

Pollution, Prices, and Perception by Daniel Gabaldon

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Pollution, Prices, and Perception

Carbon regulation will be unexpectedly complex — and business leaders will need to plan their approach accordingly.

by Daniel Gabaldon

Climate change is unlike any other environmental or public-health challenge that industrialized democracies have ever faced. The problem's sheer scale over time and space, its protean and complex causes, the massive cost of addressing it (and the even more massive cost of ignoring it) all defy our intuition. And this immense complexity will confront executives as they begin to contemplate what the realities of climate policy will mean for their businesses.

Much of the current discussion among business and policy leaders involves details of how to apply a market-based “cap and trade” system. This is, of course, the scheme in which regulators prescribe emissions limits (the “caps”) and set up a system of fungible credits that allow businesses to comply with those limits (the “trade”) — thus creating an incentive to find the lowest-cost, most efficient ways to reduce emissions. It is clear that most governments will end up relying primarily, or even exclusively, on this sort of market-focused approach, and that it will provide a national and global

context for business action on climate change.

But cap and trade by itself will be insufficient, for two reasons. First, given current technologies, the price of CO₂ credits would need to rise to politically unsustainable levels to achieve the emissions reductions that most scientists think are necessary to avoid irreversible damage to the environment. Second, many of the most powerful measures for reducing emissions involve new infrastructure, new technical standards, regional planning, and basic research — domains in which prices and markets, by themselves, are inadequate.

The nature of climate change, as well as the realities of economic and political behavior, make it more likely that a multipronged regulatory approach will end up being used — incorporating, but not limited to, market-based approaches. Although it is impossible to predict exactly what form this set of private and public policies will eventually take, the most realistic possibilities are coming into focus today. Unfortunately, some companies, in planning for a post-carbon future, are betting on strategies that would



pay out only in more extreme (and unlikely) scenarios. Currently available carbon sequestration technology, for instance, makes sense only when the prices of CO₂ credits are extremely high; building conventional coal-powered generation plants would work financially only if no limits were placed on CO₂. A clear-eyed assessment of the strengths and limits of a cap and trade system suggests a more nuanced strategic path for energy and industrial producers.

Costs and Complexities

Climate change is an inherently challenging issue to come to terms with. First is the sheer magnitude of the problem. Under “business as usual” scenarios in which carbon emissions continue growing (or even level off), the total cost of climate change–related damage over

require trillions of dollars to implement. For most of us, these figures are so enormous as to be practically meaningless.

The problem of how to address climate change is equally perplexing, in part because of the diffuse chain of causality and extensive time delays involved. Emissions entering the atmosphere today might have negligible impacts in the short run, but could contribute directly to dangerous greenhouse gas (GHG) levels 100 years or more in the future. The best technological fixes are not yet commercially available, and thus we don’t know how much they will cost to deploy. And the sheer variety of human activities that result in emissions poses its own challenges. Acid rain was reduced successfully by cap and trade, but it was primarily caused by sulfur dioxide and nitrous oxide emissions,

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the next two centuries is estimated to be “equivalent to an average reduction in global per-capita consumption of at least 5 percent, now and forever” — and 20 percent in the most vulnerable countries. (The source of these estimates is Nicholas Stern’s authoritative 2007 report, *The Economics of Climate Change*, published by Cambridge University Press.) These costs can be mitigated, but only if power-sector emissions are cut by 60 to 75 percent, and extensive cuts are made in transportation emissions as well. Even the best-designed approaches may

both largely from coal-fired power plants; GHG emissions originate from a wide variety of activities and sectors of the economy. No single source of atmospheric carbon represents more than 30 or 40 percent of the total. Indeed, the only current consensus about solutions appears to be that no silver bullet exists.

And of course, the entire discussion is occurring at a time of imperfect and rapidly evolving science as well as highly partisan perspectives. Issues of equity — such as whether rich or poor nations should bear the costs or whether today’s

uncertainties justify the costs that future generations might bear — abound. Efforts to establish appropriate interest rates for cost-benefit analysis of alternative policies end up tangled in what appear to be irreconcilable contradictions.

Despite this issue's many complexities, public support for action on climate change is wide and growing. Many nations have already adopted mandatory limits on CO₂ emissions; so have numerous states, cities, and companies in the industrialized world. The debate over the cap and trade system in particular is moving beyond the question, Should we do it? to the multiple questions of how to design it. And here again there are disagreements: over the percentage of the emissions rights that should be given free to companies versus auctioned off; over the pace and severity of emissions reductions; and over the appropriate use of the proceeds by governments. In general, these debates come down to a question of distribution: whether to set up the details of allocation to favor particular geographies (areas dependent on coal-fired generation versus those amenable to windmills), industries (energy-intensive manufacturers versus service sectors), or types of firms (electric power companies with large nuclear and renewable portfolios versus those with mostly coal-fired units).

However, the heated quality of these debates can obscure a more fundamental issue related to the nature of markets themselves.

Emissions Market Omissions

Winston Churchill famously said that democracy was the worst political system, except for all the others. Something similar could be

said about using cap and trade markets to reduce greenhouse gases. Markets may be imperfect and incomplete, but all the alternatives (at least individually) are worse. Classic command-and-control regulation would be massively inefficient and probably politically unpalatable. Carbon taxes are widely viewed as a political nonstarter, at least in the

prise that in the U.S. Midwest and South, where electricity rates have remained steady or fallen in real terms for two decades and where political support for addressing climate change is low, people balk at the idea of steeply increased rates. But environmentally and socially progressive survey respondents in places like the Northeast and Pacific

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United States. And doing nothing, at either the corporate or the national level, is too risky a proposition.

As previously noted, cap and trade regimes were applied with great success in the regulation of acid rain, beginning in 1989. (See “The Making of a Market-Minded Environmentalist,” by Fred Krupp, *s+b*, Summer 2008.) Existing regulatory regimes in Europe, the U.S. Northeast, and California are using similar approaches. The benefits of these market-based regimes, compared with quantitative or technological mandates, are well known. Markets create price signals that allow billions of uncoordinated choices to be directed to reduce carbon, while inducing technological and business innovation, without the need for centralized control.

But the shortcomings of markets in reducing emissions cannot be ignored. First and foremost, as a recent Booz & Company survey of U.S. consumers showed, many people are unprepared for the energy prices they would have to pay under a cap and trade regime. It's no sur-

Northwest were also disinclined to pay higher prices for electricity or transportation fuel, even when told it would reflect the need to reduce carbon emissions. Instead, the research showed that consumers across the United States and of all political persuasions believe someone else — typically big business — should shoulder the costs. This suggests that attempts to foist price increases on consumers to reduce climate change would be politically unsustainable, perhaps depleting the widespread goodwill that is currently bestowed on action against climate change.

Unfortunately, energy prices under most proposed cap and trade systems still wouldn't be high *enough* to move consumers to take the steps needed to mitigate climate change. And evidence suggests that, no matter how high energy prices might get, they would still be insufficient motivators in themselves. For example, many people still don't take advantage of home insulation, weatherization (modifying buildings to make them less vulnerable to

heat, cold, and moisture), and other opportunities to improve energy efficiency, despite such solutions being economically attractive at current prices. Habit, ignorance, and inconvenience serve as durable barriers to behavior change, regardless of the incentives.

Another shortcoming of cap and trade systems is their reliance on pecuniary incentives — which have a poor track record at influencing certain types of human behavior. Consider the millions of people who choose to donate blood, to volunteer for military service during wartime, to donate time to local community efforts, and to voluntarily sort recyclables from trash every week. Feeling good about oneself or receiving social approbation or blame can work where markets don't — or where they are viewed as socially inappropriate. The same appears to be true in the case of popular attitudes about climate change. About 80 percent of respondents in the Booz & Company survey said that they would

financial sector in the last half of 2008 reminded us, free markets don't always direct people to the optimal or most appropriate choices. In energy markets in general, the ability of prices to provide useful information is compromised by the lengthy time lags and giant scale of investments typical in this highly capital-intensive industry.

Recent wargame-style simulations conducted by Booz & Company on potential implications of climate regulations for the U.S. electric power sector — with executives from leading utilities and oil and gas companies as the participants — underscored this issue. As in the real world, even experienced players failed to anticipate the consequences of one another's choices. The result was follow-the-herd waves of underinvestment and then overinvestment in new power generation, with emissions pricing rising to very high levels before crashing to near zero. In the real world, the European Union's nascent emissions trading scheme has experienced

What then will policymakers do? Rather than placing an undue burden on fragile market institutions, they will supplement the cap and trade system with several other venerable policy instruments.

Several climate change initiatives are already following this kind of diversified, belts-and-suspenders approach. For example, the California Global Warming Solutions Act of 2006 established a landmark climate change abatement program that blends regulatory and market mechanisms with the goal of reducing GHG emissions to only 20 percent of 1990 levels by 2050. Since transportation contributes 39 percent of California's gross GHG emissions, targeting that sector was a key element. California employs a custom mix of policies, including vehicle efficiency and mileage standards, mandates for lower levels of carbon in transportation fuels, and a transition from gasoline and diesel to alternative and renewable fuels. In addition, the state awards US\$120 million annually in grants, revolving loans, loan guarantees, and other measures to develop and deploy innovative fuel and vehicle technologies. California also aims to increase electricity production from renewable resources to 33 percent by 2020, through a combination of standards for buildings and appliances, and programs delivered by utility companies, local governments, community organizations, and the private sector. Climate Action Team subgroups have been formed in sectors such as agriculture, forestry, and energy to identify and analyze measures for reducing emissions. Land use and agricultural policies are also included in this robust portfolio.

Across the Atlantic, the Ger-

California, Germany, and Australia all employ a mix of policies to support energy efficiency and renewable fuels.

pay a substantial premium for their own renewable solution, but they would not pay even a small percentage of that amount in higher energy prices. For example, most respondents indicated that they would rather install a solar panel on their home than pay even a small increase in their utility bill to reflect the cost of carbon reduction.

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similar volatility. This pattern could easily reappear in a U.S. cap and trade market.

Belts and Suspenders

In the end, the multifaceted nature of climate change, and the requisite shifts in behavior and investment needed to address it, renders problematic any approach that depends solely on a cap and trade program.

man government has implemented a similar plan for a 40 percent reduction in the country's GHG emissions by 2020. The plan, which targets sectors such as agriculture and transportation, also calls for boosting Germany's share of electricity produced from renewable energy to 25 to 30 percent by 2020. (Germany already has the highest share of installed wind energy capacity in the world.) In addition, the government is implementing a package of emissions reduction policies, as well as 14 new laws and regulations designed to encourage businesses to conserve energy. And by providing hundreds of millions of euros in subsidies to encourage home and building owners to install efficient heating systems, the German government hopes to increase the energy efficiency of buildings. Australia's plans also take a multi-instrument approach.

Given the novelty, complexity, and scale of the challenge, governments will undoubtedly experiment with a variety of approaches. However, over time they will gravitate toward policies that reflect the underlying realities of emissions reduction, national and local politics, and economics. That almost certainly means, in the end, that the regulatory landscape will reflect these three broad principles:

1. Low-cost solutions. The cheapest sources, by far, of GHG emissions reductions are improved energy efficiency and land conservation and reforestation programs; that has been the experience of dozens of companies and governments around the world. In the past, "sexier" and higher-cost options, such as photovoltaic solar or "clean coal" technologies, have often received greater attention and fund-

ing. That will change as cost-benefit trade-offs favor such measures as efficiency standards for buildings and electronics. Automation will also help by reducing the behavioral barriers to capturing more energy-efficiency savings. For example, advanced control technologies, combined with real-time price data and information exchanges enabled by smart grid systems, will allow devices to "decide" when to reduce

is still evolving. One key trend, for example, is the movement to incorporate "offsets" such as forests, which play a large role in reducing CO₂ but are not always accepted as viable parts of a carbon trading program. Another likely development will be mechanisms to reduce price volatility. For example, some policymakers may apply to climate change some of the design principles that Harvard Professor William

Companies seeking to invest in clean technology have faced an unpredictable, constantly shifting regulatory landscape.

load as a function of overall electricity grid conditions (which in turn incorporate carbon prices).

The lowest-cost option for reducing emissions will often vary by geography, and by the stage of local economic development. A 2008 study by the World Wildlife Fund and Booz & Company found that the most significant sources of emissions shift significantly over the lifetime of a city or region. During the early stages of economic development, the greatest reduction is possible from designing new transportation and communications infrastructures to support dense habitation and high bandwidth. (Internet connectivity can reduce commuting and other travel and enable much smarter energy use within buildings.) For more established cities with slower growth, the most effective sources of emissions reduction are changes in electricity supply and energy efficiency.

2. Streamlined markets. The design of carbon emissions markets

Hogan has proposed for taming wholesale electricity markets.

3. A long-term commitment. Until now, policymakers in many countries, including the U.S., have not provided the steady, long-term conditions needed for new technologies to flourish. At the heart of GHG reduction will be corporate choices about which multibillion-dollar, multiple-decade projects to fund. Unfortunately, companies seeking to invest in clean technology have faced an unpredictable, constantly shifting regulatory landscape. Subsidies stop and start. Laws change. Without a matching commitment from their political counterparts, business leaders can't commit the capital over time that is needed to transform the sector.

Compare the fate of the U.S. wind power industry with that of the photovoltaic solar industry in Japan and Europe. In the U.S., investment in wind power has been dependent on a government-provided "production tax credit,"

which has been offered and withdrawn in a series of stops and starts over the past several years. But the mechanism for subsidizing the photovoltaic solar industry in Japan, Germany, and elsewhere was explicitly designed to be long-lived. The subsidies decreased in a slow and carefully planned fashion, thus creating incentives for producers to deliver reduced costs through increased scale, learning, and innovation. The resulting cost improvements and industry growth followed predictably. A similar comparison can be made with the nuclear industry. In the United States, shifting regulations contributed to spectacularly rising project costs, whereas in France, a more stable regulatory environment enabled rapid growth and lower project costs.

The most successful governments in a post-carbon world will be those that provide predictable long-term environments favoring investment and innovation. This will matter more than getting the market design or regulatory regime exactly right, or than picking winning technologies.

Making Better Bets

If public policies play out this way, then the path is clear for corporate decision makers in the energy and industrial sectors. Don't bet on projects that pay out only with a very high CO₂ price. For example, with current technologies, carbon sequestration is financially viable only if the price of CO₂ remains above roughly \$70 per ton. On the other hand, a status quo strategy that depends on carbon emissions remaining "free" — such as relying on traditionally coal-fired power generation — is also risky. The greatest opportunities for invest-

ment will be holistic urban or regional infrastructure makeovers, where the energy, transportation, water, and telecommunications systems are seen as interrelated and the financing, construction, technological development, and social design are all conceived in unison. (See "Lights! Water! Motion!" by Viren Doshi, Gary Schulman, and Daniel Gabaldon, *s+b*, Spring 2007.)

Many discussions of market-based solutions are either too optimistic or too pessimistic. They ignore and downplay the costs or they insist that the costs are too great for any action. The best corporate response involves a sober assessment of the strengths and limits of available options, in light of the complexity of the emerging regulatory, political, and social milieu. Envisioning a world in which society employs multiple tools to address climate change — including standards, research programs, subsidies, and interdiction, as well as carbon markets — opens up a much broader range of new opportunities than the narrow (though worthy) strategies currently being pursued. Clean coal, renewable generation, and the like are only the tip of the post-carbon iceberg. It is the actions under the surface — behavior change, efficiencies, incremental innovation, infrastructure design, and good management practice — that will ultimately have the greatest impact. +

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