Testimony of Thomas Werner at the Senate Committee on Commerce, Science, and Transportation Subcommittee on Technology, Innovation, and Competitiveness on "Alternative Energy Technologies."

Wednesday, June 14, 2006, 10:00 AM – Dirksen Senate Office Building 562

Thomas Werner, Chief Executive Officer, SunPower Corporation

"With strong policy leadership, solar power is poised to become a mainstream energy resource for the United States within a decade." – *Tom Werner, CEO SunPower Corp*.

The Solar Market has hit Commercial Scale and Growing Rapidly

- For the last 25 years, the global market has been growing at > 20%/yr CAGR.
- Since 2000, the global market has been growing at > 40% /yr CAGR.
- Drivers: solar is pollution-free, fuel-risk free, domestic, secure, peaking power.
- Installed 1500 MW globally generating $10 billion in revenue in 2005.

30 Years of Data Show Greater Scale Yields Lower Manufacturing Costs

- Global market entered commercial scale manufacturing around 2000.
- 2002 NREL study predicted cost parity with retail electric rates 2010-2015.

Japan Has Achieved a Market-Based Solar Industry

- Last year, Japan completed its federal residential solar program.
- Japan's residential market now operates without federal incentives.
- Consistent policy creates private investment which drives costs down.

Private Investment is Driving Technology Advances and Company Scale

- Cypress Semiconductor invested $150 million since 2002 in SunPower.
- SunPower went public on NASDAQ last year and has tripled capacity.
- SunPower makes the most efficient solar cells commercially available.

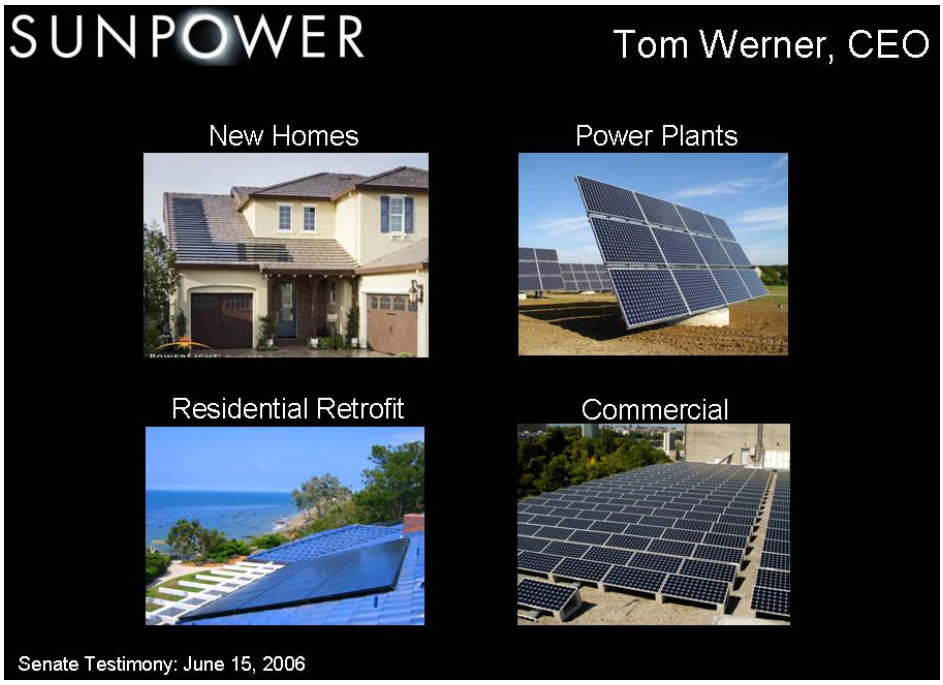
"The solar power industry will reach grid parity with incremental improvements in engineering and business processes. We do not need new breakthroughs in the science of sunlight conversion to power to achieve mass-market adoption of solar. We do need to improve the packaging of solar cell into solar panels, a task SunPower is working on under a DOE contract, and we need to radically improve the customer's buying experience. We appreciate President Bush's interest and support of our industry, in the form of the Solar America Initiative, and strongly endorse extension of the solar investment tax credit." – *Tom Werner*.

Thank you Chairman Ensign, Ranking Member Kerry and Members of the Subcommittee. I am honored to have the opportunity to discuss the rapid growth of the solar power industry. With strong policy leadership, solar power is poised to become a mainstream energy resource for the United States within a decade.

As an example of the current pace of the solar industry, consider my company, SunPower Corporation. We are the fastest growing U.S.-based, publicly-traded technology company in terms of revenue growth over the last 5 quarters.

We design and manufacture the world's most efficient solar power cells and panels commercially available. Our solar technology is up to 50% more efficient than conventional technology, meaning that our customers get up to 50% more power than conventional technology per unit area. As shown on slide 1, SunPower solar is used in a wide variety of applications, from suburban rooftops in New Jersey and Japan, to the roof of Microsoft's Silicon Valley campus, to solar power plants in Germany and Spain.

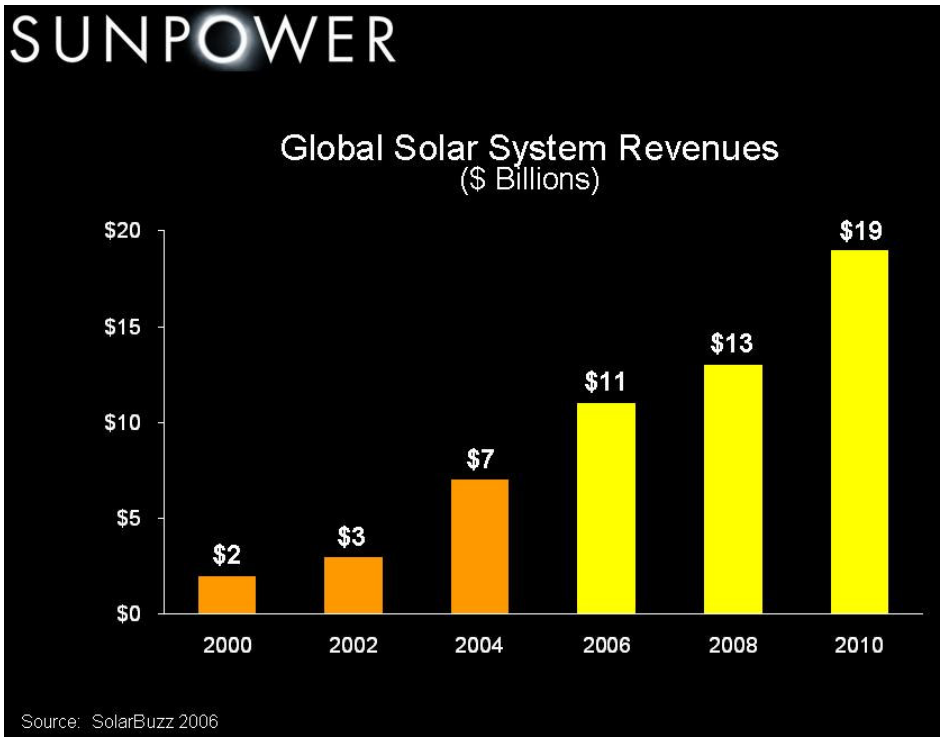
Slide 1: SunPower Solar Power Applications



Our growth is tied to the overall development of the global solar market. Most of our solar panels are shipped to Europe and Asia, the location of the most advanced solar markets, while about a quarter of our panels will go to U.S. markets this year. The irony is that the world's two biggest solar markets, Germany and Japan, have far inferior sunlight as compared to most of the U.S.

For the last 25 years, the global solar market has been growing consistently and admirably at a compound annual growth rate in excess of 20 percent. However, since 2000, the global solar market has exploded, growing a compound rate of over 40% annually. This very impressive growth started from a small base. In 2005, the about 1500 megawatts of new solar power were installed, the size of three new natural gas-fired power plants. This translates to about $10 billion in revenue for the industry, a figure expected to double by 2010, as shown in slide 2. To put this in context, 2005 global solar revenues were comparable to those at Pacific Gas and Electric Company, and ExxonMobil's were 36 times higher.

Slide 2: Global Solar System Revenues by Year



Driving the growth of the solar market are three long-term trends: the persistent decline in the price of solar power technology, the increasing cost of fossil fuels that results in increases in electric retail power rates, and policy-makers' focus in increasing the diversity and lowering the risk of our electric power resource mix.

Solar has features that are particularly valuable to energy policy-makers. First, because solar is a peaking power resource that generates best when the sun is shining, it is well-matched to the air-conditioning demand that drives our growing need for the most costly power in much of the country. As a peaking resource, solar can directly displaces natural gas to the tune of over 4 trillion cubic feet of natural gas, save consumers over $32 billion in the next 20 years. As a customer-sited resource that does not require new transmission lines, solar improves grid reliability and extend the life of current infrastructure. And as a domestic resource, solar is intrinsically lower risk which will reduce our demand for new LNG while creating tens of thousands of new, local jobs. Finally, solar is a particularly popular renewable energy resource. It creates no air pollution, carbon emissions, radiation, or noise, and requires no water.

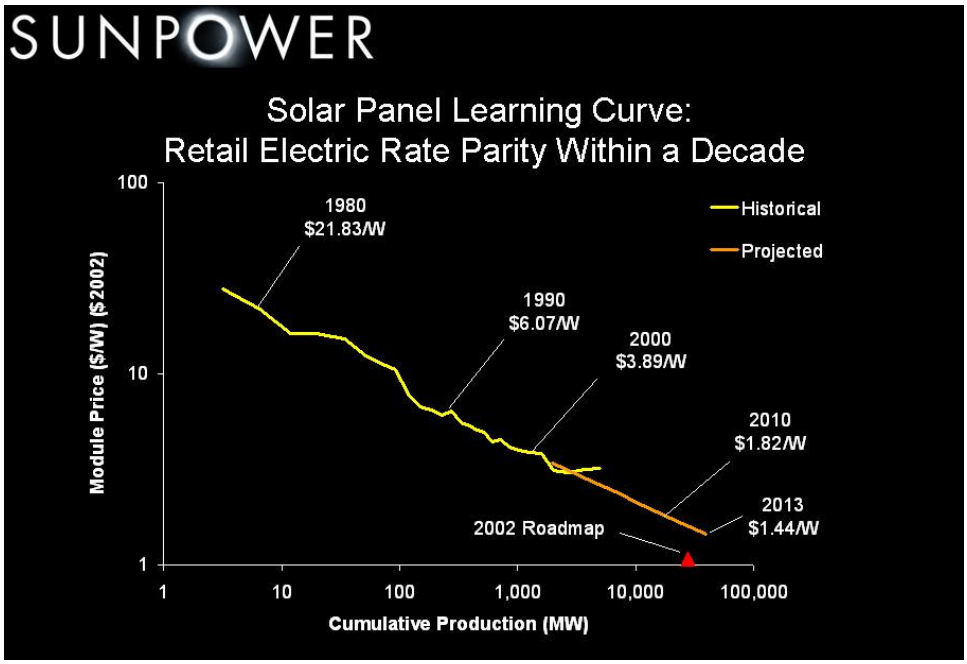
For just these reasons, much of the early research in solar electric, or photovoltaic, power was performed in the U.S. supported by both public and private funding. As a result, we have 30 years of high-quality cost data showing a classic path of lower product costs achieved with greater manufacturing scale.

This decade has seen a series of major milestones achieved due to the commercialization of solar power. Manufacturing scale has hit mass-production quantities. Solar market success has squeezed our supply chain and suppliers are racing to catch up to demand for our primary feedstock – polysilicon. And a variety of new, entrepreneurial companies, like SunPower, have formed, begun production and gone public.

All of these indicators support the analysis by the team of industry and academic researchers coordinated by the U.S. Department of Energy's National

Renewable Energy Laboratory (NREL) in 2002 to assess when solar will meet cost parity with developed country retail electric rates. They predicted that nexus to occur between 2010 and 2015, as shown in slide 3. We agree.

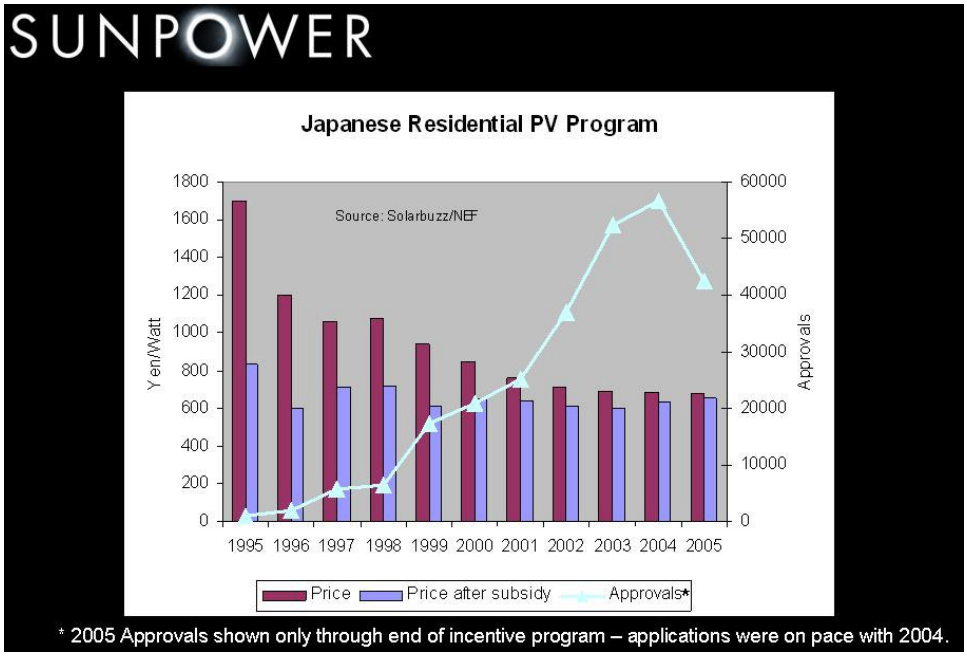
Slide 3: Historical and Forecast Solar Panel Manufacturing Costs



With consistent market development policy, commercialization can occur quickly. I say that with confidence because last year Japan concluded their decade-long program of federal incentives for residential solar systems. Japan's residential market now operates without any federal incentives, installing in excess of 50,000 residential solar systems on existing and new homes annually, as shown on slide 4.[1]

[1] Note that the Japanese federal solar program concluded before the end of 2005, so approvals are for a partial year only, which explains the apparent drop of approvals year on year in 2005.

Slide 4: Japan's Residential Program History

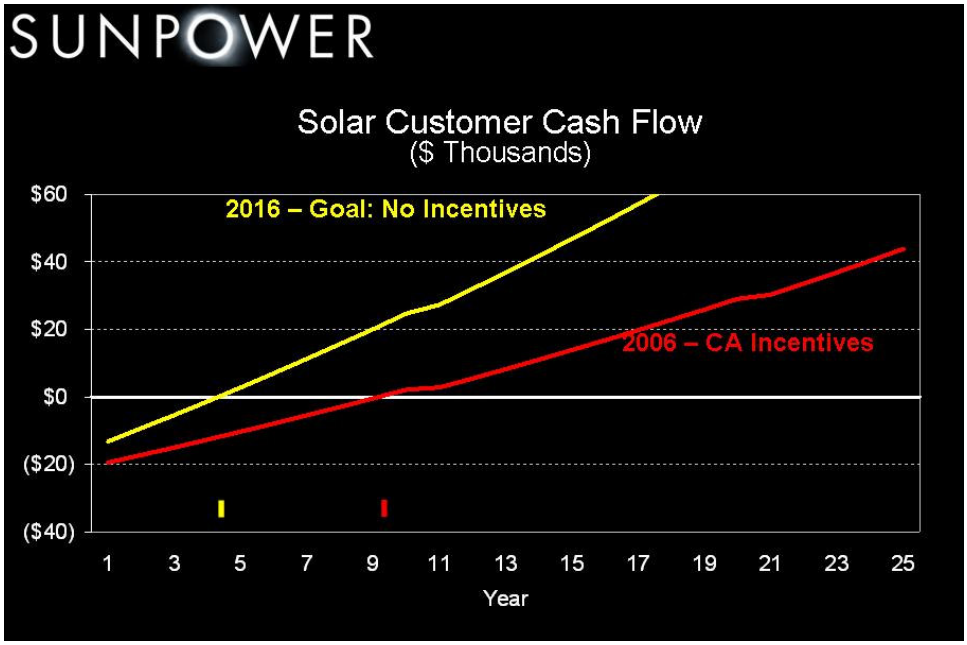


In the U.S., we have a federal investment tax credit of $2000 per residential system and a variety of state programs. We are seeing the most market activity in states that have programs to supplement the federal tax credit, which we are working with our national trade association to extend.[2] With a decade of consistent policy, the solar industry will invest in the technology, manufacturing scale-up and customer delivery infrastructure to bring solar power into the mainstream in most of the country.

Consider the economics for a customer putting solar on their home today in Northern California, as shown on slide 5. Based on federal and state incentives and current electric rates, a customer's payback on a solar system can be about 9 years. With the system cost declines we project, and very modest increases in power rates, we expect that payback to drop to under 5 years within a decade. At that point, we believe solar will become a mainstream item that comes with the building, just like a water heater or air conditioning.

[2] The Solar Energy Industries Association supports S. 2677 / H.R. 5206.

Slide 5: Solar Customer Cash Flow Current and Forecast



Achieving this goal in this timeframe is dependent on policy. SunPower is the poster-child for how public and private research dollars lead to major private investments to commercialize technology. We were founded over 20 years ago by Stanford engineering professor, Dick Swanson. He was funded by both federal and private research and development funds to work on very high-efficiency solar cells for use in utility-scale solar power plants. In the 1990s, SunPower developed the highest efficiency solar cells in the world, but they were hand-crafted, expensive and used for specialty applications, like the NASA-funded Helios aircraft. Helios set the world altitude record for an aircraft and was powered by SunPower solar cells.

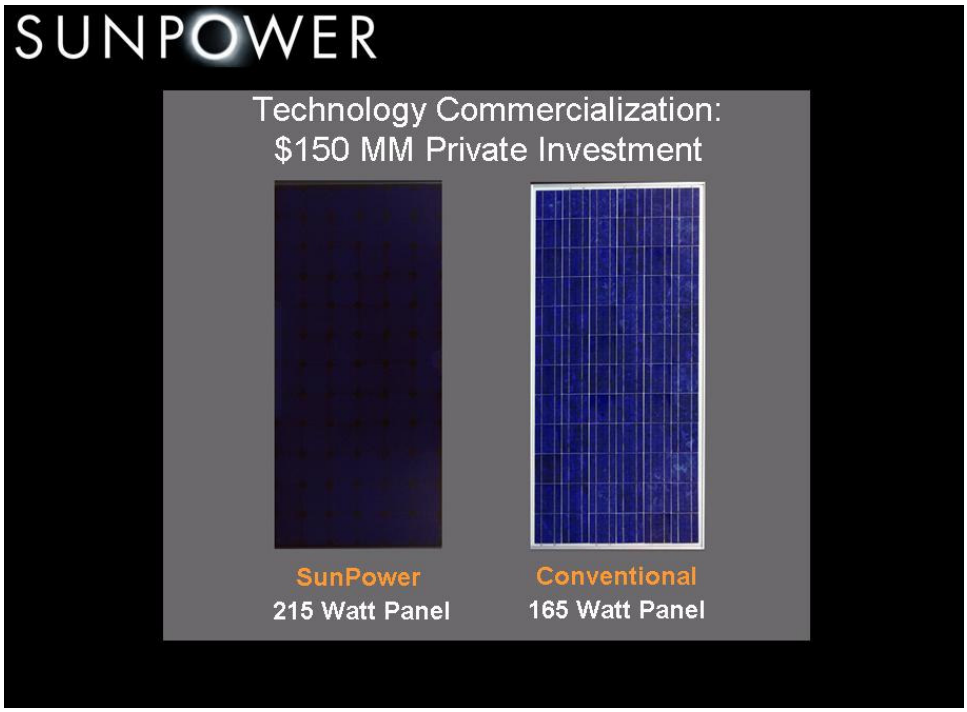
Success with these kind of projects drove SunPower to investigate whether mass manufacturing scale could drop costs to compete with conventional solar technologies. Initially, Dick and his team connected with Cypress Semiconductor for access to manufacturing scaling expertise. In 2002, Cypress bought a controlling interest in SunPower, contributing a total of $150 million of capital as well as manufacturing and management expertise. After proving our ability to

commercially produce our high-efficiency solar cells on schedule and on budget, we went public on NASDAQ last November.

Our technology is a step-change in sunlight-to-power conversion efficiency and our technological advantage is driving the competition to improve their solar cells efficiency as well. Improvements in solar cell efficiency combined with the move to thinner solar cells, better solar panel design and development of scalable customer delivery infrastructure will drive solar power costs to parity with retail electric rates within a decade in much of the U.S.

In addition, the aesthetic improvement offered by our technology, an outgrowth of our all-back contact solar cell, has turned out to be a major competitive advantage, because customers prefer a solar panel that blends into their roof, as demonstrated by slide 7. This kind of basic product design and marketing will be crucial as we move from the early stages of market adoption of solar power to mass-market adoption.

Slide 7: SunPower Solar Panel Comparison to Conventional Technology



Let me emphasize, the solar power industry will reach grid parity with incremental improvements in engineering and business processes. We do not need new breakthroughs in the science of sunlight conversion to power to achieve mass-market adoption of solar. We do need to improve the packaging of solar cell into solar panels, a task SunPower is working on under a DOE contract, and we need to radically improve the customer's buying experience. We appreciate President Bush's interest and support of our industry, in the form of the Solar America Initiative, and strongly endorse extension of the solar investment tax credit.

In summary:

- The solar power industry has hit commercial production volumes.
- Solar power is within a decade of achieving mass-market adoption.
- Predictable policy is driving billions of dollars of private investment.
- Solar grew up with government research; it now needs engineering.