To: Regulated Entities Work Group
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Combating Emissions Leakage from Oregon's Industrial Sector[1]

Emissions leakage would occur if capping Oregon's greenhouse gas (GHG) emissions causes emissions outside the state to increase. As Oregon considers cap-and-trade, the state is looking for a policy design that will achieve environmental and economic goals, including minimizing leakage. This memo explains that the distribution of emissions allowances is a powerful tool for meeting these goals. We make four main points:

1. Oregon can use allowance allocations to balance the benefits of auction revenue with the benefits of minimizing leakage;
2. The state can reduce or eliminate leakage using output-based updated allocation, recognizing that doing so has an opportunity cost because it diverts allowance revenue from other potential uses;
3. We recommend simple allocation rules based on available data;
4. For allocation to be effective at reducing leakage, covered facilities must anticipate that the allocations will be updated based on their production levels. Allocation *rules* can be updated based on new information as the cap-and-trade program unfolds.

Oregon can use allowance allocations to balance the benefits of auction revenue with the benefits of minimizing leakage

Cap-and-trade policy has three components. First is a determination of the total quantity of emissions allowed under the emissions cap, which the state can enforce by limiting the number of emissions allowances issued. Second is the distribution of emissions allowances, which includes the decision about whether and how many allowances to auction, and whether and how many allowances to distribute for free. Third is the provision for allowance trading, or more generally purchase or sale. Trading is essential for cap-and-trade to help identify the lowest cost path to reducing emissions.

In Oregon, a compelling reason to auction allowances is that the auction yields revenues that the state can reinvest to accelerate its transformation to a low-carbon economy. For example, the revenue could be used to build electric vehicle charging stations or subsidize investments in wind or solar power.

However, as the cap internalizes the currently external costs of climate change, some firms may need incentives to reduce the risk that they relocate. Oregon can reduce these

[1] Linn is a Senior Fellow and Burtraw is the Darius Gaskins Senior Fellow at Resources for the Future. Ideas in this memorandum draw partly on research by Linn on behalf of the California Air Resources Board (2016) and on the report of the Economic and Allocation Advisory Committee recommendation to the California Air Resources Board (2010), on which Burtraw served. The opinions expressed here are strictly those of the authors. Resources for the Future is nonadvocacy and takes no positions on these issues.

costs and leakage risk by reducing the share of allowances it auctions, and using free allocation as an incentive to maintain production at affected facilities. But doing so would reduce the available auction revenue, creating the need to balance the objectives of raising auction revenue and reducing leakage.

The state can reduce or eliminate leakage using output-based updated allocation

Under output-based allocation, a firm receives free allowances equal to an industry-specific factor (described below) multiplied by its production in the current or recent time period. Free allocation affects the variable costs of operating a facility because the freely allocated allowances have a market value, analogous to fuel or other inputs at a facility. When the firm uses the allowances for production it foregoes the opportunity of selling them in the market. To offset the increase in variable costs associated with using allowances for compliance, the regulators can determine the amount of free allocation on the basis of the level of production in a current or recent period, and update that allocation over time. This explicitly links free allocation to the level of production, and so it constitutes a production incentive that reduces variable costs. As a result, output-based updated allocation can help Oregon firms maintain their production levels and reduce the amount of production that shifts from Oregon to other areas—reducing the extent of the leakage. If designed carefully, such allocation can preserve incentives to reduce emissions as well.

Importantly, free allocation must be delivered as a production incentive and for a specific firm the allocation must be based on a maintained level of production. This is the approach taken by California, for example. In contrast, free allocation in fixed quantity that is not updated over time, and instead is perhaps based on a historic data such as production output, heat input or emissions in a fixed (previous) year, does not provide a production incentive. This form of free allocation constitutes a transfer of a valuable asset, which may provide compensation to the firm, but it does not provide an incentive to increase its production activities, or even to remain in business in the state. For this reason, we emphasize the need to update each firm's allowance allocation based on its production.

Output-based updated allocation does not undermine the overall integrity of a statewide emissions cap. If such an allocation causes a firm to increase production compared to its production level without output-based updating, this would decrease the allowances that can be auctioned or granted to other firms or industries. The statewide emissions cap remains unchanged, although we reiterate the tradeoff between the value of auction revenue and reducing leakage risk discussed above.

We recommend simple allocation rules based on available data

Implementing output-based updated allocation requires regulators to make two decisions: which industries should be included, and the rule that determines the allocation to specific firms. Leakage risks may be highest for "emissions intensive" firms with production processes involving intensive use of carbon-based energy (including carbon

embodied in electricity) or high levels of process emissions. Leakage risk may also be highest for "trade exposed" firms with significant market competition from out-of-state producers. The trade exposure suggests that if these firms try to pass the costs on to consumers, they would lose business to out-of-state competitors, and leakage would result.

However, emissions intensity and trade exposure do not always imply potential leakage: other factors may apply. Local producers can enjoy a cost advantage over importers due to transportation or other costs. In these circumstances a GHG emissions cap may raise local costs, but not enough to make imports cheaper than local production. In this case, local producers experience lower profits but still maintain their local production. *In short, the set of industries eligible for output-based updated allocation should be based on an assessment of the leakage risk that is made using all available data.* The literature describes approaches to quantify the leakage risk for individual industries.

For allocating the allowances to eligible industries, *an individual firm's allocation should depend on its output and an industry-specific allocation factor*. The factor should be proportional to the leakage risk for the industry—i.e., to the full production cost increase caused by the program, which may include direct emissions (from fuel combustion or processes) and emissions embodied in electricity. The output-based updated allocation would occur via a rebate that is provided in proportion to actual production. The rebate would offset at least some, and no more than all, of the production cost increase.

It is relatively easy to implement output-based updated allocation in the electricity sector because the product, electricity, is homogenous and easily measured in megawatt-hours. In contrast, some industries produce heterogeneous products. For these industries, a benchmark allocation could be determined based on specific engineering or technological criteria. Benchmarking can be used within an output-based updated allocation approach to address differences among industries, technologies, or fuels. Under the benchmarking approach, the regulator establishes a baseline emissions rate for an industry (e.g., cement) or process (e.g., fossil-fired electricity generation), and awards allowances to all facilities in that industry according to the baseline GHG content of their output. The benchmark could reflect early actions to reduce emissions intensity.

Output-based updated allocation effectively reduces the cost of producing output, which could reduce output prices relative to a full auction. Lower output prices may seem attractive, but they mitigate incentives for consumers to reduce consumption of the products. However, setting an industry-specific baseline based on best practices rather than a firm-specific factor based on the firm's actual costs would successfully preserve some of the incentive for the firm to invest in energy efficiency or find other means of reducing its emissions intensity.

We offer two caveats for choosing the allocation factors. First, one might be tempted to use entry and exit of facilities to update their allocations, and if a facility closes, it loses its allocation. Although this practice may have intuitive appeal, it creates inefficiencies because firms alter their behavior in order to influence future allocations, potentially

keeping highly emitting facilities in operation because their allowances are free. Instead, the allocation should be tied to the level of production from a facility.

Second, while it may be attractive to assign industries to categories and choose a common factor for each category, this could create economic inefficiency and a sense of unfairness for individual industries. For example, suppose two leakage risk categories are defined (high and low) and industries in the high category have a higher factor. There could be two industries that happen to fall just above and below the cutoff for the two categories, causing substantially different allowance allocations for firms that have essentially the same leakage risk. Instead, we suggest a factor that is directly proportional to the industry specific leakage risk.

For allocation to be effective at reducing leakage, covered facilities must anticipate that the allocations will be updated based on their production levels. Allocation *rules* can be updated based on new information as the cap-and-trade program unfolds

To qualify for a rebate, a firm would have to pass two tests that should be implemented by a state agency on a regular (e.g., biannual) basis to confirm the firm's leakage risk. The precise list of eligible industries should be derived from data at the 6-digit level of the North American Industry Classification System (NAICS). Moreover, if an industry's leakage risk turns out to be different from that expected—either higher or lower—the allowance factor could be adjusted accordingly.