TED NORDHAUS & MICHAEL SHELLENBERGER

Scrap Kyoto

Kyoto is dead—and that's a good thing. In its place, we need massive global investment in new clean energy technology.

The most dramatic moment during last December's climate change talks in Bali came when delegates roundly booed U.S. negotiator Paula Dobriansky for rejecting treaty language that she said required too little of poor nations. The roar of disapproval from the delegates captured not only seven years of global frustration with the Bush Administration's global-warming obstructionism, but also with American unilateralism more broadly.

Shortly thereafter, negotiators announced a face-saving compromise: An agreement would be negotiated in 2009, implicitly timed for a new U.S. administration, one presumably more supportive of global limits on greenhouse gas emissions. But the agreement also allowed the participants to avoid facing the painful, but true, fact that these countries had made no headway whatsoever in establishing binding emissions-reduction targets, most especially China

TED NORDHAUS *and* MICHAEL SHELLENBERGER *are chairman and president, respectively, of the Breakthrough Institute and co-authors of* Break Through: From the Death of Environmentalism to the Politics of Possibility.

and India, which will produce the bulk of the increase in emissions over the next century.

This last-minute arrangement also allowed those developed nations that had agreed to binding emissions targets to avoid confronting their own failures. Between 2000 and 2005, European emissions grew twice as fast as America's. Emissions in Canada grew a whopping five times faster. Since 1990, Germany and Britain reduced their emissions, but they did so for prior reasons having nothing to do with global warming: Margaret Thatcher broke the coal miners' union in the early 1980s, moving Britain to cleaner-burning natural gas, and the East German economy collapsed after the fall of communism, reducing a reunified Germany's reliance on dirty coal plants. When you remove these two from the calculation, European emissions rose almost 12 percent between 1990 and 2005.

Many Kyoto signers will, by 2012, meet their emissions reduction targets (5.2 percent under 1990 levels) on paper. But most will do so not through reducing their own carbon emissions, but rather by buying emissions reductions from poorer, developing nations through Kyoto's Clean Development Mechanism (CDM). The CDM allows developed nations to pay for equivalent reductions of greenhouse gas emissions in developing countries when doing so is less expensive than reducing their own emissions. But because many of these are of questionable authenticity, the CDM is a poor substitute for reducing developed-world emissions.

Indeed, even if the world's wealthiest nations were making substantial progress reducing their own emissions, emissions increases from developing countries like China, India, and Brazil would negate them. China's emissions alone will grow more than 10 percent annually between 2000 and 2010—that's more than the 2004 emissions of Britain, Canada, Australia, Japan, and Germany combined. From an ecological perspective, even if Europe dramatically reduced its emissions, it wouldn't matter much.

Into this morass will step the next American president. Senators John McCain, Hillary Clinton, and Barack Obama all have pledged to enact deep cuts in U.S. carbon emissions over the next four decades. All support federal legislation to cap U.S. carbon emissions. And all have pledged to return to the Kyoto process and negotiate a new international agreement with binding global emissions reduction targets.

Conventional wisdom in Washington and in Europe holds that with American leadership, international efforts to achieve deep reductions of global carbon emissions will quickly get back on track. Congress will pass, and the president

will sign, "cap and trade" legislation that will mandate emissions reductions. The next president will have the moral standing to negotiate a successor to Kyoto, which will require wealthy nations to reduce their emissions not by five percent but rather 80 percent by mid-century. In the face of renewed American leadership, China and India will agree to binding reductions as well, and the world will be well on its way to reducing its combined emissions 50 percent by 2050.

But these plans are wildly optimistic—and unrealistic. The entire global framework for reducing carbon emissions, and indeed the entire conceptual and policy framework for addressing global warming, is a failure, based on an older paradigm of pollution control that won't slow global warming.

At bottom, global warming is not so much a pollution regulation challenge as it is an energy development one. To understand how different this challenge is from past pollution quandaries, consider that by 2050 global energy consumption will more than double, even as we face the challenge of reducing greenhouse gas emissions by 50 percent. This transformation will not be accomplished by affixing scrubbers on smokestacks or catalytic converters on tailpipes—technical fixes that required little change to the underlying processes and technologies that they mitigated. Rather, it will require fundamental changes to the underlying technologies and fuel sources that power the global economy.

Kyoto allows governments to blithely agree to reduce emissions in the future while subsidizing fossil fuels and protecting domestic industry.

The problem with Kyoto, cap and trade, and most other policies aimed at enacting this transformation is that they focus primarily on the pollution problem, not the energy supply problem. As such, they attempt to enact the necessary transformation of the global energy economy through the indirect mechanism of pollution regulations and carbon markets, rather than through the direct deployment of new clean-energy technologies.

China, Asia, and much of the developing world are at the beginning of what will be a 30-year process to build a coal-and-oil-based energy infrastructure. China grew 9 percent last year, and its emissions grew 14 percent (U.S. emissions grew 0.5 percent, while Europe's grew 1 percent). Given rapid economic and emissions growth in Asia, scientists in the spring of 2008 warned that the U.N. Intergovernmental Panel on Climate Change had underestimated the emissions reduction challenge. In fact, given current trends in emissions growth, that challenge may be as much as two and half times larger than the U.N. predicted.

This is a time problem, not just a scale problem. Until recently, it was thought that we had until the end of the century to transition our energy sources. But the higher rate of increasing emissions will accelerate the rate of warming, making the case for energy modernization even more urgent.

Rapidly scaling up clean energy, and bringing down its price, will require that governments invest heavily in both the innovation and deployment of new energy sources. Even with stronger pollution regulations and a market for carbon emissions, the private sector cannot do this alone. Private firms cannot build transmission lines to transmit energy from windy and sunny places to big cities. Nor can they invest billions of dollars in high-risk projects whose final product will cost substantially more than coal and oil. Government action and investment are critical.

The good news is that a new consensus is emerging around precisely this point. Recently, influential figures, from former British Prime Minister Tony Blair to Columbia University economist Jeffrey Sachs to Duke Energy CEO (and cap-and-trade supporter) Jim Rogers, have all said that a price for carbon alone won't be enough. They join a consensus of global energy experts who have been calling for far greater government investment in technology for more than six years. While not entirely rejected as the path forward, the bloom is off the carbon-regulation rose, and the need for direct government investment to deploy new clean-energy technologies is becoming increasingly apparent. A reformed carbon-trading market must be joined with an intensive green-technology investment strategy. The question now is not only how to raise the money and spend it well, but how to create a transformational politics around closing the technology gap.

Kyoto as Cautionary Tale

The Kyoto Protocol is based on U.S. legislation passed in 1990 to deal with acid rain and capped how much companies could pollute, with the cap declining each year. Companies that exceeded their required limits could purchase credits—"pollution allowances"—from companies that reduced their emissions beyond what the law required. The U.S. government thus created a national market for allowances of sulfur dioxide (the main component in acid rain).

What cap-and-trade boosters often overlook is the fact that the acid rain cap-and-trade law only worked because of the availability of relatively cheap smokestack scrubbers and the availability of low-sulfur coal from the Powder River Basin in Wyoming. The cost of compliance was cheap, and thus consumers hardly noticed any increase in their electricity bills. Moreover, because there was only one commodity that had to be measured, monitored, and traded—and because only a

small number of energy companies were doing the trading—the enterprise was remarkably easy for the Environmental Protection Agency (EPA) to enforce.

In contrast, Kyoto attempts to create and govern a global market for trading not one but six pollutants among not a few dozen but rather hundreds of thousands of companies and billions of customers. To understand the enforcement challenge, consider that in many developing countries a large percentage of energy production is already unpermitted, unregulated, and illegal. Corruption is pervasive. And there is always more domestic political pressure on politicians and government bureaucrats to maintain or accelerate economic growth than there is to cut pollution by increasing the price of energy.

Kyoto's primary mechanism for trading emissions, the CDM, has been the victim of such corruption. It allows participating countries to purchase emissions reductions made by manufacturers in poor nations. Perversely, the CDM led to the expansion, rather than reduction, of trifluoromethane (HFC-23), a by-product of manufacturing refrigerant gases, which is a greenhouse gas 12,000 times more potent than carbon dioxide. Developing-nation manufacturers, particularly in China, were paid 4.7 billion euros—two-thirds of all the payments into the CDM to 2012—to cut HFC emissions, even though manufacturing refrigerants without HFC-23 cost manufacturers just 100 million Euros, generating 4.6 billion euros in profits. In other words, the CDM gave Chinese companies an incentive to produce HFC-23, so that they could sell off cuts in its production later.

Kyoto's other structural flaw is that it is focused on future emissions reduction targets rather than immediate action. In 1997, just weeks before Vice President Al Gore flew to Kyoto to negotiate the agreement, the Senate preemptively rejected, by a vote of 95 to zero, any treaty that would not require emissions reductions from developing nations or that would harm the U.S. economy. To give the Clinton Administration cover with Congress, Gore negotiated emissions targets that were weaker than what the European delegation and American environmentalists wanted. The modified accord, then, would reduce emissions by just 5.2 percent, instead of 15 percent, by 2012, and it would allow wealthy nations to purchase emissions reductions from developing nations. Gore and his team were so focused on establishing binding emissions targets that they ended up with the worst of both worlds: The treaty was both ecologically irrelevant and politically impossible.

The combination of low targets and a Byzantine international trading scheme meant that the global community could, for 10 years, merrily march forth under the illusion that meaningful steps were being taken to reduce carbon emissions. But during that time global emissions rose, unaffected by Kyoto. While the formal Kyoto compliance period, which runs from 2008 to 2012, has only just begun, it

appears likely that almost all of the wealthy developed nations that ratified the treaty will either have failed to meet those targets altogether or will meet them by purchasing emissions reduction credits from other nations that are often of dubious legitimacy, as the deliberate production of HFC-23 showed.

Setting emissions targets and trading allowances pushes the day of reckoning into the future and does not require a nation to decommission a single coal-fired power plant or build a single wind farm today. And yet Kyoto proponents continue to conflate agreements on emissions reduction *targets* with actual *actions* to reduce emissions. In Europe, for example, the German government calls for aggressive emissions reductions targets while, at the same time, protecting its automobile manufacturers from tougher emissions requirements. Kyoto allows governments to blithely agree to reduce emissions in the future while subsidizing fossil fuels and protecting domestic industry in the here and now.

The Energy-Technology Gap

For 20 years, environmentalists and others have insisted that addressing climate change won't be that hard or expensive. "We have the technology," insisted Al Gore last February. "If we just had one week's worth of what we spend on the Iraq war we could be well on our way to solving this challenge." But the $2 billion we spend in one week on Iraq is actually a paltry sum—about the cost of a single new coal plant that captures and stores its emissions in a world of thousands of coal plants—and thus nowhere near enough to get started on, much less solve, the energy challenge.

When energy experts and climate scientists talk about reducing global emissions 50 percent by 2050—or U.S. emissions 80 percent—they are referring to what they believe will be required to "stabilize" atmospheric carbon dioxide levels by 2050. The goal is to stabilize at 500 parts per million of carbon dioxide by 2050, the level that scientists believe is needed to prevent the melting of ice caps over West Antarctica and Greenland.

To help policy makers better understand how much carbon emissions must be reduced to stabilize atmospheric carbon dioxide at 500 parts per million, the IPCC creates different estimates, or scenarios, for how much emissions are expected to rise between now and 2050. In 2004, the world emitted about seven billion metric tons of carbon, and the UN's high estimate of emissions for 2050 is about double that. Thus, reducing emissions 50 percent from "business as usual" (BAU)—the baseline estimate for emissions absent action—means reducing emissions from 14 billion to seven billion metric tons. After stabilizing emissions in 2050, the world would need to keep reducing emissions until 2100, when emissions would need to be at something close to 90 percent of their BAU.

In 2004, two Princeton professors, Rob Socolow and Steven Pacala, wrote an article for *Science* that broke down this seven-billion-ton challenge into seven "wedges"—so named because of the triangular shape those reductions have on a graph. One gigaton wedges include ending all tropical deforestation and doubling the current rate of reforestation worldwide; doubling the number of nuclear power plants in the world; increasing 50-fold the number of wind turbines; and increasing 700 times the number of solar panels. Simply meeting one of the seven would be a Herculean task. In Socolow's words, "There is no easy wedge."

A few months after Gore stated that a week's worth of Iraq war spending would be sufficient to address the technology challenge, a spate of new analyses published in leading scientific journals revealed that the IPCC, which shared the 2007 Nobel Peace Prize with Gore, had drastically underestimated the emissions-reduction challenge: Faster-than-expected economic growth and accelerated coal-burning in Asia make the challenge of stabilizing emissions at least twice as large as predicted. The global economy, they found, is "re-carbonizing"—meaning that the amount of carbon per unit of global GDP is increasing, not decreasing.

As a consequence, all six future emissions scenarios in the IPCC report, and the scenario used in Socolow and Pacala's wedge analysis, probably greatly underestimate the challenge, as they are in part based on assumptions that the decarbonization trend over the last several decades in the United States and Europe (moving from coal and toward natural gas, nuclear, renewables, and increased efficiency) would continue globally. But developing nations like China and India, and their rapid creation of a fossil-fuel energy infrastructure, has reversed this trend.

The technology challenge is thus more than twice as large as was thought. As many as 18 stabilization wedges, not seven, may be needed, according to energy expert Marty Hoffert, a New York University physicist, who challenged Socolow and Pacala's numbers in a special issue of *Scientific American* in 2006. Against Gore's claim that "we have the technology," it's notable that Socolow and Pacala, in their famous analysis, were only able to come up with 15 ways to cut emissions enough to constitute a one gigaton wedge. The problem is considerably more urgent than even Gore has warned.

While we do not have all the technologies or strategies we need to stabilize the climate, that does not mean we should not get started using what we have now. We should. But we must proceed from the recognition that many of the technologies we have today exist in nascent form and most are far more expensive than today's fossil fuels. Several, like solar and wind, are intermittent and far from cities and industrial centers, thus requiring costly storage and transmission

lines. Others, like carbon capture and storage, appear promising but have yet to be widely demonstrated.

Advocates of Kyoto-style regulation point out that when environmental (and other) regulations are established, industries quickly and cost-effectively adapt. This was the case with automobile-tailpipe emissions, smokestack scrubbers, and seat belts. To be sure, some actions to reduce carbon dioxide emissions, such as efficiency and conservation measures, will actually save companies money. But these steps, while important, will not result in the deep reductions that scientists estimate will be necessary to stabilize the climate. Indeed, the most-often cited study on the potential of energy efficiency and conservation to reduce carbon emissions, the Department of Energy's "Five-Labs Study," found that with the perfect implementation of both strong efficiency and conservation regulations, and a $50 per ton price for carbon (a price that far exceeds most proposals currently under consideration by the U.S. Congress), U.S. carbon emissions would be reduced at most by 22.5 percent, a far cry from the 80 percent reduction scientists say we need by 2050. Subsequent studies have offered somewhat more optimistic estimates of the potential of efficiency and conservation policies, but few place that potential at greater than 30 percent.

A post-Kyoto agreement should focus on making clean energy absolutely cheaper through major government investments.

To achieve deep reductions in global carbon emissions, regulatory approaches like Kyoto will need to make dirty energy sources like coal not a little bit more expensive, but a lot more expensive. Given the energy mix of most economies in the world, this means that these approaches, if they are faithfully implemented, will result in very substantial increases in overall energy prices. And therein lies the Gordian Knot created by the pollution regulation paradigm: increase energy prices too much and face a political backlash from individual consumers and industry alike as rising energy prices result in economic pain. But increase them too little and you'll make no significant impact on emissions. This is the reason EU efforts to reduce emissions have failed.

Yet policymakers are sticking to the old pollution control paradigm. The U.S. Senate is considering legislation to cap and auction greenhouse gas permits, thereby establishing a cost for polluting carbon, but it will face a hard climb—American politicians of both parties have little stomach for policies that will result in steep increases in energy prices. It is ironic that even staunch congressional advocates of policies to require deep reductions in U.S. carbon emissions simultaneously rail against high gasoline and energy prices.

The same conflict, albeit in even starker terms, is occurring globally. Since the early 1990s, China, India, and the rest of the developing world have made it amply clear that they will not agree to any treaty that would either increase energy prices or constrain their economic development. There is, therefore, little reason to believe that they will agree to significant steps to reduce their carbon emissions unless those actions are consistent with rapid economic development. So long as efforts to address the climate crisis continue to pit ecological action and economic development against one another, they are unlikely to succeed.

As a result of this bind, the world finds itself in a kind of prisoner's dilemma. Governments can either implement their Kyoto commitments, thereby raising domestic energy costs, putting domestic companies at a competitive disadvantage globally, slowing economic growth, and ultimately getting voted (or thrown) out of power by popular and industry resistance—or they can participate in global climate talks, exaggerate their token domestic efforts, and accuse other nations of doing too little. Most countries have chosen the latter.

Technology First

The time has come to abandon the church of Kyoto. Instead of making clean energy relatively cheaper by taxing carbon, a new, post-Kyoto agreement should focus on making clean energy absolutely cheaper through major government investments in technology and infrastructure. This kind of green Keynesianism has been promoted in the past, including by Al Gore himself in his 1990 book, *Earth in the Balance*, by Ross Gelbspan in his 1992 *Boiling Point,* and by Mark Hertsgaard in "A Global Green Deal" in *Time* in 2002. But it was absent from Al Gore's 2006 book, *An Inconvenient Truth,* and it is routinely derided as unnecessary by leading liberal and environmental groups such as the National Resources Defense Council and the Center for American Progress.

A new, tech-centered solution should be modeled on the creation of the European Steel and Coal Commission after World War II or the government-spurred Silicon Valley explosion of the 1950s. Indeed, one of the best American precedents comes from the creation of Silicon Valley, which was largely built on government investments in R&D, procurement, and contracting. In the 1950s, the Pentagon guaranteed the market for computer microchips, driving the cost of a single microchip down from $1,000 to $20 in less than a decade—a potential model for buying down the price of solar panels, another silicon-based technology. Other successes abound: The precursor to the Internet was literally invented in a Defense Department lab. And the federal government invested billions in the computer sciences, with amazing benefits worldwide.

What's needed now is a broad portfolio of governmental investments in research and development, demonstration, deployment, and procurement. At the international level, the G-8 and other wealthy nations should together invest between $100 billion to $250 billion annually in technology innovation and infrastructure, both in their own countries and in rapidly industrializing nations like China and India. Together, this new clean-energy bloc could drive the commercialization of cheap clean-energy technologies throughout the global economy. The United States led a similar effort after World War II, investing heavily in the production of cheap coal and steel to rebuild Europe, effectively creating billions of consumers wealthy enough to buy U.S. products and services.

In 2005, the G-8 countries invited five big developing nations—China, India, Brazil, Mexico, and South Africa—for a "G-8+5 Dialogue on climate change Clean Energy and Sustainable Development." Because neither the Bush Administration nor the EU put any serious money on the table for investment, the dialogue has resulted in little thus far. But all of that would change with a ten-year, $1 trillion commitment by the G-8. We must stop seeing the G-8+5 discussions as a sidebar to Kyoto and start seeing them as the main event.

The contours of a new technology-first agenda are already coming into view. The basic framework for such an approach should first of all focus on equalizing per capita carbon emissions over the next century at levels consistent with climate stabilization, rather than negotiating national emissions caps that start from vastly different baselines and reflect greatly varied levels of economic and population growth. It should focus on jointly investing in, advancing, and deploying clean-energy technology across the globe. And it should offer economic benefits to all parties, as Western nations become the investors in and designers of new low-carbon technologies, and developing nations become the producers and, increasingly, consumers of them.

The prospect of billions of new investments to manufacture solar panels, erect wind turbines, and build pipelines to siphon off and store carbon dioxide underground might be enough for China and India to agree to some emissions limits, a cap-and-trade, a cap-and-lease program (as proposed by John Irons in the Spring 2008 issue of *Democracy*), or even a carbon tax. But in creating a workable emissions-trading mechanism, we should learn from Kyoto's failures. History shows that successful markets typically get built from the ground up, not the top down, as Kyoto attempts to do. As energy experts Steve Rayner and Gwyn Prins point out in their landmark critique of Kyoto, *The Wrong Trousers*:

> Building national or regional emissions markets from the bottom up would also provide opportunities for learning from different approaches. Eventually such

> fragmented markets could, and would, become linked until such time as global trading is achieved. This is how all real and enduring markets have developed historically.

Establishing national and then regional markets, and trading a single pollutant, carbon dioxide, should be the first step toward any effort to create a global market for carbon. Once functioning, well-regulated markets have been created, they can then be merged into a global market. While this approach needn't absolutely exclude other nations, focusing on creating a workable treaty, and then a global carbon market, perhaps through the auspices of the World Trade Organization (WTO), among leading emitters would be the critical first step.

Just as importantly, a global carbon market must establish a price for carbon that is consistent, stable, and sustainable. A carbon price that is not high enough to drive rapid deployment of clean-energy technologies but that significantly raises energy prices and risks significant public backlash is the worst of both worlds. The price necessary to drive rapid and wholesale transition to clean-energy technologies is higher than most, if not all, democracies are likely to tolerate. Thus, rather than fighting an endless series of pitched, unsustainable political battles to increase carbon prices ever higher, we are much better served by accepting a lower price paired with very large direct public investments in technology to drive down the price of clean energy alternatives rapidly such that they are cost-competitive with a lower carbon price.

This is all the more true given that the challenge is not simply to reduce developed-world carbon emissions but to dramatically reduce global carbon emissions. As such, the explicit objective of climate policies in the developed world must not be simply to reduce our own carbon emissions but to rapidly drive down the cost of clean-energy technologies in real, deployed, unsubsidized terms such that they are cost competitive in developing economies, where there will likely be no price for carbon any time soon.

The Next Step

What will it take domestically to achieve this transformation globally? What is our next president to do?

First and foremost, the next president must put the opportunities of building the clean energy economy at the center of any proposal to address climate change, rather than casting them as ancillary benefits. Given rising economic anxieties and the relatively low priority that global warming remains with the public, a new agenda should be justified not so much as a response to climate change but rather as a way to achieve greater energy security by lowering the

price of clean energy through investments in technology and infrastructure—an extremely popular proposition for voters.

This is not to suggest that the presidential candidates should abandon cap-and-trade—far from it. Even a modest cap-and-trade or cap-and-lease program has the potential to raise the money needed. But such efforts must be re-conceptualized as a clean energy investment program, not a pollution-regulation regime. And the revenues they raise should be directed exclusively to technological advancement so that it does not spark a feeding frenzy by cash-starved programs, which are better funded through other sources of revenue.

If cap-and-trade cannot raise the $30 to $80 billion annually that energy experts say is needed, then the next president should seek other ways to raise the money. The presidential bully pulpit should allow the next president to win a modest carbon or electricity tax if the revenue were solely dedicated to bringing down the price of clean energy—a proposal voters say they are ready for. Moreover, in early 2008, leading energy executives privately told environmental leaders and others that they would not oppose such a tax if it were dedicated to clean-energy innovation.

Fortunately, both Democratic presidential candidates have announced ambitious clean-energy investment programs. Indeed, to the extent that either Democratic candidate has articulated a coherent theory of how to grow the economy (beyond bashing NAFTA, global trade, and Wall Street bankers), it has been through investing in clean tech and green jobs.

Internationally, the balance of power in global climate negotiations has already shifted from the Atlantic to the Pacific. Whatever shape future international action to address climate change takes will likely be determined largely by China, India, the United States, and Japan. A new American president, coming to the table with billions of dollars to push new energy technology to market, would create the opportunity to craft a very different kind of international agreement and would allow the United States to take the lead on negotiating a new technology and investment-centered climate accord.

As the next president takes office, he or she will be faced with a choice: Continue with the policy agenda of the last 15 years, one that offers an unpromising mix of bad politics, poor policy outcomes, and at best very modest and incremental progress on climate change. Or strike out boldly in a new direction—one that aligns America's economic aspirations with it ecological interests, invests directly in the energy technology we need rather than attempting to wag the energy technology dog with the pollution control tail. The choice should be clear. **D**