Expanding Rural Renewable Energy Systems
2002 Farm Bill – Title 9 - Renewable Energy Systems and Energy Efficiency Improvements
Written Comments of the Solar Energy Industries Association

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Notes: The state of the solar energy industry.

The solar energy industry is thriving worldwide. For several years, annualized growth rates have been above 20%, and recently have peaked at 40% and above.

The reason is simple; solar technology is currently in a positive feedback loop of decreasing cost and increasing volume. Solar hot water technologies, composed essentially of specialized assembled plumbing devices, are hugely amenable to manufacturing economies of scale. Solar photovoltaic devices enjoy these economies as well, in addition being able to piggyback on the research and market volume of their close technological cousins – the microprocessor and the light-emitting diode (LED.)

Simple, rugged, and standardized, solar technology has achieved many breakthroughs in the past several years. Some of the very largest multinational corporations have opened solar manufacturing branches with aggressive growth plans. Increased standardization of products, along with imprimaturs of reliability and consistency such as IEEE and UL standards, have helped to bring on the beginning of sales in conventional retail outlets (e.g. Home Depot.) Global installed photovoltaic capacity shows what appears to be an exponential growth rate. (Fig.1)

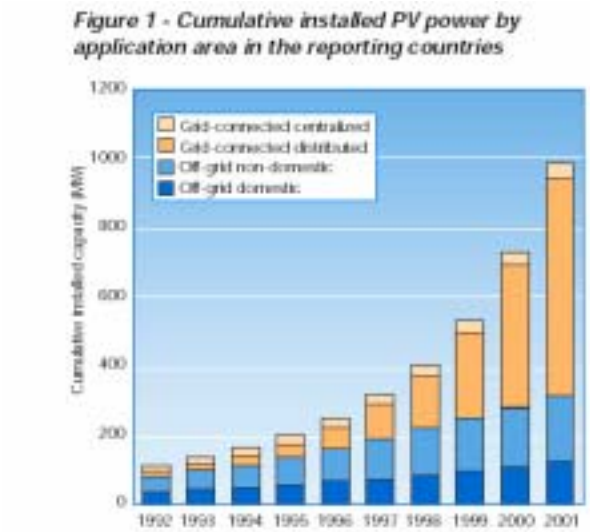

Figure 1: Global installed photovoltaic capacity is increasing at an impressive rate (Source:

Solar powered devices now power the most critical components of our society; from communications satellites to naval radar installations. All Coast Guard navigational beacons are now powered by solar energy. In an increasing number of applications, the benefits of a prepackaged energy source, with no noise or emissions and with a lifetime of two decades or more, are extremely compelling. While traditional off-grid installations are increasing (due to an increasing ratio of grid extension costs to solar installation,) on-grid applications are showing more rapid growth, as consumers seek an environmentally friendly power source that will provide decades of fixed-price electricity.

Almost all of the leading solar manufacturers have substantial operations in the United States; some of the manufacturers in this sector are, in fact, listed among the fastest-growing US companies, and are leaders in

1. The Act stipulates that financial assistance may be provided to purchase renewable energy systems and make energy efficiency improvements.

- **What projects should be eligible for funding?**

There are such a wide variety of possible rural uses that SEIA feels the Department of Agriculture should be more inclusive than exclusive in their choices: that is, providing education and incentives for a wide variety of specific projects, rather than attempting to produce a comprehensive list of rural solar applications.

That said, this grant and loan program should likely be limited to those systems which are designed primarily for on-farm or in-business use; that is, not directed towards large-scale systems designed specifically to provide saleable electrical power to the grid. Allowing these types of project would divert large amounts of funding from small, on-the-ground installations towards larger market participants, and would possibly introduce a distortion into the power market. A per-applicant funding limit, or perhaps a simple limit on the percentage of exportable power from a given project, could all be workable means of achieving this end.

SEIA respectfully submits that specially designed “one off” or research facilities are similarly beyond the scope of this program. Without a specific allocation for research support, data collection, or for operations and maintenance, it would seem that 9006 is designed to provide renewable energy systems to farmers and rural small businesses in a way that will maximize their utility as part of a whole farm or business system; prototype, research, or one-time systems are less relevant to this end. The 9006 program should be used primarily, if not exclusively, to fund the purchase of preexisting, commercial products.

Opportunities which come readily to mind for solar energy specifically include, but are not limited to:

- Water pumping systems, anti-freezing bubblers, and irrigation equipment.

- Residential and facility AC electrical usage, whether on or off-grid.

- Solar hot water systems for residences, process heated water for food processing operations, and aquaculture (For instance, General Poultry in Egypt has placed a 7,000 gallon / day, 40 deg. Celsius solar water heating system on one of their slaughterhouses to great financial return.)

- Specially-designed and integrated photovoltaic / appliance systems (such as photovoltaics-powered DC refrigerators.)

- Fence electrification devices and gate openers.

- Remote lighting systems (streetlights, grade crossings, etc.)

- Galvanic protection devices for metal structures.

Some of the most compelling, cost effective uses of renewable energy on farms and rural small businesses are at a very small scale. It is also worth noting that small devices, simply by their greater numbers, will be more visible, more pervasive, and more effective in spreading the message of renewables as a viable rural resource. We therefore urge the Department to administrate, promote, and award the grants and loans in such a way that smaller systems do not face an overly complex application process, and to contemplate a pilot program by which even the very smallest systems might be aggregated for purchase and distributed for usage by cooperative extensions, USDA field offices, and the like, with a minimum of administrative overhead.

- Should certain types of projects receive priority for funding?

In order to receive the benefits of this program as quickly as possible, we submit that projects which can be rapidly deployed (i.e. within one year of loan or grant approval,) and which can be expected to provide lasting benefits for a decade or more, should receive higher funding priority.

In light of current events, and the Federal government's ongoing efforts to reduce both air pollution emissions and the United States' dependence on imported fuels, proposals for projects which directly replace or displace petroleum product usage (e.g. replacing a diesel generator set with a photovoltaic system, reducing natural gas dependence via a grid interconnect, or supplementing a home fuel oil heating system with a solar hot water device,) should arguably enjoy substantial funding priority.

It should be kept in mind that many of the farms and rural small businesses, and even some of the individual devices (pumps, etc.,) that will be targeted by this initiative, are served by inordinate lengths of distribution infrastructure. These lines were either erected during the initial rural electrification effort or are serving markets that have diminished since their construction. In many cases, were this infrastructure to be constructed today, it would not be competitive with an onsite renewables-and-storage system. Of course, much of these rural electrification lines are 40+ years old – maintenance costs are escalating, and total replacement is on the horizon. In these cases, there is a very strong argument to be made for making the farm grid-independent and self-sufficient.

Many rural electric cooperatives could identify those customers most eligible for this kind of urgent service replacement – a program which increases on-farm renewables while diminishing this pending expense. This would have the additional salutary effect of increasing USDA staff familiarity with the technologies.

- Should preference be given to new, innovative technologies or proven technologies?

Marked preference should be given to existing commercial technologies, which are ready for widespread usage, but have not yet achieved market penetration. Title 9 of the Farm Bill appears to provide minimally or not at all for product refinements or data gathering. It will be difficult to conclusively establish the benefits of "innovative" technologies within this program. It would probably be advisable for USDA staff and clients to gain more nationwide experience with the unique characteristics of extant renewable products, before venturing into less well-known territory.

The intended end-users, of course, are likely more interested in day-to-day results and performance than they are in innovation, research, or demonstration. Solar technologies, at least, have compelling economics and market-ready, mature products *today*, and we feel that this should be the emphasis of the 9006 program.

Proven technologies also offer USDA the maximum potential for self-catalyzation. Simply by virtue of being proven, reliable, and economical, they will inspire imitation on the part of those who see them in operation. Thereby, increased deployment will spur increased deployment. And of course, renewable energy technologies in general, and solar in particular, are still in the position where any increase in deployed volume decreases per-unit production costs, with a high degree of certainty and predictability. (Fig.2 demonstrates this effect in the case of photovoltaics.)

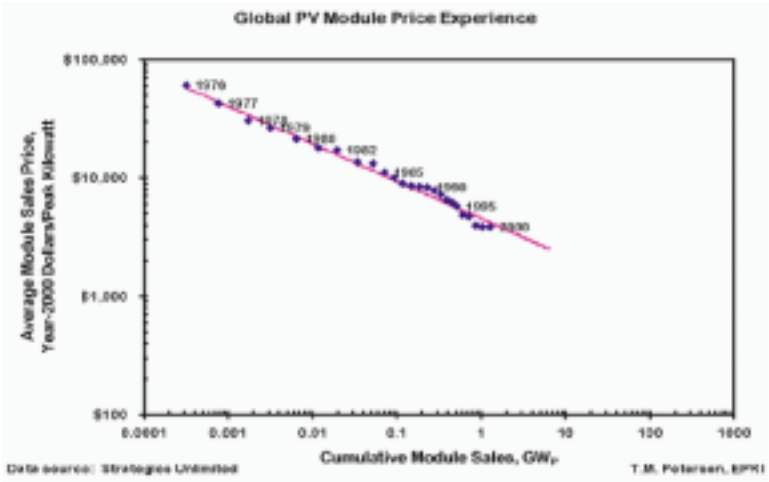

Figure 2: Increased sales decrease marginal cost (note log scales)

Solar appliances (pumps, openers, etc.) can be frequently delivered on the back of a pickup truck. Systems for residences or commercial buildings are composed of precertified, prepackaged individual components connected by an appropriately-trained electrician; both types of installation are by their nature highly replicable.

2. Loan guarantees, direct loans, and grant programs are authorized under the legislation. What type of financial assistance is most in need (i.e., grants, direct loans, or loan guarantees)?

To the maximum degree possible, section 9006 should seek to lower the initial capital costs through the use of targeted grants. Solar technologies have a unique lifecycle cost structure for an energy technology: that is, almost all of the associated costs are upfront, with a *de minimis* operations and maintenance cost. This makes the technologies ideally suited to incentive programs such as this. With a minimum of administrative overhead, a tailored grant program can precisely determine the energy cost of a solar system at the time of the grant, with almost no associated uncertainty.

SEIA proposes that the USDA assign at least 5 million dollars annually specifically for a 25% cost share / 25% available loan program for on-farm solar energy systems, with loan applicant matching funds to come from such sources are available. (Including state and utility incentive programs.)

3. **Section 9006 states that, in determining the amount of grant or loan, the Secretary shall take into consideration as applicable: "…g. other factors as appropriate." What other factors, if any, should the Department consider in determining the amount of grant or loan?**

SEIA agrees with other commenters that USDA should make loan and grant determinations on the basis of an explicit and transparent scoring system, and proposes some criteria that should be included in any such rubric.

As mentioned above, those renewables applications which go directly to replace or displace fossil fuel usage (including electricity generated from natural gas combustion,) make a compelling national security contribution that should entitle them to an increased funding priority.

Similar arguments can be made for grid-connected electrical applications. By reducing stress on the grid, and possibly by moving some establishments off of the grid entirely, it both reduces the chances that the grid will fail, and makes it a less attractive target.

The benefits to the ultimate end-use customer should be explicitly accounted for. In particular, the ability of an installed system to insulate the farmer from price shocks or inflation trends should be considered. Solar energy systems are particularly suitable for these applications, as in the case of grid failure (more frequent for rural areas than any other, as they tend to be served by more miles of distribution line per customer,) onsite renewables can go a long way towards mitigating spoilage and livestock losses. This criterion is especially important in areas such as New England, where energy costs represent a substantial portion of agricultural operating expenditures, or California, where energy price *uncertainty* has proven to be a force nearly as damaging as actual prices.

As regards criterion (f) – an energy cost-benefit analysis – we would urge the USDA to take a holistic view of energy usage, keeping in mind that for many applications (e.g. remote water pumping,) the proposed activity would more than likely

never occur without the supporting solar power system; there is, therefore, no meaningful comparison from which to derive an estimate of "energy cost savings."

In many cases, a renewable energy systems' lack of fuel requirements and low maintenance can improve the labor efficiency of a farming operation – a valuable consideration for small and family farmers in particular.

Though most systems are low maintenance, (and in the case of solar, frequently zero maintenance,) there should be some consideration of the likely lifetime of such a system, and the difficulty of the maintenance burdens it is likely to place on its operators. Will this system be functioning 20 years from now? If it breaks down, how will the owners find help? Solar systems are generally warranteed by their manufacturer for 20 years or more, and these manufacturers are national (if not international) entities, with comprehensive maintenance and support capabilities.

Should certain types of projects or geographic areas be targeted and given preference for financial assistance?

Small (< 10 kW) solar systems should be specifically targeted for financial assistance, as they are currently the most capable of providing proven, immediate, and long-term financial and operating benefits to America's farmers and rural small businesses.

We feel that in order to maximize the utility of this program as regards the diversity of our national energy supply, and to avoid needless duplication of effort, that those designing the grant program consider the degree to which other technologies already enjoy incentivization, research programs, and the like under other USDA programs, and prioritize them for 9006 funds accordingly.

4. **The Act states that the amount of grant shall not exceed 25 percent of the cost of the activity funded under the program. Additionally, the combined amount of a grant and loan made or guaranteed shall not exceed 50 percent of the cost of the activity funded.** ***What are various sources of program matching funds (i.e., other Federal, State, local, or private programs)?***

In the wake of energy deregulation, and with the renewables industry picking up steam, various states are offering packages of tax credits, tax concessions, special loan funds, and outright buydown grants to installers of renewable systems. The details of each program vary from state to state – a comprehensive list can be found at http://www.dsireusa.org Many offset a substantial percentage of a solar system's cost, and explicitly allow "double-dipping" from multiple incentive programs.

This program might also be used synergistically with other development and assistance programs administered by USDA – particularly, the 7 CFR 3550 and HB1-3550 household water well assistance and drought assistance packages would be well-used on solar water pumping systems.

Fannie Mae administrates a program of unsecured and below-market-rate Residential Energy Efficiency Improvement Loans of up to $15,000, which can be used towards residential energy efficiency and renewable energy purchases. (Whether on-or off- grid.) Freddie Mac, FHA, and even Veteran's Affairs offer similar "energy-efficient-mortgage" programs that can be used for residential systems. A helpful guide to Federal financing programs may be found at http://www.millionsolarroofs.com under "Financing – Other Resources."

Concluding Remarks

Rural users have long been in the forefront of renewable energy usage, and this is a trend which is only slated to increase in the coming years as renewables systems become steadily less expensive and fulfill more on-farm roles. The benefits to our global environment and national security are potentially massive; USDA has an opportunity with the Farm Bill's visionary Energy title to vastly accelerate these trends. With a sophisticated understanding of current and future technologies, and prudently administered funding, USDA could make many of these technologies almost universally prevalent within the space of a very few years – generating benefits which are both far-reaching and long-lasting, while still realizing certain, rapid benefits on the scale of the individual farmer.