

MEMORANDUM

April 29, 2011

TO: Stephen Merrill, Executive Director, Board on Science, Technology, and Economic Policy (STEP), National Academy of Sciences

CC: Christopher Avery, Daniel Mullins, and Paul Beaton, NAS

FROM: Doug Koplou, Earth Track, Inc.

SUBJECT: Scoping Suggestions for NAS Review of Effects of the Tax Code on Greenhouse Gas Emissions (PGA-STEP-10-02)

Thank you for the opportunity to provide input on NAS' upcoming analysis on the effects of the federal tax code on greenhouse gas (ghg) emissions. The discussion below summarizes a number of the issues related to tax subsidies and climate change that I've encountered over the two decades or so that I have worked on environmentally harmful subsidies. I hope that this information will prove useful to the panel, and would be happy to answer any questions that you have.

1) Quantifying the value of tax subsidies

Whichever elements of the tax code NAS ultimately decides to evaluate, there are a number of issues related to quantifying the tax subsidies that frequently arise.

a) Revenue loss versus outlay equivalent. Historically, the cost of federal tax expenditures was routinely presented using two main metrics: revenue loss and outlay equivalent. The former estimated the tax revenues forgone for each provision due to special tax rules; the latter scaled that loss up to reflect the fact that the tax benefits were often not themselves taxed, and therefore had a higher pre-tax value to the firm. Outlay equivalent values are usually higher than revenue loss estimates (in some cases they are equal). However, their purpose was to provide a more equal comparison with other forms of subsidy support such as grants.

Unfortunately, the US Treasury stopped reporting outlay equivalent values some years ago. Government subsidy assessments completed since the demise of routine outlay equivalent reporting, such as those by the US Energy Information Administration (EIA), have simply replaced their outlay equivalent values with revenue loss. This shift has reduced data

comparability with non-tax subsidy instruments, and has understated the degree to which government interventions are affecting market behavior.

Recommendation: NAS should report both revenue loss and outlay equivalent values for the tax expenditures evaluated. NAS should request that Treasury prepare outlay equivalent measures or should calculate such values itself.

b) Expenditure estimates vary widely across estimating agency. Unlike easily measured grant subsidies, estimating tax subsidies can be quite complicated. Estimators often require assumptions about subsidy uptake, which in turn require projections of market conditions. They may also require counterfactual scenarios on how much taxes particular activities would pay absent the break. Different estimators (e.g., Joint Committee on Taxation and Treasury) may also use different budget baselines. As a result, estimates by the different parties can differ by hundreds of millions of dollars per year or more. For an illustration of the significance of this issue, the Pew Center's Subsidyscope project has processed an enormous amount of historical data from Treasury and JCT to allow direct comparisons of estimates. Their database can be accessed [here](#).

Recommendation: NAS should present a range value rather than a point estimate in order to more accurately represent estimate uncertainty and variance across estimators. NAS should not arbitrarily select one federal data source over another, as has been done in some past subsidy studies. Where the disparity in estimated subsidy values between different estimators is particularly large, NAS should request the contributing agencies to provide an explanation of the causes and adjust estimates as appropriate.

c) Marginal evaluation of impact. Studies of federal tax subsidies often report current losses caused by existing investments, or extend loss estimates a specified number of years into the future based on projected investment. The impact of available subsidies on the economics of one (higher carbon) option versus another (presumably lower carbon option) at the margin is rarely considered directly. However, tax breaks that are on the books begin to influence and alter investment decisions well before losses start hitting the Treasury. These distortions can be important factors in artificially boosting the expected returns from one type of capital or industry versus another, at the margin tilting the country's energy path. Where the more heavily-subsidized sector is carbon intensive, the marginal incentives create a potential risk of locking the country into more ghg-intensive activities during the decades-long operation of some of these capital-intensive options. There is a political feedback loop as well that exacerbates that issue: large subsidies (such as those to corn ethanol) give rise to a powerful lobby that works both to protect existing subsidies from reform and expand policies to subsidize related activities. All of these features make it important for NAS to consider the bias the tax code may introduce to marginal investment.

Recommendation: NAS should incorporate in its review all existing tax subsidies that are likely, if used, to affect ghg emissions. This should be done even if estimated tax losses over the next few years appear small. Rather than simply listing the subsidy line item along with a zero value based on current costs to Treasury, NAS' work should also present the value of that subsidy to a particular sector were it to be used. Assessing the impact of such subsidies on a theoretical new

investment can be a useful way to illustrate this issue. [Work](#) by Stan Kaplan, then at the Congressional Research Service (now at EIA), can provide one model for how to integrate this approach into reporting. Work by Gib Metcalf is another useful approach to evaluate relative distortions on capital investment by energy type. Dr. Metcalf is appearing in person before the panel, so will be able to direct you to his relevant publications.

d) Appropriate metrics of impact. Corporate financial reporting requires a number of ratios and financial statements to provide an accurate picture of the health of company operations; no single metric could convey all key information. Subsidies are the same: multiple metrics are needed to assess policy impacts on ghg emissions or other factors (e.g., the cost to taxpayers). In addition to total dollars of support (revenue loss and outlay-equivalent), metrics such as tax subsidies/unit energy produced; tax subsidies/mt CO₂e avoided; or tax subsidies as a percentage of total capital deployed to the project would all be useful.

Aggregate metrics, such as the average effective tax rates for specific industries, can be a useful supplement to line-item detail. For example, were the average effective tax rate (AETR) for a particular industry be well below the statutory rate, but have few associated tax expenditure line items thus far identified, the AETR would tell the study team to redouble their efforts to find the missing subsidies to that industry.

These metrics also provide an important check to the generic arguments routinely brought forth by subsidy beneficiaries to justify and protect their favored programs. For example, they provide much greater resolution on the relative efficiency of the subsidy pathway versus alternatives or the value of the product produced. In addition, they can flag situations where the incentives relating to sharing upside gains and downside risks are askew, greatly reducing the likelihood of achieving any particular public policy objective.

In my own work on subsidies to ethanol and nuclear power, for example, industry proponents often justify the programs on the grounds that they reduce ghg emissions. Being able to present subsidies per mt CO₂e abated has allowed me to clearly demonstrate the massive inefficiency of these approaches relative to other carbon reduction options. The metrics can also make it easier for Congress to identify the most distortionary subsidies for priority removal or reform.

Recommendation: NAS should solicit input on useful metrics early in its research, identify the most useful ones, and incorporate them into its reporting.

2) Modeling impacts of tax code changes on GHG emissions

The NAS research mandate includes the potential use of econometric modeling to assess the impacts of particular subsidies and particular reform strategies on national or global ghg emissions. There are a number of issues to consider in determining an appropriate path for integrating various modeling options in NAS' work:

- **Model variation.** Past modeling efforts have generated fairly wide dispersion in results. Understanding the drivers of that variance is important in deciding what modeling approach and specific model makes the most sense for NAS' work; and in being able to

predict and report on potential sources of bias in whatever selections are made. For a review of ghg reduction modeling efforts through 2000 see section 3.2 in [this](#) paper. Note that many of the international models in the past have relied on the [price gap](#) methodology, implicitly assuming zero subsidies in the United States (often the reference price market) and generally ignoring producer subsidies. Any NAS effort will need to model producer subsidies as well as consumer subsidies in order to be useful, since in the US and most of the OECD countries it is the producer subsidies that dominate.

- **Subsidy inputs matter a great deal.** If NAS inputs a very narrow range of subsidies into any model, the benefits of reform predicted by the model will be small. This point seems obvious, but is actually quite important to keep in mind as the panel comes under pressure to eliminate a wide variety of subsidies that clearly support the energy sector, though perhaps not exclusively. Around 1994, the US Environmental Protection Agency conducted two modeling exercises on subsidy reform, one using the Jorgenson-Wilcoxon Model, the other using a Decision Focus, Inc. model that had more resolution on the energy sector. While there were some differences based on the models used, the larger impact was driven by which policies were included. When the models ran only the EIA's short-list of targeted energy subsidies (from their 1992 report), subsidy reform generated minimal climate benefits. When they re-ran using my broader, and in my view more accurate, set of subsidies (from [this](#) study), the benefits of reform were much higher.

You will not reach full consensus on what policies to include in your analysis. However, it is important that any model runs include both a highly restrictive subsidy scenario (only including special tax breaks targeted only to energy) and another using a more appropriate definition that includes programs that may benefit more than one sector but disproportionately supports energy or the other sectors being examined. These runs will provide an important contribution to the debate on reform. Additional information on EPA's past efforts in this area can be obtained from Michael Shelby at the US EPA or Robert Shackleton, now at the Congressional Budget Office.

- **National versus international modeling.** There are a variety of trade-offs to be considered in deciding whether NAS modeling should be limited to the United States or include the global energy system. From a fiscal standpoint, there may be strong arguments to focus domestically. However, ghg emissions are a global burden, and past modeling suggests that the impact of price reforms in one part of the world in reducing demand will be partially muted on international markets by increased demand elsewhere. Thus, from a climate perspective, integration of US policy with the international trading system seems warranted. For additional perspective on the international efforts to model ghg impacts of subsidy reform, NAS may wish to contact Jean-Marc Burniaux at the Organisation for Economic Cooperation and Development (OECD). He has overseen much of [OECD's modeling work](#) in this area and has also worked with the GTAP trade model.

3) Setting the boundaries of analysis

Over the years, there have been a variety of issues regarding the boundaries of subsidy analysis that recur. It will be useful for the NAS panel to consider these up-front in order to ensure that work proceeds along the most useful trajectory.

a) Optimal versus actual tax systems. Any review of US tax subsidies quickly runs into arguments that many of the subsidies under our income-tax based tax system would not be subsidies under alternative tax systems (e.g., a consumption-tax based approach). These debates can quickly redirect research effort and time into tangential issues that reduce the quality and scope of analysis of our existing tax system.

Recommendation: NAS should have a discrete task that evaluates the impact of a variety of alternative tax systems on climate in general and include it as a separate work product or chapter in the final report. It may be useful to integrate this more theoretical work with the macroeconomic modeling to quantify the potential impact of broad-based tax shifts. However, the majority of the research effort should assume that the US federal tax system affecting ghg emissions remains reliant primarily on income taxes and related user fees (e.g., motor fuel excise tax).

b) Tax-exempt organizational structures. Most reviews of tax expenditures have focused on the impact of line item provisions on Treasury revenues. This starting point, however, may entirely miss a core tax issue of increasing importance: the growing use of tax planning and organizational structures that allow firms to bypass corporate-level taxation entirely. The use of transfer pricing within multinational firms to shift taxable profits to lower tax operations or regions has long been exploited by the oil and gas sector, and is also a continuing problem with foreign firms operating in the US. Corporate inversions, where managers relocate a US firm abroad in order to eliminate most or all US federal taxes despite substantial continuing US operations, have been used by many energy firms. Corporate forms such as large scale publicly-traded partnerships, LLCs and LLPs that pass income directly to shareholders, members, or partners with no corporate tax burden are another technique of growing popularity. There is some evidence (see discussion in Section 4.4 of [this](#) review) that natural resource firms are disproportionately able to use these techniques. Further, power, water, and agricultural sectors rely on other structures exempt from corporate-level (or all) taxes through municipal and cooperative ownership structures.

Recommendation: NAS should work with Treasury and with the US Government Accountability Office (GAO has analyzed many of these issues in the past) to evaluate the trends in corporate structures and their impact on the effective tax rates borne by specific sectors. This work will be particularly important in the areas of energy; water; forestry and agriculture; mining; and the construction and maintenance of transport infrastructure.

c) User fees. The energy and transport sectors have many excise taxes for which the proceeds are held in trust funds and earmarked for particular uses. Some examples include the cleanup of past energy-related messes (abandoned mine lands or leaking underground petrol tanks); accrual of funds for future messes (nuclear waste fund, oil spill fund); and construction of transport

infrastructure heavily used to move bulk fuels, or by vehicles consuming ghg-emitting fuels (highway, airport, inland waterway and mass transit trust funds).

Special exemptions from these fees, as for ethanol under the volumetric ethanol excise tax credit (VEETC), also sometimes exist and can cost the Treasury billions of dollars per year. In many other cases, the fees are set too low to cover even the direct cost of the infrastructure the fee is supposed to support, generating a subsidy for the related activity. Data compiled by Pew's Subsidyscope project, for example, indicated that for 2007 alone gross receipts from users to finance the federal highway system were about \$70 billion less than funds spent on highways, even when all diversions to mass transit were credited to highways.

Some of the trust funds support fiendishly complex operations – such as the nuclear waste repository – where all risk has been shifted to taxpayers to run the operation on, at best, a break-even basis with zero return on taxpayer's invested capital. In these cases, even if gross receipts were high enough to fund direct costs, there are still very large subsidies being generated for the beneficiary industries.

Recommendation: The NAS review needs to include excise taxes and related trust funds. The analysis of net subsidies should be based, at a minimum, on the actuarial needs of the purpose for which the fund was created. In the past, EIA has instead looked at current operating surplus or deficit within the fund, an inappropriate and inaccurate metric. Where large scale operations that materially affect ghg emissions are being operated on a break-even basis with no ROI, NAS should estimate the incremental value of that subsidy as well. Finally, NAS should include targeted reductions in excise taxes (such as VEETC) within its review.

d) Accelerated depreciation. Government reviews of energy subsidies have been inconsistent in their treatment of accelerated depreciation as a subsidy to particular industries. Accelerated depreciation, particularly during times of low inflation, provides substantial subsidies to capital-intensive activities relative to capital-conserving approaches such as energy conservation. Special rules that vary by asset or industry sector introduce further market distortions.

Where Treasury has broken out specific provisions (e.g., natural gas distribution pipelines treated as 15-year property), the subsidies have generally been captured in studies (for example, in work by EIA, Subsidyscope, and the Environmental Law Institute). Where the special depreciation rules do exist, but are hidden in the IRS guidelines (e.g., allowing nuclear reactors to be written off in 15 years, rather than over their 40-year license period) rather than listed and quantified by Treasury, the subsidies have been ignored.

Recommendation: NAS should use the asset class structure in [Table B-1 of IRS publication 946](#) as the basis for evaluating depreciation subsidies. Data from Treasury and JCT can assist in this effort, but should not restrict which asset classes are reviewed. NAS should also review whether there has been any material sectorial bias in short-term bonus depreciation rules implemented in recent years. Depreciation subsidies should be benchmarked against actual service lives, not the lives used in the IRS MACRS system. For example, asset class 49.12 "Electric Utility Nuclear Production Plant" should not be compared to the 20 year depreciation for other fuels (nuclear gets 15), but to the 40-year initial license period for the facility. When the US system for

depreciation is compared to other countries, it becomes clear that many countries have even more generous depreciation schedules than the US. Domestic industry lobby groups often point to this result as a justification for retaining or increasing US subsidies to capital. However, it would be more helpful for the NAS team to highlight the reverse: that these foreign subsidies may be skewing investment, and thereby contributing to climate change, even more sharply than in the US.

e) Other “generally-available” tax subsidies. EIA studies, and many done by industry, eliminate any provision that is available to multiple sectors of the economy on the grounds that it is part of the tax “baseline”. As with accelerated depreciation, however, many of these provisions disproportionately benefit one sector over another. In addition, the boundary lines are often inconsistently drawn. For example, EIA included the excess of percentage over cost depletion as a subsidy even though it benefits many extracted minerals including those as basic as gravel. In contrast, Australia excluded percentage depletion allowances from their review of subsidies to oil and gas under a G-20 reform effort arguing it was part of their baseline. Similarly, EIA *included* tax-exempt private activity bonds in its subsidy tally, though the bonds are used by multiple sectors, including non-energy ones. Yet, they excluded municipal tax-exempt debt from its subsidy tally on the grounds that it supported multiple economic sectors – though the energy-related volume of issuance for was actually much higher in the excluded category.

Recommendation: NAS should evaluate any tax provision that *has the effect* of providing large subsidies to ghg-increasing activities, whether or not that is the stated intent of the subsidy. This approach will reduce fights over whether a particular provision is sector-specific or not, and provide a quite useful perspective on whether some of the “general” provisions are really as neutral as beneficiaries argue they are.

With respect to tax-exempt debt in particular, NAS is in a position to obtain a full database of all forms of tax-exempt debt, including the use-of-proceeds category. This data could then be analyzed to identify overall patterns of support. The specific bond instrument used seems secondary to the general issue of how subsidized credit is being deployed in climate-degrading or climate-enhancing ways. Were provisions that really are part of the tax baseline (expensing of R&D spending, perhaps) turn out to be heavily used by ghg-increasing activities, that, too, would be an interesting finding.

f) Subsidies to ghg-reducing activities. I’ve participated in many conversations on tax policy and climate change that seek to divide the subsidies into two groups: on one side are to be the policies that increase ghg-emissions; on the other are those that decrease them. In reality, the lines here are rarely clear. Subsidies to carbon capture and sequestration (e.g., Section 45Q of the tax code) appear to reduce carbon emissions relative to a business-as-usual baseline. What in fact is happening, however, is that the policies subsidize energy pathways with a high ghg-content. This makes them more competitive than they would otherwise be relative to even lower carbon substitutes (wind energy, for example), and undermine the value of the “clean” element

of these alternative power sources – something that should be a competitive plus to help them overcome higher costs in other areas.

Similar issues are common throughout the tax code. PTCs for landfill methane perhaps avoid some methane releases, but only if one assumes the pollutant isn't otherwise restricted. In addition, subsidies to landfilling or to energy recovery from waste incinerators, undermine the value of embedded energy in materials reuse and recycling. Subsidies to erosion protection also may have climate benefits, but like landfill methane, only if one assumes farmers shouldn't be regulated on pollution like any other industry. In these, and many other situations, the supposed ghg benefits of the subsidy become murky.

Recommendation: NAS should take a broad, longer-term view as to the substitute ways to meet a particular demand in the economy. Thus, CCS subsidies for coal should be benchmarked not against conventional coal, but against the wide range of options for providing low-carbon energy services. The practical implication of this recommendation is that NAS should not divide tax subsidies into “ghg-increasing” and “ghg-decreasing” categories. Rather, a more complicated metric should be used to ensure that core economic services rather than parochially-designated options, are assessed. For example, presenting the subsidies per mt CO₂e avoided can provide a useful perspective on the efficacy of particular options and allow NAS to construct a continuum of policy options rather than the cruder “increase-ghg” and “decrease-ghg” categorization.

g) Risks of evaluating policy using a single issue. While the mandate of this work is clearly to look at the impact of the tax code on ghg emissions, it is important to caveat this report by acknowledging that conclusions drawn from this single metric may break down under a broader set of criteria. Nuclear power, for example, is a lower ghg form of baseload energy; but heavy subsidies would not necessarily be a good strategy because the subsidy cost per unit abated is so high, and because the fuel cycle creates other types of problems for the public in terms of accident, long-term waste management, and increased proliferation risks. Other subsidies that are strong pluses from a ghg perspective may generate negative impacts in terms of labor markets, wealth equality, or trade.

Recommendation: General caveats on this issue should be included in the introductory material to the report. Where modeling results or other data indicate substantial negative impacts in other areas for particular policy reforms, this should be acknowledged in the report as well.

4) **Relevant sectors for analysis**

Climate impacts of tax policy go well beyond the energy sector, something the NAS team clearly recognizes. My views on the most relevant sectors to include are below.

a) Energy production and delivery systems. Tax subsidies that support location, extraction, beneficiation, delivery, sale, and cleanup of bulk energy or electricity should be included in the review.

b) Land conversion and settlement patterns. Tax subsidies that favor a particular form of land use, or the conversion of one form of land use to another – including changes in human

settlement patterns, should be included in the review. All of these issues affect the ghg-intensity of particular industries or activities, as described below:

- **Subsidized transport systems and vehicles.** Energy delivery systems, noted above, look at the movement of bulk energy. This section looks at transport more broadly, including the vehicle mix, incentives to use lower ghg-intensive transport modes or increase load factors, and subsidies to the transport networks themselves. Tax subsidies often overlooked in this area include tax-exempt debt issued by non-federal governments to build and maintain roadways; and a lack of any property tax paid on federal highway systems or other roadways. It is useful to note that even for national forests the federal governments makes payments in lieu of taxes to states. User fees are also important in this sector.
- **Building and housing subsidies.** There are a variety of tax breaks to build residential and commercial real estate. Some, such as the mortgage interest rate deduction, likely worsen ghg emissions both by encouraging larger housing footprints, and by subsidizing second homes as well as first. Comparisons with countries such as Canada that do not have these subsidies would be useful. Other subsidies through depreciation schedules or tax breaks for specific types of housing; or through conservation retrofits of existing housing stock should also be included.
- **Population growth.** Over the years, I have been approached by multiple people who argue that subsidies to larger families are at the root cause of our environmental impact. While I am not convinced either that population is a primary determinant of climate impact or that the subsidies (rather than other factors) are driving reproductive decisions, NAS may find it useful to address this issue to some degree in the report.
- **Emissions, emissions controls.** As with subsidies to CCS, subsidies to any emissions more generally through the tax code should be considered. Tax-exempt pollution control bonds and rapid amortization of certain pollution control equipment are two examples of this type of subsidy. Just as CCS is likely to disproportionately benefit coal, tax exempt pollution control bonds have also been heavily used by coal plants. The result has been to subsidize the price of coal-fired power relative to alternatives.
- **Agriculture, forestry, land preservation, irrigation.** While perhaps a subset of land conversion in general, these sectors are so significant in the US and play a central role in our carbon footprint that they warrant special mention and detailed review. Ideally NAS would develop a continuum of ghg-emissions for particular types of land uses and map the subsidies to particular uses (or shifts from one to another) against that context. Particularly with respect to agriculture, however, there are many subsidies to ghg-reducing activities that are more properly dealt with through regulation as would occur for other industrial activity. Examples include pollutants in run-off, soil erosion, odor control and management of animal wastes. It is important that the NAS study not treat subsidies to these activities (e.g., PTC for energy production from poultry wastes) as ghg-reducing.