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Is a Clean Energy Standard a Good Way to Move U.S. Climate Policy Forward?

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Following the failure in 2010 to pass a comprehensive cap-and-trade bill to reduce carbon dioxide (CO₂) and other greenhouse gas emissions, the Obama Administration and some in Congress are now focused, in particular, on a *clean energy standard* (CES). Under this approach, electricity producers would be required to meet a rising fraction of their generation using zero carbon sources or sources with lower carbon intensity (CO₂ emissions per kilowatt-hour [kWh]) than that of coal generation.²

Although a CES would lower the carbon intensity of the power sector, it is typically viewed as a second-best approach relative to a well-designed, economy-wide cap-and-trade policy, as the latter promotes a broader range of behavioral responses to reduce CO₂ emissions across all sectors of the economy.

We argue in this article, however, that in some important economic and practical regards a CES may be a better first step than the cap-and-trade proposals floated in Congress. In particular, it can be significantly more cost-effective and it avoids, at least initially, large increases in energy prices, which are a major political hurdle for emissions pricing policies. But getting policy details right is critical. In fact, policymakers should also be open to a pricing alternative to the CES, known as a *feebate*, which involves fees for generators with above average emissions intensity and subsidies or rebates for those with below average emissions intensity. The feebate appears to represent a more transparent and cost-effective approach. Moreover, in principle it would be

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² At the same time, the U.S. Environmental Protection Agency is also initiating regulations to reduce CO₂ emissions under the Clean Air Act. The most well-developed part of the program has been new passenger vehicle fuel economy standards which are set to rise from about 25 to 35 miles per gallon over the next few years and which will ultimately reduce economy-wide CO₂ emissions by around 5 percent.



straightforward to progressively transition from this policy towards the simplest and most cost-effective policy of all—a tax on carbon with revenues used to offset other more distortionary taxes (like taxes on labor and capital income)—whenever the latter policy becomes politically viable.

Comparing Policy Costs: A First Look

Carbon taxes or cap-and-trade systems, where fuel suppliers are either taxed or required to hold permits in proportion to the carbon content of their fuels, are usually thought to be cost-effective policies for reducing energy-related CO₂ emissions. As taxes or allowance prices are passed forward into higher prices for fuels, electricity, energy-intensively produced goods, and so on, all potential options for reducing CO₂ throughout the economy are exploited. This includes fuel switching in the power sector, reductions in electricity demand, purchase of more fuel efficient vehicles, and reduced use of fuels in the residential and commercial sectors. And because the price of emissions is uniform across the economy under either policy, the incremental cost of emissions reduction activities tend to be equated across sectors, firms, and households, which means that emissions reductions are allocated across the economy in the least-cost way.

A CES policy requires switching away from coal in power generation, and promotes cost-effectiveness by offering full credits for clean fuels (nuclear and renewables) and partial credits for fuels with lower emissions intensity than coal (natural gas or coal with carbon capture and storage). But it does not discourage direct fuel consumption in other sectors. Moreover, a CES has a weaker impact on electricity prices, and hence is less effective at reducing electricity demand. Under a CES, electricity prices rise to reflect the costs of producing with cleaner, but more expensive, generation fuels. However, under carbon taxes and cap and trade, energy prices also rise to reflect the price on CO₂, providing a greater incentive to reduce electricity demand and seek gains in energy efficiency. In fact, the pass-through of carbon tax revenues, or the value of emissions allowances, has a much bigger impact on electricity prices than the costs of fuel switching.³ In short, for a given total emissions reduction, a CES would appear to be more costly than cap-and-trade as it places too much burden on emissions reductions from fuel switching, too little burden on electricity conservation, and no burden at all on other sectors.

One cautionary note here is that most of the (relatively) low cost options for reducing CO₂ in the U.S. economy are, in fact, from fuel switching in the power sector. According to policy simulations reported in Krupnick et al. (2010, 73), using a variant of the U.S. Energy Information Agency's National Energy Modeling System (NEMS-RFF), under an economy-wide CO₂ pricing policy around two-thirds of the emissions reductions over the next 20 years would come from fuel switching in

³ These conceptual results are borne out in policy simulations of CES, cap and trade and a carbon tax in Palmer et al. (2010, figure 12, pg. 44). They find that, for policies achieving the same economy-wide CO₂ reductions, CES-related electricity price increases are minimal in 2020 compared to those of pricing policies, while leading to price increases of about 70 percent of those of the pricing policies by 2030.



the power sector, about another 20 percent from reductions in electricity demand, but less than 10 percent from reductions in the transportation sector. An appropriately designed CES could therefore still exploit a large portion of emissions reductions that would be forthcoming under cap and trade.⁴

A Closer Look: Cost Assessment in Real (Distorted) Economies

But in the above discussion we are comparing policy costs in a hypothetical economy in which there are no sources of pre-existing distortions of economic activity. In reality, the economy is full of distortions (from taxes, market power, other externalities, and so on) and public finance economists have long warned us that such distortions can affect the economic costs of new policies in important ways.

Here we focus on an important and under-appreciated source of pre-existing distortion for climate policy, namely distortions created by broader fiscal policies. Personal income and payroll taxes reduce the overall level of work effort below levels that would maximize economic efficiency, by lowering the returns to labor force participation, effort on the job, accumulation of skills, and so on. Similarly, personal taxes paid on dividend and capital gains income, and taxes at the corporate level on the return to investment, cause distortions by reducing capital accumulation. And generous tax preferences in the fiscal system, such as tax exemptions and deductions for employer medical insurance and home ownership, cause further distortions by creating a bias towards tax-favored spending and away from ordinary (non-tax-favored) spending.

Emissions pricing policies potentially interact with these sources of pre-existing distortion in two important, but offsetting, ways (e.g., Bovenberg and Goulder 2002). First, if carbon tax (or permit auction) revenues are used to reduce taxes on labor and capital income, there is a relatively large source of economic efficiency gain from slightly alleviating distortions from the broader fiscal system. On the other hand, the overall level of economic activity will contract in response to higher energy prices, leading to a (slight) reduction in work effort and capital accumulation, which exacerbates the costs of pre-existing taxes on labor and capital income.

These linkages with the broader fiscal system have two key implications for the ranking of different policies on cost grounds. First, there is a large cost saving from emissions pricing policies that exploit the revenues to reduce tax distortions (what we term revenue recycling) versus pricing policies that do not exploit this effect, say by returning the revenues in lump sum transfers

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⁴ Reductions from the transportation sector are modest for three main reasons. Most important, emissions pricing has only a modest impact on the retail price of motor fuels, whereas it dramatically increases the price of coal (given its high carbon content). In addition, in contrast to the power sector, options for replacing carbon-intensive fuels with other fuels are presently very limited in the transportation sector. Furthermore, higher fuel prices have only modest effects at best on promoting the adoption of fuel-saving technologies for automobiles, given that many new technologies are already being incorporated to meet rapidly rising fuel economy standards.



to households. The second (and more surprising) implication is that emissions pricing policies without the revenue-recycling benefit may no longer be superior to the CES on cost-effectiveness grounds. This is because emissions pricing policies have a bigger impact on energy prices, and hence cause more exacerbation of pre-existing tax distortions.⁵

These implications are borne out in a recent study by Parry and Williams (2011). They looked at several policies to reduce domestic, energy-related CO₂ emissions by 8.5 percent (about 0.5 billion tons) in 2020 below levels otherwise projected to occur for that year.⁶ Under cap-and-trade policies with free allowance allocation (or a carbon tax with revenues returned in lump-sum transfers) the estimated average cost per ton reduced is \$91 (in current dollars). In contrast, under a carbon tax or cap and trade with full allowance auctions, where revenues are used to cut distortionary income taxes, average costs are actually slightly negative (as a result of large gains from cutting other taxes when they distort both factor markets and create distortionary tax preferences). Parry and Williams also examined a CO₂ intensity standard for the power sector, which is similar to a CES in that it promotes fuel switching without a large increase in electricity prices. This policy represents an intermediate case, with average costs of \$29 per ton reduced.

In short, the revenues created by carbon taxes, or rents created under cap-and-trade, are potentially problematic. They need to be used to cut distortionary taxes (or used in other ways that yield comparable economic efficiency benefits) for these instruments to be unambiguously better on cost-effectiveness grounds than CES and similar policies. If not, then well-designed policies to lower the emissions intensity of the power sector could be the better way forward, at least for the scale of energy-related CO₂ reductions envisioned for the medium term.

There are caveats here. One is that a CES may not be well designed in practice (for instance, it could be designed with limitations on credit-trading provisions—see below), with a resulting loss of cost-effectiveness. Another is that the relative differences in the average costs per ton of different instruments, caused by their interactions with the tax system, become less pronounced as the goal for CO₂ reductions becomes more ambitious. A third, related point, is that there are limits to the reductions in CO₂ that a CES can deliver compared to a cap-and-trade or carbon tax policy because the CES offers less of an incentive for energy conservation and would only apply to the electricity sector. So, pushing the CES hard could, beyond some point, result in a rapid escalation of costs compared to a cap-and-trade policy.

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⁵ In practice, price impacts might be somewhat reduced under cap-and-trade systems, depending on how allowances are allocated. For example, one proposal involves allocating some free allowances to local distribution companies in the expectation that they would not pass through the value of these allowances into higher end-use prices for electricity.

⁶ These reductions are approximately consistent with those projected under the Waxman-Markey bill (H.R. 2454). Although target reductions in greenhouse gases under this bill were 17 percent below 2005 levels by 2020, much of the reduction was projected to occur through emission offset provisions (e.g., domestic firms paying for forest carbon projects in other countries in lieu of reducing their own emissions).



Further (Practical) Considerations

Nevertheless, important practical obstacles are associated with higher energy prices that are holding up emissions pricing policies and that would seem to favor a CES-type approach for the time being.

One is competitiveness and the related issue of emissions leakage. As energy prices rise in response to climate policy, firms trading in global markets with energy-intensive production processes (e.g., steel, aluminum, and cement) suffer a loss of competitiveness and may relocate some of their activities to countries without emissions pricing policies. However, policies to address capital flight, like taxes, or permit requirements, imposed on embodied carbon in imported products (with symmetrical rebates for exported products), are contentious, because of problems in measuring carbon content and possible conflicts with international trade obligations.

Similar issues arise in the context of distributional impacts. CO₂ emissions-pricing policies are regressive (i.e., the burden of higher energy prices, relative to income, is greater for poor households than for wealthy households) because lower income households tend to spend a relatively larger portion of their income on energy. Under emissions pricing policies, complicated compensation schemes could be designed to address some of these regressive effects (e.g., using revenues to fund tax cuts that disproportionately benefit the poor), though these schemes typically lower the economic efficiency benefits from revenue recycling.

In short, to the extent that competitiveness and emissions leakage is a concern for the near term (until emissions pricing becomes more prevalent in other countries), a CES may be favored over a cap-and-trade or carbon tax policy because the former results in less of an energy price increase. And until carbon taxes can be implemented as part of a broader fiscal package that has some progressive elements (like scaling back tax preferences favoring the wealthy), distributional concerns might be better addressed through a CES or other policy that avoids large increases in energy prices.

A Feebate as an Alternative to a CES

Although we have discussed some potential merits of the CES, there are also some potential pitfalls in design details (rather than the general thrust) of the policy. In fact, a feebate policy shares the advantages of the CES noted above, and can have some further advantages of its own.⁷

A feebate—a term taken from the literature on applying rebates to vehicles more than meeting a fuel economy standard and a fee applied to vehicles with fuel economy worse than the

⁷ Here we compare the pros and cons of the CES and feebate. There are additional design issues, such as whether the policies cover both existing and new generation sources, but these issues apply equally to either instrument.



standard—in the electricity context would have two elements. First is a price on CO₂ emissions. Second is a *pivot point* level of CO₂ per kWh. Firms with emissions intensity (averaged across their portfolio of generation plants) in excess of the pivot point would pay a fee equal to the CO₂ price times the difference between their CO₂ per kWh and the pivot point, times their electricity generation (in kWh). Conversely, firms with CO₂ per kWh below the pivot point would receive a rebate or subsidy equal to the CO₂ price times the difference between the pivot point and their CO₂ per kWh, times their electricity generation. The policy can be made revenue-neutral (approximately) by setting the pivot point in one year equal to the average observed CO₂ per kWh in the previous year. The feebate approach has several potential advantages over the CES.

One is that the incremental costs of reducing CO₂ are automatically equated across different generators, which promotes a cost-effective allocation of emissions reductions within the power sector at a given point in time. This is because all generators receive identical benefits (either reduced fees or increased rebates) per ton of CO₂ reduced. In principle, the CES approach could also be cost-effective in this regard, though this would require extensive credit trading provisions, allowing coal-intensive generators to exceed the standard by purchasing credits (converted into CO₂ equivalents) from other generators that are well below the standard.

Another attraction of the feebate is that it automatically handles changes in the future costs of different generation technologies or fuel prices. If, for example, the future expansion of nuclear power is temporarily held up, firms would be permitted a higher emissions intensity (at the expense of paying more fees or receiving fewer rebates), whereas under a strict CES they would be required to meet a given emissions intensity standard, regardless of costs. Conversely, if the competitiveness of wind power improves, firms are rewarded for exploiting this opportunity and further cutting their emissions under a feebate, whereas under the CES, they have no incentive to do better than the emissions intensity standard. Under a CES, these problems could in part be mitigated if firms were able to offset shortfalls in meeting the standard one year by being credited for exceeding the standard in other years. And a CES could include an alternative compliance payment, which would enable firms to pay fees instead of meeting the standard, if credit prices reach a certain limit. These provisions complicate the design of the CES program, however.

Furthermore, a CES where credits are defined by fuel is a “blunt” instrument, as it does not encourage efficiency upgrades at plants that reduce required fuel inputs for a given amount of generation. Several categories of credits would be created: a full credit (1) for nuclear and hydro plants, perhaps a 0.9 credit for coal with carbon capture and storage, perhaps a 0.5 credit for natural gas plants, and so on. However no credits, for example, would be created for coal plants that are more efficient than other coal plants. In fact, CO₂ intensities may vary by a factor of two or more in coal plants and vary for gas plants as well. The savings from recognizing these



differences in trading clean energy credits are forfeit unless this heterogeneity is recognized and plants can trade energy credits at rates reflecting their carbon intensities.⁸

Finally, by establishing a fixed price on CO₂ emissions, a feebate facilitates comparison of policy stringency across countries. This price could be set in line with estimates of the (global) environmental damages from CO₂ (currently about \$21 per ton, according to a recent review across US agencies and subsequent use in U.S. regulatory impact analyses [US Interagency Working Group on Social Cost of Carbon 2010]) or prices prevailing in the European Union's Emissions Trading Scheme (currently about \$22 per ton).⁹ And designing a transitory compensation scheme (to help coal-intensive generators) should be straightforward under a feebate, where the future emissions price is known, rather than being revealed later on during credit trading.

Looking Ahead

A revenue-neutral carbon tax (or auctioned cap-and-trade system) is where we should be headed over the longer term, perhaps in coordination with other large emitting countries, or as part of a package of reforms that will be needed, sooner or later, to address the federal budget deficit. But in the meantime, a serious and reasonably comprehensive effort on behalf of the United States to begin scaling back CO₂ emissions is urgent, not only for its own sake, but also to undermine excuses for delaying emissions-reduction programs in other countries.

We have argued that a CES could, under certain conditions, be more cost-effective and less contentious than a tax or cap-and-trade program. In addition, we suggested that a feebate applied to power sector emissions could strike a better balance between cost-effectiveness and practical realities faced by policymakers than the CES. Moreover, once emissions are priced in the power sector through a feebate, it would be relatively easy to progressively transition to emissions pricing in other sectors and gradually convert the fee to a carbon tax for the power sector by scaling back the pivot point.

⁸ In this regard, a simple CO₂ emissions standard per kWh would be more cost-effective than a CES (Burtraw et al. 2001).

⁹ Alternatively, under a CES approach, if an alternative compliance payment is included this could be scaled to CO₂ prices in other countries.



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