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Thank you, Chairman Bingaman, Ranking Member Bunning and distinguished members of this Committee for the privilege of contributing to your discussion this afternoon. My name is Kevin Book and I lead the research team at ClearView Energy Partners, LLC, a research and consulting firm that serves institutional and corporate strategic investors in energy and natural resources.

A CHALLENGING ENVIRONMENT FOR CLEAN TECHNOLOGY AND GREEN ENERGY FINANCING

In December 2007, as the U.S. economy was collapsing into the downturn that has come to be known as the "Great Recession", clean technology and renewable electricity investments were surging ahead. At the time, I covered alternative energy as a research analyst at an investment bank, and I can distinctly recall the strong, negative reactions I received from financial investors when a colleague and I published an ambivalent assessment of solar power market potential. Our concern at the time seems almost trivial today, given the massive dislocations that subsequently confronted global manufacturers of every kind. We believed that rapidly expanding manufacturing capacity, much of it in China, was likely to outstrip demand in the primary markets for solar power. Even this humble assertion seemed overly pessimistic to many investors, and they had plenty of reasons for optimism: many industrialized countries appeared to offer at least one of three basic types of "clean" and "green" power demand:

- **Fundamental demand** that reflected high power prices due to resource scarcity, population growth, industrialization or limited electric generating potential;

- **Legislative demand** that derived from renewable energy mandates and/or carbon surcharges;

- **Financial demand** generated by government programs in many OECD nations – especially Germany, Spain and Japan – that paid generous "feed-in tariffs", or per-kilowatt-hour premiums, to the financial sponsors of alternative power projects.

Here in the U.S., fundamental demand was mixed. Solar demand was weak, because "grid parity", or the cost of power generation at which a solar power investment would deliver electricity at the same price as the electrical grid – appeared to be about 4-6 years away, outside of a few isolated markets. By contrast, many wind power projects were in the money thanks to manufacturing efficiencies that had lowered equipment costs, technology improvements that had improved generation yields and high natural gas prices that had made wind projects more competitive.

U.S. legislative demand was a growing factor in clean and green prospects. A carbon surcharge that could close the generation cost gap between clean and conventional sources appeared to be several years away, but state-level renewable portfolio standards (RPS) contributed to a growing alternative power demand, primarily for wind projects, but also for solar installations within states where RPS created solar "set-asides".

The biggest driver of U.S. clean and green demand, however, came from financial investors who funded wind, solar and geothermal projects by paying project developers for "tax equity", the stream of income-shielding state and federal tax credits generated by the projects. At the end of 2007, some of my clients anticipated that investor appetite for clean energy tax equity might be as large as $7-9 billion in 2009. Investor confidence probably reflected the still-rising prices of conventional fuels and many investors' optimism that the daunting 3Q 2007 spike in subprime mortgage defaults would remain "contained" as the global economy continued to prosper. My clients' primary concern regarding green and clean sources was that Congress might fail to reauthorize the production tax credits (PTCs) and investment tax credits (ITCs) due to expire at the end of 2008.

They would soon have much bigger worries.

As this Committee well knows, the PTCs and ITCs were expanded and extended on October 3, 2008 within the Emergency Economic Stabilization Act of 2008, the same legislation that created the Troubled Asset Relief Program (TARP). This was cold comfort to clean technology manufacturers and their investors, however, because the once-profitable financial institutions that held the once-untroubled assets that TARP was designed to "relieve" also represented a large portion of alternative power tax equity demand. Troubled assets meant losses, and losses meant that financial sponsors had neither the working capital with which to sponsor projects, nor profits that required tax shelters.

Not only had financial demand dried up, but fundamental energy demand had also weakened substantially: U.S. electric power consumption declined by about 1.15% in 2008 and fell by another 3.76% in 2009, a two-year contraction without precedent since the beginning of EIA recordkeeping in 1949. A speculator-led sell-off in energy commodities during late 2008 gave way to an even starker reality at the beginning of 2009: manufacturers and shippers were using less and less energy as retailers sold off their inventories, layoffs decreased transportation fuels demand and residential and commercial foreclosures diminished building energy needs.

Weak demand fundamentals hurt alternative power producers in two ways. First, less demand for a commodity means less demand for all producers of that commodity, clean and conventional alike. Second, the combination of prolific, low-cost shale gas discoveries and collapsing end-user demand led to bargain-basement generation costs for natural gas-fired power plants, undermining the economic case for many clean and green sources.

GREEN CONSUMERS, GREEN PRODUCERS AND GREEN PROTECTIONISM

The February 13, 2009 American Recovery and Reinvestment Act (ARRA) created two mechanisms intended to preserve clean tech investment: the "Section 1603" Program, which makes payments for specified energy property in lieu of ITCs and PTCs; and the Advanced Energy Manufacturing Tax Credit (or "48C" program), which pays 30% tax credits to new, expanded, or re-equipped domestic manufacturing facilities of clean energy infrastructure, and for which Congress authorized and appropriated $2.3 billion.

The two credits differ markedly in nature and structure:

- Whereas the Section 1603 grants allow clean energy project developers to fund their projects in the absence of financial-sector demand for tax equity, 48C credits provide credits to clean technology manufacturers.

- Section 1603 grants continue the U.S. policy of subsidizing clean and green consumption that dates back to the PTC created by the Energy Policy Act of 1992 (and even further, to the energy ITC that preceded it), while 48C credits encourage U.S. manufacturers to build, expand or retrofit for clean and green production capacity.

- Section 1603 grant recipients can source technology without country-of-origin restrictions, but the 48C credit is awarded exclusively for manufacturing facilities located within the U.S.

The 48C credit includes several innovative features that distinguish it from the Section 1603 program:

- A broad universe of potentially-qualifying projects: in addition to facilities that manufacture renewable energy technologies, the 48C credit applies to energy storage; transmission projects to support renewable energy infrastructure; renewable fuel refining/blending; energy conservation; plug-in vehicles; carbon capture and storage and "other property designed to reduce greenhouse gas (GHG) emissions".

- Spending limits defined by the Congressional authorization and appropriation process, rather than a "blank check".

- A "use it or lose it" provision that requires funds to be spent within four years.

Figure 1 presents summary data regarding the Section 1603 program outlays through March 15, 2010.

Figure 1 – Section 1603 Grants in Lieu of Tax Credit, As of March 15, 2010, by Technology Type

Technology	Amount	%
Biomass	$63,394,826	1.80%
Combined Heat and Power	$2,960,227	0.08%
Fuel Cell	$2,770,235	0.08%
Geothermal	$154,693,463	4.40%
Hydropower	$2,678,644	0.08%
Landfill	$15,592,966	0.44%
Open Loop Biomass	$30,836,200	0.88%
Small Wind	$723,272	0.02%
Solar (All Types)	$182,001,522	5.18%
Wind	$3,057,159,898	87.03%
Total	$3,512,811,253	

Source: ClearView Energy Partners, LLC, using data from U.S. Treasury

Figure 2 presents summary data regarding tax credits approved under the 48C program.

Figure 2 – Section 48C Credit Requests, by Technology Type (to the Extent Specified by Requestors' Voluntary Responses to DOE Survey)

Technology	Amount	%
Battery	$29,360,400	1.28%
Biomass	$29,304,480	1.27%
Buildings	$147,339,742	6.41%
CCS	$4,842,438	0.21%
Fuel Cell	$5,510,100	0.24%
Geothermal	$9,054,126	0.39%
Hydropower	$4,053,733	0.18%
Industrial	$168,655,585	7.33%
Smart Grid	$73,800,000	3.21%
Solar (all)	$1,092,546,921	47.50%
Vehicles	$196,790,145	8.56%
Wind (all)	$289,609,000	12.59%
Not Specified in DOE Survey	$249,133,331	10.83%
Total	$2,300,000,001	

Source: ClearView Energy Partners, LLC, using data from U.S. Department of Energy

The ambitious premise of the 48C program – to help the United States re-tool to become a competitive manufacturer, and perhaps a competitive exporter, of clean energy technologies – offers an appealing prospect during the current employment slump. Building capacity to satisfy either internal or export demand for clean technology would represent an impressive expansion of U.S. manufacturing capabilities. Moreover, it is easy to understand why a policy intended to create jobs would require manufacturing capacity to be built within U.S. borders. Practically speaking, the fastest way to bring U.S. capabilities up to the level of foreign competitors may be to bring those companies, their business practices and their technologies here to the U.S. in the hope of promoting knowledge capital diffusion into the U.S. workforce. Figure 3 suggests that the 48C program could contribute to such a result: 33% of the 48C projects approved for credits are subsidiaries or affiliates of foreign-domiciled corporate parents, many of them global leaders in clean tech manufacturing.

Figure 3 – 33% of Surveyed Projects, or $761.5 MM in 48C Tax Credits, Went to U.S. Affiliates or Subsidiaries of Foreign Corporations (Showing Top 25)

Rank	Company	$ Requested, by Company	% of Total	Parent or Affiliate Corporate HQ
1	REC Silicon	$154,896,429	6.73%	Norway
2	Volkswagen Group of America Chattanooga Operations LLC	$150,000,000	6.52%	Germany
3	Hemlock Semiconductor Corp.	$141,870,000	6.17%	USA
4	Wacker Polysilicon North America LLC	$128,482,287	5.59%	Germany
5	UTC Power Corp.	$115,700,100	5.03%	USA
6	Miasole	$101,800,200	4.43%	USA
7	General Electric Company	$89,849,798	3.91%	USA
8	SolarWorld Industries America Inc	$82,200,000	3.57%	Germany
9	Alstom Inc.and Subsidiaries	$65,725,800	2.86%	France
10	E.I. du Pont de Nemours and Co.	$65,265,000	2.84%	USA
11	Vestas	$51,769,800	2.25%	Denmark
12	CaliSolar, Inc.	$51,563,980	2.24%	USA
13	Texas Instruments Incorporated	$51,450,000	2.24%	USA
14	AE Polysilicon	$44,850,000	1.95%	USA
15	Nanosolar	$43,453,309	1.89%	USA
16	Cree Inc.	$39,087,000	1.70%	USA
17	Stion Corporation	$37,500,000	1.63%	USA
18	Siemens Industry, Inc.	$36,110,979	1.57%	Germany
19	Xunlight Corporation	$34,500,000	1.50%	USA
20	SCHOTT Solar, Inc.	$33,000,000	1.43%	Germany
21	SAGE Electrochromics, Inc.	$31,500,000	1.37%	USA
22	Gamesa	$30,946,582	1.35%	Spain
23	ZF Steering Systems, LLC	$28,560,000	1.24%	USA
24	Novozymes Blair, Inc.	$28,401,000	1.23%	Denmark
25	Dow Corning - Solar Silane	$27,300,000	1.19%	USA

Source: ClearView Energy Partners, LLC, using DOE and corporate data

It is less clear, however, that abandoning origin-agnostic, consumption-oriented policies for some measure of "green protectionism" will achieve the broader goal of sustained economic growth. U.S. clean technologies will not win market share at home or abroad until they can compete on a price basis with technologies produced overseas. Nor is it clear that the U.S. is naturally well-positioned to compete in every corner of the international clean tech market. According to DOE data, solar technologies accounted for approximately 47.5% of 48C credits approved, a surprising statistic for a country responsible for less than 5% of global photovoltaic production in 2009, as presented in Figure 4.

Figure 4 – 2009 Global PV Manufacturing Share, Major Manufacturers

Country	Share of 2009 PV Manufacturing
China	31.68%
Germany	17.37%
Japan	16.02%
Taiwan	13.27%
Malaysia	8.87%
USA	4.87%
Philippines	4.49%
Netherlands	0.90%
Spain	0.79%
Belgium	0.61%
India	0.57%
France	0.55%

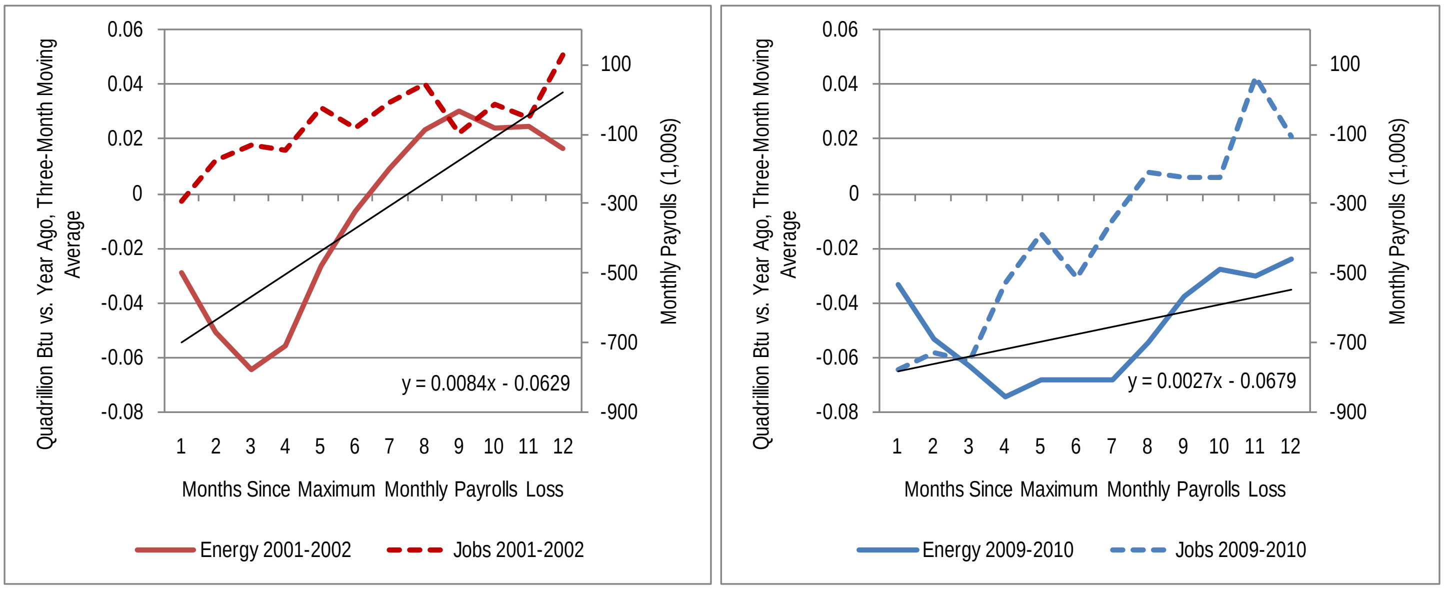
Source: ClearView Energy Partners, LLC, using Photon Magazine *data*

Michael E. Porter, head of Harvard Business School's Institute for Strategy and Competitiveness, in his seminal 1990 work *The Competitive Advantage of Nations,* highlighted four key factors that contribute to an industry's international competitiveness. Loosely paraphrased, these are: innate and acquired factor cost advantages; the presence of "related and supporting" industries; competition between firms; and robust domestic demand.

The U.S. is unlikely ever to enjoy lower factor costs than China. Nor is it clear that domestic demand will prove sufficient to create an internationally competitive solar sector comparable to those driven by energy security and power price pressures in Japan and Germany. Even more vexingly, on a fundamental basis, U.S. energy demand remains weak, even as growing employment rolls reinforce early indications of economic recovery.

Figure 5 compares the energy intensity of the 2001-2002 U.S. jobs recovery to the 2009-2010 jobs recovery. Over comparable periods, the slope of the current recovery is considerably flatter than the last one (243 billion Btu vs. year-ago per 1,000 jobs recovered then, compared to 68 B Btu/1,000 jobs now).

Figure 5 – Year-on-Year Change in Monthly Demand, 3-Month Moving Average, vs. Nonfarm Payrolls Changes, 2001-2 and 2009-10



Source: ClearView Energy Partners, LLC using data from EIA and BLS

On a legislative demand basis, it remains unclear whether efforts aimed at putting a price on carbon or establishing a national renewable electricity standard will succeed this year. Similarly, the possible lapse of the Section 1603 program at year-end could substantially diminish U.S. clean energy demand from financial investors. Absent fundamental, legislative or financial demand, clean technology producers spurred by stimulus monies to increase domestic manufacturing capacity could face the unpleasant prospect of a 2011 supply glut. It may not make sense to expand 48C funding without corresponding expansions in domestic demand.

That said, there may be other sources of domestic demand, especially technologies that capture, sequester or reduce energy-sector GHG emissions. Last week, the U.S. Environmental Protection Agency released its final "Tailoring Rule", establishing a phased-in regulation of GHG emissions from stationary sources that will begin on January 2, 2011. Future 48C allocations could play a significant role in establishing the U.S., a nation where 44% of electric power came from coal-fired plants in 2009, as a global leader in post-combustion retrofit technologies.

HOW TO COMBAT EQUITY SUBSIDY FATIGUE: GIVE DEBT SUBSIDIES TO DEVELOPERS

The downside of demand subsidies for clean tech generally boils down to government discomfort with the cost of funding them, a phenomenon our firm refers to as "equity subsidy fatigue". Although extraordinary economic events like the Great Recession may temporarily blunt public opposition to extraordinary stimulus programs, cash or cash-equivalent payments to project sponsors typically must come either from ratepayers' pockets or government treasuries. Several of the OECD governments that encouraged clean tech demand through generous subsidies (Spain and Germany especially) discovered that feed-in-tariffs for renewable power worked too well and imposed unanticipated costs. Ultimately, financial investors weren't buying solar or wind capacity; they were generating rates of return in excess of those available through investment-grade corporate bonds and other low-risk fixed-income instruments, and the clean power was a just a byproduct of their investments.

Debt subsidies like loan guarantees may encourage clean and green demand while minimizing equity subsidy fatigue. Figure 6 applies different subsidy mechanisms to a hypothetical 1 kilowatt (kW) wind project. At $2,000 per kW of installed capacity, a 33% capacity factor, a 12% cost of debt, ten-year financing life, 80:20 debt-to-equity split and 20-year useful life, the project would incur "levelized" (amortized) fixed generation costs of approximately 5.93 cents per kilowatt-hour (kWh).

Figure 6 – Theoretical Subsidy Impacts on Generation Cost Impacts and Project Benefits per Taxpayer Outlay, at 100% of Tax Equity Value

Scenario	Base Case		PTC over ten years		30% ITC paid in Year 1		30% Grant in Year 0		Loan Guarantee 10% default rate	
Present Value (PV) or Value			($350.68)		($532.86)		($600.00)		($699.36)	
How Modeled			Subtract PV from Capital Cost		Subtract PV from Capital Cost		Subtract PV from Capital Cost		Lower Interest Rate	
Effective Capital Cost	$2,000	per kW	$1,649	per kW	$1,467	per kW	$1,400	per kW	$2,000	per kW
Capacity Factor	33%		33%		33%		33%		33%	
Useful Life	20	years	20	years	20	years	20	years	20	years
Financing Life	10	years	10	years	10	years	10	years	10	years
Debt	80.00%	of project	80.00%	of project	80.00%	of project	80.00%	of project	80.00%	of project
Cost of Debt	12.00%	APR, monthly	12.00%	APR, monthly	12.00%	APR, monthly	12.00%	APR, monthly	5.00%	APR, monthly
Interest Costs	$1,127	nominal	$930	nominal	$827	nominal	$789	nominal	$428	nominal
Equity	20.00%	of project	20.00%	of project	20.00%	of project	20.00%	of project	20.00%	of project
Cost of Equity	15.00%	hurdle rate	15.00%	hurdle rate	15.00%	hurdle rate	15.00%	hurdle rate	15.00%	hurdle rate
Equity Costs	$300	levelized	$247	levelized	$220	levelized	$210	levelized	$300	levelized
Discount rate (WACC)	12.600%		12.600%		12.600%		12.600%		7.000%	
Total Cost	$3,427	per kW	$2,826	per kW	$2,514	per kW	$2,399	per kW	$2,728	per kW
Total Hours	57,816	hours	57,816	hours	57,816	hours	57,816	hours	57,816	hours
Levelized Fixed Cost	$0.0593	per kWh	$0.0489	per kWh	$0.0435	per kWh	$0.0415	per kWh	$0.0472	per kWh
Savings			$0.0104	per kWh	$0.0158	per kWh	$0.0178	per kWh	$0.0121	per kWh
Taxpayer Cost			$0.0220	per kWh	$0.0104	per kWh	$0.0104	per kWh	$0.0028	per kWh
Fixed Cost Benefit per Taxpayer Cost			-- 53%		52%		71%		337%	

Source: ClearView Energy Partners, LLC

If our theoretical wind project developer did not have any tax liability, but he could sell 100% of his 10-year stream of Section 45 PTCs of 2.20 cents per kWh, Figure 6 suggests that the present value of that sale (excluding transaction costs) would reduce his levelized generation costs by about 1.04 cents per kWh. Taking a 30% ITC, paid at the end of Year 1, would reduce generation cost by 1.58 cents per kWh. A 30% cash grant, paid immediately, would reduce generation costs by 1.78 cents per kWh. Alternatively, a loan guarantee that lowered the developer's borrowing costs from 12% to 5% would reduce generation costs by 1.21 cents per kWh, a modest improvement relative to reductions achieved through equity subsidies, but an approximate savings of about 26.6% from the theoretical base case, nonetheless.

But what must taxpayers give up in return? In the case of our theoretical PTC, taxpayers would give up 2.2 cents for every 1.04 cents the developer would save, a loss of 53%. The 30% ITC and 30% grant would return 51% and 71% respectively in developer benefit per taxpayer dollar spent. Assuming a 10% loan default rate, the loan guarantee would theoretically return 337% in developer benefit per taxpayer dollar spent.

Debt subsidies may be a more appropriate mechanism for encouraging long-term clean and green demand for another reason: equity payments like investment tax credits have a tendency to flow directly through to sellers, but lower debt costs tend to give market power to project developers. In a world where manufacturers receive 48C credits, it makes sense to balance incentives on the demand side with incentives on the supply side, rather than paying the supply side twice.

Figure 7 highlights the capital intensity of renewable generation. Capital costs account for only about 27-39% of natural gas power generation costs, but they account for about 80-95% of nuclear, wind and solar power generation cost. In other words, green and clean project valuations are likely to be highly interest-rate dependent, making debt subsidies a powerful lever to encourage demand.

Figure 7 – EIA AEO2010 Projections of 2016 Levelized Generation Cost and Capital Cost as a Percentage of Total, by Fuel and Technology

Plant Type	Capacity Factor	Levelized Capital Cost	Fixed O&M	Variable O&M including Fuel	Transmission Investment	Total System Levelized Cost	Capital Cost as % of Total Levelized Cost
Conventional Coal	85%	$0.0692	$0.0038	$0.0239	$0.0036	$0.1004	68.9%
Advanced Coal	85%	$0.0812	$0.0053	$0.0204	$0.0036	$0.1105	73.5%
Advanced Coal with CCS	85%	$0.0926	$0.0063	$0.0264	$0.0039	$0.1293	71.6%
Natural Gas: Conventional Combined Cycle	87%	$0.0229	$0.0017	$0.0549	$0.0036	$0.0831	27.6%
Natural Gas: Advanced Combined Cycle	87%	$0.0224	$0.0016	$0.0517	$0.0036	$0.0793	28.2%
Natural Gas: Advanced CC with CCS	87%	$0.0438	$0.0027	$0.0630	$0.0038	$0.1133	38.7%
Conventional Combustion Turbine	30%	$0.0411	$0.0047	$0.0829	$0.0108	$0.1395	29.5%
Natural Gas: Advanced Combustion Turbine	30%	$0.0385	$0.0041	$0.0700	$0.0108	$0.1235	31.2%
Advanced Nuclear	90%	$0.0949	$0.0117	$0.0094	$0.0030	$0.1190	79.7%
Wind	34%	$0.1305	$0.0104	$0.0000	$0.0084	$0.1493	87.4%
Wind – Offshore	39%	$0.1599	$0.0238	$0.0000	$0.0074	$0.1911	83.7%
Solar PV	22%	$0.3768	$0.0064	$0.0000	$0.0130	$0.3961	95.1%
Solar Thermal	31%	$0.2244	$0.0218	$0.0000	$0.0104	$0.2566	87.5%
Geothermal	90%	$0.0880	$0.0229	$0.0000	$0.0048	$0.1157	76.1%
Biomass	83%	$0.0733	$0.0091	$0.0249	$0.0038	$0.1110	66.0%
Hydro	51%	$0.1037	$0.0035	$0.0071	$0.0057	$0.1199	86.5%

Source: ClearView Energy Partners, LLC using EIA projections

CONCLUSION

Extending and expanding the 48C program seems reasonable as long as fundamental, legislative or financial demand exists to absorb the new supply, and particularly if the next round of funding unlocks innovative investments for which significant domestic demand may soon exist, like technologies that improve the GHG efficiency of fossil energy sources.

Proposals to retroactively allocate an additional $1.5 billion of new money to fund original applicants for 48C projects may not represent the best investment strategy, however. The sluggish nature of the 2009-2010 energy demand recovery suggests that new dollars might best be directed at new applications and new award considerations informed by new energy-use patterns and new commodity price expectations.

Similarly, it is not clear that any proposals to rescind existing benefits for fossil energy as a means of financing new 48C outlays will be consistent with the goals of creating jobs or improving global competitiveness. The U.S. remains 85% fossil-fueled, which means that taxing fossil energy will result in higher energy prices, potentially increasing the cost of clean technology manufacturing along with every other industrial sector. And even though higher U.S. fossil energy prices could make clean tech investments seem more attractive here at home, they are unlikely to augment the U.S. share of the global clean tech export market.

Mr. Chairman, this concludes my prepared testimony. I will look forward to any questions at the appropriate time.