1. **What do we mean by "allocation"?**

   Any emissions trading program creates a new currency, in the form of emissions permits or allowances that entitle the holder to emit a defined quantity of pollution. Allocation concerns the initial distribution of this new currency to individual entities. In other words, which entities get permits or allowances on Day 1 of program implementation? How many do they get and how is this determined?

2. **What makes allocation contentious?**

   Under a trading program, the right to emit is limited and therefore has value—in other words, carbon permits or allowances are worth something. Potential recipients thus have a direct financial stake in how this finite pool of new assets is distributed: whether allowances are given away for free or must be purchased; how many are available to a particular sector or individual firm; etc. Because carbon dioxide emissions are so ubiquitous, the combined value of allowances in the case of a national greenhouse gas trading program could be very substantial (e.g., on the order of tens or hundreds of billions of dollars per year, depending on the stringency of the program).

3. **What are the main options for allocation?**

   Government can sell permits or allowances (typically through an auction) or give them away for free. If given away for free to emitters (an approach sometimes known as "grandfathering"), policymakers must decide how to divvy up permits or allowances to individual entities. This can be done on the basis of historic (past) emissions; according to output or some other metric (e.g., an electric power company could get allowances based on kwh generated or customers served); or in a manner designed to address specific equity concerns (such as ameliorating adverse impacts on carbon-intensive industries) and/or to deliver additional incentives for certain technologies or activities.

4. **What public policy objectives or principles should guide allocation decisions?**

   Three public policy objectives are likely to dominate allocation decisions:

   - Economic efficiency — minimizing the overall cost of achieving the desired environmental result, in this case reducing carbon emissions.
   - Equity — ensuring that the cost impacts associated with a carbon trading program are widely shared and not unduly concentrated on certain groups (e.g., carbon-intensive industries, low-income consumers, etc.).
   - Investment and innovation — providing additional incentives for the development and deployment of new technologies that can reduce the long-term cost of reducing emissions.

Allocation decisions are complicated because these objectives are often at odds. For example, auctioning allowances can maximize economic efficiency (see below), but tends to magnify equity concerns.

5. Why do economists tend to favor selling (auctioning) allowances?

Theoretically, the great advantage of auctioning allowances—rather than giving them away for free—is that resulting revenues can be used to reduce other taxes that act as a drag on income or investment. This produces benefits to the overall economy that can substantially offset the costs of the carbon policy. In fact, depending how revenues are recycled, an auction has the potential to be the most efficient of all allocation options (where efficiency is defined as minimizing net costs to the overall economy). The great disadvantage of an auction approach is that it tends to produce the most concentrated profit losses in carbon-intensive industries.

6. Why have most emission trading programs to date (including the U.S. Acid Rain program and the EU's new carbon trading program) nevertheless allocated most allowances for free?

Entities subject to new costs under an emissions trading program inevitably exert strong political pressure to be compensated in the form of a free allocation. This approach may be justified to win support for the emissions policy and to mitigate potential profit losses in affected industries. Because the impacts of an auction-based approach tend to be concentrated, whereas the potential benefits of recycling auction revenues are by nature more diffuse—and because policymakers and the public don't usually equate giving away emissions permits or allowances with giving away money—political reality usually favors a free allocation.

7. Does giving away permits or allowances negate the carbon price signal? Why would a firm that received free allowances still be motivated to reduce emissions?

Allocation does not change the financial incentive for reducing emissions, nor should it affect which entities reduce emissions and by how much. To see why this is so, consider a hypothetical firm with 100 tons per year of emissions. Under a greenhouse gas trading program, the market price (or value) of a 1-ton allowance is $7. The firm can reduce its emissions to 80 tons per year (a reduction of 20 tons) for a cost of $100 (or $5 per ton). After that, the per-ton cost of further reductions rises to more than $7. This firm will reduce its emissions by 20 tons per year, *regardless of whether it has to buy all the allowances it needs, or was given 100 free allowances at the outset.* In both cases, implementing 20 tons of reductions at a cost of $100 makes the firm $40 better off—in the first instance because the firm thereby avoids buying 20 tons of allowances at $7 per ton and in the second instance because making the reduction leaves the firm with 20 tons of excess allowances it can sell at $7 per ton. In other words, the financial incentive to avoid using an allowance is exactly the same in both cases and depends entirely on its price. That price is driven by the underlying supply

and demand for allowances, which in turn depends on the total number of allowances available (as determined by the overall program target or emissions budget) and by the economy-wide cost of achieving reductions.

8. Does the portion of allowances given away for free need to decline over time to generate a steadily stronger price signal for reducing carbon emissions?

As noted in the previous question, the price signal depends on the size of the total allowance pool—in other words, on the overall emissions target or budget—and on the cost of achieving emissions reductions. (In the NCEP proposal, the safety valve also puts an upper limit on the magnitude of the price signal.) The price signal does *not* depend on how the pool of available allowances is allocated or on what portion of allowances is given away for free. In the NCEP proposal, a steadily declining emissions target relative to business-as-usual emissions projections and a steadily increasing safety valve price create a gradually stronger price signal over time.

9. Does allocation change the costs associated with a carbon trading program, or merely the way those costs are distributed?

The effects of allocation are primarily distributional. In the example discussed above, both firms—the one that starts with 100 free allowances and the one that starts with zero allowances—stand to lose $7 for each ton of carbon they emit. Both firms will have an equal incentive to pass this cost on to their customers in the form of higher prices and both firms can expect to incur some profit losses as a result. The firm that starts with 100 free allowances is in a better position, however, because it has effectively received a $700 windfall at the outset of the program. In fact, for firms that can pass most of the opportunity cost of allowances through to their customers, the value of this initial allowance windfall could substantially exceed any profit losses incurred as a consequence of having to charge higher prices under a carbon policy.

10. Is it true that even carbon-intensive industries could actually come out ahead if they receive free allowances under a carbon trading program? If so, why haven't more companies supported this type of policy?

Economic models indicate that this is indeed possible in the case of a free allocation based on historic emissions, and there is empirical evidence to suggest that it happened in the case of the U.S. Acid Rain program. More recently, some large industrial energy users in Europe have complained that utilities given free allowances under the new EU carbon trading program were, contrary to regulators' expectations, able to pass allowance costs through in electricity prices and are therefore reaping unjustified windfall profits at consumers' expense. There are a variety of reasons why companies might oppose a carbon trading program despite these potential gains. These include uncertainty about how any individual firm would fare in a future allocation, fear that the number of allowances available for free allocation would diminish over time, and ideological or institutional opposition to regulation in principle.

11. If the goal were to avoid conferring windfall profits on individual firms while also holding energy producers and other key sectors "harmless" under a carbon trading program, what portion of the total permit or allowance pool would need to be allocated for free to compensate the most strongly affected industries?

Because most energy producers will be able to pass most of the cost associated with a carbon trading program on to consumers, the number of allowances required to compensate these producers for lost profits is generally well below expected emissions. For example, a recent analysis using the NEMS model found that the electric power sector would need allowances equivalent to roughly 60 percent of projected emissions to be fairly compensated for costs arising under the NCEP greenhouse gas trading proposal. It should be emphasized here that these are aggregate, sector-wide estimates. The allocation required to fairly compensate an individual firm might be higher or lower than the sector-wide average.

12. Can we use allocation to hold *everyone* "harmless"?

Allocation cannot be used to make a carbon control program costless or to "hold harmless" everyone in the economy. After all, the purpose of the trading program is to reduce emissions and eventually some entity within the economy—fossil fuel producers, electric generators, end-use consumers—must bear the cost of achieving those reductions. Allowance allocation can, however, be used to help ameliorate the cost burden for particular sectors and to distribute the overall cost burden more fairly across all sectors.

13. How does allocation affect firms' ability to pass through carbon-control costs?

As noted above, allocation affects neither the price signal created by a carbon trading program nor firms' motivation to pass that price signal through to their customers. This is a good thing insofar as cost pass-through is necessary if the trading program is to elicit a full range of efficient responses throughout the economy, from fuel producers all the way down the supply chain to end-use consumers. In fact, as long as all suppliers are treated equally under a carbon policy, that policy should not affect firms' competitive position or their ability to pass through new costs (whether carbon-related or not). Of course, where firms compete with foreign suppliers that do not face similar carbon constraints, cost pass-through may be an issue. In those cases, allocation can be used to compensate affected firms for competitive harm. In addition, allocation may affect cost-pass-through in the case of certain publicly regulated entities, such as utility companies. Specifically, if utility companies receive free ("grandfathered") allowances, regulators may not allow them to pass the opportunity costs associated with using these allowances through to consumers. If, on the other hand, utilities have to pay for allowances, public utility commissions may be more likely to allow them to pass these costs through, just as utilities are generally allowed to raise rates to pass through higher fuel costs.

14. How does allocation relate to the question of where (in the chain of energy supply and demand) emissions should be regulated?

Theoretically, the two issues are entirely separable; though in reality the decision about where to regulate may create a presumption about which entities are more entitled to receive allowances under a free allocation. One could, for example, regulate far upstream (in the sense that the requirement to hold allowances would primarily be imposed on fossil fuel producers), while simultaneously distributing at least some allowances to energy consumers further downstream, such as electric utilities, large industrial users, etc.

15. How might one approach allocation if the chief purpose is to address equity concerns?

One might begin by looking for sectors of the economy that are (a) likely to be disproportionately affected (e.g. carbon-intensive industries like the coal industry) and (b) where firms are likely to have difficulty passing through any new carbon control costs. Importantly, it should not be assumed that those sectors that have the highest emissions will necessarily face the highest costs. An example is the petroleum industry where most of the cost of a carbon policy is likely to be passed directly through to end-use consumers. In this instance, policymakers might place more emphasis on using allocation to mitigate the regressive impacts of higher fuel prices on consumers and less emphasis on compensating petroleum producers.

16. What is the case for using allocation to promote lower-carbon alternatives (e.g., energy efficiency, renewables, biofuels, etc.) and new climate-friendly technologies (e.g., advanced nuclear, coal IGCC with sequestration, etc.)?

By attaching tangible market value to each ton of avoided carbon emissions, a greenhouse gas trading program will by itself provide some stimulus to low- and no-carbon energy technologies. In a relatively modest program such as the one NCEP has proposed, however, the marginal cost advantage conferred by a carbon trading program will likely be too small—especially in the early years of program implementation—to overcome the barriers faced by many existing low-carbon alternatives, let alone not-yet-commercialized technologies like coal IGCC. Using some portion of the asset value associated with newly minted emissions allowances to provide an additional stimulus to these technologies may be justified on the basis that early investment to reduce current barriers will reduce the long-term costs associated with meeting more stringent carbon reduction targets in the future.

17. How could allocation be used to promote technology innovation and investment?

One option is to set aside a portion of allowances (or, equivalently, the revenues generated from selling some allowances) to be distributed on a competitive basis to

certain activities or technologies. An updating, output-based allocation has also been proposed for the power sector as a means of providing added incentives for electricity production using technologies that are more efficient and have inherently lower emissions. Under this approach, allocations to the electric sector would be continually updated on the basis of megawatt-hours of output (rather than historic emissions or heat input). The economic literature is generally critical of updating, output-based allocations on grounds that this approach could produce inefficient outcomes by subsidizing increased production and distorting future behavior (the latter concern would apply to any updating allocation). However, proponents counter that these theoretical concerns are overstated in the context of real-world regulatory and market constraints that would tend to limit any inefficient subsidy effects.

18. Can allocation "do it all"?

No, if by "all" we mean generate substantial revenues for the government, compensate all losers (including consumers), and promote new technologies. In any allocation discussion, the demands of potential claimants will undoubtedly exceed the pool of allowances available and difficult trade-offs will need to be made. Preliminary analysis suggests, however, that it should be possible to significantly offset adverse impacts on the most strongly affected industries, while leaving enough allowances to provide some broad-based economic relief to American households (in the form of deficit reduction, tax reform, or consumer rebates) and to provide additional support for the accelerated development and deployment of advanced low-carbon technologies. This result can only be achieved, however, if the compensation extended to firms via allowance allocation is designed so that it partially offsets, but in no case *exceeds*, the actual profit losses they can expect to incur under a greenhouse gas trading program.