

Hearing on

Policy Options for Reducing Greenhouse Gas Emissions

WRITTEN TESTIMONY OF RAY KOPP

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Mr. Chairman, Senator Murkowski, members of the committee, thank you for the opportunity to testify before the Senate Committee on Energy and Natural Resources. My name is Ray Kopp, and I am a senior fellow and director of the Climate Policy Program at Resources for the Future (RFF), a 57-year-old research institution based in Washington, DC, that focuses on energy, environmental, and natural resource issues. RFF is independent and nonpartisan, and shares the results of its economic and policy analyses with environmental and business advocates, academics, government agencies and legislative staff, members of the press, and interested citizens. RFF neither lobbies nor takes positions on specific legislative or regulatory proposals. I emphasize that the views I present today are my own.

My testimony today will focus on approaches for the regulation of greenhouse gas (GHG) emissions. When evaluating and choosing among regulatory approaches, it is important to keep four attributes of such regulation in mind.

The first attribute concerns the goals of regulation. The goal of stabilizing GHG concentrations to achieve a maximum 2 degrees Celsius increase in global mean temperature has been embraced by the G8 and the United States at their July meeting in L'Aquila, Italy. Such a goal requires global net GHG emissions to eventually decline to zero, and that in turn requires regulatory policies that will lead to a full de-carbonization of the U.S. economy over the next several decades,

The second attribute concerns technology. Attaining the 2 degree goal in the United States with existing technology will likely be very expensive. Doing so in the developing world with existing expensive technology is likely to be impossible.

The third attribute concerns the scale and required efficiency of the effort. The U.S. economy is composed of millions of GHG sources from very large to very small and everywhere in between. We don't need to control them all, but certainly we must control 90 percent of them by volume. And importantly, the cost of controlling emissions varies greatly among these sources. Therefore, to be efficient we must gain the greatest reductions from the least expensive sources.

The fourth attribute is cost. While it is a well-worn cliché among economists, it is not invoked nearly enough—there is no free lunch. There will be costs that are unlikely to be distributed evenly across regions, demography, and economic sectors.

Attribute 1, goals, points to the enormity of the task in front of us. Achieving full global de-carbonization will require a great deal of effort and investment over a very long period of time. Therefore, the policies we put in place to drive that transformation must be highly efficient, robust over time, and able to withstand changing economic, political, and social conditions, as well as adapt to new scientific information regarding the process of climate change.

Attribute 2, technology, mandates a policy that will substantially enhance our ability to invent, develop, and—importantly—finance and globally deploy a wide range of inexpensive, low- and zero-carbon technologies over the next 50 years.

Attribute 3, the scope and varied nature of current emission sources, requires a regulatory policy that is politically, socially and economically tractable, environmentally effective, applicable across an incredibly varied economy, and one that encourages and incentivizes every sector of our economy to continually reduce emissions.

Attribute 4 reminds us this task will be economically challenging and therefore the regulatory policy must be hyper efficient. We must be prepared to address issues of equity resulting from the uneven distribution of costs across society due to the regulatory program.

Economists generally agree that these four attributes call for a regulatory program that first and foremost places a price on the emission of GHGs from as many sources throughout the economy as is logistically possible. An economy-wide emissions price provides economic incentives for all GHG sources to reduce their emissions. Working through the private market spurs all mitigation activity, whether or not those activities are known to the regulator. And an emissions price will generate investment in the development and deployment of new and more economically efficient mitigation options—options that at present may be completely unknown.

An economy-wide emissions price ensures economic efficiency in terms of action taken to reduce emissions. Those sources that can reduce them for less than the emissions price will continue to do so until the cost of reducing the last ton equals the price.

As the price rises over time, higher cost mitigation options will come into play, but in an efficient manner with the least-cost options being deployed first. An emissions price that is perceived by all sectors of the economy to rise over time will alter the expectations of both households and firms with respect to long-lived investment decisions and accelerate the transition to a low carbon economy.

Importantly, an emissions price provides incentives for sources to continually search for mitigation options that can be deployed for less than the emissions price. This incentive behavior is in sharp contrast to standards- or technology-based regulation where all

incentives to reduce emissions disappear once the standard is met or the technology installed.

While an emissions price is an absolute requirement for an efficient regulatory framework, it is likely not the sole requirement. Due to some imperfections in any market economy, price signals may be dampened or be short circuited. This is particularly true in the market for research and development, where it is well known that firms have incentives to under-invest in research and development (R&D) due to the fact they cannot capture all the returns to R&D—some of those returns spill over to others in the market that did not invest as much. In this case, the emissions price cannot fully motivate the R&D market and therefore a well-designed regulatory program will contain a role for government funding of R&D. One important point, the economic case for support of government funding grows weaker as one moves from R&D to demonstration and deployment.

In addition to the economic rationale for government support of R&D, there is a political case to be made. Spurring R&D and demonstration and deployment of financially risky technology investments may require an emissions price that is not politically viable (that is, it is too high to be politically acceptable). In this case, absent the market imperfections above, the price is simply too low to generate the needed investments and government must step in to support the required levels of R&D and demonstration and deployment.

The requirement for some level of government support of technology implies the need for a source of revenue. Moreover, given the diverse nature of the U.S. economy in terms of its use of energy, the sectoral, geographic, and income distribution of the burden of a GHG mitigation program will be uneven. Efforts to even this distribution through transfer payments of one form or another will also require a source of revenue.

Witnesses today will address five different regulatory approaches including cap and trade, GHG taxes, direct regulation under the Clean Air Act, sector-specific regulatory approaches, and technology policy. The attributes of GHG regulation mentioned above can give some guidance when evaluating them. In short, new emissions regulations should:

- Include as many sources as possible within the regulatory program.
- Be hyper-efficient—get the absolute most out of every dollar spent.
- Incentivize all actions to reduce emissions, especially all new technology.
- Be robust and adaptable over a very long period of time.
- Recognize and address issues of equity.

Cap and Trade

The basic steps in the design and implementation of a cap-and-trade program for GHG mitigation are now widely known and include:

- identification of the sources of emissions that will fall under the regulatory program,
- a series of annual caps (tonnage restrictions) on emissions,
- issuance of allowances in amounts equal to the caps and requirements of sources to surrender allowances equal to their annual emissions, and
- provisions for the creation of a private market in allowances.

The two most important elements of a cap-and-trade program are the cap and the allowance price serving as the price on GHG emissions. When combined with allowance trading, economic efficiency is achieved meaning that at any point in time those most able to reduce emissions at the lowest cost are motivated to do so. When the program allows for banking of allowances economic efficiency is gained over time.

The scope of a cap-and-trade program, that is the sources that can be regulated under the cap, is limited only by the ability to effectively and efficiently monitor emissions and therefore the program can be truly economy-wide. Given an economy-wide program, the price signal tells all sources to deploy existing technology options to control emissions and gives an incentive to the private sector to develop and deploy new technology.

Emissions caps can be set decades into the future serving to alter household and business expectations, thereby affecting current and near-term investment decisions. If climate science requires more severe reductions than initially planned, the distant year caps can be tightened leaving the rest of the program unchanged. However, such an adjustment—if unanticipated—will bring with it a concurrent cost.

Allowances in a cap-and-trade program have value since the holder of an allowance can emit GHGs. Creating allowances does not create wealth in the economy; what it does is move wealth around. This is desirable for two reasons. First, a portion of that wealth can be used to deal with equity issues, and second, a portion can be used finance government support for R&D.

When the pricing mechanism and the allowance allocation options are combined, a cap-and-trade program matches up very well with the attributes of GHG control identified above.

GHG Taxes

Taxes on GHGs (often referred to as carbon taxes) have many of same desirable attributes as cap and trade. First and foremost, taxes place a price on emissions. However, unlike cap and trade where the price is set by the private market, under a tax system the price is set by the tax rate. This provides the greatest difference between the two regulatory approaches. A tax program provides no uncertainty with respect to the price of emissions, but there is uncertainty with respect to the quantity of emissions abated. In contrast, cap and trade provides a good deal of certainty over emissions (limited by the cap), but the price can vary and is uncertain. Concerns about price

volatility in a cap-and-trade program have given rise to the price collars contained in the recent cap-and-trade bills.

Cap-and-trade and tax programs share many other features. A tax approach can be as broad as a cap-and-trade one, and emissions source coverage is only limited by the ability to effectively and efficiently monitor emissions. A tax approach is also economically efficient, ensuring GHG reductions are obtained at least cost. And, like emissions caps, tax rates can be established quite far into the future and adjusted as new climate science becomes known—but, like changing caps, altered out-year tax rates can entail adjustment costs.

The revenue from GHG taxes can play the same role as allowance value in addressing equity and the need for government technology funds. The emissions price, as specified by the tax rate can be established quite far into the future, thereby altering future expectations, affecting long-lived investment decisions and speeding the transformation of the economy.

Other Forms of GHG Regulation

Looking beyond economy-wide GHG pricing approaches like cap-and-trade programs and GHG taxes, many other approaches are already in place, including renewable energy portfolio standards, efficiency standards for buildings and appliances, as well as subsidy programs for the production of energy from renewable resources.

One obvious alternative to an economy-wide regulatory program would begin with the regulation of GHG emissions on a modest scale, starting with a single sector like electricity generation, and then adding others over a period of time. Such staged regulation may prove to be more politically achievable than a full-scale economy-wide approach since the number and influence of regulated entities at each stage can be made relatively small. However, while perhaps politically expedient, staged regulation has drawbacks, the most obvious being the need for political will to continue adding sectors to the regulatory structure over time.

A second drawback is the loss in economic efficiency that could arise from a piecemeal approach. The staged approach could begin with a cap-and-trade program for electricity generation, but as the scope of regulation is expanded to include other large stationary sources, a standards approach to regulation might be applied to the new sources. Mixing a price-based approach like cap and trade with a standards approach will guarantee a loss in economic efficiency across sources when compared to a single cap and trade applied to all sources.

Following the U.S. Supreme Court decision in *Massachusetts v. EPA* in 2007, the EPA has the authority to regulate GHGs under the Clean Air Act (CAA). A staged approach to GHG regulation could logically flow from the CAA in the absence of congressional action on a comprehensive approach. Some argue that an economically efficient cap-and-trade program for carbon dioxide emissions from the electric power generation sector could be established, but such a price-based program would likely be paired with “tail-

pipe” and other standards for mobile sources and technology-based standards for all other sources.

In contrast to an economy-wide emission pricing program, an approach such as that described above would not be economically efficient, would not push all emission sources to adopt abatement activities, would not provide incentives for continual emission reductions, and importantly, would not provide incentives for R&D and demonstration and deployment of advanced low-carbon technologies. Finally, non-pricing regulatory approaches provide no sources of funds for government R&D programs or for programs to address equity issues.

It is often remarked that we cannot meet the challenge of climate change with existing technology and that what is needed is a wave of innovation giving rise to perhaps unimagined new zero-carbon technologies. I agree with this presumption; however, the question that logically arises is what public policies would stimulate this wave of innovation? At this point, economists and technologists usually part company with those economists pleading for a pricing mechanism to create a demand for the new technologies as well as some supply-side technology push.