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Reduce Greenhouse Gases Profitably

A regulatory system that rewards energy companies for innovations that boost efficiency can appeal to environmentalists and industry alike.

After the Senate's failed effort to pass the Lieberman-Warner climate change bill, Congress could conclude that reducing greenhouse pollution is a political impossibility—the costs too high, the benefits too uncertain, the opposition too entrenched. But that would ignore a convenient truth: Technology already exists to slash carbon emissions and energy costs simultaneously. With a little political imagination Congress could move beyond Lieberman-Warner and develop an energy plan that satisfies both pro-business and pro-environment advocates.

The Lieberman-Warner bill would create a cap-and-trade system to govern carbon emissions from power plants and major industrial facilities. What the bill does well is to limit greenhouse gas emissions to 19% below the 2005 level by the year 2020. The bill further demands a 71% reduction by 2050. Some argue that these goals should be stricter or looser, but the legislation does at least set clear targets and timetables.

Then the legislation becomes needlessly complicated. In order to provide "transaction assistance" (or what might be described as bribes for the unwilling), the bill offers massive subsidies to utilities, petrochemical refiners, natural gas distributors, carbon dioxide (CO_2) sequesterers, state governments updating their building codes, and even Forest Service firefighters wanting to prepare for climate changes that spark more blazes. The gifts may garner political support from key constituencies, but they induce little clean energy generation. The same criticism can be levied against a carbon tax, even one that returns some of the receipts to taxpayers and spends the rest researching emissions-mitigating technologies.

Nearly 70% of U.S. greenhouse emissions comes from generating electricity and heat, whereas only 19% comes from automobiles. Electricity generation is a particular problem because only one-third of the energy in the fuel used to produce electricity is converted to useful electric power. Enhancing the efficiency of electric generation is essential in the battle against global warming, and making use of the wasted thermal energy produced in power plants is the key to improving efficiency. The technology to capture and use that excess thermal energy already exists. The nation needs a policy that encourages every electricity generator and every industrial user of thermal energy to follow this approach. An elegant market-oriented approach that avoids the quicksand of government picking technology winners would be a system founded on output-based allocations of carbon emissions.

First, each producer of electricity and thermal energy

would obtain initial allowances equal to the previous year's national average output of CO_2 emissions per delivered megawatt-hour of electricity and Btu of thermal energy.

Second, every plant that generates heat and/or power would be required to obtain total allowances equal to its CO_2 emissions. As with the trading system in the Lieberman-Warner bill, high-carbon facilities would need to purchase extra allowances from clean plants at market prices.

Third, these allowances would be cut every year to insure total emission reductions. Under this output allocation system, companies using clean energy such as wind turbines or industrial waste-energy–recovery plants can sell their pollution allowances, thus improving their economic position. Combined heat and power units, by earning allowances for both electric and thermal output, would have spare allowances to sell, increasing their financial attractiveness. Improving efficiency at any energy plant would lower emissions (and fuel costs) without lowering output, thereby saving allowance purchases or creating allowances to sell. In contrast, a dirty power plant that did not increase its efficiency would have to buy allowances.

Output-based allocations create carrots and sticks, additional income for low-carbon facilities that sell allowances, and additional costs for high-carbon facilities that must purchase allowances. Lieberman-Warner or a carbon tax, in contrast, impose a cost on polluters but provide no direct incentive for the use of clean energy sources or to companies like mine that boost energy output and efficiency by merging electric and thermal energy production.

Establishing such a system is relatively simple. Measurement and verification for electric and thermal output and CO_2 are easy, since all plants have fuel bills and electric meters, and thermal output can be calculated. Continuous emission meters, moreover, are now affordable and proven. Regulators simply need to require energy plants to submit annual audited records, along with allowances covering actual emissions of each pollutant.

How it works

Each electric producer would receive initial allowances of 0.62 metric ton of CO_2 emissions per delivered megawatt-hour of electricity, which are the 2007 average emissions. Each thermal energy producer would obtain initial allowances of 0.44 metric ton of CO_2 emissions per delivered megawatt-hour of thermal energy, roughly the 2007 average emissions.

At the end of each year, a plant's owner must turn in allowances for each pollutant equal to actual output. Consider CO_2. Every producer of thermal energy and/or electricity would keep track of all fossil fuel burned in the prior year and calculate the total CO_2 released. Each plant also would record the megawatt-hours of electricity produced, subtracting the amount for line losses, and record each unit of useful thermal energy produced and delivered. The plant would automatically earn the scheduled allowance of CO_2 per megawatt-hour and per unit of thermal energy, but it must turn in allowances for every ton of carbon dioxide actually emitted in the prior year.

The allowance credits would be fully tradable and interchangeable between heat and power. Note that efficiency improvements reduce the burning of fossil fuel and thus reduce carbon emissions, but they do not decrease the plant's output, and thus would not decrease total output allowances. Any production of heat or power without burning additional fossil fuel would earn an emission credit but produce no added emissions, which enables the producer to sell the allowance and improve the profitability of cleaner energy.

Heat and power producers, of course, have many options. By increasing efficiency, a company can reduce CO_2 emissions, save fuel, reduce purchases of allowances, or add revenue from sold allowances. By installing a combined heat and power unit sized to the facility's thermal load, it would earn additional allowances, providing revenues above the value of the saved fuel.

Consider a typical carbon black plant that produces the raw material for tires and inks. It currently burns off its tail gas, producing no useful energy service. If the owner built a waste energy recycling plant to convert the flare gas into electricity, it would earn 0.62 ton of CO_2 allowance for every delivered megawatt-hour. A typical carbon black plant could produce about 160,000 megawatt-hours per year of clean energy. At a value of $20 per ton of CO_2, the plant would earn $3.2 million per year from the output allowance system.

Now consider the options for a coal-fired electric-only generator that emits 1.15 tons of CO_2 per delivered megawatt-hour. It receives only 0.62 tons of CO_2 allowance and must purchase an additional 0.53 tons, costing $10.60 per delivered megawatt-hour (with $20- per-ton CO_2). To reduce carbon emissions and save money, it could invest in devices to improve the plant's efficiency and lower the amount of coal burned per megawatt-hour. Second, it could entice a thermal-using factory or commercial building to locate near the power plant and sell some of its presently wasted thermal energy, earning revenue from that sale and added CO_2 allowances for the useful thermal energy. Third, it could invest in a wind farm or other renewable energy production facility and earn CO_2 credits. Fourth, it could pay for an energy recycling plant to earn added allowances. Fifth, it could purchase allowances. Or, sixth, it could con-

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sider operating the plant for intermediate instead of base load. All of these options reduce total U.S. CO_2 emissions.

Rather than collect and distribute trillions of dollars, Congress would have only two key tasks: to set fair rules for calculating useful output and to establish the decline rate for the allowances per unit of useful output. Current scientific thinking suggests that we must reduce total carbon emissions by 70% or more over the next 50 years. If initial output allowances are set equal to average outputs in 2006 for each megawatt-hour of electricity and useful thermal energy, allowances would need to decline by 2.38% per year for the next 50 years in order to reach the 70% reduction. If there were no increase in the amount of useful energy consumed for the next 50 years, this reduction would cause CO_2 emissions to drop to 30% of 2006 emissions. Of course, if the nation's total energy use increases, allowances would have to decline more rapidly to reach the 2050 goal.

Advantages

Output-based allowances are simple, keep government from picking technology (which is always a bad bet), allow maximum flexibility for the market to lower fossil-fuel use, and encourage profitable greenhouse gas reduction. As with cap-and-trade systems, output-based allowances can be ratcheted down to ensure greenhouse gas reductions. Consider the faults of other approaches.

A carbon tax requires legislators to determine the precise price per ton of CO_2 emissions that would cause the desired reduction of fossil-fuel consumption. Congress then must decide how to spend the collected money, creating an atmosphere ripe for mischief.

A cap-and-trade system that allocates initial allowances to existing emitters, as was done with sulfur emissions in 1990, rewards pollution rather than clean energy. A new combined heat and power facility, although emitting half as much CO_2 per megawatt-hour as do older plants, would receive no baseline allowances, be required to purchase carbon allowances for all CO_2 emissions, and then would compete with an old plant that was granted sufficient allowances to cover all emissions. Such an allocation approach is favored by owners of existing plants, for obvious reasons, but it retards efficiency.

A system of allowances per unit of input fuel, such as the Clean Air Act's approach toward criteria pollutant emissions, pays no attention to energy productivity and gives no credit for energy efficiency. In contrast, an output-based allowance system rewards every approach that emits less CO_2 per megawatt-hour, regardless of technology, fuel, location, or age of plant. Thus, the output allowance approach will produce the lowest-possible-cost CO_2 reductions.

An output allowance system is quintessentially American, solidly based on market forces and rewarding power entrepreneurs for "doing the right thing." It leverages the U.S. innovative and creative spirit by encouraging all actions that lower greenhouse gas emissions per unit of useful output and penalizing above-average pollution per unit of output. The Lieberman-Warner approach, in contrast, has government picking winners and distributing up to $5.6 trillion to a hodgepodge of political interests.

The output-allowance system, moreover, sends powerful signals to every producer of heat as well as every producer of power. The total money paid for allowances exactly matches the total money received from the sale of allowances, so the average consumer pays no added cost for electricity. The impact on consumer impacts will vary and will be higher for those with few current alternatives to dirty fossil-fuel plants. The market decides the clearing price of the allowances, and every producer, regardless of technology, fuel, age of plant, or location, receives the same price signals.

Output-based allocations could also improve several provisions of the Clean Air Act, which has achieved impressive results but has blocked investments in energy productivity. The current approach, crafted in 1970 when global warming was not yet a concern, gives existing energy plants the right to continue dirty operations but forces new facilities to achieve significantly lower emissions. By forcing any plant that undergoes significant upgrading to become subject to stricter emission standards, the law's New Source Review has effectively blocked investments to increase efficiency.

A transition away from a carbon-intensive economy will doubtless hurt some businesses, particularly big polluters. But others will prosper. Rather than having environmentalists focusing on the moral need to reduce pollution and industrialists responding that change will hurt the economy, a better way to structure the climate change debate is to ask how the nation can profitably reduce greenhouse gas emissions. On this point, environmentalists and industrialists should be able to find common ground. Output-based allocations, by unleashing market forces and sending clear signals, can muster such a political agreement as well as stimulate an investment boom in increased energy productivity.

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