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Hearing on EPA's Greenhouse Gas Regulations and Their Effect on American Jobs
Subcommittee on Energy and Power
Committee on Energy and Commerce
United States House of Representatives
March 1, 2011

Mr. Chairman and Members of the Committee, thank you for the opportunity to testify. My name is Dan W. Reicher. I am Executive Director of the Steyer-Taylor Center for Energy Policy and Finance at Stanford University, a joint center of the Stanford Law School and Stanford Graduate School of Business, where I also hold faculty positions.

Prior to my post at Stanford, I was: Director of Climate Change and Energy Initiatives at Google where I helped lead the company's energy policy, investment and technology work; President of New Energy Capital, a private equity firm that invests in energy projects; Executive Vice President of Northern Power Systems, a venture capital-backed renewable energy company. Prior to my roles in the private sector I held a number of posts at the U.S. Department of Energy, including Assistant Secretary for Energy Efficiency and Renewable Energy and DOE Chief of Staff.

I would like to make two points today.

First, controlling U.S. carbon emissions – along with other policy and investment measures to address climate change and advance clean energy technology – is critical to our nation's economy, security, health, and environmental quality.

Second, experience over the last few decades makes clear that well designed environmental and energy regulation, far from being an economic drag, can spur U.S. innovation, enhance competitiveness, and cut costs.

Regarding the first point, we need a comprehensive commitment to low carbon/no carbon technologies that involves robust public and private R&D, significant and well-conceived finance mechanisms, reliable incentives and, yes, regulation. We can debate the relative merits of the various approaches to regulating carbon emissions – from new comprehensive climate and energy legislation to existing Clean Air Act regulation – but science tells us we need to act quickly and the vast global market

for clean energy technology tells us it is in our best economic and security interest to do so. Given the new make-up of Congress, we are unlikely to see the enactment of comprehensive climate and energy legislation. Therefore, EPA's current authority to regulate carbon emissions should be strongly supported, building on the agency's solid record of air regulation over the last four decades as well as the Supreme Court's 2007 decision upholding EPA's authority to control greenhouse gas emissions. Additionally, we should enact a national clean energy standard, building on clean energy mandates in scores of states.

Regarding the second point, experience since the 1970's – from air pollution controls to appliance efficiency standards to auto fuel economy rules – makes clear that well conceived and executed carbon regulation will not only stimulate technological innovation but can be implemented cost effectively and in many cases lead to actual decreases in the purchase, installation and operating costs of key technologies. Importantly, these controls can enhance U.S. economic competitiveness. Countries all over the world – from China to Germany to Japan – have committed to controlling carbon emissions through a variety of mechanisms and in doing so have grown a massive clean energy industry – measured in the trillions of dollars and millions of jobs – that was once led by the U.S. We can cede this market by turning back the clock on carbon controls and related energy policy and investment. Or we can seize the opportunity to lead the global clean energy industry and in the process create jobs, improve national security, and protect human health and the environment.

We must drive a strong domestic market for clean energy technology or, as history demonstrates for an array of technologies, we will lose the race internationally. To build a strong domestic market – whether it's in nuclear power or renewable energy or advanced coal technologies or natural gas – we need to do what our competitors are doing:

- Set nation-wide standards for clean energy deployment and energy efficiency improvements;
- Fund R&D aggressively;
- Provide targeted finance mechanisms for technology commercialization;
- Establish reliable incentives for manufacturing and deployment;
- Improve energy project permitting and siting processes; and
- Control carbon emissions

We need look no further than China to see the clean energy technology industry – largely invented and once dominated by the U.S. – slipping away: reactor by reactor, turbine by turbine, panel by panel. As we have dithered in our country in recent years in setting national energy and climate policy, China has been working aggressively to become the world's clean energy powerhouse. The Chinese have:

- Set standards for power companies to produce more clean electricity;

- Shut down more than 50,000 megawatts of old coal-fired power plants and a substantial amount of outdated heavy manufacturing capacity;
- Established a program to improve the efficiency of its top 1,000 most energy-consuming enterprises;
- Invested heavily in R&D;
- Provided incentives for homeowners to install solar panels and water heaters;
- Provided low cost financing for clean energy generating and manufacturing projects;
- Made major investments in the electricity grid; and
- Importantly, set a target to reduce carbon intensity 40-45% below 2005 levels by 2020. There are increasing indications that China will make these targets binding domestically in its next Five Year Plan, due out this month.

With this attention to innovation, investment, and policy – including increasing controls on carbon emissions – the Chinese are quickly becoming the dominant world player in clean energy technology. Consider:

- The Chinese are now the world's largest manufacturer of wind turbines, having vaulted past several EU nations and the US in this fast-growing clean energy technology business;
- The Chinese also recently leapfrogged the West as the world's largest manufacturer of solar panels, with six of the top ten global solar photovoltaic manufacturers now in China;
- The Chinese have 13 nuclear power plants operating today and 27 more under construction with the intention to raise the percentage of nuclear-generated electricity from 1% to 6% by 2020, and make dramatic increases beyond that point. Importantly, China is also becoming increasingly self-sufficient in reactor design and construction;
- The Chinese have plans for 140,000 megawatts of new hydropower capacity by 2015; and
- Major US companies have set up not only new clean energy technology manufacturing facilities in China, but increasingly are locating significant R&D facilities there. Thus the Applied Materials Corporation, based in Silicon Valley and the world's largest supplier of equipment for making semiconductors, flat-panel displays, and solar panels recently decided to build its newest and largest research lab in China.

Beyond China, other countries including Germany, Japan, South Korea, and Denmark are forging ahead with ambitious clean energy economic strategies and becoming top competitors in the vast emerging global marketplace for clean energy technology. Significantly, all of them are taking aggressive approaches to policy and investment. The work of these countries is critical in mitigating climate change, but their top motivation has been their own economic self-interest through the creation of vibrant new industries, significant new jobs, and growing international markets

in clean energy technologies and projects. In contrast, the U.S. has largely stayed on the sidelines, endlessly debating the need for and approach to a successful clean energy economic strategy.

That's the bad news from a US competitiveness, security, and environmental perspective. The good news is that we can and should regain our leadership in clean energy. As the President said in his 2010 State of the Union address, we should "not accept a future where the jobs and industries of tomorrow take root beyond our borders..." Among the solutions:

- Adopt a national clean energy standard, following the lead of many states that have set renewable energy and energy efficiency standards. I would note that during the 111th Congress, Congressman Barton (R-TX), and sixteen of his Republican colleagues, currently serving on the full Committee, supported an amendment to the American Clean Energy and Security Act that included a detailed clean energy standard;
- Increase our investment in energy R&D. The President's proposed 2012 budget is a good start with a one-third increase in overall investment in clean energy technologies compared to 2010. We should also avoid the major cuts in clean energy spending proposed in the 2011 House rescission package. And over time we should increase federal energy R&D budgets substantially;
- Support the DOE loan guarantee program that is proving pivotal in the deployment of clean energy technologies. The program is particularly important in financing U.S. projects that scale up clean energy technologies from initial pilot plants to first commercial facilities. This is the so-called "Valley of Death" where many energy technologies perish because of lack of capital, or their developers are compelled to go to other countries, like China, with more supportive financing mechanisms;
- Over time, replace the DOE loan guarantee program with a new Clean Energy Deployment Administration (CEDA) that was adopted last year by the full House and by the Senate Energy and Natural Resources Committee. Under the Senate legislation, CEDA would have a particular focus on Valley of Death projects, provide a broad array of financing mechanisms, enjoy an important degree of independence from DOE, and have the authority to take an equity stake in projects thereby reducing or eliminating the need for appropriations, following its initial capitalization;
- Extend federal tax credits that have been so vital in encouraging private sector financing of clean energy projects; and
- Most relevant to this hearing, the House should reject the proposal to withdraw EPA authority to regulate carbon emissions under the Clean Air Act. This authority was upheld by the Supreme Court in 2007 and as EPA Administrator Lisa Jackson said to this subcommittee just a few weeks ago, the pending House bill to withdraw EPA's authority to control carbon emissions would "depriv[e] American industry of investment certainty and new incentives for upgrading to advanced, clean energy technologies."

With regard to the current debate over EPA's authority, I believe it is inevitable that we will put strong controls on greenhouse gas emissions given the high costs of failing to act – from a loss of US market share in the massive clean energy sector to the rising cost and insecurity of importing foreign oil to devastation caused by increasing floods and droughts. The question of carbon regulation is not whether but when. And in this regard, there is a significant and increasing portion of the business community that seeks greater certainty and reliability regarding carbon controls, and supports a well-designed regulatory approach. As the CEO's of several major utilities said recently in the Wall Street Journal:

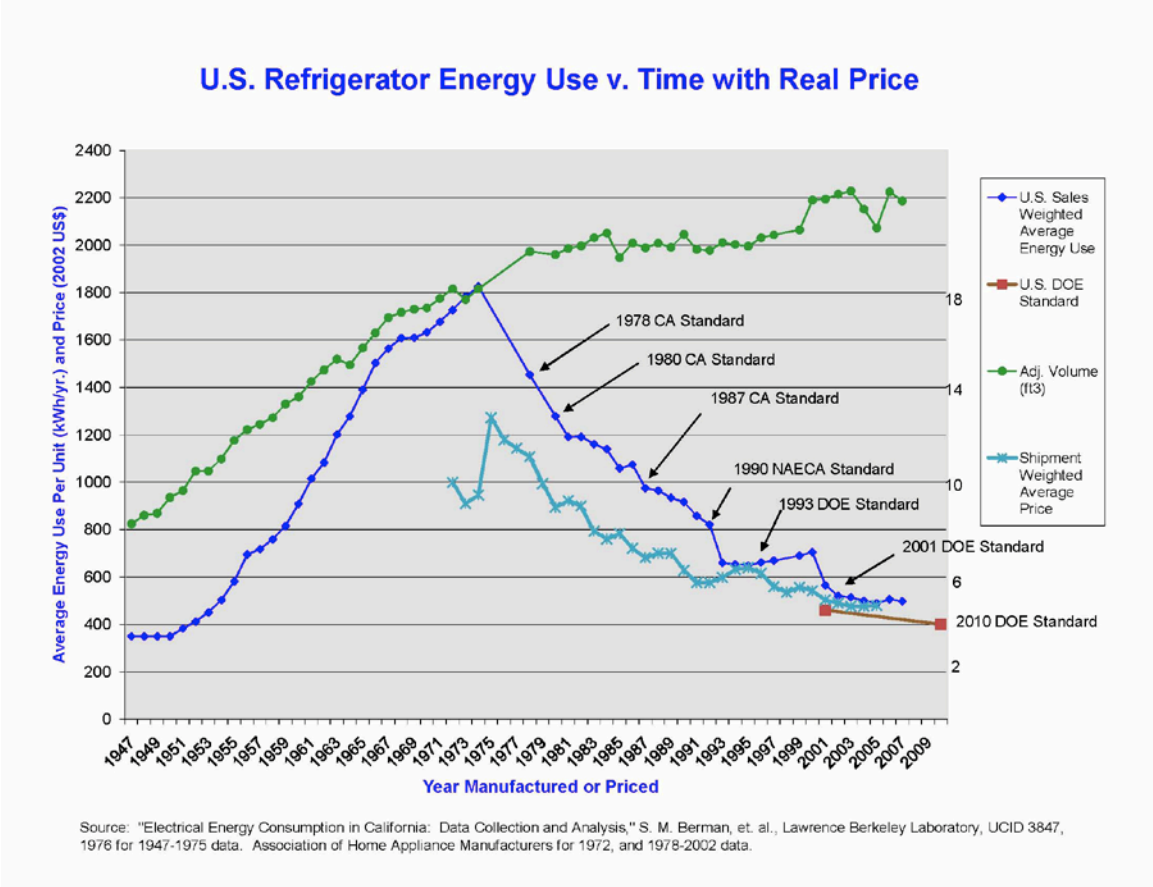
> *"Contrary to the claims that the EPA's agenda will have negative economic consequences, our companies' experience complying with air quality regulations demonstrates that regulations can yield important economic benefits, including job creation, while maintaining reliability. The time to make greater use of existing modern units and to further modernize our nation's generating fleet is now."*

Michael Porter, a top Harvard economist and an economic policy adviser to the George W. Bush campaign, has been a champion of the view that well-designed regulation can spur technological innovation and enhance competitiveness. According to the "Porter Hypothesis", strict environmental regulation can induce efficiency and encourage innovations that help improve commercial competitiveness. Regulation triggers the discovery and introduction of cleaner technologies and environmental improvements. This "innovation effect" makes both production processes and products more efficient and achieves savings sufficient to compensate for both the costs of complying with the new regulations as well as innovation expenses. And ultimately the investment returns from new markets for advanced technologies can make the cost-benefit ratio even more attractive.

The "Porter Hypothesis" enjoys strong support across the spectrum of environmental and energy regulation. With regard to clean air regulation, study after study demonstrates that substantial public health and environmental benefits have resulted from reductions in air pollution achieved under the 1990 Clean Air Act Amendments and, importantly, the cost of achieving these benefits was a fraction of industry forecasts, and significantly below even EPA's own projections. The dire cost predictions in 1990 overlooked the power of U.S. innovation unleashed by the goals of the Clean Air Act Amendments and the market-based system Congress established to achieve them. Thus in 1990, power companies predicted that reducing sulfur dioxide to address the acid rain problem would cost $1000-$1500 per ton and electricity prices would increase in many states. In fact, the actual pollution reduction cost has been between $100 and $200 per ton for most of the program, and electricity prices fell in most states.

With regard to energy efficiency regulation, the lowly refrigerator demonstrates again what smart regulation can achieve. As a result of a series of state and federal

standards – issued by both Democrat and Republican Administrations – a typical refrigerator today uses roughly a quarter of the electricity that it did in the 1970's, holds significantly more food, no longer has to be manually defrosted, and actually costs less in real terms. The refrigerator story – repeated in several other appliances over the last few decades – demonstrates that smart policy can not only harvest the "low hanging fruit" of technological innovation but grow it as well as new more rigorous standards drive further breakthroughs. And importantly, the refrigerator story also shows that smart regulation can actually cut purchase and operating costs significantly. The chart below tells the story I like to call *"Building a Fridge to the 21st Century".*



Source: "Electrical Energy Consumption in California: Data Collection and Analysis," S. M. Berman, et. al., Lawrence Berkeley Laboratory, UCID 3847, 1976 for 1947-1975 data. Association of Home Appliance Manufacturers for 1972, and 1978-2002 data.

With regard to automobile fuel economy, in early 2009 the Administration reached an agreement with the auto industry that will result in a single national program for fuel economy and greenhouse gas emissions. Under the agreement, the Department of Transportation and EPA promulgated 2012 to 2016 model year fuel economy and greenhouse gas standards that not only align with one another, but are deemed to comply with California and other state standards. This program, which has broad support from industry, states and environmental groups, will increase average fuel economy levels in new passenger vehicles to 35.5 miles per gallon, save consumers

roughly $3000 over the life of a vehicle, and drive fuel consumption in new vehicles down by 30% from 2012 to 2016.

On a global scale, the International Energy Agency (IEA) in its 2010 World Energy Outlook concluded that aggressive reductions in carbon emissions from transportation sources, by stimulating fuel ecconomy improvements, would significantly lower oil demand and decrease oil prices. Under the IEA scenario, global oil prices would be $90 per barrel in 2035 and U.S. oil imports would drop from more than 10 million barrels per day in 2009 to less than 6 million barrels per day in 2035. This level of oil imports, last seen in the mid-1980's, would provide a profound boost to U.S. energy security by making us far less vulnerable to oil price shocks from global events like those occurring today in the Middle East as well as from natural and man-made disasters.

Finally, a recent report, "Driving Growth: How Clean Cars and Climate Policy Can Create Jobs," by the Center for American Progress, United Auto Workers, and the Natural Resources Defense Council, found that strengthening auto fuel economy standards could produce significant investment and innovation in fuel efficiency technology and create tens of thousands of jobs in the process.

These examples of smart regulation point to the high likelihood that EPA will implement carbon controls in a manner – consistent with the "Porter Hypothesis" – that will stimulate technological innovation, increase U.S. competitiveness, and produce cost savings sufficient to compensate for both the compliance and innovation costs. I would also note that the several provisions of the Clean Air Act that EPA would use to cut carbon emissions explicitly require the agency to *prove* that any pollution standard it sets is technically feasible *and economically reasonable.*

Wrapping up, I spent the last four years at Google helping to develop and implement the company's approach to energy policy, investment and technology. Coming from the energy sector, I was struck at Google by how innovation, investment and policy came together so effectively to build an entirely new industry – the Internet – that has fundamentally transformed life as we know it and created vast numbers of good paying U.S. jobs. The federal government had a large role in the creation of the Internet, providing early R&D support and becoming one of its initial users. Critical policy decisions by Congress, a series of Democratic and Republican Administrations, and regulatory bodies like the FCC, set smart rules of the road for development and use of the technology. Trade policy has helped ensure opportunities for U.S. companies in advancing the Internet across the globe. And I would be remiss if I didn't mention the role the Internet is playing – literally as we speak –in recent efforts to bring democratic government to key countries in the Middle East.

We must take a similarly coordinated approach between the private sector and the U.S. government in order to seize the opportunities in clean energy technology. We

face declining federal R&D funding, unreliable incentives, inadequate financing mechanisms, a lack of priority in U.S. trade policy, and unknown direction when it comes to carbon controls. Arguably, cooperation between industry and government is even more critical in clean energy technology than the development of the Internet as the stakes are higher in terms of our nation's security, competitiveness, health, and environment.

We tend to measure progress in information technology in months or years. In contrast, we measure progress in energy technology in decades. If we don't get our act together between our government and the private sector, other countries, like China and Germany, that are taking the long view when it comes to energy technology, will be the winners of this marathon. A prize worth trillions of dollars and millions of jobs hangs in the balance – to say nothing of the future of our planet.

Thank you for the opportunity to testify. I look forward to your questions.