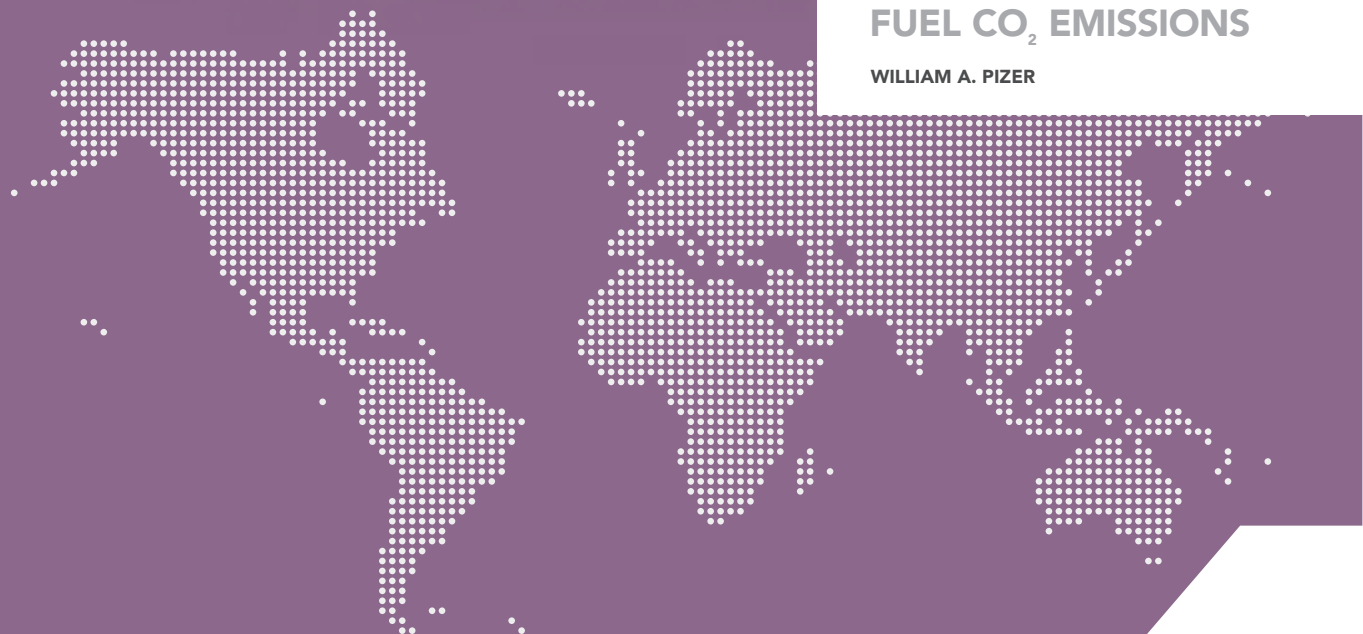




ISSUE BRIEF 4

**SCOPE AND POINT OF
REGULATION FOR PRICING
POLICIES TO REDUCE FOSSIL-
FUEL CO₂ EMISSIONS**

WILLIAM A. PIZER



SCOPE AND POINT OF REGULATION FOR PRICING POLICIES TO REDUCE FOSSIL-FUEL CO₂ EMISSIONS

William A. Pizer

SUMMARY

This issue brief examines the choice of what emissions to include—and where to regulate them—under a tax or tradable allowance policy to reduce fossil-fuel carbon dioxide (CO₂) emissions. A companion brief (Issue Brief # 14) examines options for regulating non-CO₂ greenhouse gases (GHGs) and non-fossil CO₂ emissions. Several points emerge from this discussion:

A regulatory program that establishes a price on CO₂ emissions—either through a tax or tradable permit system—will achieve the most reductions at the least cost when it covers as many emissions as possible under a single program with one price. Broader coverage also mitigates the tendency for emissions to shift to uncovered sources over time, raising the profile of any excluded emissions sources (that is, leakage).

- The argument for a broad-based, single-price program is grounded in cost considerations. Other policies, however, are often proposed instead of, or in addition to, a pricing policy. These proposals are often motivated by a desire to pursue more popular technologies, to guarantee certain technology outcomes or emissions-reducing actions within a sector, and to shield some fossil-energy users from higher energy prices.
- A program to price CO₂ emissions that focused on large emission sources (for example, sources that emit over 10,000 metric tons of CO₂ annually) could cover

just over half of U.S. GHG emissions by regulating roughly 13,000 facilities. A program focused solely on the electricity sector would cover roughly one-third of U.S. emissions and involve 2,000–3,000 facilities.

- An upstream tax or emissions-trading program could effectively cover almost all fossil-energy CO₂ emissions by regulating approximately 3,000 entities, including refineries, natural gas pipelines or processors, coal mines, and importers.
- While regulatory programs for other forms of pollution have traditionally focused on emitters, the unique nature of CO₂ emissions makes it possible to regulate effectively at any point in the fossil-fuel supply chain. The vast majority of CO₂ emissions result from the combustion of fossil fuels. Because these emissions do not depend on the combustion technology used or on other operating parameters, and because there is limited opportunity to reduce emissions other than by burning less fuel, downstream emissions can be calculated with relative ease and accuracy based on the quantity of fuel produced or processed and its carbon content. Thus, fuels can be regulated as a proxy for emissions at any point in the chain from production to processing to distribution and final consumption. Important adjustments must be made for imported and exported fossil resources and fuels, sequestered emissions (including carbon capture and storage), or uses of fossil fuels that do not result in emissions.

- A concern frequently raised about upstream regulation of CO₂ emissions is that fossil-fuel users will respond more strongly to direct incentives for reducing emissions than they will to higher fossil-fuel prices. There is a psychological appeal to this logic, but basic economic theory and business pressure to minimize cost argue against it.
- While existing tradable permit programs have traditionally allocated free permits to regulated sources, there is no reason why CO₂ permits cannot be allocated to other actors throughout the fossil-fuel supply chain that are directly or indirectly affected by regulation. Decisions about how to allocate permits or allowances need not be tied to decisions about which entities will be required to submit permits or allowances under a trading program.
- For a *given* set of design choices concerning permit allocation and program coverage, the decision about where to regulate does not generally change the economic burden imposed on different actors in the fossil fuel supply chain. Important caveats may apply in situations where products are not competitively priced (as, for example, in regulated utility markets). In addition, point of regulation does affect which entities bear the administrative burden of demonstrating compliance under a tradable permits program (in a well-designed program, however, administrative costs should be relatively small).

Key Choices

A high-level question that arises early in designing a market-based climate-change mitigation policy for the United States is how to define the scope of economic activities regulated under the policy, particularly with respect to fossil energy CO₂ emissions. Entities involved in generating emissions that are covered by a market-based policy (including entities upstream and downstream of the entity that is actually regulated) face a common incentive to reduce emissions; entities involved with the production of emissions that are not covered do not. This issue brief outlines the basic motivations for including and excluding various emissions sources, along with different regulatory options for including sources in a market-based emissions-reduction program.

Motivation

A principal motivation for market-based policies—taxes or tradable permits—is that they encourage the most reductions

at the lowest cost compared to other policy architectures.¹ Among market-based policies, those that include more emissions sources can deliver larger reductions at even lower costs. Broader coverage implies more opportunities—including possibly very cost-effective opportunities—to reduce emissions. Broad coverage also avoids the tendency for emissions to shift over time to sources that are not covered under the trading program. This is referred to as emissions leakage. Finally, broad coverage may satisfy a desire for fairness—that is, ensuring everyone is part of the policy—though it is worth noting that this desire could also be satisfied by a less-efficient, sector-by-sector approach (and is, in any case, a much more subjective goal).

Reducing GHG emissions enough to limit future climate impacts could eventually cost the world economy as much as 1–3 percent of gross product according to recent assessments by the Intergovernmental Panel on Climate Change (IPCC) and other studies.² All of these studies assume cost-effective global efforts to reduce emissions in which all emission sources face the same market price for CO₂. If future mitigation efforts focus on a smaller number of sources or use less-efficient policies, costs could rise significantly—perhaps by a factor of ten.³ A sector-by-sector approach that tackles various emissions sources with distinct policies risks precisely this outcome.⁴ Even though such an approach may “cover” all emissions, it does not do so in a way that encourages least-cost reductions across all sectors.⁵

Distinct from the issue of cost is the concern that, over time, excluding some fuels and sources from regulation could gradually encourage leakage as CO₂ prices rise. A program that only covered electricity-related emissions, for example, could encourage households and businesses to shift to direct use of fossil fuels.⁶ While policies with partial coverage may not create significant leakage problems in the short run because the price incentive is not sufficiently high, this may change over time as policies evolve to achieve deeper reductions and incentives for regulated sources to avoid emissions rise

1 Alternate, technology-based regulations are discussed in a companion issue brief on technology deployment options.
 2 See companion issue brief on costs and Intergovernmental Panel on Climate Change, 2007. *Report of Working Group III, Summary for Policymakers*.
 3 See Pizer, W. et al., 2006. Modeling Economywide versus Sectoral Climate Policies Using Combined Aggregate-Sectoral Models, *Energy Journal* 27(3): 135-168. The authors find that mitigation costs double when only electricity and transportation are included, and increase by a factor of ten when standards for fuel economy and renewable portfolios are used in those sectors.
 4 Consider, for example, the suite of actions being considered in California under AB32, <http://www.arb.ca.gov/cc/ccea/ccea.htm>.
 5 Sector-by-sector regulations lead to higher costs for three reasons. First, absent emissions pricing of some sort in all sectors, there will not be an efficient balance of conservation and mitigation. Second, it is unlikely marginal costs will be balanced, leading to expensive reductions in one sector while cheaper abatement opportunities go unrealized in another. Third, absent emissions pricing, there will be a weaker incentive to innovate. See Issue Briefs #10 and #5 on technology deployment policies and different forms of regulation, respectively, for additional details.
 6 There is already anecdotal evidence, for example, that high oil and gas prices are encouraging some households to consider switching to coal. See Howe, Peter, 2005. Fuel prices usher in new coal age. *Boston Globe*, October 24.

accordingly. These two points suggest that including as many sources as possible under a single program is an important design objective for market-based emission-reduction policies. At the same time, there is often pressure to exclude various sectors and emissions sources from these policies—for different reasons. Emissions from some sources may be small and/or expensive to mitigate, administrative costs for including some sources may be high, and international competitiveness concerns may argue for exempting some firms or sectors, particularly if they compete with overseas producers that do not face similar carbon constraints (competitiveness impacts and potential responses are discussed in Issue Briefs #7 and #8). Some sectors may prefer to be regulated separately in order to seek a more tailored—and perhaps less onerous—result. In addition, tailored approaches might be appealing because they more directly promote popular technologies or emissions-reducing activities and result in less obvious price increases for end users. Finally, some sectors may be sufficiently vocal and recalcitrant that their inclusion in a mandatory regulatory program is simply considered not worth the political effort.

There is also the view that different sectors or sources face different hurdles that are best addressed through distinct policies. Passenger vehicles require fuel economy standards, aircraft require aircraft regulations, power plants require power plant standards, etc. This line of thinking tends to ignore a basic tenet of market-based policies: that, given an aggregate emissions objective, the private sector is best suited to determine the least-cost combination of measures required to achieve that objective. Instead, this view assumes government can design a cheaper approach through targeted regulation. Economists tend to find the latter argument unconvincing: decades of research suggest that broad, market-based policies can substantially reduce costs relative to targeted regulatory approaches.⁷

A desire to minimize costs and avoid leakage problems provides the primary motivation for thinking carefully about what to include in a uniform market-based policy as society pursues gradually deeper emissions reductions. Whether exclusion means that some sources are covered by a separate policy, or are simply excluded from regulation completely, may matter for leakage, but not for our central conclusion about costs—indeed, the largest unnecessary costs arise not from excluding some sources but from addressing them with poorly designed, inflexible regulation.

7 See Stavins, R. forthcoming. *Market-Based Environmental Policies: What Can We Learn From U.S. Experience (and Related Research)? Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience*, eds. Jody Freeman and Charles Kolstad. New York: Oxford University Press.

Deciding what Sources to Include— the Traditional Approach

The traditional approach for regulating air emissions is to focus on emitters; this is the model used in the Acid Rain trading program, the NO_x budget and SIP call programs, and the EU Emissions Trading Scheme.⁸ In this model, emitters are required to surrender allowances in proportion to their measured emissions. A fixed number of allowances are issued, thereby effectively limiting total emissions from covered sources while still giving individual emitters the flexibility to trade allowances and implement the most cost-effective compliance strategy.

Under the traditional approach, program coverage is generally limited to relatively large sources because the administrative burden of monitoring emissions and allowance obligations (or collecting a tax) on increasingly smaller sources quickly becomes prohibitive. In practice, two models for applying this approach to CO₂ emissions have emerged: one model focuses solely on the electricity sector, the other focuses more broadly on large emitters (those that emit, for example, more than 10,000 tons of CO₂ annually and/or sources in certain energy-intensive sectors).

The electricity-only model for CO₂ has appeared in a variety of market-based U.S. climate policy proposals, first as part of an effort to develop multi-pollutant regulations for power plants earlier this decade,⁹ and more recently as the basis of the multi-state Regional Greenhouse Gas Initiative that is currently being implemented in the Northeast.¹⁰ Part of the appeal of this approach is that the electricity sector has considerable experience with emissions trading; in addition, a growing number of companies within this sector have begun to support greenhouse gas regulations so as to achieve some measure of investment certainty. Applied in the United States, an electricity-only climate policy would cover about one-third of overall emissions and involve 2,000–3,000 sources.

In contrast, the EU Emissions Trading Scheme adopts the large source model, regulating electricity generators as well as large industrial sources. Applied domestically, this approach would cover about half of U.S. emissions and involve perhaps 13,000 sources.¹¹

8 See <http://www.epa.gov/airmarkets/progreps/arp/s02.html>, <http://www.epa.gov/airmarkets/progreps/nox/index.html>, and <http://ec.europa.eu/environment/climat/emission.htm>. See also Ellerman, A.D. and B. Buchner, 2007. *The European Union Emissions Trading Scheme: Origins, Allocation, and Early Results*, *Review of Environmental Economics and Policy* 1(1):66-87.

9 Proposed policies would have covered SO₂, NO_x, mercury, and CO₂ in one program. See various legislative analyses at http://www.epa.gov/air/oaq_caa.html/. Interestingly, the policies never proposed to allow trading across pollutants, something that economists have suggested for some time.

10 See www.rggi.org and Burtraw, D., D. Kahn, and K. Palmer, 2006. *CO₂ Allowance Allocation in the Regional Greenhouse Gas Initiative and the Effect on Electricity Investors*, *Electricity Journal* 19(2), 79-90.

11 Data on numbers of sources are discussed at greater length in Issue Brief #1 on emissions and emission sources.

Alternative Regulatory Approaches that Provide Broader Coverage

An alternative to the traditional smokestack-oriented approach is to regulate upstream—that is, to regulate the production, processing, or distribution of fossil fuels.¹² Entities that initially produce (or process / transport) a fossil fuel in the United States would be required to surrender allowances in proportion to the carbon content of the fuels they handle. As with the traditional model, a fixed number of allowances are issued so as to limit the total volume of CO₂ ultimately released by the combustion of fossil fuels. In contrast to traditional regulatory programs, where emitters face both a fuel price and an emissions price, the price of emissions under an upstream system would be bundled with fuel prices.

For most conventional air pollutants, an upstream approach would have serious drawbacks. First, most of these emissions can be addressed through end-of-pipe pollution controls. Second, downstream emissions of these pollutants are not a simple function of the properties of the fuel consumed—rather, eventual emissions depend on a variety of factors including the type of combustion technology and post-combustion pollution controls used. Thus accurate measurement is only possible at or near the actual emissions source. CO₂ emissions from fossil-fuel combustion are different. The only end-of-pipe control option for these emissions is carbon capture and storage—a technology that, if applied, would be readily amenable to a post-combustion crediting scheme. Moreover, the carbon content of fuels is easily measured at any point in the supply chain and provides an accurate proxy for eventual CO₂ emissions. In fact, the EU program regulates on the basis of fuel use rather than actual emissions measurement.¹³

It should be noted that an upstream program requires a few critical adjustments to avoid perverse incentives: imports of fossil fuels must be covered and exports must be credited. In addition, CO₂ capture and storage must be credited. Further, any uses of fossil fuels as feedstocks (for example, in the manufacture of plastics or road asphalt) that do not result in emissions need to be credited. All of these adjustments, however, are relatively straightforward.

Because of this flexibility in choosing the point of regulation for CO₂ emissions, a variety of approaches have been

proposed, some of which regulate all emissions upstream and some of which use a hybrid model in which certain sectors or fuels are regulated upstream, while others are regulated midstream or downstream. The advantage of an upstream approach is that it provides broad emissions coverage while regulating a relatively small number of entities. Emissions from hundreds of millions of vehicles, households, and small businesses can be effectively captured by a program that regulates a few thousand petroleum refineries, natural gas pipelines or processors, and coal mines. As noted at the outset, broad coverage under a single regulatory program is often an important policy design objective because it will produce emissions reductions at lower cost.

A common concern about regulating fossil energy producers instead of end-use emitters is that this approach weakens incentives for mitigation. The logic goes that fuel producers can do little to reduce emissions (other than sell less fuel) and hence will not respond to regulation, whereas end users—who are actually in a position to change behavior and reduce emissions—will respond less strongly to regulation if the costs of emitting are simply bundled with fuel prices. While this view may seem intuitively reasonable, however, economic theory and the pressure to minimize costs and maximize profits argue strongly against it.

In fact, economic theory argues that the decision about where to regulate should have little or no bearing on the incentives faced by different entities under a market-based program. After all, the basic premise of market-based policies is that price drives behavioral change. If upstream fuel suppliers are regulated, they will pass emissions costs to downstream end-users in the form of higher fuel prices.¹⁴ Higher prices will encourage end users to reduce their consumption of fossil fuels. Because reducing fuel use is, in most cases, the only real option for reducing energy-related CO₂ emissions, an incentive to reduce emissions is an incentive to reduce fuel use and vice versa. (The exception, of course, is post-combustion carbon capture and storage, but this technology is likely to be an option only for large point-source emitters, such as electric power generators and can be addressed with a crediting program.) While there are strong reasons to believe that theory holds up in practice on this point, we return to the question of whether upstream regulation is just as effective as downstream regulation at delivering emission-reduction incentives below.

¹² This approach has some parallels to the lead phase-down program in which refineries were regulated based on the lead content of the gasoline they produced, rather than vehicle emissions being regulated directly. The key difference is that lead was an additive in gasoline, not an intrinsic part of the fuel itself.

¹³ That is, CO₂ emissions are not directly measured in the EU ETS. Rather, fuel use is measured and emission factors are applied. See Kruger, J. and C. Egenhofer, 2006. Confidence through compliance in emissions trading markets, *Sustainable Development Law and Policy* 6(2), 2-13 (Climate Law Special Edition).

¹⁴ It is also possible that regulating CO₂ would lead to lower prices for fossil-fuel producers (versus increases for end users). Empirical evidence suggests this is likely to be a very small effect; see, for example, Energy Information Administration (2007), *Energy Market and Economic Impacts of S.280, the Climate Stewardship and Innovation Act of 2007*, and other studies, showing a minimal impact on fossil-fuel producer prices.

Table 1

Summary of the three broad regulatory models policymakers can consider in designing a market-based regulatory program for limiting CO₂ emissions.

	Potential coverage <i>(as percent of total U.S. CO₂ emissions from fossil-fuel combustion)</i>	Likely number of sources	Examples
Emissions sources / fossil fuel users	Electric power plants and large manufacturing facilities; ~50% of U.S. emissions	2,000–3,000 sources in the electric power sector; 10,000 sources in manufacturing	Acid rain program, EU ETS, Feinstein-Carper S. 317 (110 th Congress)
Fossil fuel manufacturers / distributors	Entire economy / nearly 100% of U.S. emissions	3,000 coal mines, refineries, natural gas processors / pipelines	Lead phase-down in gasoline; Bingaman S.A.868 (109 th Congress)
Hybrid <i>(some emissions sources covered directly; others covered via regulation of fuel distributors)</i>	Likely scenario for this approach would cover electric power, large manufacturing facilities, and transportation ~75% of U.S. emissions	13,000 downstream sources plus around 150 refineries	Lieberman-McCain S. 280 (110 th Congress).

To summarize: policymakers face a unique set of choices and opportunities when regulating energy-related CO₂ emissions compared to conventional air pollutants. As with most programs designed for the latter, policymakers can focus regulation on emitters. In the case of CO₂ this will necessarily mean focusing on large point sources and excluding numerous small emissions sources because it would be too expensive to monitor their emissions and verify compliance. As a result, this approach would fail to capture as much as half of U.S. emissions. Instead, policymakers have the option to regulate fossil-fuel producers and distributors on the basis of the fuel they deliver into the energy system for eventual sale to end-users. This approach provides an opportunity to cover the great majority of emissions from small sources—including vehicles, households, and small businesses—by focusing on a much smaller number of upstream entities. Several design considerations are relevant in comparing these approaches:

- Coverage.**
More coverage in a single market-based system lowers cost and reduces potential for emissions leakage.
- Number of regulated facilities and their ability to manage compliance with a market-based program.**
Fewer regulated facilities mean lower administrative costs; more sophisticated management means a more efficient market.
- Equity and fairness.**
This objective does not require a single economy-wide program, but does suggest that no sector or area of

emissions-related activity should be exempt from the effort to mitigate emissions. While economics can shed light on the magnitude and distribution of cost burdens, it is not helpful in establishing what is fair.

- Durability.**
How well will a particular policy configuration work in the future as societal objectives evolve? Except to note that broad coverage may become more important as society seeks deeper emissions reductions in the future, economic analysis offers little clear guidance.

2. Questions Concerning Allocation and the Distribution of Cost Burdens

Because past tradable permit programs have awarded most free allowances to directly regulated entities, the issue of allowance allocation is often explicitly or implicitly bound up with discussions about where to regulate. The critical point here, however, is that any free allocation of allowances need not be tied to the question of which entities will be required to surrender allowances. This point is important because if one assumes a direct connection between free allocation and point of regulation, the decision about where to regulate becomes tied to the distribution of potentially billions of dollars worth of assets. This would potentially distort a design choice that should be based primarily on maximizing program coverage and other considerations. A related point is that the burden of regulation—that is, whose fortunes diminish as a result of emissions constraints—does not necessarily fall on

the economic actors that are being directly regulated. Entities that are required to submit allowances or pay an emissions tax under a market-based regulatory system can usually pass some if not most of these costs forward (to their customers) or back (to their suppliers). More generally, point of regulation does not affect the distribution of associated cost burdens, with some important caveats, for reasons discussed in more detail below.

While it is somewhat obvious that allowances in a cap-and-trade system do not *need* to be freely allocated to regulated entities, this was the approach generally taken, as noted above, in all the fully operational emissions-trading programs that exist today.¹⁵ Despite historic precedents, however, recent climate proposals show a growing interest in auctioning significant numbers of allowances, rather than giving them away. And in a few cases, recent proposals would give free allowances to businesses that are not directly regulated.¹⁶ Why?

This change in thinking about allocation reflects a more sophisticated understanding of what happens when a price is put on CO₂ emissions associated with fossil-fuel use. First, users of fossil fuels face higher production costs as fuel prices rise to reflect the carbon price signal. Second, demand for fossil fuels can drop as a result of higher prices and/or underlying fossil-fuel prices can fall, shifting some of the cost of regulation onto fossil-fuel producers.¹⁷ Third, prices for products made with fossil fuels—especially electricity—may rise shifting some of the cost burden onto consumers.¹⁸ In the latter case, higher market prices for electricity may benefit non-fossil electric generators that do not face higher fuel or emissions costs under a CO₂ trading program, such as nuclear or renewable electricity producers.¹⁹ Even mostly fossil-fuel based companies can benefit, however, if they can pass most of their emissions costs on to consumers and have simultaneously received an allocation of free allowances. In that case, the asset value of free allowances can exceed, perhaps substantially, the actual cost burden imposed on allowance recipients under the regulatory program. This phenomenon was observed in some European electricity markets where, in response to the EU ETS, a close correlation

A desire to minimize costs and avoid leakage problems provides the primary motivation for thinking carefully about what to include in a uniform market-based policy as society pursues gradually deeper emissions reductions.

emerged—not only between wholesale electricity prices and allowance prices, but also between the stock value of some power companies and allowance prices. That is, stock prices for some power companies rose with higher allowance prices and fell with lower allowance prices.²⁰ Because these companies could pass most of the opportunity cost of using allowances through to consumers in the form of higher prices and because they had been given free allowances to start with, they were actually better off when allowance prices were high. Evidence from the EU ETS, perhaps more than any other recent development, has changed current thinking about allocation and provoked a more nuanced approach to the question of who should receive free allowances.²¹

The issue of allocation is discussed at length in a companion issue brief (Issue Brief #6) on that topic (as well as in Issue Brief #11 concerning the electricity sector) but two relevant points are worth making here. First, there is a trend toward moving free allocation away from regulated emitters and toward a more nuanced notion of burden, taking into account the ability of regulated firms to pass emissions costs forward or back. Second, the fact that costs can be passed forward and back along the energy supply chain generally implies that the

15 That is, the Acid Rain trading program, the NOx Budget Program and SIP Call, and the EU ETS. See references in footnote 7.

16 Many states in the Regional Greenhouse Gas Initiative propose auctioning all permits; among the half-dozen cap-and-trade proposals in the 110th Congress, free allocation accounts for between 50 and 85 percent of initially available allowances and is, in many cases, phased out over time.

17 As noted in an earlier footnote, the principle impact on upstream suppliers is lower demand; prices received by fossil-fuel producers are not estimated to change much in response to near-term climate regulations.

18 We discuss the many issues surrounding electricity in Issue Brief #11. The question of whether other sectors can pass through costs, especially where firms face international competition, is the subject of a pair of issue briefs on competitiveness impacts and policy options (Issue Briefs #7 and #8).

19 This benefit to nuclear and renewable generators can be viewed as an appropriate reward for cleaner generation. More generally, questions of fairness and equity are extremely subjective; here we try to simply note where burdens exist, not where they should exist.

20 See Sijm, J. K. Neuhoff, and Y. Chen. 2006. CO₂ cost pass-through and windfall profits in the power sector. *Climate Policy* 6(1), 49-72.

21 See revised allocation recommendations by the National Commission on Energy Policy, <http://www.energycommission.org/site/page.php?report=32>.

distribution of economic burden is the same, regardless of who is regulated—the emitter, the fuel distributor, or the fuel producer. That is, requiring either producers or distributors of fossil fuels to surrender allowances based on the carbon content of the fuels they handle generally raises the price of those fuels by the value of associated allowance. Thus, the outcome is the same as in a system where the downstream end user has to buy emissions allowances to satisfy a direct compliance obligation.

One caveat to this observation that the point of regulation does not really matter, except in terms of emissions coverage and administrative complexity, relates to the structure of markets along the fossil-fuel supply chain.²² In some cases, long-term fuel supply contracts may not allow for a price adjustment in response to a new upstream allowance requirement. In the case of western coal, the market power of railroads may affect the ability of western suppliers to pass along higher prices associated with upstream CO₂ regulation to eastern utilities without some of that price increase being captured by the railroad. Finally, pipeline companies with regulated tariff rates that do not own the fuel they transport may not be easily able to pass through the cost of CO₂ allowances. While none of these obstacles is insurmountable, especially over time, they serve to underscore two points. First, the basic notion that point of regulation does not affect the distribution of regulatory cost burdens depends on a central assumption: that prices are set by a competitive market. Second, where this is not the case, policymakers will need to address or work around impediments to cost pass-through to ensure that incentives for reducing emissions under a tradable permits system are properly transmitted up and down the energy supply chain.

The choice of where to regulate does, of course, affect the distribution of cost burdens in one obvious way: administrative costs related to a tradable permits program will fall largely on the entities that are being directly regulated.²³ Regulated businesses have to obtain and surrender allowances (or pay taxes), and document fuel carbon content or emissions to demonstrate compliance. While small relative to either the cost of allowances or the cost of reducing emissions, these administrative costs could be burdensome to small businesses. Perhaps more burdensome for some businesses will be the need, under a tradable permit system, for some sophistication in managing permit holdings in advance of

compliance: permits or allowances are market assets that can rise and fall in value (sometimes quite dramatically). Managing them in an intelligent way to minimize compliance costs can require a variety of financial market skills quite different from those required to comply with ordinary environmental regulations (to some extent, such skills will also be required of businesses that are indirectly impacted by the regulation, even if they are not directly involved in handling allowances themselves).²⁴ While there is no shortage of external financial market expertise that could (and eventually will) be brought to bear to help companies navigate carbon permit markets, matching everything up can take time. Recent proposals that seek as a first step to cap only electric-sector emissions may be motivated by this concern. Electric utilities have experience with emissions trading under other regulatory programs so proponents of this approach may be weighing the desire for knowledgeable participants against the competing desire for greater coverage. Of course, any future expansion of a utility-only program to cover more sources would eventually require firms in other sectors to acquire similar expertise.

Policymakers have the option to regulate fossil-fuel producers and distributors on the basis of the fuel they deliver into the energy system for eventual sale to end-users. This approach provides an opportunity to cover the great majority of emissions from small sources—including vehicles, households, and small businesses—by focusing on a much smaller number of upstream entities.

22 The general point that regulating at different points does not affect “who really pays” was established decades ago in the context of tax policy. See Musgrave, R. A. and P. B. Musgrave, 1980, *Public Finance in Theory and Practice*. McGraw-Hill: New York.

23 There is also the burden on regulators; but again, for market-based policies this is typically small. An office of 100 operates the current U.S. acid rain trading program.

24 This was recently discussed in the context of the EU ETS. See Kambayashi, S. 2007. Lightly carbonated: European companies are not yet taking full advantage of carbon markets. *Economist*, August 2. Lack of experience in managing allowance holdings has likely contributed to the volatility observed in a number of trading programs during the early phases of implementation. As such, it provides a further argument for cost-containment mechanisms; see Issue Brief #5 on various forms of regulation.

Lingering Issues

A few final points concerning the scope of a market-based CO₂ program and point of regulation do not fit neatly into the discussion so far: these include the idea of expanding the range of covered sources over time and recent proposals for regulating “load-serving entities” in the power sector.

Taking the first issue (expanding program coverage over time), one option clearly is to start with emission sources that are relatively easy to regulate and include additional sources over time—such an expansion would likely be necessary if more stringent targets are to be met over time. This was basically the model used for the EU ETS. While focusing initially on the largest sources and on sources that have experience with trading programs has some appeal, for the reasons noted above, this approach raises a tricky practical question: How easy is it to create the necessary political momentum to add smaller and perhaps more resistant sources *after* the largest and most amenable sources are in? A related question is whether it might be possible to create a hybrid program that adds numerous small sources by regulating a small number of upstream fuel distributors *after* a program initially focused on large downstream emitters is implemented. If either outcome is unlikely, there may be a stronger argument for including more sources from the outset by using an upstream approach. Although it may be tempting to choose whatever regulatory approach seems most politically expedient in the interests of initiating a mandatory policy without further delay, policymakers should keep in mind that the core architecture of the program is important for its long-term environmental success. A program that cannot evolve to deliver needed emissions reductions at a reasonable cost could be a serious handicap over time. On the other hand, if a phased expansion of the program over time seems likely to be more feasible politically than starting with a broad-based approach there may be little reason to hold up progress with sources that are ready to go.

A somewhat related question is whether recent proposals to regulate load-serving entities in the electric power sector—versus power generators or other entities further upstream—are appropriate for cap-and-trade programs at the state or regional level. This approach is being considered in California as a response to serious concerns about leakage.²⁵ California imports 20 percent of its electricity so failure to address the emissions associated with power imports creates the distinct potential for out-of-state emissions to rise once constraints

are imposed within California. A proposed solution is to make the companies that procure wholesale electricity for sale in the California market responsible for the emissions associated with that electricity regardless of where it is generated. There are some potential problems with this approach. One is that it runs the risk of double counting emissions if another jurisdiction selling power to California enacts a similar regulatory program for limiting CO₂ emissions. In that case, California would need to work with the exporting state to ensure that emissions are not double-counted and double-charged—once when they occur and again when the power is sold into California. A second problem is the difficulty of accurately assigning emissions between buyers and sellers in a competitive wholesale market (discussed in Issue Brief #11 on the electricity sector). In general, regulating load-serving entities would seem to be a poor model for covering electric-sector emissions at the national level, where leakage is not a problem and where wholesale competition is more important.²⁶

Just as starting with a narrow program may be appropriate if coverage can be expanded over time, locating the point of regulation for electric-sector emissions at the load-serving entity may make sense in the context of a state or regional program, provided this does not interfere with implementing a more appropriate program architecture at the federal level. The risk is that momentum and familiarity may carry early decisions for some time, even if much better options exist.

²⁵ This approach has been proposed by the California Public Utilities Commission; see http://www.cpsc.ca.gov/static/energy/electric/climate+change/_index.htm.

²⁶ A different question is whether load-serving entities might receive free allocations—this question is likewise discussed in Issue Brief #11.