

January 2009 edition

Cap and Trade 101

A Climate Policy Primer

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SIGHTLINE INSTITUTE is a not-for-profit research and communication center—a think tank—based in Seattle. Founded in 1993 by Alan Durning, Sightline’s mission is to bring about sustainability, a healthy, lasting prosperity grounded in place. Our focus is Cascadia, or the Pacific Northwest.

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SUMMARY

Climate change presents both a challenge and an opportunity. The same actions that will curb greenhouse-gas emissions will also let us break through to a clean-energy economy—an economy that ends our addiction to oil and other dirty fossil fuels once and for all.

If we are to seize this opportunity, however, a fundamental change is required: We must stop treating earth’s atmosphere as a free dumping ground for pollution. The key to making polluters pay for emissions is a system known as “cap and trade.” A cap-and-trade system, when done right, enforces an economy-wide limit on greenhouse gas emissions; sets realistic goals and commonsense rules for reducing emissions over time; and harnesses the creativity and dynamism of the market to achieve these goals.

This primer reviews various ways of designing a cap-and-trade system. It focuses particularly but not exclusively on the context of the Western Climate Initiative, in which seven US states and four Canadian provinces are participating. Climate policy that works is built on three principles: efficiency, effectiveness, and fairness. To satisfy these three criteria, Sightline recommends a particular cap-and-trade design: one that is *comprehensive*, operates *upstream*, is *auctioned*, and has *built-in protections* for families. Here’s what these terms mean.

Comprehensive. Cap and trade should cover *all measurable emissions of greenhouse gases* to ensure an efficient, economy-wide transition away from carbon-based fuels. In particular, it should cover transportation fuels such as gasoline and diesel.

Upstream. For simplicity’s sake, cap and trade should operate as high as possible in the supply chains for fossil fuels—as close as is convenient to the point at which fossil fuels enter the economy of the state, province, or nation in question. This approach means that far fewer than one-tenth of one percent of businesses will have any direct interaction with the cap-and-trade system. Cap and trade does not create any paperwork for families or small businesses.

Auctioned. Permits to emit greenhouse gases should be sold at quarterly public auctions, not distributed free—“grandfathered”—to historic polluters. Auctioning prevents windfall profits for energy companies, allows the proceeds of the auctions to serve the public interest, and prevents market manipulation and “gaming.” Grandfathering the privilege to pollute would take money from low-income consumers and give it to the predominantly wealthy shareholders of energy companies.

Built-in protections. Revenue from auctioning cap-and-trade permits should go, first and foremost, to compensate families for the burden of expensive energy. Good strategies include full rebating of all auction proceeds on an equal per-person basis (“Cap and Dividend”); rebating certain auction proceeds to low- and moderate-income families (“Cap and Buffer”); investing a share of proceeds in upgrading the energy efficiency of in-state families’ homes (“Cap and Caulk”); and investing a share of auction proceeds in green-collar-job training programs—giving low-income families a chance to gain from the new opportunities of the clean-energy economy.

Carbon tax shifting, commonly discussed as a rival policy to cap and trade, is actually more a complement than an alternative. A carbon tax shift combines fees on greenhouse-gas emissions with dollar-for-dollar reductions in other taxes. British Columbia’s carbon tax shift, implemented in July 2008, is a model policy that other jurisdictions would do well to emulate. It can be readily integrated into cap and trade in the form of an auction “reserve price” to create a hybrid policy that is stronger than either a carbon tax shift or a cap-and-trade system individually.

INTRODUCTION

Why do we need cap and trade?

Climate change is not only one of the greatest challenges of our time, it's also an epic opportunity. When we rise to the challenge through smart solutions, we will also unleash a wave of new economic development, generating jobs and revitalizing local economies. We already have the technology to jump-start a clean-energy economy. The ingenuity and dynamism of the marketplace can expand on these technologies over the coming decades, generating broadly shared prosperity while safeguarding our climate.

But seizing this opportunity will require us to adopt policies that effectively curb climate-changing emissions. At base, the threat of climate disruption stems from a single fact: We treat the atmosphere as a free dumping ground. No one has to pay to pollute our shared air. The result has been increasing concentrations of climate-warming gases, along with other maladies of our energy system like oil addiction.

Jump-starting a transition to a clean-energy economy means, above all else, putting a price on climate-warming emissions: *no more free dumping*. The way to make polluters pay, while guaranteeing that we'll meet emissions-reduction goals, is to implement a system called "cap and trade." Cap and trade commits a region to responsible limits on global warming emissions; gradually ratchets down those limits over time; and harnesses the power of the marketplace to reduce emissions as smoothly, efficiently, and cost-effectively as possible.

What does "cap and trade" mean?

Cap: A cap is a legal limit on the quantity of greenhouse gases our economy can emit each year. Over time, the legal limit diminishes—the cap gets tighter—until we've hit our targets and launched a clean-energy economy. The cap acts as a solid backstop behind all other climate policies. Energy efficiency standards for vehicles and appliances, smart-growth plans, building codes, transit investments, tax credits for renewable energy, public investment in energy research and development, utility regulatory reforms—all manner of public actions can move us toward our climate goals. *But the cap is our only guarantee that we will get there.* There is no substitute for the certainty of an emissions cap.

Trade: "Trade" means that, by law, companies may swap among themselves the permission to emit greenhouse gases. In other words, there is a market for pollution "permits." The point of such a trading system is to put a price on pollution that will travel throughout the economy, motivating businesses and families to find ways to trim greenhouse gases. By turning the permission to pollute into a commodity that is bought and sold, everyone up and down the economic ladder gets new opportunities to make and save money. "Trade" hitches the flexible power of the marketplace—the mobilized

ingenuity of millions of diverse, dispersed, innovative, self-interested people—to our climate goals. Cap and trade is a compelling combination: guaranteed results, flexible means.

Putting a price on pollution may sound a lot like “higher energy prices.” But fossil fuel prices are already up because of basic supply and demand. Were cap and trade in effect already, it would probably simply maintain high prices, not raise them further. Besides, a well-designed trading system encourages efficiency, innovation, and lowest-cost solutions. In the long term, cap and trade will reduce demand for dirty energy and make emerging clean technologies more and more affordable.

Most important, a well-designed cap-and-trade climate policy allows us to take charge of our energy future, rescuing ourselves from our fossil-fuel dependence. It redirects the proceeds of high energy prices toward the common good. In short, if we do it right, cap and trade lets us all share in not only the costs but also the benefits of the new economy.

Much depends, then, on the design of cap and trade. Different cap-and-trade proposals vary on how both “cap” and “trade” function. These differences have profound implications for the fairness and effectiveness of climate policy. Explaining these differences is the purpose of this primer.

How does cap and trade work?

Here are the basic steps to operating a cap-and-trade system:

1. **Tally greenhouse-gas emissions.** For example, track fossil fuels at the points where they enter the region’s economy: the pipeline or oil tanker.¹ The state of Washington has only about 100 companies in business at such entry points.
2. **Set a cap.** Decide how much carbon pollution to allow in the program’s first year and require permits for emissions: one permit per ton of carbon dioxide or its equivalent in other heat-trapping gases (known as CO₂ equivalent, or CO₂e). The number of permits will match the cap to ensure we hit our goals. (A cap does not limit emissions from individual citizens; no paperwork for families or small businesses is required. Instead, it affects wholesalers or suppliers of fossil fuels and similar big “upstream” businesses. Price signals travel downstream through the economy to other businesses and to consumers.)
3. **Distribute permits.** Permits can be valid for a single year, or for a multi-year period. One method for distributing them is auctioning; another is to give them away free on the basis of past emissions (“grandfathering”), past energy sales, or some other criterion. Permit holders can buy and sell allowances among themselves. That’s the “trade” part.
4. **Enforce the cap.** Affected businesses (for example, those that bring fossil fuels into the economy) will file periodic reports verifying that they hold enough permits to cover their emissions. Authorities will audit some reports to deter misrepresentation. They will curb speculation and gaming by overseeing the permit market, much as the Securities and Exchange Commission oversees Wall Street.

5. **Step it down.** Each year, distribute fewer emissions permits, on a predictable, published schedule that takes us to our targets. The gradual nature of this transition maximizes choice and flexibility in a way that narrowly targeted climate policies cannot match.

Within this general description, cap and trade can vary, depending on how a specific system is designed. Key design choices make a world of difference.

IN BRIEF: WHY CAP AND TRADE?

- ◆ It's tested and proven. A cap-and-trade system worked cheaply and efficiently to reduce acid rain pollution in the United States in the 1990s.
- ◆ It's cost-effective. A cap provides market incentives to steadily reduce pollution in a cost-effective and efficient manner, encouraging a healthy shift away from the instability and insecurity of fossil fuels.
- ◆ It's economically sound. Today, we stand at the top of the pollution staircase. It would be dangerous and risky to jump to the bottom or run down too fast. Instead, cap and trade allows our businesses and families to step down, stair by stair, at a gradual pace that is safe and manageable. We can adjust through fuel efficiency and increased renewable energy resources like solar and wind power. Cap and trade offers us a path to success in the new energy economy: maximum flexibility, clear and feasible goals, and a predictable timeline.
- ◆ It's a prudent, long-term investment. The key to our long-term prosperity and a stable economy is a shift away from oil. This shift can work for businesses and consumers alike, allowing us to take charge of rising energy costs, invest in new technologies, and ensure a smooth transition. Right now, we're sending billions of dollars a year out of local economies to pay for dirty energy.
- ◆ Most importantly, the cap is a solid guardrail on the path to success. No policy measure can substitute for setting a solid cap on the greenhouse gas emissions that are allowed into the atmosphere; it's our firm guarantee that we will meet crucial pollution targets.

What's the status of cap and trade elsewhere?

Cap and trade has emerged as the most popular climate policy solution, in both Europe and North America. It's based on successful cap-and-trade programs for other pollutants such as airborne sulfur dioxide, first implemented in the 1990s in the United States. The European Union has operated a limited carbon cap-and-trade system since 2005.

In June 2008, Congress considered the Lieberman-Warner bill, one of a bevy of cap-and-trade bills introduced by different members. Barack Obama advocates a cap-and-trade climate solution with 100 percent auctioned permits. The US Supreme Court recently ruled that the US Environmental Protection Agency has

authority to regulate greenhouse gas emissions: if Congress does not act, a US president can.

Elected leaders in jurisdictions throughout North America have already committed to designing and implementing cap-and-trade policies. They have started by setting bold greenhouse-gas goals—cutting emissions by as much as 75 percent by 2050.² In the Northeast US, the Regional Greenhouse Gas Initiative (RGGI) aims to stabilize certain emissions immediately, and effect a 10 percent reduction by 2018. States in the Midwest have created the Midwest Greenhouse Gas Reduction Accord (MGGRA) with similar goals. The largest agreement, both in area and in population, is the Western Climate Initiative (WCI), which unites leaders from Arizona, British Columbia, California, Manitoba, Montana, New Mexico, Ontario, Oregon, Quebec, Utah, and Washington. WCI’s collective goal is reducing overall emissions to 15 percent below 2005 levels by the year 2020. The WCI leadership council, comprised of representatives of the “Partners” (member jurisdictions), developed a cap-and-trade plan in 2008.³

These three regional cap-and-trade agreements—the MGGRA⁴, RGGI,⁵ and WCI⁶—encompass more than more than half of the people in Canada and the United States (see figure 1).

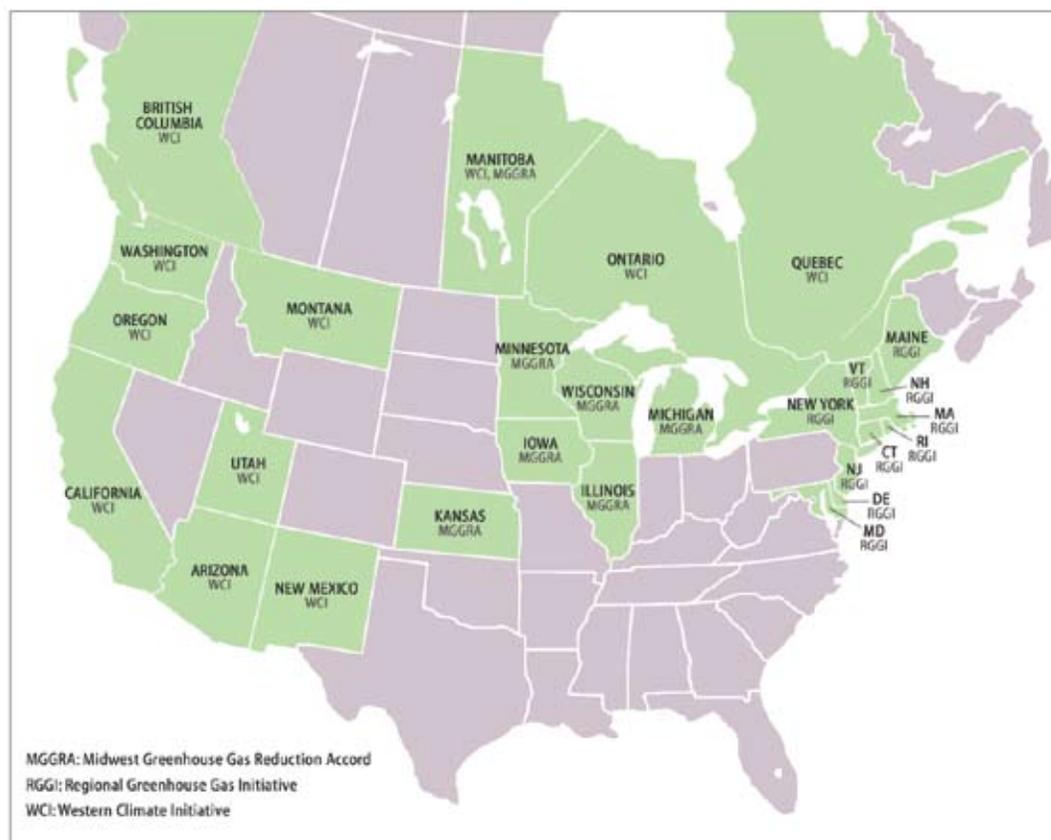


Figure 1. Twenty-eight states and provinces are forming regional cap-and-trade systems.

What are the main design variables in a cap-and-trade program?

Think of cap and trade as a climate-protection machine with four dials, each of which controls part of the machine. The four are:

1. **Scope:** Which gases and what industries are covered?
2. **Point of regulation:** Which people or companies must hold permits?
3. **Allocation:** How are the permits distributed initially, by auction or for free? (And subsidiary to that, how long does a permit last? Who can you sell it to? Can you save it for later? How many may one company hold?)
4. **Revenue use:** If some or all permits are auctioned, what should authorities do with the proceeds?

How to tell whether a cap-and-trade program is well designed

Cap-and-trade programs should embody three core principles:

- ◆ **Effectiveness:** Climate policy should cut global-warming pollution gradually enough for businesses and families to adjust but at a pace rapid enough to meet the safe targets recommended by science and set by law in many jurisdictions. In short, it should be capable of causing emissions to decline by 15 percent (below 2005 levels) by 2020 and of largely eliminating greenhouse-gas emissions from fossil fuels in four or five decades.
- ◆ **Efficiency:** Climate policy should chart the most cost-effective route. It should be simple, flexible, and market-oriented; it should minimize cheating and gaming. We have neither the time nor the money for a strategy that's wasteful, poorly conceived, or vulnerable to manipulation.
- ◆ **Fairness:** Climate policy should share equitably the economic burdens and benefits of climate stewardship. In fact, climate policy should redress some of the injustice of climate change itself.

WHAT DO WE MEAN BY “FAIRNESS”?

The fairness principle deserves elaboration. Climate change is a universal menace, threatening hardships for everyone. But not everyone will suffer equally. Perversely, those least to blame for causing it are most vulnerable to it, whether in low-lying Bangladesh, the Ninth Ward of New Orleans, or the floodplains around Chehalis, Washington, where small towns and rural areas were inundated with floodwaters in the spring of 2008.⁷

Throughout western North America, climate change promises to widen the gap between economic winners and everyone else. Seniors, children, and low-income families, particularly in rural areas, face the worst climate insecurity. Low-income families are most likely to live in floodplains or fire-prone forests. (Or, if they have a home in the woods, it's their only home, not a second one.) They're unlikely to have the means to move to safer ground. They're unlikely to have air conditioning for the heat waves that may be coming. What's more, they are less likely to have health insurance to protect themselves from whatever disasters or hardships come.⁸

Forestry workers in British Columbia may see massive job losses by 2012 from the climate-induced plague of pine beetles laying waste to the forests.⁹ Reservation-dwelling Native Americans and First Nations are vulnerable because of their dependence on fisheries, forestry, and agriculture. Farm laborers also face disproportionate hardship: crop failures and dwindling irrigation water will post “not hiring” signs across farm counties.

A certain amount of climate change is already unavoidable, and it will punish the blameless. Smart climate policy, therefore, should not only treat all economic classes evenly, but also should especially benefit low-income families.

What cap-and-trade design works best?

The principles of effectiveness, efficiency, and fairness described above lead to a particular cap-and-trade system design, which has four crucial characteristics:

1. It is *comprehensive* in scope.
2. Its point of regulation is *upstream*.
3. Its permits are allocated by *auction*.
4. It uses auction revenues to provide *built-in protections for families*.

The rest of this primer elaborates on those key terms: *comprehensive*, *upstream*, *auctioned*, and *built-in protections for families*.

SCOPE: COMPREHENSIVE

Scope determines how much of our total greenhouse-gas output is covered by cap and trade—that is, which greenhouse gases and from which sources. Carbon dioxide is the main greenhouse gas, accounting for 85 percent of the Pacific Northwest’s contribution to climate disruption. Fossil-fuel combustion is the main source of CO₂, contributing almost 70 percent of climate impact in the Pacific Northwest and British Columbia.¹⁰

Existing cap-and-trade systems are limited in scope. Europe’s system, launched in 2005, covers only electric power plants and certain heavy industries; the Regional Greenhouse Gas Initiative of the Northeast states covers only the former.

A cap is like a roof: it needs to cover the whole building. In other words, it works best when it covers all measurable emissions of greenhouse gases from all measurable sources. Such comprehensiveness will dramatically increase the policy’s effectiveness, and will also guarantee the cheapest and most efficient reductions possible. Achieving overall emissions reductions of 15 percent by 2020 and 75 percent by 2050, for example, will be almost impossible if only half of emissions are covered by the cap. Besides, leaving gases or sources “out” means forcing those that are “in” to do more than their share.

What’s more, a partial cap creates a plethora of perverse incentives that could undercut the cap itself. For just one example, waiving transportation fuels while including the electric-power sector and non-transportation fuels would raise the price of power relative to the price of diesel fuel. As a result, some businesses would likely circumvent the cap by buying small generators and fueling them with highway diesel.

Transportation fuels are the largest source of greenhouse gas emissions in the Northwest. So a cap that excludes them would be like a roof without half its shingles.

POINT OF REGULATION: UPSTREAM

The *point of regulation* is the place in the economy where cap and trade actually creates new legal requirements: “downstream,” where consumers buy fossil-fuel energy; “midstream,” where retailers and other fuel handlers sell it; or “upstream,” where fossil fuels first enter the economy.

Emissions of CO₂ are readily calculated from fuel volumes: if you know how much and what grade of coal or gasoline is burned, all you need is a basic conversion figure to know how much CO₂ went into the air.¹¹ This property of fossil fuels makes it possible to operate a cap-and-trade system almost entirely on the basis of sales information that energy companies already gather. Some of that information they already report to public agencies under existing laws, such as those governing motor fuels taxes. In short, we can run a cap-and-trade system with very little new paperwork.

By implementing cap and trade “upstream” before the fuel fans out through the distribution system, we can run a cap-and-trade system without any required actions for more than 99.9 percent of companies (and 100 percent of families). Fossil fuels enter our economy through a handful of “chokepoints.” The Pacific Northwest and

British Columbia, for example, get oil from just four oil pipelines, plus tanker docks at just five oil refineries along Puget Sound and the Strait of Georgia. This region gets natural gas from three pipelines. Coal arrives on a handful of railroads, and coal- and gas-fired electricity zips in on three large transmission lines.¹² Each of these portals is a natural point of regulation.¹³

Cap and trade would require that fossil-fuel energy handlers—either purchasers or sellers—record fuel volumes and obtain emissions permits for the carbon that will be released when those fuels burn.

WHAT ABOUT OFFSETS?

Offsets could improve the cost effectiveness of cap and trade while bringing substantial side benefits. Unfortunately, they could also gut cap and trade, making it no more than a sham. The devil is in the details.

Offsets are cuts in emissions that are outside the cap, either legally or geographically, but that are nonetheless honored like carbon allowances under the cap. For example, an oil company in the Northwest might buy 100 offsets from a coal-fired power plant in China that shut down one of its dynamos and replaced the power through conservation programs. To use the offsets under cap and trade, the electric utility or oil company would present authorities with documentation of the offsets as a substitute for an equal number of carbon allowances.

Offsets hold both promise and peril.

Offsets' main advantage is their ability to tap cost-effective emissions-reduction opportunities wherever they may be, smoothing the transition to climate security. Greenhouse gases are not local pollutants, but global ones: it doesn't matter to the atmosphere whether the CO₂ is emitted in India or Indianola (Washington). Offsets can also provide substantial side benefits, such as financing for farm- and forestland restoration, and accelerating the spread of efficient, renewable technologies in developing countries.

Offsets have countervailing disadvantages. First, it's difficult to verify that offsets truly reduce emissions, rather than cover emissions cuts that would have occurred anyway. Second, it's hard to know how permanent some offsets will be: trees not cut today might be cut later. Third, outside of cap and trade's geographical boundaries, offsets might have unintended consequences. For example, forest conservation in one place may simply shift logging operations to another country. Similarly, fuel conservation may slightly lower the price of fuel and increase consumption—and emissions.¹⁴ Fourth, paying certain landowners and industries to limit (or sequester) emissions through offsets may set a bad precedent: it may make politically difficult the later task of capping their emissions as a matter of law.

The case of carbon storage in forests and other ecosystems illustrates both promise and perils.¹⁵ Sequestering carbon by regrowing forests, revegetating ecosystems, and enhancing soils is appealing. It could bring benefits not only for climate security but also for rural landowners' bank balances and for our natural heritage. Still, ecological

storage of carbon is less reliable than not releasing greenhouse gases in the first place. Forests that regrow can also burn down or become infected with insects or disease, unexpectedly releasing their carbon skyward. Besides, offsets substitute carbon storage in regrowing forests for emissions cuts elsewhere in the economy; arguably, we should do both.

In the early years of cap and trade, if we allow offsets at all, they should be limited in quantity and rigorously audited for quality. Sightline recommends that cap-and-trade systems allow offsets to contribute up to 10 percent of emissions reductions. For example, in a cap-and-trade system aiming to reduce emissions by 20 percent, capped companies would be allowed to include in their annual portfolio of allowances as much as 2 percent offsets. We also recommend that each cap-and-trade system recognize only those offsets that originate within that system's political boundaries, at least until international measurement and auditing protocols for emissions are dramatically more robust than at present. This strategy would ensure that the positive side effects of emissions reductions—such as a decline in local air pollution, the growth of green-collar jobs, and the resulting benefits to human health and community—accrue to the places that have capped their emissions.

ALLOCATION: AUCTION

Allocation is how emissions permits are distributed. Acting on behalf of citizens, authorities can give them away for free—on the basis of past emissions, past energy production, or some other criterion—after which permit holders can trade them among themselves. Or authorities can sell permits at regularly scheduled auctions, allowing emitters such as utilities and refineries to purchase the credits they expect to need. After the permits are auctioned, a “secondary market” would allow permit holders to buy extras or sell unneeded ones. In hybrid systems, authorities give some permits away and auction some.

Free distribution of permits might sound like a good option, on the assumption that giving away permits wouldn't raise energy prices. But free distribution is actually far more disruptive than auctioning.¹⁶ Supply and demand—not producers' costs—determine the price of permits, and the cap establishes the supply of carbon permits. Kristen Sheeran of Maryland's Saint Mary's College and James Barrett of Redefining Progress¹⁷ explain:

Try buying World Series tickets from a scalper. Would he charge you any less if he found the tickets on the ground? Of course he wouldn't. . . . The supply and demand for tickets is the same no matter how much the scalper paid for them, and so the price he charges you will also be the same no matter how he got them.

Cap and trade puts the same price on climate pollution whether the permits are given away, auctioned, or some mix of the two. The only difference—and it's an extraordinarily important difference—is who gets the extra money that consumers are paying for energy: the scalper (fossil-fuel companies) or the public treasury (on behalf of all citizens). Giving away carbon permits is just like handing out money. In economic terms, it's a windfall profit. How big would these windfalls be? The US Congressional Budget Office (CBO) answers:

if . . . all of the allowances were distributed for free to producers in the oil, natural gas, and coal sectors, stock values would double for oil and gas producers and increase more than sevenfold for coal producers, compared with projected values in the absence of a cap.¹⁸

Handing out free permits boils down to taking billions of dollars out of the pockets of energy consumers and handing them to the shareholders of energy companies. Worse, it takes disproportionately from low-income families. CBO estimates that a US nationwide carbon price high enough to reduce greenhouse gas emissions by 15 percent would take about 3.3 percent of low-income families' after-tax money and, in contrast, only 1.7 percent of the richest households' income. (See figure 2.)¹⁹

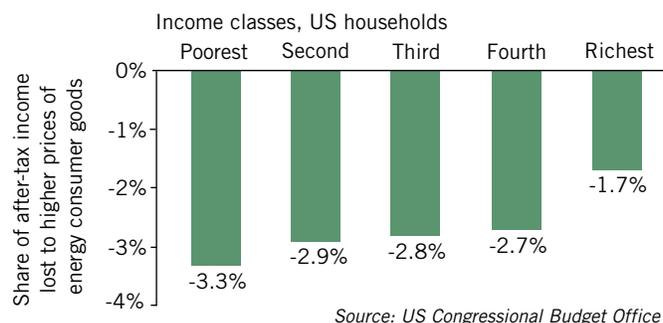
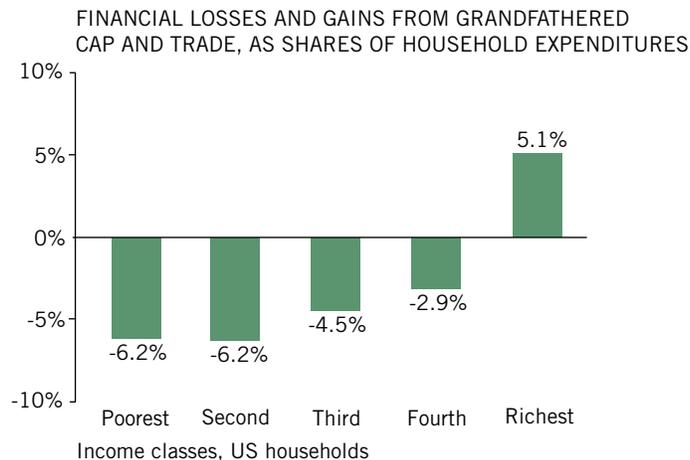


Figure 2. Climate pricing will take the biggest bite out of the poorest households' income.

Under free-allocation cap and trade, fossil fuel prices would remain elevated (as they already are). Families would continue to pay more for their energy. Energy companies, flush from high prices, would reap huge windfall profits. These windfalls would ultimately accrue to the shareholders of energy companies, who are mostly rich families. For the highest-income fifth of US households, stock portfolios would get so much fatter that the net effect would be an additional \$1,200 a year per person, according to James Boyce and Matthew Riddle of the University of Massachusetts-Amherst.²⁰

Free allocation means the rich get richer, and the poor get poorer. Figure 3, from Boyce and Riddle, shows roughly how much. It's the New Deal in reverse. (Unlike the



Source: Boyce and Riddle

Figure 3. Grandfathered cap and trade makes the rich richer and the poor poorer.

previous figure, this one reflects the impacts of massive windfalls for energy company stockholders and various other side effects of free allocation, and expresses losses and gains as shares of total household expenditures rather than income. This figure is also based on somewhat different assumptions about energy spending and carbon prices.)

Auctioning permits prevents such windfalls. Energy consumers still pay as much, but the proceeds go to public purposes such as ensuring fairness and investing in green-collar job training and clean-energy research.²¹

SPECIAL CASES? ELECTRIC UTILITIES, EXPORTERS, TRANSITION

Are there special cases where free permits make sense? Some arguments sound plausible, but Sightline recommends 100 percent auctioning of permits. Here's a case-by-case examination.

Electric utilities. One subset of the energy industry—electric utilities—makes a plea for free permits that appears reasonable at first. In much of the US West, public utility commissions set the prices that investor-owned electric utilities charge consumers. They can guard against windfall profits under free allocation.

Some argue that free permits will benefit consumers by limiting rate increases. But handing out permits to utilities for free could backfire in two ways. First, free permits for utilities could raise the overall cost of emissions reductions, by displacing emissions-reduction efforts from power plants (where reductions can be cheap) to transportation and industry (where reductions may be more expensive). The net effect would be to drive up consumers' overall energy costs.²²

Second, if utilities get free allowances, the political reality is that other energy companies will likely insist on getting the same treatment. Giving any free allowances could trigger a lobbying free-for-all, in which each industry and firm attempts to expand the number of permits it gets for free. The European emissions-trading scheme is almost overrun with lobbyists, each angling for a thicker slice of the permit pie.

Energy-intensive exporters. Industries such as aluminum smelters that use lots of energy and sell their products into a global market often argue for free permits on the grounds that cap and trade will put them at a competitive disadvantage. They've got a point. Ultimately, climate pricing needs to span large sections of the globe. In the near term, however, a far better solution than free permits may be simply to refund some of the proceeds of permit auctions to these firms, in proportion to their sales outside the cap-and-trade region. Simply giving them free permits to compensate would create a dangerous precedent.

The transition. Imagine that lawmakers enact a cap-and-trade system that expands in scope over time, beginning with the regulated electric power sector and later adding other commercial, industrial, and residential uses of fossil fuels, plus transportation. Would it then make sense to allocate permits to regulated utilities for free during the first phase of the transition, because utility regulators can prevent windfall profits? Maybe.

Still, auctioning permits is better, for three reasons. First, auctioning sets the precedent that everyone has to pay to pollute the air. Second, auctioning would forestall a battle royal among lobbyists over who should get free permits, on what grounds. (For example, coal-heavy utilities will want a system that's based on prior emissions. Hydro-heavy utilities will want a system that's based on prior electricity generation.) Third, auctioning makes unnecessary the cumbersome step of setting an emissions baseline for each utility: utilities will decide for themselves how many permits to buy.

How to auction

As auctions of public assets go, auctioning carbon permits is not especially complicated. Specialists in financial auctions have already designed a rigorous set of rules and procedures for the Northeast's Regional Greenhouse Gas Initiative.²³ Other cap-and-trade systems would be wise to follow the same strategy.

Although some technical details remain undecided or debatable, here's a sketch of one workable, fair, transparent, and efficient auction system:

Carbon permits are tagged to a particular starting date (their "vintage" or "compliance period"²⁴), but they will be freely and indefinitely "bankable." That is, if you own a 2012 permit, you may save it for use in any future year. (In effect, this gives permits a start date but no expiration date.) Conversely, you may never "borrow" a future permit and use it now.

Auction bidders must qualify in advance by showing evidence that they have the money to cover their bids. They themselves need not be energy companies or other greenhouse gas emitters. Other parties—brokers, for example—are also welcome to bid. Some observers argue for limiting auction participation to fossil-fuel energy firms, because they believe that financial and securities firms are more likely to attempt market manipulation. In fact, the more potential participants, the harder it becomes to

manipulate a market: collusion is much more likely among a small pool of bidders. And energy businesses are no less likely than anyone to profiteer in the permit market: the energy giant Enron, not Morgan Stanley or another Wall Street broker, gamed the California electricity market in 2001.

Auctioning is conducted in a format called “uniform price, sealed bid, single round.” In this type of auctioning, all bidders submit a single, confidential bid sheet specifying the quantity of each vintage of permits they wish to buy at each price level. High bidders win, but all winning bidders pay the same price for all their permits: they pay the price of the highest rejected bid (“uniform price”). Auctions are quarterly, and each auction includes several vintages. To stabilize prices and make them transparent, the earliest batch of permits for any vintage is sold as much as four years early.

To prevent market manipulation and collusion, no participant is allowed to buy more than a certain share of the permits sold at a single auction. RGGI recommends a limit of 33 percent; a lower limit might be even better. Equally important, all participants are required to reveal any third party on whose behalf they are acting. Auction officials monitor the market for signs of gaming and manipulation, just as regulators keep the financial markets for stocks, bonds, and commodities futures open and fair. As a further hedge against gaming, auction officials set a price floor or “reserve price,” below which no permits are sold. (In WCI, a reserve price at least equal to British Columbia’s carbon tax rate makes sense, as discussed later.) Any permits for which the reserve price is not met are permanently retired.

All participating jurisdictions in a single cap-and-trade system sell their permits at the same coordinated, quarterly auctions, and all permits are equally valid throughout the capped region. Through “linkage,” a share of permits from other cap-and-trade systems with similarly rigorous controls and safeguards are also honored; for example, WCI, RGGI, and the European Emissions Trading System might honor each other’s permits.²⁵

To minimize price volatility, authorities will ensure transparency about prices and the number of permits available, both at auction and on secondary or “spot” markets. Other particulars of auction design also help: the larger the permit trading market and the more linked it is with other cap-and-trade systems, the more stable prices will be. Making permits perpetually bankable also stabilizes prices. For example, a hydro-dependent utility can use banking to accumulate a cushion of permits for use in an unexpected December cold snap during a “low-water” year, when the utility must generate (or import) more coal-fired power. Opening auctions to all bidders with adequate financial reserves, conducting auctions frequently and early, and limiting the number of permits any one actor may hold—all these things will keep prices stable and prevent market manipulation.

One potential price stabilizer to which Sightline recommends saying “no” is the use of price ceilings, also called “off-ramps.”²⁶ A price ceiling is a permit price at which authorities announce they will sell extra permits, above and beyond the scheduled annual permits for emissions. An off-ramp would punch a hole in the cap, slowing progress and discouraging other trading systems from linking with our own. It would also erase a strong incentive for investment in clean energy: the knowledge that the cap is unyielding, regardless of price.

REVENUE: BUILT-IN PROTECTIONS FOR FAMILIES

If carbon allowances are auctioned rather than allocated for free, the resulting revenue could be substantial. At the early-February carbon price in Europe of \$13 per one-ton permit, it would be nearly \$2 billion in the Pacific Northwest jurisdictions of British Columbia, Oregon, and Washington alone.²⁷ What should we do with the money?

With auctioning, the public gains a source of revenue to distribute among citizens; invest in clean energy; help consumers deal with rising energy costs; boost efficiency in homes and buildings; ease transitions for affected workers and energy-intensive export industries; fund training in green-collar jobs; or some combination of these. Auctioned permits let us take charge of price increases rather than being victims of volatile supplies and suppliers. It also ensures that permit revenue revitalizes local economies rather than enriching distant energy producers.²⁸

But at the outset, let’s underline a point that is easy to miss: A comprehensive cap-and-trade system guarantees declining emissions. It is, all by itself, a complete strategy for reducing greenhouse gases. Nothing else needs to be done to limit emissions of capped gases. (Other strategies are needed for noncapped sources, such as CO₂ released from forestry.)

Other, complementary policies—incentives for renewable energy, public investments in energy efficiency, training in green-collar jobs, energy-saving building codes, and scores of other smart steps—will smooth the transition. But they probably will not accelerate the reduction in emissions.

The cap itself will set the pace. Except in unusual circumstances such as steep recessions or sudden spikes in energy market prices, the economy will generate exactly as much greenhouse-gas pollution as permitted by the cap—and no less. Why? Because carbon permits will be limited in number and valuable. Under a cap, complementary climate policies do not reduce emissions, they lower the price of permits.

For example, transportation fuel handlers who must possess carbon permits will charge—or maintain—higher prices (because the cap curtails fuel supply). High fuel prices will stimulate conservation, as they already are doing; sales of fuel-efficient vehicles will increase; families with two vehicles will opt for the more-efficient one; transit ridership, walking, and cycling will proliferate; and some drivers will combine or cut discretionary trips. Ultimately, high fuel prices will encourage investment in low-carbon alternatives, from streetcars to sidewalks, and will nurture more-efficient communities, as demand grows for housing that’s near stores, services, and jobs.

Complementary policies and programs—transit infrastructure investments, fuel-economy rules, carpooling incentives, smart growth policies—will give consumers more ways to cope with an economy in transition from dirty fuels to new clean energy sources. And they will keep the price of gasoline and diesel lower than they would otherwise be. In fact, if these complementary policies are successful, the price of emissions allowances won't be very high.

However, if these complementary policies aren't successful, the cap will create a price signal for emissions reductions—a signal that's self-adjusting to meet the conservation targets. The cap can do the job, guaranteed, all by itself. Complementary policies and programs cannot guarantee results.

This reasoning has a corollary: If the cap is sufficient, we do not necessarily need to use auction revenue to reduce emissions. The revenue can be used to smooth the transition to clean energy, to support programs that complement cap and trade, and to moderate the price increases it may otherwise cause.

Above all, however, the revenue can be used to ensure fairness. Climate change is brutally unfair; so are high energy prices. But auctioned cap and trade can correct those injustices by compensating families.

Taking charge of energy prices

With or without climate policies, energy prices have been rising for a decade. (See figure 4.)²⁹ Auctioning permits gives us the opportunity to take charge of price increases and share the benefits widely—even while we safeguard the climate and stimulate local jobs.

Low-income families have been taking it on the chin from high prices, as energy takes a growing share of their budgets. As of 2005, when energy prices weren't yet as high as in 2008, low-income families in the US were already devoting almost 15 percent of their household budgets to residential energy, more than four times as much as better-off families. High energy prices siphon money from people in the bottom half of the income scale to the energy-company shareholders at the top.

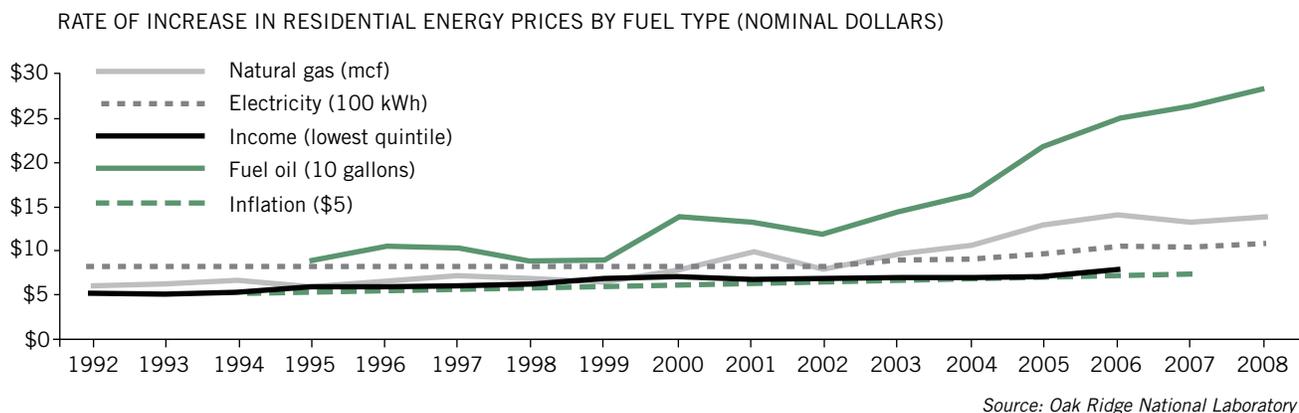


Figure 4. *Even before 2008, energy prices have risen faster than inflation or income.*

Energy prices have been rising not because of cap and trade but because of supply and demand. Oil and gas are in short supply; global demand is growing. The result: escalating prices. Prolonging our dependence on fossil fuels will leave us in this market vise.

Placing a cap on emissions, though it will maintain or even increase high energy prices, will also direct the price premium to the public treasury. Auctioned cap and trade lets us take charge of price increases and ensure that the money goes to local economies, not distant oil drillers; in-state families, not energy companies; and community projects, not historic polluters.

Option 1: Rebates for all

The simplest use for auction revenue is to rebate all of it to families on an equal per person basis. This “Cap and Dividend” plan prevents financial losses for families. Everyone pays more for energy; everyone gets a dividend check.³⁰ A \$55/ton carbon dioxide charge would yield almost \$700 a year per person in the United States. It’d be like the Alaska Permanent Fund, which pays out an annual share of oil earnings to each resident of the state.

The net effect of Cap and Dividend, shown in figure 5, is to take the sting out of climate pricing for low- and middle-income families. (See figure 5.) They pay more for energy, but their climate dividend covers the expense.

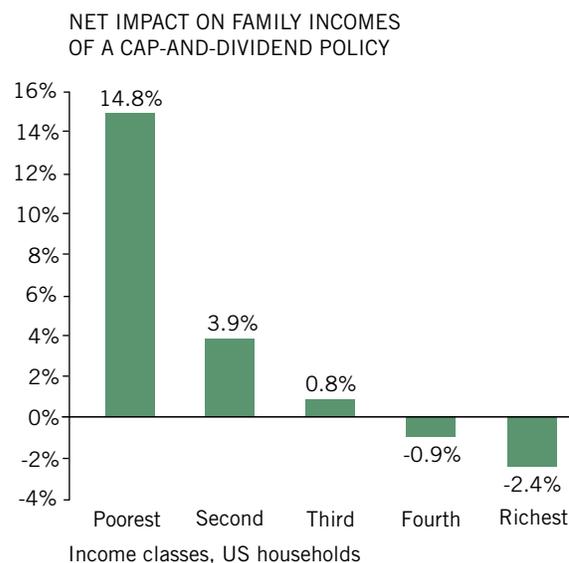
Cap and Dividend wouldn’t end poverty in the Pacific Northwest or reverse the widening income gaps that plague our continent. But it would mitigate some of the unfairness of climate change itself.

Cap and Dividend isn’t the only way to make climate pricing fair, but it may be the simplest. It also has the advantage of creating a strong political constituency for perpetuating the cap-and-trade system—every family will benefit from regular dividends. Like Social Security, Cap and Dividend will entrench itself politically as a universal benefit. What it doesn’t do is smooth the transition to a clean-energy economy through complementary programs funded from auction revenue.

Unlike other options for investing auction revenue (listed below), Cap and Dividend would use almost all of the proceeds of the auction. The other options are all “mix and match.” Cap and Dividend stands alone.

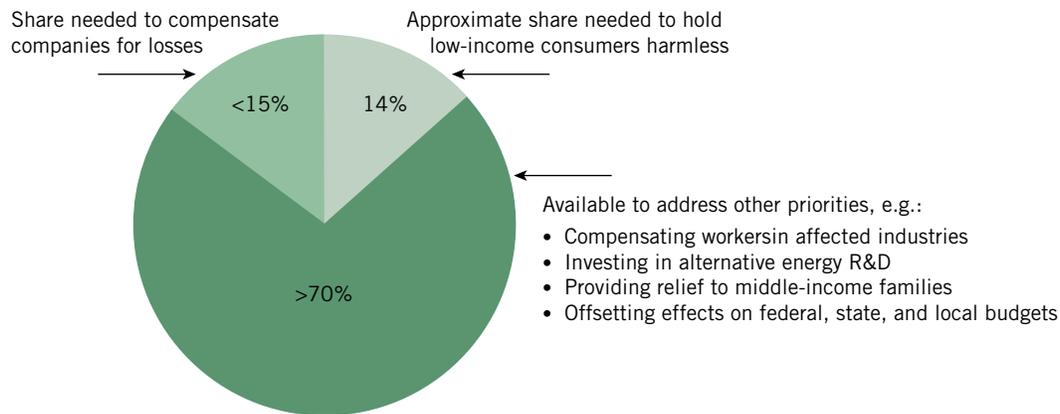
Option 2: Rebates for low-income families

Another approach to shielding low-income families from high energy prices comes from the Washington, DC-based Center on Budget and Policy Priorities (CBPP).³¹



Source: Boyce and Riddle

Figure 5. *Cap and dividend moderates the regressive effects of climate disruption.*



Source: Center on Budget and Policy Priorities

Figure 6. Auctioning carbon permits can generate the resources needed to address crucial priorities.

This plan gives dividends only to families with very low incomes, to buffer them from cost increases. It's Cap and Dividend, but only families who need it most get a dividend. Call it "Cap and Buffer." CBPP suggests compensating the poorest fifth of families for energy price increases and also providing some assistance to those in the second fifth of the income ladder. The poorest fifth of families, according to CBPP, stand to pay \$750 extra each year for fuel and other goods, once climate policy boosts energy prices enough to reduce emissions by an initial 15 percent.

The good news is that Cap and Buffer isn't an exorbitant proposition. Auctioning permits would generate seven times more money than would be needed to cover the extra costs for poor and near-poor families. (See figure 6.)

CBPP pays special attention to the practical details of delivering money to millions of poor families in the United States:

No single mechanism is likely to reach most of the low-income population. Fortunately, there are two existing delivery mechanisms that, between them, can largely accomplish this task: the Earned Income Tax Credit (EITC) and the electronic benefit transfer (EBT) system that states already use to provide various types of state and federal assistance such as food stamps and Medicare's prescription drug benefit to low-income families and individuals through a debit card.

Earned Income Tax Credit (EITC) and Electronic Benefit Transfer (EBT) debit cards could together reach three-fourths of eligible low-income US families immediately and a greater number later, as outreach campaigns bring more and more families onboard. Other mechanisms can't match that promise.

If lawmakers choose, they could expand income assistance to middle-class families by enacting a progressive payroll tax refund instead of, or in addition to, the EITC. In this way, the climate dividend could go to people further up the income ladder.

Cap and Buffer is both elegant and practical. It matches funds neatly to needs. It would be easy to administer once passed. And it has frugality about it.

What's more, states and provinces could get started on Cap and Buffer right away—without waiting for action from Washington, DC, or Ottawa. Oregon already has its own Earned Income Tax Credit on its state income tax, which legislators could use as a model when crafting a climate-pricing dividend. British Columbia, California, Montana, and most other states and provinces in cap-and-trade systems have income taxes to which they could add earned-income tax credits.

Washington, which lacks a state income tax, could achieve the same result through its newly enacted Working Families Rebate. This ingenious initiative will distribute limited sales-tax rebates to low-income state residents on the basis of their federal income tax returns.³² In all states, legislators can ensure that climate rebates are in addition to, and not substitutes for, much-needed expansions in earned-income tax credits.

Option 3: Help Northwest families save energy

A third way to build protections for local families into cap and trade is to invest auction proceeds in energy efficiency in ways that benefit low-income families in particular—by weatherizing homes, for example.³³ This strategy can help to compensate for the unfairness of climate change even while it tempers emissions. It's a natural complement to Cap and Buffer.

Most low-income energy improvements in the Pacific Northwest—aside from what landlords and families do themselves—are carried out by nonprofit community action agencies. With about \$15 million of public and utility contributions a year in Idaho, Oregon, and Washington, these groups manage to implement basic efficiency measures in about 6,000 homes annually.³⁴ These programs save 12 percent of electricity, on average, in homes heated with electricity and, in natural-gas-heated homes, they trim energy use overall by 25 percent.³⁵

Still, after three decades of public support for low-income weatherization, community action agencies have treated a scant 4 percent of the almost 5 million houses, apartments, and mobile homes in the Northwest states.³⁶ What share of homes still needs weatherization? In the Pacific Northwest, no one knows, but nationwide in the United States, perhaps two-thirds of low-income homes are still waiting.³⁷ At current rates of investment, for example, it might take until 2040 to finish all low-income housing units in Washington.³⁸

According to the Northwest Power and Conservation Council, residential space conditioning—insulation, window and door upgrades, better furnaces and air conditioning—account for only about 2 percent of the electricity conservation potential in the Northwest states. That's not just low-income space conditioning but *all* residential space conditioning. From the perspective of regional electricity demand, low-income weatherization is a relative drop in the bucket.³⁹

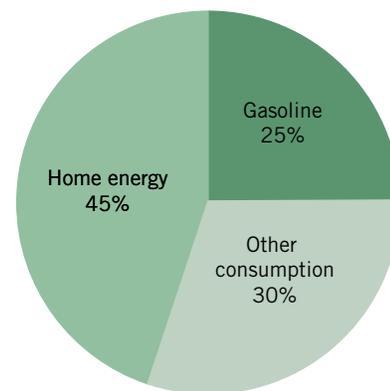
Oak Ridge National Laboratory has looked at efficiency upgrades for families as a way to offset higher energy prices⁴⁰ and concluded that they cannot do the job alone.

For one thing, weatherization (call it “Cap and Caulk”) is unlikely to provide families with enough money in savings to defray the higher prices they will be paying. Even if efficiency gains keep home energy expenses level, they won’t compensate for increased expenses for transportation and consumer goods. Home energy price increases are likely to account for less than half of the “hit” that higher energy prices exact. (See figure 7.) Besides, no public program of energy retrofits is ever likely to reach as large a share of families as do cash benefits.

For another, it takes time to retrofit buildings and replace appliances. It could take the Pacific Northwest a decade to train enough weatherization crews, retrofit enough old houses, and replace enough old appliances. But auctioned cap and trade will generate a revenue stream that starts small and grows. When the funds are finally available to upgrade their homes, many families will already be hurting financially from high prices. Indeed, they already are. One solution would be to issue public bonds for weatherization work, then pay off the bonds from future auction proceeds.

Conversely, as Oak Ridge’s research shows, climate dividends that cover the average cost of energy price increases for low-income families won’t suffice either. A small share of low-income families, living in older single-family and mobile homes, have energy consumption far above the norm. For these households, home energy upgrades are essential.

For all these reasons, Cap and Caulk is a good complement to Cap and Buffer but no substitute for it. Cap and Caulk deserves a place in the Pacific Northwest’s climate policies. It’s an opportunity to lower bills and emissions. To seize it, we can quadruple funding for weatherization and dramatically accelerate progress, generating hundreds of green-collar jobs along the way.



Shares of cost increase for the poorest 20 percent of population by product category

Source: Center on Budget and Policy Priorities

Figure 7. *The cost bite from climate pricing on low-income households goes well beyond home energy.*

FOUR STRATEGIES

Low-income energy efficiency programs bring some special challenges. Here are four complementary strategies for rising to them.

- 1. Bridge split incentives.** Low-income families are usually renters, not home owners, so the incentives for energy efficiency are split. If tenants pay the energy bills, landlords have no incentive to invest in building or appliance upgrades. If landlords pay the energy bills, tenants have no incentive to conserve. Bridging these “split incentives” is a priority. One innovative strategy, in development in some California communities, is to loan public or utility funds to building owners for efficiency upgrades and home solar retrofits, then repay the loan by adding a charge to a home’s property tax or to its utility bill.⁴¹

- 2. Target older mobile homes.** Many low-income families, particularly outside of metropolitan areas, live in mobile homes. (Trailers account for nearly 10 percent of housing units in the Northwest states.⁴²) Older mobile homes are notoriously inefficient. Those who are renting their trailers often lack the funds to make a down payment on new, efficient ones, even if they could afford the monthly payments. Low-income families who own their trailers often lack the home equity to trade up to new ones. We'll need programs specially targeted at residents of old mobile homes.
- 3. Break the cycle of dying appliances.** The region needs a new generation of programs to ensure that the refrigerators and other appliances in low-income homes are upgraded to efficient new units every time they are replaced. At present, low-income families typically get a sequence of cheap but wasteful, hand-me-down appliances that break quickly. This dying-appliance cycle limits families' up-front expenses, though it raises their energy budgets and emissions. The Energy Trust of Oregon, working with a community action agency near Bend, developed a model for breaking the cycle. The Energy Trust provided coupons for the purchase of new, high-efficiency fridges to low- and moderate-income households that agreed to retire aging juice hogs. The province of Ontario used an old-appliance roundup—offering free collection—to unplug 50,000 inefficient units. British Columbia offers a sales tax exemption for efficient new appliances. Similar programs, turbocharged with auction revenue, might work for other appliances and possibly even for mobile homes.⁴³
- 4. Put hybrids in hyperdrive.** As for appliances, so for family cars: low-income families tend to drive the oldest cars in the fleet—vehicles that middle-class families drove ten or fifteen years earlier and that head for the junkyard next. In the years ahead, as waves of better-off families sell their SUVs and buy hybrids, in response to high fuel prices and climate policy, the efficiency of the vehicles that low-income families drive will likely worsen. Targeted programs to finance fuel-efficient cars for low-income families, combined with incentives to scrap old, inefficient vehicles, could work wonders to help them leapfrog to the next generation of vehicles. Imagine placing “bounties” on inefficient vehicles payable in down-payments on hybrids or in “points” on car loans for gas sippers.⁴⁴

Option 4: Job training

Converting the Pacific Northwest over the next few decades to a place of compact, walkable communities that run on superefficient, renewable energy system—a climate-safe economy—will be a lot of work: *paid* work.⁴⁵ But for all the exciting announcements of solar jobs and green-tech investment that pepper the newspapers, the skill sets of today's workers are not yet aligned with the needs of this future.

A fourth good use for cap-and-trade auction revenue is to spend a portion of it training a green-collar workforce for the clean-energy trades. In many sectors of the economy right now, a limiting factor on seizing the opportunities of the new energy

economy is a shortage of mid-skill labor.⁴⁶ For example, low-income weatherization programs across the Pacific Northwest are currently crippled by a scarcity of crew chiefs qualified to supervise retrofits on job sites.

A mid-skill worker is neither a laborer nor someone with a four-year degree. Rather, he or she is a tradesperson or technician, usually with an apprenticeship credential, an associate's degree, or a vocational certificate. For unskilled, low-income workers, a pathway to mid-skill work is the best route out of poverty, but many obstacles loom. Finding the time and money to study is the day-to-day challenge. The larger challenge, not only for workers individually but for society's poverty-reduction goals overall, is to integrate work with studies into a "career ladder" of steadily rising competence, experience, education, opportunity, and earnings.

To grow green-collar jobs for disadvantaged, low-skill workers, auction revenue might best be spent on expanded public funding for narrowly focused training programs in community and technical colleges that lead to vocational certificates or degrees in the trades:⁴⁷ carpenters trained in green building, plumbers capable of installing commercial-scale solar water heaters, electricians educated in photovoltaics and advanced energy-system controls, machinists who can produce windmill turbines and carbon-fiber aircraft parts, metalworkers skilled in forging bicycle frames and the ultralight components for the automobiles of the future, and forest managers knowledgeable about carbon sequestration.

Such programs are already sprouting in two-year institutions around the Pacific Northwest. Columbia Gorge Community College now offers an electronics engineering technician program. Many graduates of the first cohort are already working in the wind industry, earning from \$35,000 to \$60,000 a year.⁴⁸ Lane Community College, in Eugene, Oregon, trains renewable-energy technicians in a two-year program that teaches students how to improve the energy efficiency of homes and businesses and install solar-power and wind-power systems. In Washington, Bellevue Community College and Cascadia Community College offer similar programs.

Still, for the clean-energy transition to become a chance for workers to achieve economic security, much more needs doing. The national organization Green For All has published the most detailed road map. Called *Greener Pathways*, it identifies the specific programs that northwesterners can use to build a ladder from poverty to climate-safe prosperity for low-skill workers.⁴⁹

Many of these approaches are integrated well into Washington State's 2008 Climate Action and Green Jobs Act. The law puts green-collar jobs at the center of the state's response to climate change. It directs the state Employment Security Department to conduct a detailed assessment of green-collar job potential in the state and to identify jobs that pay family wages and could grow rapidly. The law also establishes a process for coordinating the assessment of, and planning for, workforce development needs in several industries through the creation of panels that include representatives of businesses, trade associations, labor unions, educational institutions, and others involved in the labor market. Finally, it authorizes a grant-funded set of investments in workforce training programs (typically, at community colleges) that target jobs

prioritized by the industry-specific panels. This approach is a national model, because it so carefully targets public spending to training programs that actually help low-income workers get qualified for high-demand, family-wage jobs. Although the 2008 law authorizes the creation of training grants, the state has yet to fund them—an obvious use for carbon auction revenue.

Option 5: Other uses

Several other uses for revenue from carbon-permit auctions recommend themselves:

- ◆ Funding research and development for new clean-energy systems and related transformational technology, especially efficient and renewable energy technology that can be exported to fast-growing developing countries. Low-carbon energy research and development yields huge returns. Because the benefits of energy research tend to spread far beyond state or provincial borders, public R&D funding should most sensibly come from national government, rather than from state and provincial governments. In the Northwest, publicly supported research and development might best focus on applied questions, such as benign, ecosystem-specific methods of capturing wave, tidal, and small-scale hydropower.
- ◆ Funding incentives and programs to reduce greenhouse-gas emissions from hard-to-cap sectors such as forests and farms.
- ◆ Funding public infrastructure for a climate-safe future, such as transit services; sidewalks and bikeways; and retrofits for public-sector structures such as schools, public buildings, fire stations, and streetlights.
- ◆ Transitional assistance for energy-intensive exporters.
- ◆ Funding temporary, transitional assistance for workers in sunset industries such as fossil fuels. Large expenditures for this purpose seem unnecessary. Because cap and trade will transform the energy economy gradually, most workers will be able to switch jobs at natural moments in their careers.
- ◆ Creating pools of capital for use in public, clean-energy lending programs, as described above. Auction revenue could capitalize such programs.

CARBON TAX VS. CAP AND TRADE

Many commentators draw a sharp contrast between cap and trade and an alternative way to put a price on pollution: a carbon tax. In fact, cap and trade and carbon taxes are overlapping sets of policy designs. Like cap and trade, carbon taxes can have a range of scopes, points of regulation, and price schedules. And they can be fair or unfair, depending on how the revenue is used.

A comprehensive, upstream, auctioned cap-and-trade system is very similar to a comprehensive, upstream carbon tax. The main difference is what's certain and what's uncertain. Under a carbon tax, elected officials set the price of carbon, and the market determines the quantity emitted; in auctioned cap and trade, elected officials set the quantity of carbon emitted, and the market sets the price.

There are four other, smaller differences:

- ◆ A carbon tax is somewhat less vulnerable to gaming than cap and trade.
- ◆ A carbon tax may be simpler to initiate and administer quickly.
- ◆ Cap and trade allows us to link state, regional, and national carbon permit markets with each other and with international ones, which may contain the costs of climate solutions.
- ◆ Auctioned cap and trade, especially in its Cap and Dividend form, will create its own political constituency. Citizens who come to expect climate dividends will rebel at the notion of relaxing the cap. Businesses that have bought and banked carbon permits will oppose any action that reduces the value of those permits.⁵⁰

Fortunately, we don't have to choose between a cap and a tax. We can combine the two and capture the strengths of each in a self-adjusting carbon tax or an auctioned cap-and-trade system with a price floor.

Cap and trade has far more political momentum in the United States than does a carbon tax, so this chapter concentrates on how to infuse what works best about a carbon tax into a cap-and-trade system. First, though, we review British Columbia's pioneering 2008 carbon tax shift.

The British Columbia model

British Columbia put a carbon tax shift into effect on July 1, 2008, just five months after announcing the plan. An exceptionally clean and elegant policy, it is built on four principles:⁵¹

1. Revenue neutrality—shifting taxes from “goods” to “bads.” Like Cap and Dividend, the tax shift returns all its proceeds to taxpayers. As the BC Finance Minister's plan says, “All revenue generated by the carbon tax will be returned to individuals and businesses through reductions in other taxes. None of the carbon tax revenue will be used for expenditure programs.”⁵²
2. Phased implementation—an economy-friendly timeline. Carbon taxes rise from \$10 per metric ton of carbon dioxide equivalent (CO₂e) in 2008 to \$15 in 2009, then \$20 in 2010, and so on up to \$30 per ton in 2012. On the other side of the equation, personal and corporate income taxes decline on a similar schedule.
3. Tax benefits—built-in protections for families. BC's income tax reduction will benefit everyone who pays income taxes, but it will benefit low-income families the most. In addition, low-income families will get an annual and escalating Climate Action Dividend. “The bottom two personal income tax rates [have been] reduced for all British Columbians resulting in a tax cut of 2 per cent in 2008 and 5 per cent in 2009 on the first \$70,000 in earnings – with further reductions expected in 2010.”
4. Comprehensive, upstream coverage. The carbon tax falls on all greenhouse

gases emitted from the burning of fossil fuels within the province: gasoline, diesel, natural gas, coal, heavy fuel oil, propane, kerosene—everything. Its comprehensiveness will make the tax credible, defensible, and easy to administer.

The province's carbon tax shift starts small, as it should. But it could finish bigger. Continuing the annual tax rate increases beyond 2012 would help deliver now on its promise of climate security and market opportunity. Advance notice of high or rising carbon prices is as important as are the future prices themselves. If families and businesses know now that the price of fossil fuels will stay high or rise, they'll make different decisions now. People will choose different jobs; live in different neighborhoods; and buy different homes, cars, and appliances. Businesses will invent different products, market different services, and invest in different technologies.

Another enhancement to BC's law would be to make the tax shift self-adjusting—an innovation first discussed when Switzerland introduced climate pricing in the 1990s. In a self-adjusting tax shift, emissions levels automatically trigger tax rate adjustments. If emissions aren't diminishing fast enough to match provincial targets, carbon taxes automatically rise and income taxes automatically fall. A self-adjusting carbon tax shift combines the simplicity of a carbon tax with the climate-protection certainty of cap and trade. Of course, it also diminishes the price certainty of the carbon tax, because businesses cannot easily predict future tax rates.

ELSEWHERE

Several other countries implemented carbon tax shifts years ago. None of them is as consistent and comprehensive as BC's. In most cases, these levies came in tax shifts that reduced payroll taxes, business taxes, or other energy taxes.

At least nine jurisdictions elsewhere in the world claim to have carbon taxes.⁵³ Finland's carbon tax,⁵⁴ first enacted in 1990, is \$27 per metric ton of CO₂e at current exchange rates. Sweden's, enacted the following year, is now \$69, although industry pays half as much and electricity-generation fuels are exempt.⁵⁵

Denmark and the Netherlands also began taxing carbon in the early 1990s. Denmark's tax is \$14 for household fuel use but half as much for businesses. Poland and Switzerland have small carbon taxes, too. On this continent, Quebec enacted a token carbon tax last year, set at about \$3 per ton of CO₂e.⁵⁶ Then, in early 2008, California's Bay Area Air Quality Management District proposed a starter carbon fee,⁵⁷ and in the Pacific Northwest, the business-oriented Washington Policy Center proposed a carbon tax shift.⁵⁸ Three other jurisdictions claim carbon taxes—Norway, the United Kingdom, and Boulder, Colorado—but they overstretch the definition.⁵⁹

British Columbia doesn't have the highest carbon tax in the world, but it has the most consistent and comprehensive one. And the province's tax reductions for businesses and families, with dividends for low-income families, set a new standard.

Carbon-tax feasibility in the Northwest states

Most other Northwest jurisdictions have no legal or constitutional barriers to emulating British Columbia, if they've got the political will. California, Idaho, and Oregon all have state income taxes to which they could add BC-style Climate Action Dividends—tax reductions for middle-income families coupled with rebates for the lowest-income citizens—to ensure climate fairness.

Washington has no state income tax and therefore might have difficulty mitigating the sting of climate pricing on families. Fortunately, in 2008, the state authorized a Working Families Rebate that will provide tax refunds to low-income Washingtonians.⁶⁰ The state could fatten these rebates to offset the impact of climate pricing on household budgets, or it could develop a separate program of per-capita or targeted rebates.

Couldn't Washington ensure fairness by reducing sales taxes? Sales taxes are steeply regressive, but carbon taxes are even more regressive. So this tax shift would not make climate pricing fair. Economist Yoram Bauman calculates that families would be financially worse off from a tax shift that used carbon tax proceeds to replace part of Washington's sales tax (and its property tax too).⁶¹ Fortunately, devoting only 5 percent of the carbon tax revenue to low-income Climate Dividends would fully compensate the poorest fifth of families.⁶²

Cap + tax: a hybrid

In the near term, more likely than a carbon tax shift in any of the Northwest states is a cap-and-trade system that imports the main benefit of a tax shift: price predictability. By setting a bid floor, or "reserve price," in the auction of permits, climate policy can let businesses know the lower limit of the carbon price. As ebay users know, nothing gets sold unless its reserve price is met.

A reserve price has the same effect as combining a carbon tax with cap and trade. Imagine this case: To reduce emissions by 2 percent in a certain year, let's say that the price must be \$40 per ton of CO₂e. Under an auctioned cap-and-trade system, permits will sell for \$40 on average. (One possible outcome, with the price of auctioned permits varying around \$40, is shown in figure 8.)

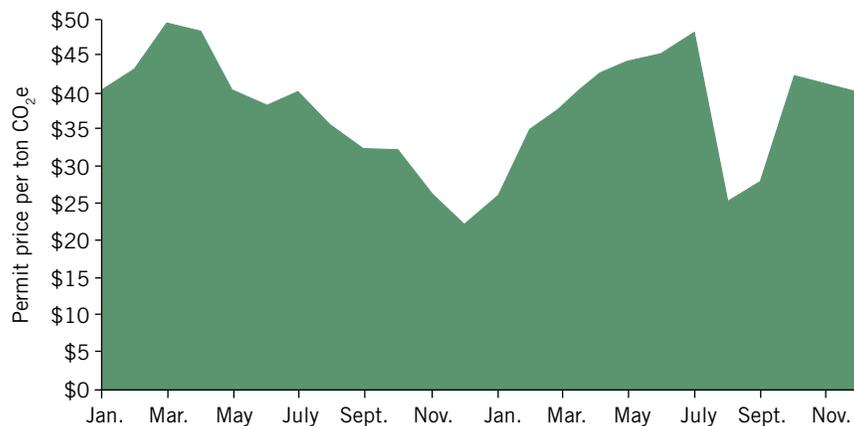


Figure 8. *The price of carbon permits might vary in auctioned cap and trade.*

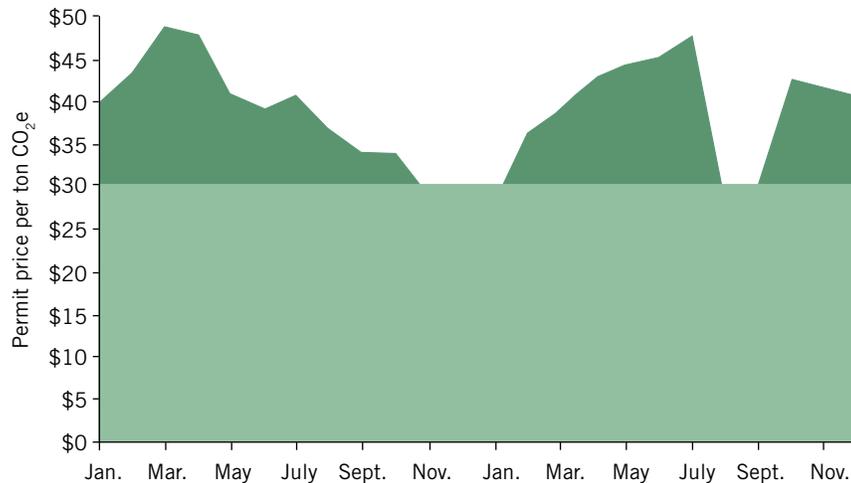


Figure 9. Adding a carbon tax—or reserve price—to auctioned cap and trade puts a floor under carbon prices.

When the prices are high, everyone will pay attention to their emissions; when prices drop, so will attention. The variability of prices could weaken the incentive to embrace clean energy.

A carbon tax (see figure 9) puts a floor under the price of carbon and tells everyone in advance what that floor will be. It ensures that the incentive for clean energy remains strong. It also gives certainty to business about prices and to government about revenue.

By building the carbon tax into cap and trade as a reserve price, we eliminate administrative duplication. If we set a reserve price of \$30 per permit, we've effectively implemented a \$30 carbon tax.

That's the upside of Cap + Tax. The downside is the risk of gaming, which emerges only where the geographic scope of cap and tax do not align. For example, in North America, only British Columbia and Quebec have carbon taxes at present, and their rates are different. The WCI's cap-and-trade system will span seven states and four provinces. That mismatch creates some risks of profiteering and other unintended consequences. The best prevention for those risks is to set a region-wide price floor. Other, more-complicated tools also exist.⁶³

BC's carbon tax shift sets a new standard for all states and provinces. These jurisdictions can meet that standard by setting a reserve price that matches or exceeds BC's carbon tax rate in their cap-and-trade systems. Such a provision in WCI would essentially universalize BC's carbon tax shift, raising the bar across the West.

CONCLUSION: THE CAP

Seizing the economic opportunities of a clean-energy future, while avoiding the perils of climate disruption and oil addiction, is arguably the defining challenge for our time. We have exciting chances to slash emissions through low-carbon energy sources such as wind and other renewables and through a revolution in energy efficiency. Similarly, we have an abundance of ways to curb hard-to-track emissions at landfills, industrial facilities, and factory farms. We may be able to soak carbon dioxide out of the atmosphere by restoring forests and grasslands to their historic richness. We may even perfect underground carbon storage.

To ease compliance with the cap, we will need a host of other smart policies and innovations: complete, compact neighborhoods that free us from long, tiresome commutes; pay-as-you-drive insurance; bounties on juice-hogging old appliances and gas guzzlers; efficiency standards for buildings, vehicles, and appliances; weatherization brigades to retrofit low-income homes; continuous, separate, citywide bikeways and walkways; pervasive for-profit and nonprofit car-sharing; richly networked, flexible, and reliable public transit; loans for efficiency upgrades that are repayable on your utility bill or property tax; and more.

It's a bracing challenge, and the clock is ticking. But the most important step—bar none—is the cap. With a firm, legal, comprehensive cap, emissions will decline. Without one, there's no guarantee. In the absence of a cap (or a self-adjusting carbon tax shift), we could do everything else on the list—including even radically high regulatory standards—and still watch emissions grow.

The key to smart climate policy is putting a price on carbon—ideally through a comprehensive, auctioned, upstream cap-and-trade system with built-in protections for Northwest families. Anything else is second best.

NOTES

- 1 Emissions associated with the generation of electricity in one state for consumption in another create some complexities, but they're manageable. Certain emissions of greenhouse gases from industrial facilities, such as perfluorocarbons from aluminum smelters and carbon dioxide from cement factories, also require slightly more work than simply tracking the entry of fossil fuels into the capped jurisdiction's economy.
- 2 For a look at how Northwest jurisdictions are tackling climate change, see Sightline Institute, "Backgrounder: How Do the Northwest's Climate Strategies Stack Up?", www.sightline.org/research/energy/res_pubs/backgrounder-climate-policy.
- 3 Western Climate Initiative, "Statement of Regional Goal," August 22, 2007, www.westernclimateinitiative.org/ewebeditpro/items/O104F13006.pdf.
- 4 Midwestern Greenhouse Gas Reduction Accord, www.midwesternaccord.org.
- 5 Regional Greenhouse Gas Initiative, www.rggi.org.
- 6 Western Climate Initiative, www.westernclimateinitiative.org.
- 7 Alan Durning, "Climate Fairness," Sightline Daily Score Blog, January 24, 2008, http://daily.sightline.org/daily_score/archive/2008/01/24/climate-fairness. See also, Sightline Daily Score Blog, "Special Series: Climate Fairness," http://daily.sightline.org/daily_score/series/climate-fairness.
- 8 J. L. Gamble et al., US Climate Change Science Program and the Subcommittee on Global Change Research, "Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems," US Environmental Protection Agency, July 2008, www.climate-science.gov/Library/sap/sap4-6/final-report.
- 9 Mark Hume, "Ravaged Area Plans for 'Social Chaos,' Report Says," *Globe and Mail*, July 23, 2008, www.theglobeandmail.com/servlet/story/LAC.20080723.BCBEETLE23/TPStory/TPNational.
- 10 Percentages are from Alan Durning et al., *This Place On Earth 2002* (Seattle: Sightline Institute [formerly Northwest Environment Watch], 2002), www.sightline.org/publications/books/this-place-on-earth/tpoe02, p. 48. Cement and aluminum production emit carbon dioxide from their industrial processes, and forest clearing releases carbon dioxide as well. Other gases such as methane also contribute to climate change. Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydro- and perfluorocarbons, and sulfur hexafluoride, along with some other, less-common gases. Anthropogenic methane comes from leaking natural gas lines; from anaerobic decomposition of organic matter in landfills, sewage lagoons, rice paddies, and livestock manure piles and ponds; and from the digestive tracts of cattle. Nitrous oxide comes from agricultural practices, including nitrogen fertilizers and animal waste handling, as well as from some industrial processes such as acid production and from burning fossil fuels in internal combustion engines.
- 11 Fossil fuels are essentially long chains and rings of carbon molecules, held together by energetic carbon-carbon bonds. Combustion is the process of breaking these bonds, releasing the energy, and sending off the carbon molecules, one by one, sandwiched between oxygen molecules. Other pollutants released by combustion, such as acid-rain-causing sulfur dioxide and the brain toxin mercury, are mostly born out of impurities in the fuel, but carbon *is* the fuel. Thus, CO₂ isn't so much a byproduct of burning fuel as it is the main product. And this fact of chemistry is a stroke of genuine luck for climate policy: it makes CO₂ the easiest of all pollutants to monitor.
- 12 Energy infrastructure from Alan Durning et al., *Cascadia Scorecard 2005* (Seattle: Sightline Institute [formerly Northwest Environment Watch], 2005), www.sightline.org/publications/books/cs2005/scorecard05, especially chapter 7, "Special Section: Energy and Security."
- 13 For transportation fuels, another logical point of regulation would be the "terminal rack": wholesale facilities that load petroleum products onto trucks, trailers, and rail cars. Currently, the US Internal Revenue Service and many state revenue departments collect gasoline and diesel taxes at the terminal rack—a logical choice because virtually all highway fuels flow through the rack, and sales volumes are carefully measured by buyers and/or sellers. A "cap at the rack"

system can piggyback on the state-level tax systems—systems that already accurately account for imports and exports, and that have careful auditing controls for fuel volumes.

- 14 This “takeback” effect is one of the reasons that a firm, legal cap is so important.
- 15 The other main form of carbon sequestration is to inject it deep underground into geologic deposits that might hold it more or less permanently. This approach holds substantial long-term promise and is worthy of research and testing. Still, it’s unproven. See Mark Jaccard, *Sustainable Fossil Fuels* (Cambridge, UK: Cambridge University Press, 2005), www.emrg.sfu.ca/sustainablefossilfuels.
- 16 Clark Williams-Derry and Eric de Place, “Why Free Allocation of Carbon Allowances Means Windfall Profits for Energy Companies At the Expense of Consumers,” Sightline Institute, February 2008, www.sightline.org/research/energy/res_pubs/windfalls/windfalls.
- 17 Kristen Sheeran and James Barrett, “A Critical Question in the Climate Debate,” E3 Network, January 8, 2008, www.e3network.org/resources/SheeranBarrett2008.pdf.
- 18 Windfall figures assume a 23 percent reduction in greenhouse gas emissions and an associated increase in energy prices. See Peter R. Orszag, “Approaches to Reducing Carbon Dioxide Emissions,” Congressional Budget Office, November 1, 2007, www.cbo.gov/ftpdocs/87xx/doc8769/11-01-CO2Emissions.pdf.
- 19 Peter R. Orszag, “Approaches to Reducing Carbon Dioxide Emissions,” Congressional Budget Office, November 1, 2007, www.cbo.gov/ftpdocs/87xx/doc8769/11-01-CO2Emissions.pdf.
- 20 James K. Boyce and Matthew Riddle, “Cap and Dividend: How to Curb Global Warming While Protecting the Incomes of American Families,” Policy Economy Research Institute, University of Massachusetts-Amherst, November 2007, www.peri.umass.edu/fileadmin/pdf/working_papers/working_papers_101-150/WP150.pdf.
- 21 For a full explanation see Clark Williams-Derry and Eric de Place, “Why Free Allocation of Carbon Allowances Means Windfall Profits for Energy Companies At the Expense of Consumers,” Sightline Institute, February 2008, www.sightline.org/research/energy/res_pubs/windfalls/windfalls.
- 22 For more on the dynamics of free allocation to utilities, see Clark Williams-Derry and Alan Durning, “Utilities and Auctions: There Is No Free Power Lunch,” Sightline’s Daily Score Blog, May 9, 2008, http://daily.sightline.org/daily_score/archive/2008/05/09/there-is-no-free-power-lunch.
- 23 Chris Holt et al., “Auction Design for Selling CO₂ Emissions Allowances Under the Regional Greenhouse Gas Initiative,” University of Virginia, Cooper Center for Public Service and Resources for the Future, October 26, 2007, www.coopercenter.org/sitefiles/documents/rggi_final_report.pdf; and Chris Holt et al., “Auction Design for Selling CO₂ Emissions Allowances Under the Regional Greenhouse Gas Initiative: Addendum: Response to Selected Comments,” University of Virginia, Cooper Center for Public Service and Resources for the Future, April 8, 2008, http://www.rff.org/focus_areas/features/Documents/Auction_Design_Addendum_April08.pdf.
- 24 To be more precise, “vintage” and “compliance periods” are slightly different concepts, though the differences matter little for this introductory discussion. A permit’s “vintage” is the period during which it becomes valid; a “compliance period” is the time (three years in WCI, for example) during which businesses must match their emissions with permits.
- 25 One complication about linkage is that it raises the risk that flaws in one cap-and-trade system might become flaws in all of them. For example, the European system has had a problematic history with offsets: some of the offsets honored have been of dubious value. Linking with Europe’s system creates the risk of reinforcing those problems even if offsets honored in Europe have no standing in WCI, for example. Northwest firms might buy more European allowances, while European firms bought more dubious offsets.
- 26 Sometimes “off-ramps” are called “price caps” or “circuit breakers” or given the misnomer “safety valves.”
- 27 Total greenhouse gas emissions for British Columbia, Oregon, and Washington was an estimated

- 227 million metric tons of carbon-dioxide equivalent in 2005 according to the Western Climate Initiative, “Scope Subcommittee: Summary of Major Design Options,” January 2, 2008, www.westernclimateinitiative.org/WCI_Documents.cfm; European Trading Scheme carbon permit price of \$13.39 per metric ton on February 4, 2009, from Point Carbon, “Point Carbon EUA OTC Assessment,” www.pointcarbon.com. \$2 billion assumes that 70 percent of total emissions are capped (and therefore require permits) and that all permits are auctioned.
- 28 The advantages of auctioning and disadvantages of free allocation from many places on the Sightline Daily Score Blog, http://daily.sightline.org/search?SearchableText=grandfathering&portal_type=blog.
- 29 Figure is from Joel F. Eisenberg, “Short and Long Term Perspectives: The Impact on Low-Income Consumers of Forecasted Energy Price Increases in 2008 and a Cap-and-Trade Carbon Policy in 2030,” US Department of Energy, Oak Ridge National Laboratory, December 30, 2007, <http://weatherization.ornl.gov/pdf/CON503-FINAL.pdf>.
- 30 This plan is also known as “Skytrust,” “Cap and Rebate,” and “Cap and Share.” See www.capanddividend.org and www.capandshare.org.
- 31 Robert Greenstein et al., “Designing Climate Change Legislation That Shields Low-Income Households From Increased Poverty and Hardship,” Center on Budget and Policy Priorities, May 9, 2008, www.cbpp.org/10-25-07climate.pdf.
- 32 Washington State Budget and Policy Center, “A Working Families Credit for Washington State,” www.budgetandpolicy.org/WorkingFamiliesCredit.htm.
- 33 For a fuller discussion, see Alan Durning, “Cap and Caulk: How Smart Climate Policy Can Cut Our Energy Costs,” Sightline Daily Score Blog, February 27, 2008, http://daily.sightline.org/daily_score/archive/2008/02/27/cap-and-caulk-how-smart-climate-policy-can-cut-our-energy-costs.
- 34 US Department of Energy, “Weatherization Activities in the States,” http://www.eere.energy.gov/weatherization/state_activities.cfm.
- 35 Martin Schweitzer and Linda G. Berry, “Evaluation of the Washington State Weatherization Assistance Program,” US Department of Energy, Oak Ridge National Laboratory, March 2001, <http://www.ornl.gov/~webworks/cppr/y2001/rpt/110117.pdf>.
- 36 Number of low-income homes weatherized assembled from, among others, US Department of Energy, “Weatherization Activities in the States,” http://www.eere.energy.gov/weatherization/state_activities.cfm; Washington Department of Community, Trade, and Economic Development, “Weatherization,” <http://www.cted.wa.gov/site/500/default.aspx>; and Dan Elliot, coordinator, Weatherization Assistance Program, Oregon Housing and Community Services Department, Salem, private communication, December 2007. Number and type of housing units from US Census Bureau, “State and County QuickFacts,” <http://quickfacts.census.gov/qfd>.
- 37 Share of unweatherized homes from Weatherization Assistance Program, Technical Assistance Center, www.waptac.org.
- 38 Unfinished weatherization work in Washington estimated by Chuck Ebert, director, The Energy Project (a program of The Opportunity Council), Bellingham, Wash., private communication, December 10, 2007.
- 39 Charlie Grist, Northwest Power and Conservation Council (NPCC), Portland, Ore., private communication, December 10, 2007, based on NPCC, *Fifth Northwest Electric Power and Conservation Plan* (Portland: 2005), <http://www.nwcouncil.org/energy/powerplan/5/Default.htm>.
- 40 Joel F. Eisenberg, “Short and Long Term Perspectives: The Impact on Low-Income Consumers of Forecasted Energy Price Increases in 2008 and a Cap-and-Trade Carbon Policy in 2030,” US Department of Energy, Oak Ridge National Laboratory, December 30, 2007, <http://weatherization.ornl.gov/pdf/CON503-FINAL.pdf>.
- 41 Clark Williams-Derry, “Loan Payday,” Sightline Daily Score Blog, August 5, 2008, http://daily.sightline.org/daily_score/archive/2008/08/05/loan-payday. Spending public dollars to upgrade private property can have some unwelcome effects, if we’re not careful. People who don’t need

the help may appropriate the benefits. For example, the private owner of a rental unit may decide to sell the newly retrofitted—and more-valuable—building or simply raise the rent. Typically, community action agencies require owners to promise not to do these things, but we could do a better job of enforcing such contracts.

- 42 For example, in 2000, mobile homes accounted for 8.5 percent of housing units in Washington, according to the US Census: http://factfinder.census.gov/servlet/QTTable?_bm=y&-geo_id=04000US53&-qr_name=DEC_2000_SF3_U_DP4&-ds_name=DEC_2000_SF3_U
- 43 See, for example, Eric de Place, “Riding Herd on Refrigerators,” Sightline Daily Score Blog, March 4, 2008, http://daily.sightline.org/daily_score/archive/2008/03/04/riding-herd-on-refrigerators.
- 44 The most sophisticated and detailed articulation of this approach to vehicle efficiency for low-income families is Amory Lovins et al., *Winning the Oil Endgame* (Snowmass, Colo.: Rocky Mountain Institute, 2005), <http://www.oilendgame.com>. pp 193-94.
- 45 See Anna Fahey, “Green Pay Day,” Sightline Daily Score Blog, April 22, 2008, http://daily.sightline.org/daily_score/archive/2008/04/22/green-pay-day.
- 46 David R. Baker, “State Has Serious Green-Collar Labor Shortage, Summit Attendees Say,” *San Francisco Chronicle*, January 15, 2008, www.ecy.wa.gov/climatechange/CATdocs/Calif_gls.pdf.
- 47 David Prince and Davis Jenkins, “Building Pathways to Success for Low-Skill Adult Students: Lessons for Community College Policy and Practice from a Statewide Longitudinal Tracking Study,” Community College Research Center, April 2005, www.dataqualitycampaign.org/files/publications-building_pathways_to_success_for_low-skill_adult_students-040105.pdf.
- 48 Keith Schneider, “Majoring in Renewable Energy,” *New York Times*, March 26, 2008, www.nytimes.com/2008/03/26/business/businessspecial2/26degree.html.
- 49 Sarah White and Jason Walsh, “Green Pathways: Jobs and Workforce Development in the Clean Energy Economy,” Center on Wisconsin Strategy, University of Wisconsin-Madison, 2008, www.greenforall.org/resources/greener-pathways-jobs-and-workforce-development-in.
- 50 A carbon tax that pays out all its revenue in equal dividends, like Cap and Dividend, might also create its own constituency. But because it would not create any property rights in permits, a carbon tax cannot motivate businesses to support it politically. Businesses possessing banked permits or permits for future years (or permits given to them for free) will have a vested interest in protecting the value of these assets by opposing efforts to relax the cap.
- 51 Sightline has been promoting tax shifting since 1994. See, especially Alan Thein Durning and Yoram Bauman, *Tax Shift* (Seattle: Sightline Institute [formerly Northwest Environment Watch], 1998), www.sightline.org/publications/books/tax-shift/tax.
- 52 British Columbia Ministry of Finance, “Budget and Fiscal Plan 2008/09 – 2010/11,” February 19, 2008, www.bcbudget.gov.bc.ca/2008/bfp/2008_Budget_Fiscal_Plan.pdf.
- 53 Good starting places for learning about carbon taxes are Carbon Tax Center, “Where Carbon Is Taxed,” www.carbontax.org/progress/where-carbon-is-taxed; and these dated but informative Web pages: US Environmental Protection Agency, “Energy/Carbon Taxes,” National Center for Environmental Economics, <http://yosemite.epa.gov/EE/Epalib/incent.nsf/c484aff385a753cd85256c2c0057ce35/0483a144da8fa434852564f7004f3e68>; and US Environmental Protection Agency, “Table 57, Table 11-12: Energy/Carbon Taxes,” National Center for Environmental Economics, <http://yosemite.epa.gov/EE/Epalib/incent.nsf/c7950cb0634d42808525634e00438a4a/032bb32faab7e7a3852564f7005e325a%21OpenDocument>.
- 54 Finland Ministry of the Environment, “Environmentally Related Energy Taxation in Finland,” www.environment.fi/default.asp?contentid=147208&lan=en.
- 55 Sweden’s carbon tax rates are calculated from Bengt Johansson, “Economic Instruments in Practice: Carbon Tax in Sweden,” Organisation of Economic Co-operation and Development, www.environment.fi/default.asp?contentid=147208&lan=en; and “Carbon Taxes Raised to Tackle Climate Change,” *The Local*, September 17, 2007, www.thelocal.se/8522/20070917.

- 56 Alan Durning, “Other Carbon Tax Shifts,” Sightline Daily Score Blog, March 10, 2008, http://daily.sightline.org/daily_score/archive/2008/03/10/other-carbon-tax-shifts. Quebec’s carbon tax is set in a complicated manner and is adjusted annually, based on funds required by certain provincial programs and the previous year’s carbon emissions.
- 57 Carbon Tax Center, “California Leads With Proposed Carbon Fee!” www.carbontax.org/blogarchives/2008/02/10/california-leads-with-proposed-carbon-fee.
- 58 The Washington Policy Center’s proposal is modest and sensible. It includes a starter carbon tax that pays for a small sales-tax reduction. As a bonus, it throws in a business and occupations tax reduction on all capital investment. See Todd Myers, “Promoting Personal Choice, Incentives, and Investment to Cut Greenhouse Gases,” Washington Policy Center, April 2008, www.washingtonpolicy.org/Centers/environment/PolicyBrief/08_Myers_CarbonTax.pdf.
- 59 The United Kingdom has a small tax on certain forms of energy called a “climate change levy”; it isn’t actually based on emissions. The City of Boulder, Colorado, taxes electricity and calls it a carbon tax; it does exempt certain renewable power. Like Sweden, Norway imposed a tax on carbon in 1991 and, like Sweden, Norway exempts a raft of industries. (See Jonathan Maslow, “Carbon Tax or Carbon Trading?” *The Energy Independent*, March 25, 2007, www.theenergyindependent.com/backgrounders/carbon-tax-or-carbon-trading.html.) Norway’s tax rates average \$21, but they are confused and inconsistent. They charge gasoline and natural gas more heavily than coal, in direct contradiction to those fuels’ relative carbon emissions. (See Annegrete Bruvoll and Bodil Merethe Larsen, “Greenhouse Gas Emissions in Norway: Do Carbon Taxes Work?” Statistics Norway, Research Department, December 2002, www.ssb.no/publikasjoner/DP/pdf/dp337.pdf.) Norway appears to have a peculiar energy tax, not a carbon tax. The governments of Australia, Japan, and New Zealand have seriously considered carbon levies, and the Canadian federal government plus the Canadian province of New Brunswick are currently debating such a policy.
- 60 Washington State Budget and Policy Center, “A Working Families Tax Credit for Washington State,” www.budgetandpolicy.org/WorkingFamiliesCredit.htm.
- 61 Alan Thein Durning and Yoram Bauman, *Tax Shift* (Seattle: Sightline Institute [formerly Northwest Environment Watch], 1998), www.sightline.org/publications/books/tax-shift/tax.
- 62 Alan Durning, “Cascadian Carbon Tax Shifts?,” Sightline Daily Score Blog, April 24, 2008, http://daily.sightline.org/daily_score/archive/2008/04/24/cascadian-carbon-tax-shifts.
- 63 Alan Durning, “Cap-and-Trade or Carbon Tax? Both!” Sightline Daily Score Blog, May 14, 2008, http://daily.sightline.org/daily_score/archive/2008/05/14/carbon-cap-or-tax-both.

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