Description:

The AB 32 maximum feasibility mandate, requiring "maximum technologically feasible and cost-effective reductions in greenhouse gas emissions," presents a policy dilemma. Some emission reduction measures have the potential to achieve very significant emission reductions within limits of cost-effectiveness, but unless cost-effectiveness can be virtually guaranteed in advance, such reductions cannot be mandated and emission caps cannot be premised on such reductions. However, the Market Advisory Committee's report[1] recommended one policy mechanism that could resolve this dilemma: A price floor, applied to an allowance auction, would impose no requirement to reduce emissions below the cap, but would provide an economic incentive to do so, to the extent that such further reductions can be achieved within a specific marginal cost limit defined by the price floor.

This proposal is a specific implementation of the MAC recommendation, which comprises the following elements (1) a cap-and-trade system (either sectoral or economy-wide), (2), 100% auctioned allocation of emission allowances, (3) a reservation (or floor) auction price, and (4) 100% refunding of auction revenue, distributed in proportion to emissions-related economic output ("output-based" refunding). Taking the electricity sector as an example, the refund would be distributed in proportion to generation capacity. At the time regulated entities surrender emission allowances, they would provide an accounting of energy generation (MWh) associated with allowed emissions, and the refund would be distributed in proportion to generation. (Established firms could obtain short-term loans or advances, based on their historical emissions and generation, to cover their auction costs until the refund is distributed.)

Comparing the options of refunding versus no refunding, the marginal incentives for emission reduction technology ($/MT-CO2) would be substantially equivalent to the emission price in either case; and for a given price the industry would incur similar abatement technology costs in either case. Refunding would make the policy revenue-neutral within the regulated sector, whereas the no-refund policy would impose a substantial tax burden in addition to the technology costs. Without the price floor, the refund would not affect aggregate emissions (which are set by the cap); it would only affect the distribution of costs and emission reductions between different industries. But with a price floor, the refund would make it feasible for the regulated sector to sustain a substantially higher price, resulting in potentially greater emission reductions.

A refunded auction would have some similarity to free allocation in terms of its distributional impacts, but in contrast to grandfathering-based allocation the refund would be based solely on emission intensity and would give no preference to incumbent firms. To the extent that the refund creates "windfall profits", the profits would accrue to low-emission energy producers, particularly renewable energy. Commercialization of renewable energy would be accelerated, and competition from expanding renewable generation would help to moderate energy price increases.

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[1] MAC Final Report, June 2007 (http://www.climatechange.ca.gov/policies/market_advisory.html), page 68.

Emission Reduction Calculations and Assumptions:

The following calculations use the electric sector to illustrate the policy, but a similar approach could be applicable to other industries.

A state-scope cap-and-trade program for electricity should apply to energy consumed in California (including imports and excluding exports) to avoid problems with leakage and industry competitiveness. The data for analysis of such a program is not readily available, so for the purpose of illustration a national program will be considered. (Also, it is useful to focus on national policy because the effect of California's precedent on national policy could be much more significant than in-state emission reductions.)

Figure 1 illustrates the emission profile of all U.S. power plants with at least 2 million MWh generation, based on EPA 2006 data. Each bar in the graph represents a particular generation facility. The bar width is the facility's annual generation (MWh), and the height relative to the right-hand vertical scale is its emission intensity (ton CO2 per MWh). The product of these two dimensions (i.e. the bar area) is the facility's annual emissions (ton-CO2). The left-hand vertical scale represents the facility's emission charge, in cents per KWh, assuming an emission price of $10 per ton CO2. (This happens to be numerically equivalent to emission intensity for this case.) The charge represents an effective emission tax for an unrefunded auction with an emission price of $10 per ton (which may be either market-determined or set by the floor price). The charge ranges from 0 to 1.78 cents/KWh; the sales-average charge is 0.93 cents/KWh (dashed horizontal line); and the aggregate annual auction revenue is $21.8 billion.

Figure 2 is the same as Figure 1, but with output-based refunding. The emission charge (left-hand scale) is the net regulatory cost (auction cost minus refund), which ranges from -0.93 cents/KWh (a net gain) to +0.85 cents/KWh. The sales-average charge and aggregate auction revenue are zero. The average positive charge is 0.15 cents/KWh, the average negative charge is 0.36 cents/KWh, and the aggregate revenue flow between firms incurring positive and negative charges is $2.49 billion. Thus, regulatory costs are significantly reduced while maintaining the same $10/ton marginal technology incentive.

Figure 3 is the same as Figure 2, but with a higher emission price of $25/ton. The charge ranges from -2.34 to +2.12 cents/KWh; however, the average positive charge is only 0.38 cents/KWh (still much less than the 0.93 cents/KWh of the unrefunded auction at $10/ton), and the average negative charge is -0.90 cents/KWh. The aggregate revenue flow between firms incurring positive and negative charges is $6.23 billion, much less than the $21.8 billion revenue for the $10/ton auction with no refunding. Marginal technology incentives are significantly increased (by a factor of 2.5 in this illustration) while regulatory costs to the industry are greatly diminished.

The estimated emissions reduction of "at least 29%" is based on the AB 32 reduction requirement. Without the price floor the reduction would be 29%, and if the price floor has any effect it will result in greater emission reductions.

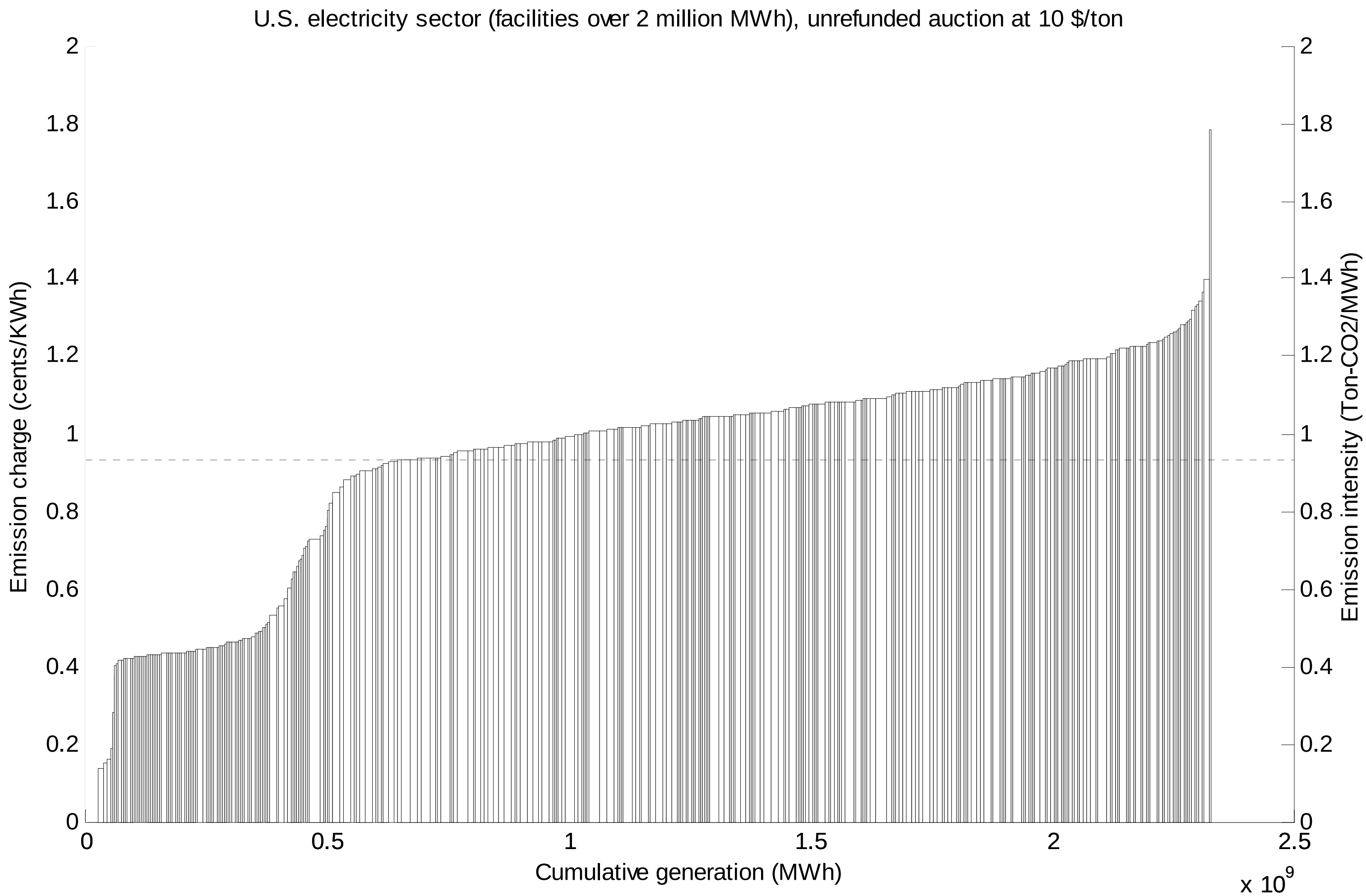

Figure 1. Unrefunded auction, \$10/ton.

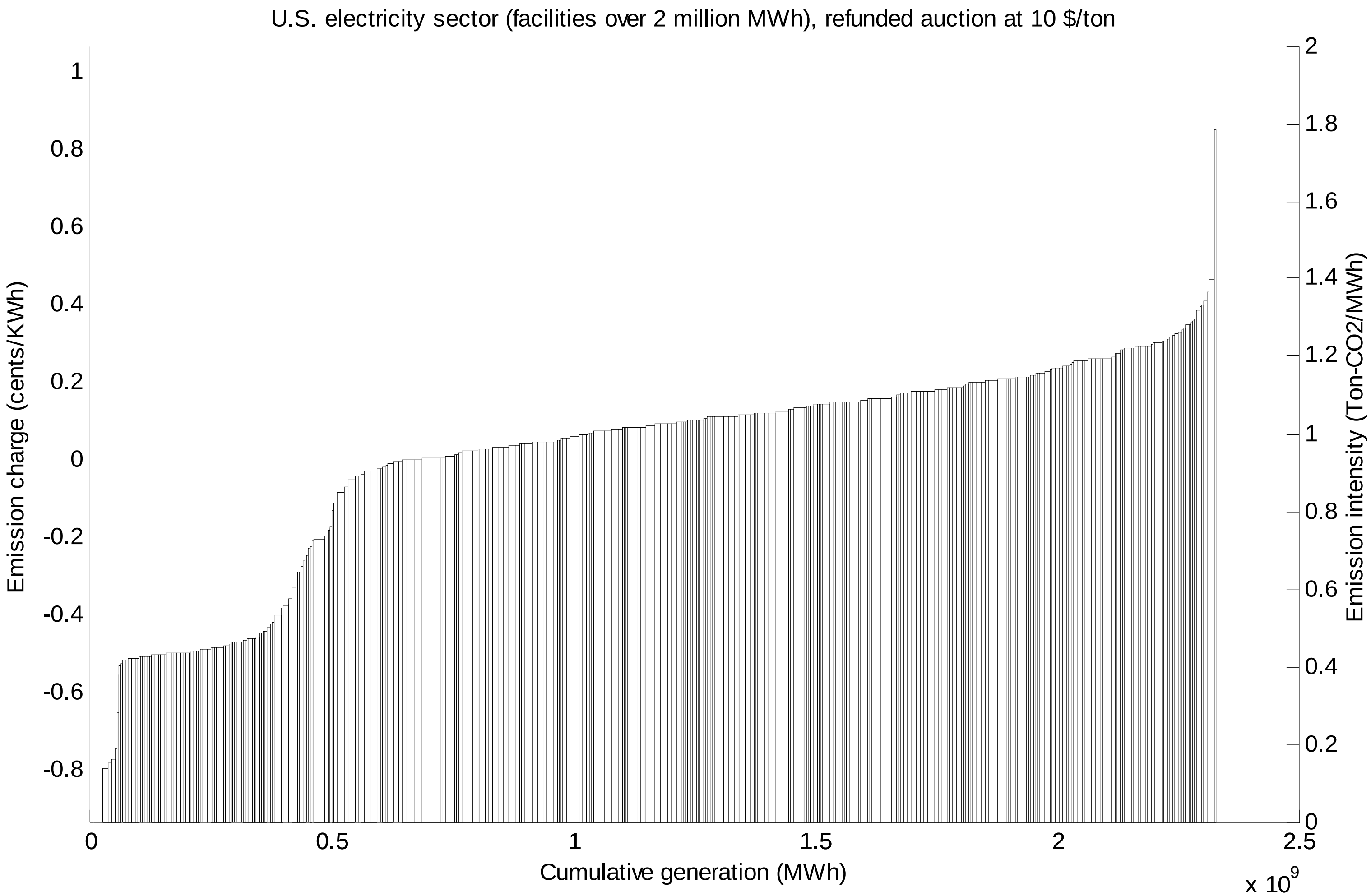

Figure 2. Refunded auction, $10/ton.

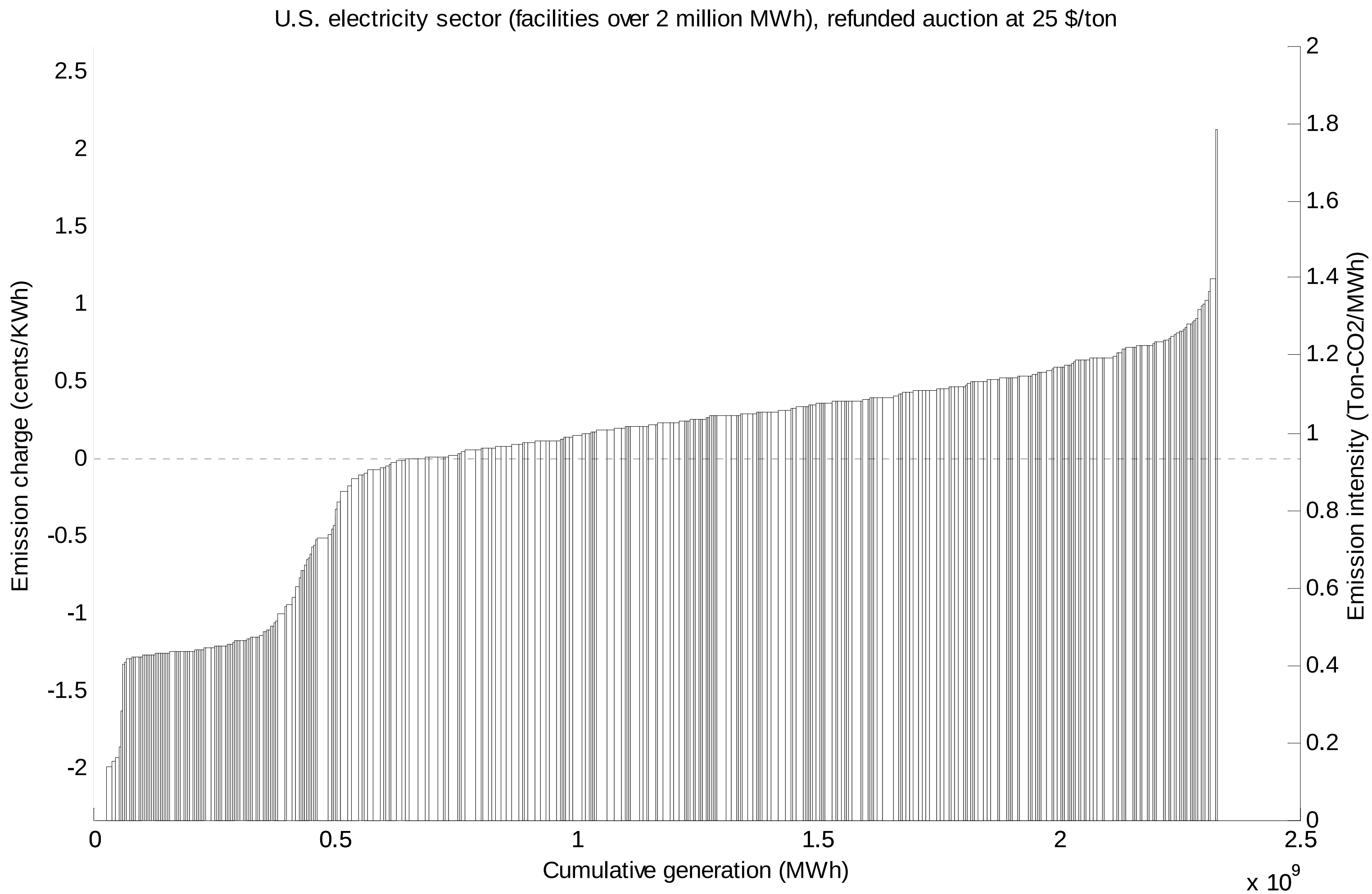

Figure 3. Refunded auction, $25/ton.

Cost-Effectiveness Calculations and Assumptions:

If the price floor is invoked, the aggregate marginal cost of regulation-induced emission reductions would not exceed the price floor, which is set by mandate. Note that the aggregate cost of the regulation itself is zero, because the policy is revenue-neutral within the regulated sector. The only cost to the regulated industry is the abatement technology investment resulting from the regulation-induced competitive incentive.

Implementation Barriers and Ways to Overcome Them:

(1) There may be institutional resistance to this policy approach because of its unfamiliarity. Refunding is not typically used with allowance auctioning. A refunded auction is economically equivalent to a free allocation system if refunds and free allowances are distributed according to the same proportionate allocation formula. However, free allocation is typically based on grandfathering (it is not output-based), and the perversities of grandfathering (e.g. windfall profits accruing to high-emission producers) may create the impression that refunding would create similar perversities. The institutional bias against refunding policies could be overcome by applying economic analysis to elucidate the benefits of this approach.

(2) If a price floor (with or without refunding) is applied selectively to a particular sector such as electricity generation in the context of a broad-based, economy-wide cap-and-trade system, it would probably result in no environmental benefit because any further reduction of emissions in that sector would result in equivalent emission increases in other sectors. This “leakage” effect can be avoided by either applying the price floor broadly, throughout the cap-and-trade system, or by regulating the sector with the price floor under a separate, sectoral cap-and-trade system. The latter approach may be preferable if different price floors are appropriate for different industries.

(3) A national-scope program might be resisted because of the large revenue flows that it would induce between different geographic regions. For example, under the scenario illustrated in Figure 3 (electricity sector, national-scope, refunded auction at $25/ton), California energy producers would receive $648 million net revenue because of their greater reliance on comparatively low-emission sources such as hydroelectric power. This could create political resistance from the coal industry, which would be funding most of the “windfall profits” in California, and it would divert economic resources that might be better spent on subsidizing local renewable energy industries in states that are heavily dependent on coal. This limitation can be overcome by structuring the refund to be revenue-neutral within separate geographic districts. For example, the program could be revenue-neutral for energy consumed in each individual state. If this form of refunding is applied, then a California-specific refunded auction program could later be seamlessly integrated with a national program.

(4) A national-scope program might also be resisted because of the destabilizing effect it could have on some industries. For example, fuel switching from coal to natural

gas would affect prices for home heating and fertilizer production. However, the refunding method could be designed, for example, to eliminate revenue transfers between coal and natural gas, but without affecting revenue transfers between fossil fuels and renewable energy. This regulatory approach would induce the electricity sector to reduce both coal and natural gas dependence, rather than increasing reliance on natural gas.

Potential Impact on Criteria and Toxic Pollutants:

CO2 emissions tend to correlate with criteria and toxic pollutants such as SO2, so regulatory policies relating to CO2 emissions tend to positively impact criteria pollutants. Furthermore, the same policy approach can be extended to explicitly cover criteria pollutants by combining emission charges on CO2 with similar charges on other pollutants.