar issues with NdFeB magnets, which all EVs require. BUREAU OF INDUS. AND SEC., OFF. OF TECH. EVALUATION, THE EFFECT OF IMPORTS OF NEODYMIUM-IRON-BORON (NDFEB) PERMANENT MAGNETS ON THE NATIONAL SECURITY 39, 96-98 (2022), https://bit.ly/NdFeB. We import 100% of NdFeB magnets—75% from China—which, in turn, threatens national security. *Id.* These national security concerns are severe enough that Congress has barred our military from purchasing NdFeB magnets from China. *See* 10 U.S.C. § 4872; 84 Fed. Reg. 18,156 (Apr. 30, 2019).

The Proposed Rule ignores these known national-security risks. And by leaving manufacturers no choice but to turn to EVs in increasingly high numbers, finalizing the proposal will only make those grave concerns worse. Once again, responsible rulemaking requires more.

We urge NHTSA to reconsider this unlawful, unrealistic, and dangerous rule.

Sincerely,

Patrick Morrisey
West Virginia Attorney General

Steve Marshall
Alabama Attorney General

Treg Taylor
Alaska Attorney General

Tim Griffin
Arkansas Attorney General

Ashley Moody
Florida Attorney General

Raúl Labrador
Idaho Attorney General

Todd Rokita
Indiana Attorney General

Brenna Bird
Iowa Attorney General

Kris Kobach
Kansas Attorney General

Daniel Cameron
Kentucky Attorney General

Jeff Landry
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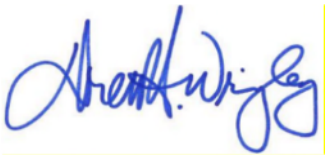

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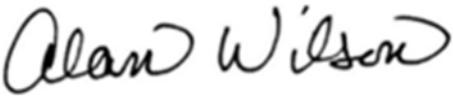

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EXHIBIT A

DECLARATION OF DR. ANNE E. SMITH

UNITED STATES DISTRICT COURT

WESTERN DISTRICT OF LOUISIANA

THE STATE OF LOUISIANA, By and through its Attorney General JEFF LANDRY, *et al.* Plaintiffs, v. JOSEPH R. BIDEN, JR., in his official capacity as President of the United States; *et al.*, Defendants.	No. 2:21-cv-1074-JDC-KK **DECLARATION OF** **ANNE E. SMITH, Ph.D.**

I, Anne E. Smith, am a Managing Director and Co-Head of the Global Environmental Group at NERA Economic Consulting ("NERA"). I make this declaration in support of Plaintiffs' Motion for a Preliminary Injunction. This declaration is based on my personal knowledge, my review of cited materials, and my decades of experience in environmental policy, economic policy, and analysis. I could competently testify to its contents if called to do so.

EDUCATION, EXPERIENCE, AND EXPERTISE

1. I earned a B.A. in Economics, *summa cum laude*, from Duke University in 1977. I then earned a M.A. in Economics from Stanford University in 1981, and a Ph.D. in Economics from Stanford University in 1984 that included a Ph.D. minor in Stanford's Engineering School focused on engineering-economic systems modeling and decision analysis.

2. From 1977 to 1979, I was employed as an economist by the U.S. Environmental Protection Agency. Since earning my Ph.D., I have been employed as a consultant in matters related to economics, environmental policy, and decision analyses.

3. Since 2011, I have been employed by NERA Economic Consulting. Founded in 1961, NERA is one of the world's foremost economic consultancies.

4. A true and accurate copy of my curriculum vitae, including my publications and testimony within the previous four years, is attached as Exhibit A.

5. I am being compensated for the study and testimony in this case through NERA, which is being compensated at a rate of $725 per hour for my services and $315-$535 per hour for the services of assisting members of my practice.

6. I am an expert in economic analysis, cost-benefit analysis, decision analysis, and integrated assessment modeling.

SUMMARY OF OPINIONS

7. As the Obama Administration acknowledged, the science and economics community concurs that "any assessment [of Social Cost of Carbon, "SCC"] will suffer from uncertainty, speculation, and lack of information."

8. The Integrated Assessment Models ("IAMs") used by the Interagency Working Group ("IWG") in-fact suffer from serious flaws. For example, the empirical basis for calculating damages due to greenhouse gases is weak for temperature rises from 0°C to 3°C, and is entirely lacking for a temperature rise above 3°C.

9. In any event, simplification of scientific relationships in the IAMs and the IAMs' sensitivity to both scientific and subjective modeling assumptions limit the absolute quantitative reliability of any IAM results. This makes the model results mainly useful for relative comparisons among alternative potential policy design choices and limits their appropriateness as absolute quantitative estimates.

10. Even if IAMs were quantitatively reliable, the IWGs of the Obama Administration (and now the Biden Administration) failed to update key parameters in their IAMs to account for changes in scientific information.

11. Compounding those deficiencies and biases, the IWG departed from the Office of Management and Budget's ("OMB") decades-long requirement for performing regulatory cost-benefit analyses using discount rates of 3% and 7%, which represent "the real rate of return on long-term government debt" and the "average before-tax rate of return to private capital in the U.S. economy,"

respectively. The result of the IWG's excluding the 7% discount rate is to significantly increase the lower bound of its range of SCC estimates.

12. The SCC estimates at every point in the range are further biased toward higher SCC values by use of baseline emissions assumptions that are fundamentally inconsistent with regulatory adoption of those SCC values.

13. The IWG's SCC estimates are further elevated by excessively speculative damage estimates associated with use of a time horizon of 280 years; this speculative leavening of the SCC estimates is particularly pronounced for the SCC estimates at the higher end of the IWG's range (*i.e.,* those calculated using lower discount rates).

14. Finally, the IWG estimates are arbitrarily focused on global costs and benefits, despite the availability of regional estimates. Although the costs of U.S. regulations that apply the SCC are borne by the United States, the benefits will accrue disproportionately elsewhere.

15. The resulting SCC values will impose large costs on American families. For example, before households and industry can make a significant transition of infrastructure and technologies, the near-term cost of just meeting current average household needs of transportation, gaseous fuels, and electricity could increase by about $1,000/year for a $51/ton emissions adder for CO_2, and by about $3,000/year of the CO_2 price were $152/ton. Reduction of those costs through offsetting carbon revenue recycling would require a legislative rather than regulatory approach.

COST-BENEFIT ANALYSIS

16. Cost-benefit analysis is a quantitative method for determining whether a public policy action or regulation will enhance the net well-being, or "welfare," of the society that is considering the action. The theoretical basis for cost-benefit analysis lies in the field of welfare economics, which is concerned with the principles of improving the quality of the human experience, and the role of public policy in making such improvements. Cost-benefit analysis is a cornerstone tool of applied welfare economics. Its core purpose is to guide domestic policy decisions in the direction of maximizing a nation's welfare. While the method is based on certain foundational theoretical principles and some specific ethical principles, the basic method is relatively simple to describe: "net benefits" are the

added benefits of an action minus the added costs of that action, or "benefits minus costs." Stated in terms of emissions control policies, emissions should be controlled to a level where the benefits minus the costs of the controls are at their maximum.

17. At least as far back as the Nixon Administration, U.S. Presidents have directed federal regulatory agencies of the executive branch to perform cost-benefit analyses of economically significant regulations being proposed and finalized by federal regulatory agencies of the Executive Branch.

18. At least since the Reagan Administration, these federal cost-benefit analyses have been conducted in accordance with guidance issued by OMB. The most current formal OMB guidance is Circular A-4, which was produced in 2003 after a thorough review process that included notice and comment, interagency input, and peer review by leading economists. Two key aspects of Circular A-4 are its instruction that the main analysis consider only domestic effects and provide results employing discount rates of both 3 and 7 percent. Sensitivity cases are permitted for lower discount rates in certain situations, such as where intergenerational impacts are in question, and to also (separately) evaluate benefits to entities outside of the U.S. However, Circular A-4 still requires that analysis results be presented for both the 3% and 7% discount rates, and for domestic benefits alone. [1]

19. Circular A-4 remains the standard of best regulatory analysis in the Executive Branch. But, as detailed below, the Biden Administration's interim Social Cost of Carbon is inconsistent with Circular A-4, as well as having numerous other deficiencies.

SOCIAL COST OF GREENHOUSE GASES

BACKGROUND

20. Carbon dioxide, methane, and nitrous oxide are ubiquitous by-products of everyday life in America and everywhere else globally, but they also trap heat in the atmosphere, *i.e.*, they are so-called "greenhouse gases," ("GHGs"). Virtually every activity we rely on or participate in—energy production, agriculture, transportation, waste disposal—produces at least one of those gases. Carbon

[1] Office of Management and Budget, Circular A-4 (September 2003) (available: https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/).

dioxide, for example, "enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., manufacture of cement)." It is also emitted when humans and other respiratory organisms breathe. Methane emissions are also inherently part of a wide range of human activities; they are "emitted during the production and transport of coal, natural gas, and oil [and] also result from livestock and other agricultural practices, land use and by the decay of organic waste in municipal solid waste landfills." And "[n]itrous oxide is emitted during agricultural, land use, industrial activities, combustion of fossil fuels and solid waste, as well as during treatment of wastewater." EPA estimates that 75 percent of nitrous oxide emissions in 2019 were caused by fertilizing crops. In short, emissions of these three greenhouse gases are fundamental to how our economy meets the needs of modern American life and society. [2]

21. In 2009, President Obama sought to apply cost-benefit analysis to greenhouse gas emissions. He thus convened an IWG to establish an "estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year" that non-independent agencies would have to use in their regulatory cost-benefit analyses, *i.e.*, a SCC.[3]

22. The Obama IWG's first set of SCC estimates—which it dubbed "interim" estimates—were first used (and thus available for public review) in a regulatory impact analysis released in August 2009.[4] As explained in a subsequent February 2010 technical support document ("TSD"), for those efforts, the IWG "did not undertake any original analysis. Instead, it combined SCC estimates from the existing literature to use as interim values until a more comprehensive analysis could be conducted."[5]

23. The IWG then released its "final" SCC estimates to replace the 2009 interim values in

[2] USEPA, *Overview of Greenhouse Gases* (available https://www.epa.gov/ghgemissions/overview-greenhouse-gases).
[3] IWG 2010 Technical Support Document at 1 (Feb. 2010) (available https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf).
[4] GAO 14-663 at 6 (available https://www.gao.gov/assets/gao-14-663.pdf).
[5] IWG 2010 Technical Support Document at 4 (Feb. 2010) (available https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf).

a February 2010 TSD that described their derivation. In making those 2010 estimates, the IWG relied on three IAMs, called FUND, DICE, and PAGE. The IWG relied on those models despite other types of models that "better reflect the complexity of the science in their modeling frameworks" because the more scientifically-complex models "[did] not link physical impacts to economic damages."[6] [7]

24. As the IWG explained, "[t]he three IAMs translate emissions into changes in atmospheric greenhouse concentrations, atmospheric concentrations into changes in temperature, and changes in temperature into economic damages."[8] The IWG's exercise produced "45 separate *distributions* of the SCC for a given year, the product of 3 models, 3 discount rates, and 5 socioeconomic scenarios."[9] The average estimates of these 45 SCC distributions ranged from -$2.7/ton at a 5% discount rate to $65.5/ton at a 2.5% discount rate.[10] Concluding that "[t]his is clearly too many separate distributions for consideration in a regulatory impact analysis," the IWG simply weighted each scenario equally and combined them to produce one SCC distribution for each assumed discount rate.[11] The IWG accordingly "selected four SCC estimates for use in regulatory analyses," *i.e.*, $5, $21, $35, and $65 per ton emitted in 2010 (in 2007 dollars). "The first three estimates are based on the average SCC across models and socio-economic and emissions scenarios at the 5, 3, and 2.5 percent discount rates, respectively. The fourth value is included to represent the higher-than-expected

[6] *Id.* at 5.
[7] Although the IWG uses the DICE moniker, it actually made a significant alteration to the logic of the actual DICE model developed by Nordhaus. Specifically, it removed the logic in DICE whereby emission reduction costs in each time period reduce GDP from its baseline levels, thus enabling DICE to identify an optimal emissions path. (*id.* at 7, fn 3). Thus, results from the model that the IWG uses under the name DICE are not the same as would have been produced by that same version of DICE if run by Prof. Nordhaus using the same socioeconomic input assumptions and climate sensitivity assumptions that the IWG uses.
[8] *Id.* at 5.
[9] *Id.* at 25 (emphasis added). "Distribution" refers to a set of many alternative values with associated probabilities characterizing the uncertainty on the true value. Sometimes a distribution is summarized in terms of a single value, called its "average" value, which is (more formally) its probabilistic "mean."
[10] *Id.* at 26. These are values estimated for emissions in the year 2010 and are stated in year 2007 dollars.
[11] *Id.* at 25.

impacts from temperature change further out in the tails of the SCC distribution."[12]

25. In 2013, the IWG issued "an update of the SCC estimates based on new versions of each IAM (DICE, PAGE, and FUND)." The update "[did] not revisit other interagency modeling decisions (e.g., with regard to the discount rate, reference case socioeconomic and emission scenarios, or equilibrium climate sensitivity)."[13] Additionally, "[i]mprovements in the way damages are modeled are confined to those that have been incorporated into the latest versions of the models by the developers themselves in the peer-reviewed literature."[14] The updated estimates were $11, $32, $51, and $89 per ton for emissions in 2010 (in 2007 dollars).[15]

26. The 2013 update noted a continued "need to improve the quantification of both non-catastrophic and catastrophic damages, the treatment of adaptation and technological change, and the way in which the inter-regional and inter-sectoral linkages are modeled."[16]

27. In 2015, the IWG released a technical revision to address a time horizon error in the DICE model and a dollar indexing error in the PAGE model.[17] The revisions resulted in updated SCC estimates of $10, $31, $50, and $86 per ton in 2010 (in 2007 dollars) for discount rates of 5.0%, 3.0%, and 2.5%, and a long-tail cost at a discount rate 3.0%.[18] "On average, the revised SCC estimates are one dollar less than the mean SCC estimates reported in the November 2013 version of [the] technical support document."[19]

28. In 2016, the IWG issued an additional technical revision to respond to interim

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[12] *Id.* at 33. The TSDs label the fourth value as the "95th percentile" estimate, referring to the fact that it is taken from the 95th percentile point on that particular distribution's "tail". This means that only 5% of all the values in that distribution are higher than this value.
[13] IWG 2013 Technical Support Document at 2 (November 2013) (available https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf).
[14] *Id.* at 2.
[15] *Id.* at 13.
[16] *Id.* at 15.
[17] IWG 2015 Technical Support Document at 21 (available https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf).
[18] *Id.* at 3.
[19] *Id.* at 21.

recommendations from the National Academies of Sciences, Engineering, and Medicine, but "[did] not revisit the interagency group's 2010 methodological decisions or update the schedule of social cost of carbon estimates presented in the July 2015 revision."[20] In particular, the 2016 revision "provide[d] additional discussion of uncertainty in response to recommendations from the National Academy of Sciences."[21]

29. In 2017, President Trump disbanded the IWG, withdrew the various Technical Support Documents and Technical Updates issued by the IWG, and directed that monetization of greenhouse gas emissions should be consistent with OMB Circular A-4, "including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates."[22] The range of SCC estimates that was calculated using the well-established OMB Circular A-4 methodology was significantly lower than the one that had been estimated by the IWG. For example, a 2020 GAO report graphically compares the range of values from the IWG TSD to a range that included 3% and 7% discount rates and domestic damages only, consistent with Circular A-4, absent any sensitivity analyses. For 2020 emissions, the IWG's range is $16/ton to $80/ton and rising to $138/ton if including the "higher-than-expected" (95th percentile) SCC. The range consistent with the two Circular A-4 provisions is $1/ton to $7/ton.[23]

30. On January 20, 2021, President Biden reestablished the IWG, and directed the IWG to "publish an interim SCC, SCN, and SCM within 30 days . . . which agencies shall use when monetizing the value of changes in greenhouse gas emissions resulting from regulations and other relevant agency actions."[24]

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[20] IWG 2016 Technical Support Document at 2 (available https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf).
[21] *Id.* at 29.
[22] Executive Order 13783, 82 Fed. Reg. 16093 (Mar. 28, 2017).
[23] GAO 20-254 at 15, 57 (available https://www.gao.gov/assets/gao-20-254.pdf). (The information for the IWG range is presented only graphically in the GAO report. I estimated the numerical values by taking the original numerical values in the 2016 TSD document that are stated in 2007$ and converting them to 2018$ by multiplying by 1.6, which appears to be the approximate adjustment used by the GAO when it converted the $31/ton (2007$) in the 2016 TSD to $50/ton (2018$) in its report at 17.)
[24] Executive Order 13990, 86 Fed. Reb. 7037, 7040 (Jan. 20, 2021). ("SCN" refers to social cost of

31. In February 2021, the IWG issued a TSD "present[ing] interim estimates of the social cost of carbon, methane, and nitrous oxide . . . . These interim values are the same as those developed by the IWG in 2013 and 2016," but adjusted for inflation.[25]

32. As detailed below, the IWG's SCC estimates suffer from unsupportable assumptions and methodological flaws. These concerns also affect the SCN and SCM estimates, which use the same IAMs and key input assumptions. I will refer to the set of all three estimates as "SC-GHG".

UNCERTAINTY IN CLIMATE SCIENCE AND CLIMATIC IMPACTS

33. At the outset, it is important to recognize that even the Obama IWG acknowledged that the science and economics community concurs that "any assessment [of SCC] will suffer from uncertainty, speculation, and lack of information about (1) future emissions of greenhouse gases, (2) the effects of past and future emissions on the climate system, (3) the impact of changes in climate on the physical and biological environment, and (4) the translation of these environmental impacts into economic damages."[26]

34. A decade has passed since that acknowledgment, yet it still understates the problem. The existing estimates of SCC in peer-reviewed research still cover a wide range. Indeed, as the Congressional Research Service explained in 2019, the underlying simulation models remain problematic:

> For any level of emissions, the projected increase in global average temperature may cover multiple degrees Fahrenheit, and other measures of climate change, such as precipitation patterns, may encompass directional uncertainties. No estimates of impacts are comprehensive at this time, and many of the risks are difficult to estimate and value.[27]

35. To highlight one example of uncertainty: the 2010 TSD noted that the equilibrium climate sensitivity ("ECS"), which is defined as "the long-term increase in the annual global average

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nitrous oxide; "SCM" refers to social cost of methane.)

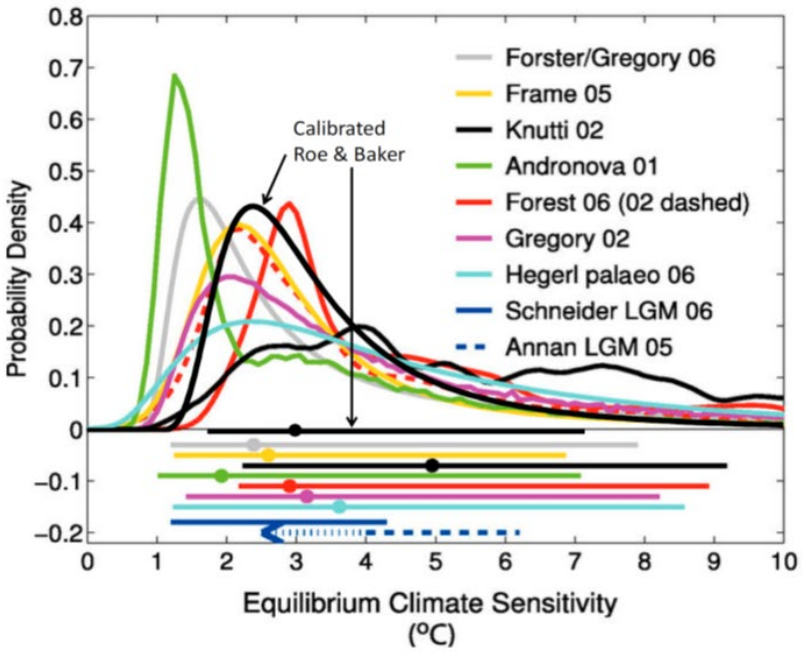
[25] IWG 2021 Technical Support Document at 1 (available https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf).

[26] IWG 2010 Technical Support Document at 2.

[27] CRS, *Attaching a Price to GHG Emissions with a Carbon Tax or Fee* (Mar. 22, 2019) at 7 (available https://fas.org/sgp/crs/misc/R45625.pdf).

surface temperature from a doubling of atmospheric CO_2 concentration relative to preindustrial levels (or stabilization at a concentration of approximately 550 parts per million (ppm)),” is “a key input parameter for the DICE, PAGE, and FUND models.” Based on the 4th Assessment Report of the IPCC, which concluded the ECS is likely to lie in the range 2 to 4.5°C with a “most likely” value of about 3°C, the IWG selected the so-called Roe & Baker distribution to characterize uncertainty on the ECS and calibrated that distribution to a median value of 3°C. The IWG illustrated this probability distribution, comparing it to several alternatives proposed by others, in figure 2 from the TSD copied below.[28]

Figure 2: Estimates of the Probability Density Function for Equilibrium Climate Sensitivity (°C)



36. But the 5th Assessment Report of the IPCC (published in 2014) reverted to earlier, less certain values for ECS with a likely range of 1.5 – 4.5°C; that is, the IPCC increased the probabilities associated with the lower range of the ECS probability distribution, meaning a greater amount of probability associated with *lower* average temperature increase and hence with *less* climate change.[29] That shift calls into question the calibrated distribution the IWG adopted in 2010, *i.e.*, despite a

[28] 2010 TSD at 12-14.
[29] 5th Assessment Report of the IPCC, Synthesis Report at 43, 62.

significant change in a "key input parameter" as published by the IWG's own technical source, the IWG did not revisit its "methodological decisions" in its 2016 update to the SCC.[30] Given the clear sensitivity of each IAM's SCC estimates to ECS assumptions, an update should have been made.

37. Prof. William Nordhaus, the Nobel Prize-winning originator of the DICE model, commented on another unusual aspect of how the IWG specified the ECS distribution:

> One strange feature of the treatment of the [ECS] by the IWG should be noted. The IWG assumed a 'most likely value of about 3°C.' The IWG harmonized the Roe-Baker distribution by setting the median at a target level of 3.0°C, and for the Roe-Baker distribution this implied that the mean [ECS] was 3.5°C. This choice of median rather than mean was casually thrown out in a spirit that it did not much matter whether the central tendency was mean, median, or mode. This procedure is indefensible, as we shall see."[31]

Thus, there was concern that the IWG used an overly pessimistic ECS distribution even before the 5th Assessment report was released. The result of misrepresenting the 4th Assessment report's most likely value and then further failing to adjust the distribution with the new information in the 5th Assessment report is to arbitrarily bias the IWG's estimates toward a higher SCC.

38. A probability distribution over the ECS parameter (as encapsulated in the Roe & Baker distribution used in the IWG's modeling) is the only form of scientific uncertainty that the IWG has addressed as it has estimated a wide range of SCC values for each model. (And, as noted in the prior paragraph, changing information on the nature of that uncertainty was never incorporated into TSD updates.) The FUND and PAGE models included uncertainties for several other scientific parameters (using assumptions made by their developers and with no review or adjustment by the IWG). However, as noted in paragraph 23, the IAMs that integrate scientific and economic considerations in order to estimate monetized damages from incremental tons of greenhouse gas emissions do not

[30] IWG 2016 Technical Support Document at 2.

[31] Nordhaus, W., 2014, Estimates of the Social Cost of Carbon: Concepts and Results from the DICE-2013R Model and Alternative Approaches, *Journal of the Association of Environmental and Resource Economists*, Vol. 1, No. 1/2 (Spring/Summer 2014), pp. 273-312, at p. 294, fn. 6. (It appears from later parts of the paper, *e.g.*, at pp. 296-298 that Prof. Nordhaus's concerns are both that the mean ECS should be set at 2.9°C rather than 3.5°C, and that he believes the elaborate Monte Carlo exercise to apply a probability distribution over the selected mean value has no meaningful effect on the average SCC that results.)

account for the complexity of the science as much as climate models that do not attempt to also address economic considerations. Simplification of scientific relationships limits the absolute quantitative reliability of any model's results. This makes the model results mainly useful for relative comparisons among alternative potential policy design choices and limits their appropriateness as absolute quantitative estimates, for example, to determine whether specific actions should be required by virtue of use of their SCC results in a cost-benefit test.

39. Thus, the IAMs used by the IWG are subject to scientific uncertainties that have been substantially simplified but also not updated to reflect new judgments about empirical information. These concerns, however, pale in comparison to the epistemological challenges posed by the models' estimates of how any given amount of climatic change translates into a monetized economic damage. I discuss this in the next section.

FLAWED MODELS AND UNCERTAINTY IN ECONOMIC DAMAGES FROM PROJECTED CLIMATIC CHANGES

40. Each IAM's estimates of climatic changes (*e.g.*, temperature change, sea level rise) from a given change in emissions in a given year is translated by its "economic" modules into the monetized estimates of SCC. Those estimates are the final result of the IWG's analysis. My research has shown—through sensitivity analyses using the same IAMs as the IWG—that the final SCC dollar estimates are as much affected by several non-scientific modeling input assumptions as they are affected by the widely discussed scientific uncertainties.

41. Non-scientific assumptions required by the IAMs are a combination of analytic framing decisions, structural limitations in how the models account for behavioral choices, disconnects between the time horizon over which economic and physical impacts can be projected, and even direct policy judgments. I will discuss the implications of each one below.

42. The most widely discussed assumption of the IAMs is called the "damage function." The damage function is an important source of uncertainty because—in the IWG's models—it is a mathematical formula that states what the percentage reduction in GDP would be in each future year as a function of the projected amount of climate-related impact.

43. For example, in the DICE model used by the IWG, if temperature is projected to change by X degrees (Celsius) in a given year, then the assumed baseline level of GDP in that year is reduced in proportion to X^2. For a given choice of damage function, this calculation is the same no matter what the year is (*e.g.*, next year or the year 2300) and no matter what the assumed baseline level of per capita GDP is. There is an additional provision layered onto the formula to ensure that the percent change in GDP will not exceed 100%, which could happen under some very pessimistic sets of damage function and ECS assumptions. In short, rather than acknowledge limitations on the validity of the models' damage functions, the modelers included kludges to address the nonsensical result obtained in certain conditions.

44. The PAGE and FUND model have more complex damage function formulas than DICE, disaggregate the damage into different formulas by different types of sectoral impact (*e.g.*, agriculture, sea level rise, *etc.*), and disaggregate damages by region of the globe. However, the concept is the same for all three IAMs. Once each source of GDP percentage reduction is calculated in a given year, the total projected loss in that year is their sum.

45. As I explained in a report from a 2014 study that evaluated the IAM damage functions in the 2013 TSD (and which have continued to be used through to the current 2021 TSD), the empirical basis for the parameters of the IAM damage functions is very weak for temperature changes in the range of 0 to 3°C, and entirely arbitrary for temperature changes exceeding 3°C.[32] (I am not alone in that conclusion: DICE developers Nordhaus and Sztorc wrote, "In reality, estimates of damage functions are virtually non-existent for temperature increases above 3°C."[33]) My report also documented the lack of any theoretical basis for making assumptions about the shape of the damage function to inform how it is extrapolated beyond the 3°C outer bound of any supporting empirical

[32]Smith, A. E., Harrison, D., McPhail, M. 2014. *A Review of the Damage Functions Used in Estimating the Social Cost of Carbon*. Report prepared for American Petroleum Institute, February 20. Submitted to OMB SCC docket with as Attachment 2 of comments of American Chemical Council and others, Docket # OMB-2013-0007-0100, at pp. 26-29 (attached hereto as Exhibit B).

[33] Nordhaus, W. and Sztorc, P. 2013. "DICE 2013R: Introduction and User's Manual," at p. 11. Available: http://www.econ.yale.edu/~nordhaus/homepage/documents/DICE_Manual_100413r1.pdf.

evidence.

46. I have also found that the temperature changes projected for well more than half of the model runs that are used to compute the TSDs' average SCC values exceed 4ºC by 2100—which is less than one-third of the time period over which the IWG's IAMs project damages and adds them into the final SCC estimates. Temperatures continue to rise even higher beyond that time in all the future scenarios used by the IWG. In fact, in a non-trivial fraction of the model runs that contribute to the IWG's average SCC values from PAGE, temperatures are projected to exceed 8ºC by 2100.[34] As I explain below, 2100 is a time horizon through which I believe one can at least reasonably project socioeconomic and technological outcomes. However, this amount of temperature change so far exceeds the range of empirical evidence supporting a statistical fit for any damage function that numerical estimates of damages that may occur even in this near-term period are essentially made up.

47. Excessive extrapolation on the temperature change effect becomes a very substantial concern for damage estimates in years between 2100 and 2300, because during that period even the other two models are also projecting temperature changes of 8ºC (and much higher as 2300 approaches).[35] As I explain below, the empirical basis for projecting socioeconomic impacts even from smaller temperature increases dissipates in this period, further compounding the arbitrariness of estimates during the last 20 decades of the 28-decade modeling horizon used by the IWG.

48. Damages projected in each future year are discounted to a present value before being summed together to produce the IWG's SCC values. As I will discussed later, lower discount rates result in more weight or quantitative influence of damages in the later years of the 280-year time horizon. Thus, the SCC values associated with the lower discount rates used by the IWG will be the most affected by the lack of any empirical basis for the IAMs' damage functions.

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[34] By "non-trivial," I mean that the IWG's modeling assumptions cause this (and even higher temperature changes) are projected to occur in at least 10% of the PAGE model runs, for 4 out of 5 of the IWG's socioeconomic scenarios. That implies that it occurs in about 8% of the PAGE simulations that are averaged into the IWG's average SCC estimates. (see p. 114 of my expert report submitted to Docket No. E-999/CI-14-643 of the Minnesota Public Utilities Commission, June 1, 2015, attached hereto as Exhibit C.)

[35] *Id.* at pp. 113-115.

49. As suggested by my review of the models' damage functions, which are just one part of the computations, I have concluded that there are significant theoretical and methodological flaws in the application of the approach taken by the IWG.

50. My concern with the approach taken by the IWG is long-standing. To that end, a true and accurate copy of a report I co-authored, *A Review of the Damage Functions Used in Estimating the Social Cost of Carbon*, is attached hereto as Exhibit B.

51. In this study, I researched how the IAMs were constructed, what the empirical evidence was for their damage functions specifically, and what the theoretical basis was for the damage function formulas that they were using.

52. I concluded that the IAM damage functions were highly abstract but lacking in any sound empirical basis. To the extent that they had empirical basis, it was only from very small incremental temperature increases, *e.g.*, no more than 3°C, and even there the evidence was far from compelling as a statistically defensible shape of the damage function. There was slight evidence in favor of net improvements in societal benefits for temperature increases of less than 2.5°C, and slight evidence of net decrements in societal benefits for temperature increases exceeding 2.5°C. However, any of a wide range of damage functions could be said to fit these very limited data, and some of the selected damage functions would assume no potential for net benefits at the lowest global temperature increases. There is no basis for defending or rejecting such damage functions because the data are so sparse.

53. However debatable the evidence may be for benefits or disbenefits at less than 3°C of temperature increase, I found no evidence in the record for estimating damages from larger temperature changes. This is because sustained changes of that magnitude have not been observed in the record of modern economies. This is a critical concern because the SCC estimates of the IWG are highly dependent on temperature changes in that higher range. There is widespread intuitive belief that damages will become nonlinearly more responsive to each increment of higher temperature increase, but no theoretical basis for any assumption about the degree of curvature.

54. While two of the three models allow for some probability of net benefits with small

temperature increases, they also force their damage functions to calibrate (*i.e.*, run their curves through) a particular amount of positive damage for a particular higher temperature increase. The effect of this type of calibration is that whenever the damage function allows for a net benefit at low temperature increases, it has to be even more highly responsive with net damages at higher temperature increases. Given that the IWG's selection of scenarios for baseline emissions do not account for any emissions reduction efforts in the future, they project substantial increases in temperature during most of the analysis time period, which extends through 2300. Thus, any consideration of some probability of net benefits in the near term is automatically more than offset by more extreme damages in the longer term. I consider this a flaw in how uncertainties in the damage function are addressed.

55. In more recent studies after I completed my 2014 report, I have concluded that the assumptions about the baseline socioeconomic projections of global GDP, population, and emissions are also evidence of a flawed analysis. The IWG used 5 scenarios, which were fixed as modeling inputs and not responsive to the levels of climatic change that they implied. Four of the five scenarios are alternative projections of effectively the same assumption: "no new control policies" for the next 280 years. Although some of the scenarios allow carbon-intensity of GDP to improve over time, emissions are still projected to increase every year through 2300 without any new climate policy constraints. Those scenarios are inappropriate inputs for assessing an SCC that is consistent with its use in emissions control policy, and they inherently result in an overstatement of the correct SCC for use in cost-benefit analysis. The reason for this is that the IWG is using the IAMs to develop SCC values that will be applied to decisions affecting emissions year after year from now until the climate change risk does become managed to an acceptable level; but the IAMs, as used by the IWG, do not incorporate those emissions-reducing regulatory actions into their baseline scenarios. As a result, the SC-GHG estimates from these models are for a future of damages that is completely inconsistent with their actual adoption—*i.e.*, in which despite their adoption, not even a dent is made in the climate damages that they are intended to mitigate. As I explained earlier (see fn 7 above), the actual DICE model of Prof. Nordhaus *does* incorporate endogenous changes to GDP and emissions as it estimates an optimized time path for the social cost of carbon. The IWG process ignores the need for such

internal consistency and as a result of this methodological flaw, its SC-GHG values are overstated. They calculate damages against extremely high future temperature increases that allow observations of very high ECS levels to be combined with nearly 300 years of inaction, even though those damage estimates (*i.e.*, the resulting SCC estimates) are specifically intended to *initiate* action. Only one of the five scenarios of the IWG (*i.e.*, the "Fifth Scenario") assumes global action (which is to stabilize atmospheric concentrations at 550 ppm—which, according to the IWG's ECS assumptions, would imply an eventual expected temperature increase of 3.5°C, far above the stated goal of the Paris Agreement). Its SC-GHG estimates also are estimated without any endogenous response of the emissions forecast, but at least this fixed baseline scenario would be somewhat more internally consistent with implementation of its SC-GHG estimates. One can readily see in the TSDs that the Fifth Scenario produces lower SC-GHG values, which corroborates my conclusion that the other four scenarios' inherent inconsistency leads to overstatement of the correct SC-GHG for use in policy. However, the IWG neutralizes the relative merits of the Fifth Scenario by averaging its results with those of the other four scenarios, which effectively assigns 80% weight (*i.e.* 4/5ths) to scenarios that have the largest degree of internal inconsistency (and overstatement) in their estimates of SC-GHG.

56. Real-world strategies for managing significant but highly uncertain risks are not developed and fixed, but take into account what reactions will be taken as more information arises and regulatory changes occur. The IWG methodology assumes that basic decisional process will not occur. In my opinion, that is not a reasonable assumption for an analysis with such exceptional temporal dynamics.

OVER-PROJECTION AND SPECULATION

57. The IAMs upon which the IWG's SC-GHG estimates are based suppose a 280-year projection into the future, *i.e.*, projecting economic outcomes and damages from climate change through the year 2300. This time horizon was selected because a portion of today's CO_2 emissions is expected, as a matter of atmospheric science, to remain in the atmosphere that long.

58. The IAMs used to estimate a SC-GHG also entail a forecast of economic values and economic growth. It is this critical dimension of the SC-GHG calculation that becomes inherently

speculative when using such a long time horizon. If the IAMs' resulting monetized estimates of SC-GHG for near-term emissions were not sensitive to estimates of damages occurring in the far later years of the modeled time period, that speculative aspect of the modeling method would not present a concern. However, that is not the case for the IWG's estimates. In sensitivity analyses using the IWG's models, I have estimated that about 12% of the 7% discount rate's SCC estimate is projected to occur in the years 2100-2300, rising to 25% for the 5% discount rate SCC estimate and to 48% for the 3% discount rate SCC estimate.[36] Based on these results, I estimate that the fraction exceeds 75% for the 2.5% discount rate.

59. The speculative content of the IWG's damage values is thus large, particularly for the lower discount rates that the IWG used. A question is whether there is a time horizon for projecting economic damages beyond which the estimates are so speculative that they become too arbitrary to guide near-term expensive spending decisions.

60. After reviewing a number of historical patterns of change and technology lifespans in past research, I conclude that our ability to project how society will value different types of commodities and services starts to dim after about 80 years into the future, and it becomes a deep uncertainty after more than 120 years.[37] "Deep uncertainty" refers to phenomena that are cannot be informed by any empirical evidence currently available.[38] Estimates of such phenomena are thus inherently speculative, and this uncertainty should be respected when attempting to make decisions that use such estimates.

61. One way to assess the limits of projecting societal values is to take an *ex post* perspective. Taking the 120-year horizon that I have proposed, consider how much of today's

[36] Exhibit C, pp. 76-77.
[37] Exhibit C, p. 74-75.
[38] See, for example, the definition provided by the Society for Decision Making Under Deep Uncertainty: "Deep uncertainty exists when parties to a decision do not know, or cannot agree on, the system model that relates action to consequences, the probability distributions to place over the inputs to these models, which consequences to consider and their relative importance. Deep uncertainty often involves decisions that are made over time in dynamic interaction with the system." (at https://www.deepuncertainty.org/)

concerns, technological solutions, and preferences could have been projected from the vantage point of 1900.

62. In 1900, for example, the vast majority of U.S. energy consumed was from burning coal, with wood a distant second. Petroleum and natural gas started to uptick as a source of energy in the early 1900s, but did not surpass coal as a source of energy until around World War II.[39] While an expert in 1900 *might* have been able to project that using energy to produce electricity would be important, no projection could have accounted for the present scale of electric energy consumption, nuclear power as an energy source,[40] or its ability to provide mass protection from heat stresses through home air conditioning technology. The reduction in both human and manufacturing vulnerabilities due to the ensuing information technology revolution would never have been anticipated as a general matter, nor in assessing how weather, temperature, or other physical changes in our environment might actually affect our welfare today.

63. Human health vulnerabilities are another example of interest. In 1900, only a few vaccines were available. Polio epidemics were becoming routine, with the transmission routes (and hence preventive actions) still poorly understood. Since 1900, polio risks have been eradicated in the U.S., and risks of death from a wide range of diseases that used to be considered routine childhood experiences have been made unimportant in our daily lives (*e.g.*, via new vaccines invented during the 20th century for measles, mumps, chicken pox, diphtheria, and a range of rarer diseases). Although the 1900 medical professional probably could have predicted advancements in disease prevention through vaccines, the specific diseases that would be addressed and their timing would not have been predictable. If projecting health risks in 2020 from the vantage point of 1900, it is unlikely that the forecaster in 1900 would have foreseen the 2020 medical community's ability to develop a vaccine for an entirely new pathogen in less than one year (as was the case for covid-19).

64. I see no reason to believe that we can better assess what our society's actual

[39] https://www.eia.gov/todayinenergy/detail.php?id=40013.
[40] The convertibility of mass to energy was first recognized by Albert Einstein in 1905, and the first artificial nuclear reactor was not built until 1942. U.S. Department of Energy, *The First Reactor* at 1, 4 (1982) (available https://www.energy.gov/sites/prod/files/The%20First%20Reactor.pdf).

vulnerabilities to climate risks will be by 2140 or later than we can imagine our turn-of-the-century great-grandparents being able to project today's societal vulnerabilities. While I conclude that 120 years is at the limit of ability to project societal vulnerabilities and changes, it should also be noted that a significant fraction of the damage estimates in the lower discount rate changes actually occur up to 280 years in the future. That would require considering how well someone living in 1740 could have projected the societal values and vulnerabilities of 2020. How accurate would economic projections made in 1740 regarding today's markets, levels of economic output, technologies, and lifestyle preferences have been? Would such projections have anticipated the present overriding importance of electricity to 2020's society, given that Benjamin Franklin's famous kite experiment only occurred in 1752? Would market seers of 1740 have overemphasized the importance of protecting against a future threat to the supply of horses, given that horses and other animals provided the sole source of locomotion on land other than walking? The socioeconomic projections of the IWG are inherently unreliable because modelers are forced to rely on experience of recent history and present knowledge to predict economic results as much as 280 years in the future.

GLOBAL IMPACTS

65. The IWG's estimates of SC-GHGs include climate change impacts projected to occur in all countries of the world, commonly referred to as "global damages." This fails to comply with the guidance of Circular A-4, which states that "Your analysis should focus on benefits and costs that accrue to citizens and residents of the United States. Where 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."[41] As I will explain below, about 90% or more of the IWG's SCC estimates of $/ton reflect benefits that are projected to accrue to people living in countries other than the U.S.

66. There is a thoroughly developed theoretical basis for this principle, but it can be encapsulated with the simple point that policymakers should focus first on the benefits to those who will be footing the bill. Lumping non-domestic benefits together with domestic benefits when

[41] Office of Management and Budget, Circular A-4 (September 2003) (available: https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/).

conducting cost-benefit analysis for a regulation that will apply only to domestic entities can result in policies that do not serve the economic interests of the economic community that would bear the cost, or perhaps even their altruistic preferences. Not only does the cost-benefit framework lose its ability to guide policy decisions towards improvement of that nation's welfare, but it could also lead to regulations that would fail to retain the political support of the affected community. For this reason, the decision of how much weight to give to benefits outside of U.S. borders should be treated as a significant policy decision that should be made completely transparent in the presentation of benefits that are to be compared to policy costs.

67. The principle that cost-benefit analyses should focus on domestic benefits is also embodied in U.S. statutes and their implementation in the courts. The Clean Air Act ("CAA"), for example, specifically identifies its purpose as being "to promote the health and welfare and productive capacity of [the Nation's] population,"[42] and the endangerment finding that EPA promulgated under the CAA to justify its authority to regulated greenhouse gases focused on domestic impacts.[43]

68. Gayer and Viscusi (2016) note other cases in the law supporting the principle of focusing on domestic impacts. For example, damages assessed under the Exxon Valdez oil spill case, litigated under U.S. law, included only damages to U.S. resources and entities. In an asbestos damages case litigated under the U.S. Toxic Substances and Control Act, standing was denied to non-U.S. petitioners, with the court ruling that "international concerns are conspicuously absent from the statute."[44]

69. The potential is very large that use of a single "global" SCC will guide U.S. greenhouse gas regulations away from improved national welfare, national political support, and be inconsistent

[42] Clean Air Act Section 101(b)(1).
[43] Final Rule, Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA, 74 Fed. Reg. 66496, 66514 (Dec. 15, 2009) ("[T]he primary focus of the vulnerability, risk, and impact assessment is the United States," and "The Administrator is looking at international effects solely for the purpose of evaluating their effects on the U.S. population.")
[44] Gayer T. and Viscusi W. K. 2016. "Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic versus Global Approaches." *Review of Environmental Economics and Policy,* volume 10, issue 2, Summer 2016, pp. 245–263, at p. 251; *see also Corrosion Proof Fittings v. E.P.A.*, 947 F.2d 1201, 1209 (5th Cir. 1991).

with the aggregate preferences of U.S. citizens. I provide specific numerical estimates in the paragraphs that follow.

70. In conducting sensitivity analyses using the IWG's three IAM models,[45] I found that two of the three models (FUND and PAGE) produce region-specific estimates of the SCC, their global estimates (which is what the IWG adopted) being the sum of the $/ton estimates across all the regions. When I had those models output their U.S. $/ton estimates across the five socioeconomic scenarios that the IWG used, using the 3% discount rate case, the U.S. SCCs were about 6% and 18% of the global SCC values for FUND and PAGE, respectively.[46] Otherwise stated, the FUND model's estimate of U.S. benefits averaged about $1/ton (compared to $19/ton globally) and the PAGE model's U.S. benefits averaged about $12/ton (compared to $69/ton globally).[47]

71. The third IAM, DICE, does not itself calculate its SCC at a regional level; however, Prof. Nordhaus develops DICE from a regional version of his model called RICE (where the "R" stands for "regional"). In his writings, however, Prof. Nordhaus has reported that the U.S.-only SCC is about 10% of his model's global SCC estimate.[48] If this 10% is applied to the IWG's 3% SCC estimates from the IWG's version of DICE, it would imply an average U.S. SCC of about $4/ton, compared to the average of $38/ton globally that the IWG attributes to the DICE model.

72. Taking the simple average over all three IAMs as the IWG did, I estimate that the IWG TSDs of 2013-2016 would have produced U.S. benefits of $6/ton (for the 3% discount rate), and that $36/ton of its $42/ton global SCC estimate is attributable to benefits in other countries (all stated in 2007 dollars).

73. The SCC values in those reports are all stated in 2007 dollars. The only change made

[45] I used the versions of those IAMs first adopted in the 2013 TSD, and which remain the IAM versions used in the TSD of 2021.
[46] Exhibit C, p. 99.
[47] These values are stated in 2007 dollars, as they were in the TSDs of 2013, 2015, and 2016. To convert them to 2020 dollars, as used in the 2021 TSD, multiply by 1.228575 (see fn 3, 2021 TSD, p. 5).
[48] Nordhaus, W., 2014, Estimates of the Social Cost of Carbon: Concepts and Results from the DICE-2013R Model and Alternative Approaches, *Journal of the Association of Environmental and Resource Economists*, Vol. 1, No. 1/2 (Spring/Summer 2014), pp. 273-312, at p. 290.

in the 2021 TSD was to restate the earlier SCCs in 2020 dollars, and thus I estimate that of the $51/ton global SCC estimate for 2020 emissions at the 3% discount rate in that report, the SCC for domestic benefits estimates that Circular A-4 requires to be reported would be about $7/ton, while the remaining $44/ton should be reported *separately* as benefits that would be accrued by other countries as a result of emissions reduction costs incurred by the U.S.

74. A 2019 paper by Prof. Tol, the developer of the FUND model, estimates the distribution of country-specific SCCs that add up to the global SCC using a wider range of assumptions about damage functions than in the three specific IAMs used by the IWG. His analysis provides theoretical support for expecting the SCC for the U.S. (and for other wealthy developed countries) to be small compared to the global total.[49] Indeed, when he incorporates a measure of income elasticity into his analysis, he finds that the U.S. SCC would be less than 1% of the global SCC value. He notes that when this measure of relative national vulnerability to temperature increases is omitted from his own analysis (as is the case for the IAMs used by the IWG), the regional pattern of country-specific SCCs is more like that found in RICE, PAGE and FUND.[50]

75. In summary, the IWG has failed to comply with a clear provision in the Circular A-4 guidance for conducting benefit-cost analyses to report U.S. benefits separately from benefits that may accrue to populations in other countries. This places the IWG's SCC estimates in the position of having made a strong policy judgment that regulatory requirements directing U.S. spending on greenhouse gas emissions reductions should be driven far more heavily by potential benefits outside of our country's borders than by potential benefits that are projected to occur inside our country.

SC-GHG AND DISCOUNT RATES

76. The element of time in climate change impacts complicates the valuation of those impacts. As the Congressional Research Service explained:

The fact that many impacts of climate change will occur in the distant future requires

[49] Tol, R.S.J., 2019, A social cost of carbon for (almost) every country, *Energy Economics*, Vol. 83 (September 2019), pp. 555-566.
[50] *Id.* at pp. 559-560.

> consideration of society's willingness to pay in the near term to reduce emissions that would cause future damages, mostly to future generations. To take time into account, economists discount future values to a calculated "present value." * * * * The choice of discount rate can significantly increase or decrease values of the SC-CO2. A low discount rate would give greater value today to future impacts than would a higher discount rate. High discount rates can reduce the value today of future climate change impacts to a small fraction of their undiscounted values. A high discount rate would recommend applying fewer of today's resources to addressing climate change impacts in the future.[51]

77. Given this importance of discount rate choices in regulatory cost-benefit analyses, Circular A-4 has provided quite specific guidance: it states that each analysis should be completed using discount rates of both 3% and 7%. (" For regulatory analysis, you should provide estimates of net benefits using both 3 percent and 7 percent."[52]) Circular A-4 also makes clear the basis for the two values in empirical observations of market data: the 3% rate represents "the real rate of return on long-term government debt" and is used as a "measure of the social rate of time preference." The 7% represents the average before-tax rate of return to private capital in the U.S. economy and is used as an approximation of the opportunity cost of capital.[53]

78. Circular A-4 does also allow sensitivity analyses to be performed to include discount rates higher than 7% (if there is a possibility the regulation could cause resources to be reallocated away from private investment in the corporate sector)[54] or discount rates lower than 3% (when the timelines are so long that issues of intergenerational equity may arise).[55] But recognizing the importance of the 3% and 7% rates, Circular A-4 is clear that such alternative discount rates are to be "in addition to" or "as well as" performing the analysis for both 3% and 7%.

79. The IWG has not followed OMB's guidance regarding discount rates. It has not provided estimates of the SC-GHG using 7%, but only for the mandated 3% and for 2.5% and 5% as well. In the present case, given the very long time lines considered, the failure to report the estimates of the SC-GHG for the mandated 7% assumption has an enormous, outcome-determinative impact

[51] CRS, *Attaching a Price to GHG Emissions with a Carbon Tax or Fee* at 7.
[52] OMB, Circular A-4, at p. 34.
[53] *Id.* at pp. 33-34.
[54] *Id.* at p. 34.
[55] *Id.* at pp. 35-36.

on the potential regulatory decisions that could result when using the SC-GHG values in a cost-benefit analysis. Although the IWG has not reported the results for the 7% discount rate case, I did calculate them using the versions of the IAMs that the IWG used. For example, the SCC estimates at the 2.5%, 3% and 5% discount rates for 2020 emissions are $76/ton, $51/ton, and $14/ton, respectively (year 2020 dollars).[56] If the range is completed with the mandated 7% case, the missing value is $6/ton (year 2020 dollars).[57] Stated another way, the range of average SCC for the mandated 3% and 7% cases is $6/ton to $51/ton. However, the range reported by the IWG is $14/ton to $76/ton.[58]

80. Thus, by ignoring standard OMB guidance, the IWG was able to report a range of values for use in regulatory decision making that is dramatically higher at both its ends. The IWG did not provide any reasoned justification for discarding the requirement under Circular A-4 to use the 7% discount rate. The TSD quotes the clear language in Circular A-4, only to then state that "[f]or the specific purpose of developing the SCC, we adapt and revise that approach here."[59] It then provides a lengthy discussion of the justification for what should have been sensitivity cases given the intergenerational setting, and appears to consider its sensitivity cases to have sufficient merit to warrant simply ignoring the clear requirement of OMB's guidance. Exclusion of the mandated 7% discount rate is thus arbitrary in the application of benefits estimates for use in Federal regulatory cost-benefit analyses.

81. Using a choice of discount rates outside of the range mandated in Circular A-4 might conceivably have been justified if the IWG had used IAMs in the manner theoretically correct within the context of the growth modeling methodology on which IAMs are originally based. As Prof. Nordhaus, the original developer of the DICE model, explains in his 2014 paper, the correct discount

[56] TSD, 2021, Table ES-1 at p. 5.
[57] This value was first reported by the U.S. government during the Trump administration as $5/ton stated in 2011 dollars (see USEPA, 2017, *Regulatory Impact Analysis for the Review of the Clean Power Plan: Proposal*, October, at p. 168, available at https://www.epa.gov/sites/default/files/2017-10/documents/ria_proposed-cpp-repeal_2017-10.pdf). However, it has been corroborated by multiple independent analysts using the IWG's IAMs, including myself.
[58] If one were to include the 95th percentile case in the range suggested by the TSD, it would be $14/ton to $152/ton.
[59] TSD, 2010, at p. 18.

rate in a growth model must be built up from two parameters (one being the social planner's assumed rate of time preference across generations and the other being the social planner's assumed aversion to inequality of consumption across different generations). While both parameters are purely policy judgments with ethical dimensions, they cannot be set independently of each other if the IAM run is to produce results consistent with current empirical evidence of average market interest rates. Many alternative combinations of these parameters are acceptable, but the combinations must be selected so that the model's projected interest rate is calibrated to observed levels. Otherwise the model will produce a SCC value that has not theoretical validity within the context of growth models. Because the growth model's discount rate also relies on the rate of growth in consumption per capita, it will also be time-varying.[60]

82. This basic theoretical tenet either eluded or was ignored by the IWG, which instead chose to remove critical logic from the DICE model that allowed for the feedback between projected societal damages from the baseline emissions trajectory and decisions on how much to invest on controlling those emissions. The IWG removed the investment decisions that were the original cost-benefit optimizing feature of the DICE model and instead calculated climate damages in each year (through 2300) against a fixed and unchangeable future of emissions growth, and then discounted them by alternative flat discount rates. The result of this process could deviate far from a theoretically based approach. As Prof. Nordhaus shows in his 2014 paper, the result of the endogenous, calibrated calculation of discount rates of the integrated original DICE model structure was approximately consistent with a fixed discount rate assumption of about 4.2%.[61]

83. More to the point here, Prof. Nordhaus notes that the IWG's methodology risks "making implicit assumptions that would be questionable if made explicitly. One example was the decision to make independent assumptions about economic growth and discounting. Virtually all

[60] Nordhaus, W., 2014, Estimates of the Social Cost of Carbon: Concepts and Results from the DICE-2013R Model and Alternative Approaches, *Journal of the Association of Environmental and Resource Economists*, Vol. 1, No. 1/2 (Spring/Summer 2014), pp. 273-312 at pp. 286-288.
[61] *Id.* at p. 296.

economic models would link the two, but the IWG took them as independent."[62] As a result the IWG's reformulated version of the DICE model produces a different answer that its original formulation was intended to do. While there remains some computational relationship in how damages *per se* are calculated, the IWG fundamentally altered the DICE model's conceptual structure. It has claimed some of the reputational merits garnered by the original DICE model's formulation despite having removed many of the core features of that formulation in the name of "harmonizing" its assumptions with other models that never had the key features of the DICE model that render it so theoretically sound. In doing so, its results were changed too. Whereas the original DICE model formulation would consistently produce a SCC of about $18/ton, the IWG approach would produce SCC estimates ranging from $12/ton to $58/ton by arbitrarily choosing exogenous discount rates from 5% to 2.5%.[63]

84. Given the inconsistency in how the IWG has attempted to address intergenerational equity by using lowered discount rates, the degree of inequity that the IWG's scenarios assume in their baseline forecasts merits discussion. Specifically, the IWG's median baseline projections of growth assume that real GDP per capita by 2300 is 7 to 25 times higher than our own. Table 1 below shows these assumptions, which I obtained from runs of the IWG's IAMs assuming the median ECS of 3°C. Because the IAMs' estimates of annual damages proportional to GDP per capita in each respective year, a given degree of temperature change in 2300 will have 7 to 25 times more monetized value per person living in 2300 than the same temperature change's impact would have if experienced right now. By assuming that it is unethical to discount future damages at a rate that adjusts for the large inequity in real per-capita consumption engendered by the assumed growth in productivity over time, the IWG's approach results in a policy prescription that we in the present must tighten their belts significantly more than the future generations would have to do if we did not take action. Tightening our belts significantly today to "protect" those much-wealthier future generations risks only increasing the real wealth inequity that the IWG's baseline assumptions project. For example, Table 2 below

[62] *Id.* at p. 297.
[63] *Id.* at p. 296.

shows how much more inequity would be experienced by today's population relative to those living in the far future under a maximal emissions control policy implemented today. It shows that real per-capita GDP in 2300 would expand to be 8 to 30 times better than our own, rather than the 7 to 25 times differential if we take no action today. In brief, the concerns with intergenerational inequity expressed by the IWG in advocating for use of lower discount rates appear to be inconsistent with their own modeling results.

Table 1. Median Baseline Real Consumption per Capita in IWG's Five Socioeconomic Scenarios (Source: Table 12 in Exhibit C)

	IMAGE	MERGE	MESSAGE	MiniCAM	5th scenario
Real global consumption per capita					
2020	$ 9,194	$ 7,427	$ 8,595	$ 7,613	$ 8,171
2100	$ 37,133	$ 22,892	$ 26,912	$ 36,671	$ 31,106
2200	$ 125,365	$ 43,798	$ 53,759	$ 134,827	$ 90,555
2300	$ 169,660	$ 49,239	$ 63,872	$ 187,494	$ 122,001
Consumption relative to 2020 consumption					
2100 relative to 2020	4	3	3	5	4
2200 relative to 2020	14	6	6	18	11
2300 relative to 2020	18	7	7	25	15

Source: NERA runs of DICE model using median equilibrium climate sensitivity (ECS=3)

Table 2. Median Real Consumption per Capita in IWG's Five Socioeconomic Scenarios After Application of Maximal CO2 Emissions Reduction (Source: Table 13 in Exhibit C)

	IMAGE	MERGE	MESSAGE	MiniCAM	5th scenario
Real global consumption per capita					
2020	$ 9,202	$ 7,433	$ 8,603	$ 7,620	$ 8,177
2100	$ 38,466	$ 23,954	$ 27,726	$ 38,072	$ 31,458
2200	$ 140,133	$ 51,271	$ 58,024	$ 151,673	$ 92,610
2300	$ 202,420	$ 63,738	$ 71,653	$ 224,995	$ 126,239
Consumption relative to 2020 consumption					
2100 relative to 2020	4	3	3	5	4
2200 relative to 2020	15	7	7	20	11
2300 relative to 2020	22	9	8	30	15

Source: NERA runs of DICE model using median equilibrium climate sensitivity (ECS=3), and with manmade emissions set to zero in 2015 and all years thereafter.

ECONOMIC IMPACT OF SC-GHG

85. CO_2 is not only ubiquitous but is also an essential input to our economic productivity in the form of cost-effective and reliable fuels. It is useful to put the meaning of $51/ton or $152/ton for SCC into the context of daily budgets using existing equipment owned by households and businesses. ($51/ton is the interim SCC for 2020 emissions using a 3% discount rate and $152/ton is the interim SCC for 2020 emissions using the 95th percentile value. Both are stated in 2020 dollars.)

86. For example, the average fuel usage of light-duty vehicles (e.g., passenger cars and SUVs) is presently about 22 mpg.[64] Based on recent trends, the average miles driven per household is about 19,000 per year,[65] implying an average annual gasoline consumption of about 863 gallons per household, or about $2,160 per year per household if gasoline prices average $2.50/gallon. If a tax of $51/ton of CO_2 were to be applied to gasoline sales, the cost of gasoline would increase to about $3.00/gallon, while it would increase to about $4.00/gallon if the carbon adder were to be set to $152/ton of CO_2. The average driver's annual costs for operating such a vehicle would therefore rise from about $2,160to $2,590 or $3,455, respectively. This implies an increase in annual household vehicle usage costs of about $432 or $1,295, depending on the SCC value adopted. The number of miles driven tends to be about 30% higher in rural areas than the national average,[66] so these costs would be disproportionately borne by rural households, with cost increases more in the range of $560/year and $1,684/year, respectively.

87. Households could lessen this cost and are likely to eventually do so, but they cannot completely eliminate the heightened cost of personal transportation. For example, in the immediate term, they could drive less, either by using public transportation, walking, or travelling less. All of these would reduce emissions, but possibly with added inconvenience, or with some new forms of expenditure such as transit fares. Over the longer run, the vehicle owner could replace the current vehicle with a lower-emitting one. While doing so would reduce the annual fuel bill, the replacement

[64] https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles.
[65] https://nhts.ornl.gov/2009/pub/stt.pdf at 7.
[66] *Id.* at 56.

vehicle would likely require an upfront purchase cost or loan that would have to be offset by the anticipated reduced operating costs (perhaps combined with other improved attributes associated with switching to a newer vehicle). The lower-emitting vehicle types may also cost more to purchase than a newer car of the current type owned. Another longer-term response might be to shift to gasoline substitute fuels, such as those with a higher ethanol content. However, these fuels presently offer much less than 100% reduction in CO_2 emissions and are usually more costly than gasoline to start with. The larger amounts of reduction possible from fuel switching usually require a different vehicle, and also entail some delay before it will occur. Thus, the larger emissions reductions (which are the intent of the emission pricing policy) will take time to occur, will come at new costs of their own, and will disproportionately impact rural households.

88. Added costs (or lifestyle changes) associated with personal transportation is just one of many ways that imposition of these SCCs will affect a typical household's budget. Natural gas and propane also would become more costly to use, as they emit CO_2 much like gasoline does. Thus, the cost of heating a home or hot water may increase. A home with gas-fired furnace, hot water heater, and stove may use about 800 therms per year,[67] which might cost $800 per year.[68] The actual amount will vary substantially by the severity of the winters. At $51/ton CO_2 and $152/ton CO_2, that household's natural gas costs would rise by about $249/year and $743/year, respectively.[69] Again, the actual amount will vary by the severity of the winters. Total costs of those energy services might be possible to reduce over the longer run by replacing the furnace, hot water heater, and stove with newer, more efficient ones, or perhaps by replacing them with electric versions (which are more expensive to purchase and may be – depending on one's region – more expensive to operate), or

[67] https://askinglot.com/how-many-therms-does-a-typical-household-use.
[68] This assumes an annual average price per therm of $1/therm (https://blog.constellation.com/2020/05/28/natural-gas-cost-per-therm/#:~:text=The%20average%20cost%20of%20natural,gas%20therm%20price%20of%20%240.92). Both the annual consumption and the price per therm will vary by region, with higher consumption levels in colder areas.
[69] This assumes 13.446 lbs. CO_2 per therm (see: https://www.pge.com/includes/docs/pdfs/about/environment/calculator/assumptions.pdf).

through investments in insulation at the home. Over the even longer horizon, gas utilities might start to blend their natural gas with lower-carbon gaseous fuels such as "green hydrogen." However, these new fuel forms are likely to be even more costly (albeit lower-emitting) and will require even more time before they are likely to be implemented. Whatever the final impact to the household budget, this higher cost for natural gas (or propane) will add to the household spending of any home that uses these fuels.

89. Electricity also involves carbon emissions, although policy implications for household electricity bills are not straightforward to predict, given the extent to which the electric utilities can take action to reduce their emissions before sending the electricity to their customers. Just as context, it is worth computing the national average impact for households. If a household consumes about 10,650 kWh of electricity per year.[70]Given that current average CO_2 emissions per kWh is 0.00045 tons,[71] the national average household's annual electricity costs could increase by $241/year to $720/year for the two example carbon adder assumptions. (Again, the actual increase will vary substantially by region, given that electricity consumption varies and so too does the average carbon-intensity of the region's electricity generating system.) Much is being discussed about how rapidly electricity generation will transition to a much lower average emission rate per MWh, and while such transition will reduce the cost of emissions the utilities would need to absorb, it will take more time than purchasing a new car or furnace, and it will imply massive capital investments that will instead need to be repaid. Whether households end up ultimately paying those cost through their electricity bills or through higher income taxes is presently impossible to predict. Nevertheless, if a SCC price were to be imposed, costs such as the above estimates would likely need to be passed on to households in the near-term.

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[70] https://www.eia.gov/tools/faqs/faq.php?id=97&t=3. (As this example is for average electricity use over all U.S. households, the usage for a home not using natural gas or propane for heating is likely higher and usage for a home not using air conditioning is likely lower.)

[71] https://www.google.com/search?q=co2+per+mwh+average&rlz=1C1GCEA_enUS934US934&oq=co2+per+mwh+average&aqs=chrome..69i57j33i22i29i30.5058j0j4&sourceid=chrome&ie=UTF-8 at 6.

90. Increased costs of energy services are just the most apparent budget impact. The average consumer also purchases food, electronics, paper goods, clothes, airplane trips, household appliances, and much more. These items are also made and transported to the consumer using emitting sources of energy. The added production cost of a CO_2 adder, or of taking action to decarbonize their operations, will also increase the costs of goods and services and will further add to households' cost of living increases.

91. Although I have not made any calculations for the budget impacts of SCM and SCN, they too will affect cost of goods and services. Food costs are likely to be most affected by a price imposed on nitrous oxides (*i.e.*, SCN). Natural gas and food costs are likely to be most affected by price imposed on methane emissions.

92. Thus, the cost of just meeting current average household needs of transportation, gaseous fuels, and electricity could increase by about $1,000/year for a $51/ton emissions adder for CO_2, and by about $3,000/year of the CO_2 price were $152/ton. This would be the immediate effect, but it will not be possible to eliminate the impacts entirely once people and market systems have a chance to alter their behavior and technology investments. The final impact on the economy and household consumption of such changes is a matter for macroeconomic modeling. The vast majority of such modeling exercises find that carbon prices in this range result in very substantial investments and changes in technologies and infrastructure, very large reductions in demand for coal, natural gas, and refined petroleum products, and eventual (long-term) per household costs only somewhat lower than the estimates reported above for immediate, near-term costs of direct purchases of energy.

INEFFICIENCIES OF CONTROLLING EMISSIONS BY INDIVIDUAL REGULATIONS

93. Controlling emissions through a set of individual regulations affecting different sectors or source technologies is an inefficient regulatory approach in the case of greenhouse gases and managing climate risk. This is because the location of the emissions reductions does not affect the level or location of the climate risk that they contribute to, and the climate risk itself is only affected by the aggregate quantity of the emissions that has accumulated in the global atmosphere. What

matters most is the quantity of aggregate emissions reduction achieved. Given the ubiquitous nature of these emissions, and the fact that CO_2 is not a mere contaminant or by-product of energy production, but core to the process of releasing energy from society's most cost-effective fuels, achieving significant aggregate emissions reductions poses major challenges for technological and infrastructure change across all of society. What society needs to focus on is finding the least-cost combination of control measures, leveraging reductions from emission-creating activities, processes, and locations that can be accomplished most cheaply and most rapidly.

94. This requires an economy-wide approach to policy in which every individual emissions source faces equivalent regulatory pressure and oversight. An example of such a policy would be to institute a uniform price per ton on all sources of carbon emissions across the entire economy, including not just domestic production but also the carbon emissions associated with imported goods and services. This sort of policy requires new legislation.

95. Attempts to substitute an economy-wide, uniform law with a complex of regulations, subsidies, fees and threats to organizational funding such as can be accomplished through existing statutes and federal authorities that were not originally established with managing climate risks in mind will leave gaps in coverage of emissions. Such gaps will quickly morph into loopholes that will undermine the effectiveness of the regulations on reducing aggregate greenhouse gas emissions. Unintended consequences will be prevalent.

96. For example, if funding pressure could be placed on institutions of public education to rapidly decarbonize their operations, the cost of public education would start to rise. If statutory authority does not exist to place equivalent regulatory pressure on private entities in that sector, the relative cost of private education could start to decline. As this shift becomes apparent to families, demand for private education can be expected to rise, educational inequities may be exacerbated, while emissions reductions in the public side of the sector could be partially offset by increased emissions on the private side of the sector. A far more effective approach would place the same form of regulatory pressure on all types of educational entities; but this would require imposing new statutory authority. This type of dysfunctional dynamic could play itself out across many sectors of the economy

if our society accepts piecemeal regulatory action under existing legal authorities as its national climate policy approach.

INFORMATION QUALITY GUIDELINES AND THE IWG PROCESS

97. The Information Quality Act of 2001 requires that OMB "shall . . . issue guidelines . . . that provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies."[72]

98. The OMB guidelines, finalized February 22, 2002, defined several key procedures that all agencies should adopt with respect to how they handle data.[73] Several provisions have particular relevance to the question of SCC. For one, it endorsed peer review as a criterion for determining the objectivity of research producing information, but also noted that agencies "should tailor the rigor of peer review to the importance of the information involved." It further established a category of information called "influential" for which "stricter quality standards" should be applied, including "additional quality checks beyond peer review." "Influential" information was defined as information that "the agency can reasonably determine . . . will have or does have a clear and substantial impact on important public policies or important private sector decisions." [74]

99. Estimates of SC-GHGs, with their significant potential impact on a wide range of regulatory decisions, clearly fall into the category of influential information under these OMB Information Quality Guidelines. The SC-GHGs were developed by the IWG expressly for use in regulatory analyses, which was the focus of the Information Quality Act's requirements. Thus, the OMB guidelines should be applied to the IWG process as well.

100. The OMB information quality guidelines describe some of the heightened quality standards for dissemination of influential information thus: "[They] shall include a high degree of transparency about data and methods to facilitate the reproducibility of such information by qualified

[72] P.L. 106-554, Section 515, 144 Stat. 2763 (2001).
[73] 67 Fed. Reg. 8452 (February 22, 2002).
[74] *Id.* at 8455.

third parties," and "[t]he fact that the use of original and supporting data and analytic results have been deemed 'defensible' by peer-review procedures does not necessarily imply that the results are transparent and replicable."[75] The OMB guidelines further note that "The primary benefit of public transparency is not necessarily that errors in analytic results will be detected, although error correction is clearly valuable. *The more important benefit of transparency is that the public will be able to assess how much an agency's analytic result hinges on the specific analytic choices made by the agency*. Concreteness about analytic choices allows, for example, the implications of alternative technical choices to be readily assessed. This type of sensitivity analysis is widely regarded as an essential feature of high quality analysis."[76]

101. As a professional in the field of decision analysis and a long-time practitioner of these methods in public policy evaluation, I strongly concur with the importance of using sensitivity analyses to demonstrate the degree to which a given model-based prediction (or set of predictions) depends on specific analytic choices adopted for the model(s) in question. This is a fundamental feature of sound and reliable analysis methodology and has especial importance when the analysis is conducted in the face of uncertainty. More importantly, good analysts are not supposed to be decision makers; their professional responsibility is to *clearly inform* decision makers when key assumptions in their analysis may sway its indications for the best decision, and not to simply decide what they consider to be the best assumption to adopt.

102. The responsibility of the analyst to provide information about the sensitivity of their modeling results applies to input parameters affecting uncertain (either variable or unknown) physical or economic phenomena, but also to subjective judgments made in the analytical framing of the model. Indeed, when the decision maker is readily identified (as in the case of business decisions), the analyst should elicit the views and preferences of the decision maker as a part of the process of initial model framing. In the case of policy analysis, the decision makers are diffuse and vary from regulation to regulation. In this policy analysis environment, it is even more important that the analysts clearly identify the sensitivity of all key value-laden or subjective judgments implicit or explicit in the analysis.

[75] *Id.* at 8455.
[76] *Id.* at 8456, emphasis added.

This should be the responsibility of the original (i.e., government's) analysts. However, even if such sensitivities are identified later by a "qualified member of the public" in the course of "independent" replication of the government analysts' information,[77] such sensitivities should be transparently identified and discussed in any future agency (or IWG) communications about the topic. This is a fundamental element of sound procedure that professional decision analysts are taught; it is also consistent with the intent of OMB guidelines for ensuring the quality of influential information being used for federal regulatory decisions. For example, "This type of sensitivity analysis is widely regarded as an essential feature of high quality analysis."[78])

103. In the case of IAMs, analytical framing judgments that are subjective include modeling time horizons (e.g., how far into the future impacts can be reasonably projected), utility functions and discounting (e.g., whether to give more weight to damages incurred by populations with lower potential consumption than others; how to weight future vs. current consumption), how much weight to assign to domestic vs. non-domestic damages, and assumptions about baseline emissions and socioeconomic scenarios.

104. In prior work, conducted over the period 2013-2016, I obtained and ran the IWG's IAMs, proved that I can replicate their reported results when using all of their input assumptions, and then conducted sensitivity analyses to the above-mentioned framing assumptions. I have presented my results publicly in testimony and in a professional conference.[79] In conducting my replications, I identified relatively small errors in some of the IWG estimates reported in the 2013 TSD; but I also identified very significant sensitivity to each of those analytic framing assumptions. Indeed, I found that the SCC estimates are every bit as malleable to alternative framing assumptions (which are not scientific in nature, but mere analyst judgments) as they are to alternative assumptions about the highly uncertain scientific phenomena assumed in the IAMs.

105. However, although the IWG released updated TSDs in 2015, 2016, and 2021, the

[77] Terms in quotes used in *id.* at 8456.
[78] *Id.* at 8456.
[79] A copy of a presentation I made at the 2016 Annual Meeting of the Society of Benefit-Cost Analysis is attached hereto as Exhibit D.

significant sensitivities that I reported regarding the IWG's subjective analytic framing judgments have never been mentioned or referenced, let alone discussed transparently. In contrast, a very minor error that my analysis team detected in the PAGE model results was corrected in the 2015 TSD update, suggesting a substantial misplaced emphasis by the IWG on precision.[80]

106. In summary, I conclude that the IWG has only selectively conducted its work in a manner consistent with the OMB information quality guidelines. This was the case during the Obama Administration (for the TSDs through 2016) but the 2021 TSD also omits discussing the additional sensitivity analyses associated with analytical framing and other value-laden assumptions. Indeed, it still fails to provide SC-GHG estimates using the 7% discount rate assumption or separate domestic from non-domestic portions of the $/ton estimates, even though these were considered the correct value judgments of the Trump Administration, and are required under OMB's guidance for conducting regulatory impact analyses. The latter two omissions are particularly egregious given that the IWG does not conduct the regulatory impact analyses—agencies do. By not even providing estimates of those values, the IWG is essentially forcing agencies to prepare climate-related regulatory impact analyses that do not comply with the formal guidance. Whether one accepts a particular alternative assumption or not is a policy judgment, but I believe it is incumbent on analysts to be transparent about the implications of alternative policy judgments and leave it to the policy makers to make the case for which set of estimates they will emphasize.

107. There have been other aspects of the IWG process that strike me as inconsistent with standard federal policy development processes, even if not directly at odds with OMB guidance. In rulemaking processes of the EPA in which I have participated over the past four decades, there has always been a formal comment and response process, as well as opportunities to hear directly from staff about the Agency's interpretations of the controlling statutes and their associated judgments. In contrast, the IWG deliberates even the technical issues without public observation or input. Final technical judgments are communicated in a single, very brief document (the TSD) that contains no

[80] See Appendix B of the July 2015 update TSD. (The PAGE model estimates were adjusted by only 4% as a result of this update.)

direct response to comments such as one finds in notices of rulemaking. Indeed, there was no formal comment period provided prior to finalization of any of the TSDs. There was only post-release acceptance of comments for two of the TSDs: a comment period that was opened 6 months after release of the May 2013 TSD, which contained major revisions to the SCC estimates,[81] and a comment period that was opened 2 months after release of the February 2021 TSD.

108. In contrast to the IWG process, I participated as a testifying expert in a proceeding about social cost of carbon estimates that took place under Minnesota statute before the Minnesota Public Utilities Commission. In that proceeding, no values were established prior to a full contested-case proceeding before an administrative law judge, a detailed opinion, followed by a public hearing of the Commissioners. I provided testimony regarding the policy framing judgments that are implicit in any set of numerical SCC values, the sensitivity of the estimates to a range of those subjective policy judgments, and provided Commissioners alternative $/ton estimates for a wide range of alternative possible value judgments that they might wish to select. In the end, the Commissioners made very explicit what the policy judgments were that they would endorse, and adopted a range of SCC values reflecting those explicit judgments. While I do not agree professionally with some of the policy assumptions that they selected, the process was open, transparent, and any interested member of the public would be able to understand how the values selected (and resulting regulatory decisions) would have differed if the Commissioners had espoused different policy positions. The IWG process is much the opposite Minnesota's, and I do not find it supportive of democratic policy making.

[81] This comment period was opened at the time of very minor update to the May TSD, correcting an error in one of the IAM models that had been reported by an independent analyst after the May release.

I DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES OF AMERICA AND THE STATE OF LOUISIANA THAT THE FOREGOING IS TRUE AND CORRECT.

Executed in Washington, D.C. this 23rd day of July, 2021.