FEDERAL SOLAR POLICY

Policy Options to Bring Solar Into the Mainstream

Solar energy can play an important role in making our country energy independent, strengthening our economy, and fighting global warming. While solar photovoltaics (PV) is currently the fastest growing energy industry in the world (60% annual growth over the last few years), to date market penetration has just scratched the surface of its potential. Key policy changes are needed to bring this emission-free, extremely reliable, and broadly popular technology into the mainstream.

With proper policy leadership, analysis shows that solar PV can generate 75% the country's total residential electricity demand by 2010, and 80% by 2020[1]. To contextualize, that's the equivalent of more than 500 moderately sized power plants—or 10 in every state. The climate change impacts would be enormous: reducing CO2 emissions by 620 million tons per year, the equivalent of removing 124 million cars from the road[2]. At the same time, solar creates more jobs, on a capacity basis, than any other energy technology (seven times more than the natural gas or coal industry) and distributes these jobs throughout local economies[3]. These are benefits that America can't afford to forgo.

This paper discusses the policy changes necessary to bring solar to scale and into the mainstream.

The most significant policies have so far been set on a state-by-state level, and there are four key buttons that must be pushed in order to make the market work:

1. Financial support (public goods fund, tax credits, RPS with solar carve-out)
2. Standardized interconnection procedures
3. Net metering (need credit for excess generation fed into the grid)
4. Fair rate design (time-of use tariffs with no demand component allows system owners to recover the investment, and fairly rewards solar's peak-shaving contribution.)

Policy needs can be divided into two categories: an engine (financial incentives) and a smooth road (removing the regulatory obstacles).

I. THE ENGINE: FINANCIAL INCENTIVES

In most cases, solar is currently not cost-competitive without some sort of financial support. Limited-term financial support can help build the economies of scale

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[1] Maya Chaudhari, Lisa Frantzis, and Tom Hoff, *PV Grid Connected Market Potential Under a Cost Breakthrough Scenario*, The Energy Foundation and Navigant Consulting, September 2004.
[2] To put this in perspective, according to the EIA, only 6 countries in the world produced more than 620 million tons of CO2 from fossil fuels in 2003. See: http://www.eia.doe.gov/pub/international/iealf/tableh1co2.xls
[3] Kammen et al. Putting Renewables to Work: How many jobs can the clean energy industry generate? UCB Energy and Resources Group/Goldman School of Public Policy. April 13, 2004.

necessary to bring down costs. Once the cost of solar falls, homeowners and business owners become the primary investors in a stable, distributed and renewable energy grid. Our suggestions for federal support include the following:

A. Extend the Existing Tax Credits. The Energy Policy Act of 2005 contained a 30% tax credit for solar installations. This credit is due to expire in 2007. Extending the tax credit for 10 years, and lifting the $2000 cap on residential applications is an absolute priority for the solar industry.

B. State Matching Funds. The incentives necessary to spur private investments in solar are state and utility specific. Many states fund solar development through Public Goods Charges, tax credits, or RPSs. A federal match to supplement these efforts would increase their effectiveness, and encourage states to develop solar incentive programs.

C. Renewable Portfolio Standards with a Solar Carve-Out. While RPSs are popular and effective tools for supporting renewable energy, solar is not a utility-scale technology and special accommodations need to be made (as 6 states have already done) to leverage a RPS to support solar. One benefit of this route is that the costs are rate-based and do not require a budget appropriation. A carve-out also helps to further diversify resources, another key objective of a portfolio.

D. Bulk Purchases. Put solar on federal buildings, including military bases. Panels could be purchased outright, or buildings could enter power purchase agreements with 3rd party solar developers (in which case no financing would be needed—solar would be purchased by the kWh)[4]. A significant purchase—optimally, phased in at predictable levels over a set period, and tied to cost reductions—can help build the market, show leadership, educate consumers, and provide energy security benefits for the host sites.

II. THE ROAD: REMOVING REGULATORY BARRIERS

Even if solar panels were free, there are regulatory barriers that limit market penetration. There are three key elements to developing the conditions necessary for solar to succeed:

1. *Standardized interconnection procedures.* Without regulatory standards that make the interconnection process both transparent and non-arbitrary, utilities can and do kill projects before they get off the ground. Solar projects must be able to connect to the grid without undue restriction, cost, or delay.

2. *Net metering.* Crediting solar systems for excess generation fed into the grid makes solar installations more economical to install, and coincidentally reduces costs for all other grid users by maximizing production during peak demand periods. Simply put, net metering rationalizes the grid's needs with solar's attributes, and vice versa.

3. *Fair rate design.* When utilities devise rate structures that weight demand charges or other fixed charges over energy charges, it discourages investments in solar, energy efficiency and other distributed generation by making it harder for these investments to pay for themselves (more fixed

[4] For a case study on how this works, see: http://www.votesolar.org/Staples_Case_Study.pdf

costs mean less savings can accrue from the customer's generation). Time-of-use tariffs without demand charges not only allow system owners to recoup their investment, but also fairly compensate solar systems for their contribution as a peak shaving resource.

All three of these elements need to be in place in order for a robust solar market to develop.

A. Interconnection Standards

Photovoltaics are primarily a distributed generation technology—that is, they are installed at the point of use, on the customer's side of the meter. However, as a non-dispatchable technology, solar systems must remain interconnected to the grid.

Standards that remove unnecessary roadblocks and ensure safety are critical to the development of the solar industry. A good interconnection standard should provide for:

- A simple, low-cost and timely process when the solar system meets nationally recognized safety standards.
- Limitations on the need for costly interconnection studies and equipment when a simplified review will ensure the proposed generator will not adversely affect the utility grid.
- A national standard so that project developers are not forced to custom-design each installation depending on the unique approaches of individual states or utilities.
- An overall process that is transparent and non-arbitrary.

Interconnection must be as quick, inexpensive and easy as possible, while conforming to the highest standards of safety and reliability.

Recommended Interconnection Standard

The Federal Energy Regulatory Commission (FERC) promulgated standards[5] for small generators, issued May 12, 2005. The FERC rule represents the current state of the art.

The FERC Small Generator Interconnection Procedures and the Small Generation Interconnection Agreement can be found at:

http://www.ferc.gov/industries/electric/indus-act/gi/small-gen.asp

Parties filing consensus recommendations (which were largely adopted) to the FERC standard include the National Association of Regulatory Utility Commissioners (NARUC), the Small Generator Coalition (SGC), the National Rural Electric Cooperative Association (NRECA), and the Edison Electric Institute. That stakeholders representing such a broad scope of interests were able to come to consensus speaks to the strength of the FERC rule.

We note that there are several subjects that the FERC standard does not address, including interconnection to distribution networks and insurance requirements. On these subjects, we believe that New Jersey's standards (October 2004)[6] provide

[5] Found at: http://www.ferc.gov/EventCalendar/Files/20050512110357-order2006.pdf
[6] See http://www.state.nj.us/bpu/wwwroot/secretary/NetMeteringInterconnectionRules.pdf

effective solutions and should be considered. We note further that the New Jersey rules have been used to install over a 1,000 new small generation systems in record time. The New Jersey rules are field tested, and they work.

Another interconnection standard was recently promulgated by the Colorado Public Utilities Commission. This standard closely tracks the FERC interconnection standard and looks promising as a working model.

The FERC, Colorado and the New Jersey standards identify 2 MW as the cut-off point for simplified interconnection agreements. We recommend that a national standard follow suit.

We also recommend utilization of a standard form interconnection agreement; a good example of which is contained in the NARUC model interconnection rules. [7]

B. Net Metering

Net metering is an important piece of the regulatory infrastructure for the development of renewable energy resources. The policy allows owners of distributed renewable energy systems (e.g. photovoltaic, wind turbines, etc.) that produce more electricity than they are using at any given moment to feed the surplus energy directly into the grid and run their meters backwards. The system owner can then use those credits when the system is not producing (e.g. at night) and is billed only for net electricity consumed. Net metering provides benefits for the system owner, and by increasing the amount of energy available during peak periods, reduces costs for all ratepayers.

From a solar system owner's perspective, net metering simplifies installation and makes solar cheaper. Because solar produces electricity during the day, system owners may not be using the power when it is generated, and net metering allows them to receive the full value of the electricity without installing expensive battery storage systems. In most cases, customers can use their existing meters, which further reduces costs by avoiding the need for a second meter installation or a meter replacement. A recent economic analysis estimated that net metering effectively makes solar 25% cheaper for system owners[8].

From other ratepayers' perspective, net metering reduces costs for everyone. A net metered solar system provides high value, peak kWh onto the grid at the low voltage distribution level, thereby reducing pressure on the overall transmission and distribution system, shaving the peak and reducing the amount of the most expensive electricity a utility must buy on behalf of its customers.

In sum, net metering simply makes the relationship between the grid's shortcomings and a solar system's attributes more rational and efficient.

Recommended Net Metering Standard

Currently, about 40 states have some version of a net metering law, but each state's policy varies in size and effectiveness[9].

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[7] See http://www.naruc.org/associations/1773/files/dgiaip_oct03.pdf, pp 34-43

[8] Howard Wenger, "Net Metering Economics and Electric Rate Impacts." Presented at the American Solar Energy Society's Solar '98 Conference, Albuquerque, NM, June 1998, pg. 4.

[9] See IREC website for chart: http://www.irecusa.org/connect/net_metering.pdf
Also: http://www.dsireusa.org/library/docs/NetMetering_Map.doc

We recommend a Federal Net Metering Law modeled on the New Jersey/Colorado standard, which provides net metering for systems up to 2 MW, and no overall system-wide cap, as a good model.[10]

Some suggested language:

> "'Net metering' means a system of metering electricity by which the Affected Utility:
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> 1. Credits a customer-generator at the full retail rate for each kilowatt hour produced by a renewable energy system installed on the customer-generator's side of the electric revenue meter, up to the total amount of electricity used by that customer during a single year; and
> 2. Compensates the customer-generator at the end of the year for any remaining credits, at a rate equal to the Affected Utility's avoided cost of wholesale power.
> 3. Does not charge the customer-generator any additional fees or charges or impose any financial, equipment, or other requirements unless the same is imposed on customers in the same rate class that the customer generator would qualify for if the customer generator did not have generation equipment."

As the rate impact on other customers from net metering is a function of the amount of solar net metered, not the size of any one system, we recommend a high net metering standard in order to facilitate the installation of the lowest cost systems. Generally speaking, the larger the system, the cheaper the installation. Data from California, with over 300 systems between 30 kW and 1 MW, shows that on average, systems of a size between 500 kW and 1 MW are 20% cheaper than systems between 30-50 kW. In particular, many efficiencies are gained in the 300-500 kW range. Artificially capping the size of any customer's system below this number needlessly drives up the cost of a solar program because it eliminates the availability of the lower cost systems. Since FERC's (and others) standard interconnection rules use 2 MW as a breakpoint for simplified interconnections, we recommend that a national standard consider 2 MW as the limit for the size of systems allowed to net meter as well.

C. Fair Rate Design

Electricity rates are the single largest factor in determining the cost-effectiveness of solar systems to the end customer. Rebates, tax breaks and other financial incentives will not generate private investment in solar systems if a customer's bill is comprised of large fixed unavoidable costs and low energy costs.

Progressive rates that charge customers based on the costs of procuring and delivering electricity at the time of consumption, called Time-of-Use rates, are necessary to incentivize investments in solar energy, energy efficiency and demand side management. Time-of-Use rates encourage customers to reduce power consumption during peak times—when the most inefficient and expensive power plants are brought online, and the grid is most strained. Without rates that pass accurate cost signals to customers, socially beneficial investments are inhibited.

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[10] See http://www.state.nj.us/bpu/wwwroot/secretary/NetMeteringInterconnectionRules.pdf

Time-of-Use (TOU) rates are based on the actual cost of procuring and distributing power to customers on a time differentiated basis. Electricity grid investments in power generation, transmission and distribution are driven by system peaks, which are mitigated by customers who are encouraged with TOU rates to reduce consumption at peak times. Distributed solar is the ultimate demand side management resource, because it can add much needed electricity to the grid at peak times.

TOU rates accurately account for the value of electricity generated by solar PV systems. According to Severin Borenstein, of the University of California Energy Institute, flat energy rates will undervalue the production from solar energy systems by 29%-48%[11]. TOU rates, however, accurately value solar production and pass that value straight to the customer.

Many utilities currently collect their revenue from a combination of energy charges and demand charges. Demand charges heavily penalize distributed generation, including PV, that has any outage during the month that lasts even a few minutes. These charges are not easy for customers to understand, are counter-productive to both energy conservation and PV. Customers who opt to install solar and other highly efficient and clean distributed generation should have an optional tariff without demand charges. This would not be a subsidy, as the TOU rates would be adjusted upwards to capture revenue lost through demand charges. This type of rate structure would be wholly performance-based for the user, but without the penalties for unavoidable outages.

Recommended Rate Design Principals

- Establish TOU rates that charge customers based on the actual cost of procuring and distributing electricity in a time differentiated manner.
- Minimize fixed monthly (or 'customer') charges, which block price signals to customers to reduce consumption or invest in onsite solar systems.
- Eliminate demand charges (or $/kW charges) and collect the required revenue through TOU energy charges ($/kWh), which send clear price signals to customers about the optimal time to conserve and consume electricity.
- Maintain utility revenue neutrality by incorporating and recovering sunk utility investments into the TOU rate.

[11] Severin Borenstein, "Valuing the Time-Varying Electricity Production of Solar Photovoltaic Cells" (March 18, 2005). *Center for the Study of Energy Markets.* Paper CSEMWP-142. http://repositories.cdlib.org/ucei/csem/CSEMWP-142