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L.S.:

This contribution is in two parts:

1. A situational analysis of the issues and causes from a high level
2. Specific answers to questions asked in the document "Something New Under the Sun: Competition and Consumer Protection Issues in Solar Power."

DG Solar PV and TPO, A Situational Analysis

Amid the recent melt-down of several Third Party Owned Solar PV providers, **it is time to address both the deceptive marketing of this industry at the retail/consumer level and at the investor level.** Based on my observations of the industry, along with analysis and writing in this area in recent years, mostly on blogs and financial sites like Seeking Alpha as well as some some Environmental/Energy websites, I have come to the conclusion that the principal impediment in this area is consumer confusion.



The confusion is often made worse by incentives that tend to put the emphasis in the wrong place, and by vendors who lead with financing or incentives, trying to convince people to do things that benefit the vendor more than the consumer, all under the subtle or not so subtle implication that if Uncle Sam gives this incentive, it has to be good.

What is missing is the analysis of what is beneficial for a given property, and therefore for the specific consumer. The typical sales pitch focuses on the 'payback period' of a given modification, or on phony 'energy savings,' never on value added to the property, for that would be too cumbersome for sales people, never mind that it is the one and only meaningful assessment the consumer needs to make. In the used car business this practice is known as “sell 'em on the payments,” and is widely recognized as a marketing deception. With TPO Solar PV retrofits it has entered the arena of real property.

The result is rivers of sunk costs, and money wasted on solutions that don't work, or are replaced by other solutions before they are ever paid off. People are spending themselves blind on energy savings, without getting anywhere. This confusion exists as much on a residential consumer level, as on a professional, commercial level, but the Consumer considered here will be primarily residential. A good analysis of the results of this confusion was published by the University of Chicago, here: <https://epic.uchicago.edu/news-events/news/study-finds-costs-residential-energy-efficiency-investments-are-double-benefits> Unfortunately, in some ways even this study barely scratched the surface.

The only viable solution is the one that was attempted in the Sen. Max Baucus proposals for restructuring of Energy Tax Credits (which addressed only the supply side of the grid), where the point was rewarding results (reductions in Green House Gas Emissions), and structuring credits to increasingly to reward such beneficial outcomes.

In other words, **the incentive should be directed to the owner of the property, not the**



supplier of the technology, for the simple reason that the locus of value is in the property, and the optimal outcome for society is one that maximizes property value for the owners, and minimizes societal costs (Green House Gas emissions).

Lastly, in the area of practical regulation the issues of reliability and safety have been getting short shrift and are not being sufficiently considered. It is not just that the solar customer of a utility needs to pay their fair share for their utility connection, they are buying insurance, in the form of the higher reliability of the grid. And finally there is also the issue of increased fire risk of rooftop solar which has not been adequately dealt with to date (see references).

TPO Solar PV Issues

The issues of Solar PV must be understood in this general concept. A lot of abuses have resulted from vendors hawking 'savings,' with a faulty and misleading financial analysis, and in flagrant disregard for the financial interests of the buyer. They fall into two categories: the capital case, and the financing. The consumer, in general, now needs the sophistication of the CFO of an energy company, and this is not realistic, so protections are in order.

DG SPV, the capital case

The capital case should be made based on what retrofit offers the maximal incremental property value (Net Present Value of the project), taking into account the alternatives, and possible engineering conflicts down the road.

The consumer therefore needs to have a view of the energy requirements of the home including the expected service life of all major components. A rolling 30-year capital budget for energy infrastructure is the ideal, given the many choices for on-site generation today, e.g. their A/C may have a remaining service life of 15 years, and their boiler of 5 years, so



that they will be forced to make a major decision in five years, and should not be painting themselves into a corner today.

If energy demand is 70% thermal, and the roof has the right orientation, perhaps they should first look for a solar thermal system that can mostly eliminate their oil or gas bill, and is 75-95% efficient, before they install a Solar PV system that is only 15-20% efficient and can only 'save' them small money on their electric bill, and, even if those 'savings' are true, the Solar PV system might usurp the roof space required for the solar thermal system that offers much better value, if they had only thought that far ahead. Plus, there are a number of minor retrofits that should be considered before putting in a solar PV system as they could significantly decrease the installed capacity needed. In many, if not most, homes another 20-50% reduction in electrical demand can usually be easily obtained, and they would result in a much smaller solar system and therefore a quicker payback.

DG SPV, the finance case, mainly TPO-related

Third Party Owned (TPO) Solar PV, is marketed very deceptively, in a way that is enabled by the tax credits, combined with low interest rates. In effect vendors stretch payments over 20 years, to ensure that the monthly payments are less than the current electrical bill, and then they represent the difference as a 'savings,' thereby obfuscating the difference between a 20-year take-or-pay contract, and a monthly bill that can be canceled if they move. This misleads consumers and the surprise comes when people sell homes and often end up taking a discount on their home, because they have to get the buyer to assume the lease or PPA on a solar panel that is no longer new. With the length of home ownership in the 7-12 year range, depending on what statistics you use, the average 20-year solar PPA or lease will see one or two changes of ownership over its lifetime.

**Answers to Selected Questions from the paper:
“Something New Under the Sun: Competition and
Consumer Protection Issues in Solar Power.”**

- “There is a robust debate about whether the retail rate is the appropriate rate to use in compensating customers for solar DG: some believe the correct price for solar DG is below the retail rate, whereas others believe the correct price is at (or even above) the retail rate. Determining the correct price depends upon a number of factors, including issues that are less specific to solar DG and relate more generally to the goals and function of regulated retail rate design.” (p.2)
 - Besides sorting out the above which hinges on valuing what goals are to be achieved, and is greatly impacted by the economics of the local grid (congestion, peak shaving, etc.), one of the biggest fallacies is that solar panels, even with battery backup cannot approach the reliability of the grid, that insurance aspect of the grid backup needs to be fairly valued.
- “For example, because solar-generated electric power does not create the same pollution or other externalities as carbon-based sources of electric power, compensating solar customers at or above the retail rate may be a way to achieve desirable environmental objectives.” (p. 3)
 - These goals need to be explicitly valued, however they can be spurious if utility scale solar is installed at less than \$1 per installed Watt, and residential Solar PV retails at \$4 or more per installed watt.
- “The cost to purchase and install solar PV panels is decreasing, although it remains a significant capital expenditure that may take years to pay off. ... It is critical to ensure that customers have accurate information about the costs, benefits, and uncertainties associated with installing solar PV panels on their properties.” (p. 3)
 - The point here is that **this is a capital expenditure**, and moreover it may restrict

(or enable) other solutions, so there are trade-offs. The consumer should not be tricked blindly into buying one solution without having the whole picture. **Third party finance, particularly if it were mortgage type financing, could require an independent energy audit, and a 30-year energy plan that could consider alternatives, as well as an NPV calculation. A positive NPV increases collateral values, and reduces risk for the lender.** The central point is that the real property is the locus of value here.

- “One important component of this information is what customers know (or can possibly know) about potential changes in the compensation for the solar electricity they generate as determined by regulatory and legislative decisions.” (p.4)
 - Indeed, where it is very clear that at least at the outset some electrical grids are not even technically capable of handling DG (such as the network system in NYC), and in general the marginal economics of the grid are such that DG solar only makes a contribution up to a point (peak shaving), the costs and benefits to the commons need to be fairly reflected, and the existing regulatory framework is often a complicating factor. Without saying everything is ideal in NY State, it is noteworthy to take note of the level of effort involved in re-thinking the entire regulatory framework of the grid. **Consumer are not seasoned energy executives, and do not understand the risks they are assuming, that to them can be as unpredictable as the weather.**
- “Does DG impose additional costs on the grid because of, e.g., changes in how the grid is used, integration costs, and/or overloading of local circuits? How can we calculate these additional costs?” (p.4)
 - Indeed, the micro economics of the grid can be modeled and may be very different from one block to the next. The rigidities of a lot of traditional regulation complicate matters, and flexible frameworks for these valuations in the long and

the short run are needed. Companies such as [Integral Analytics](#) provide exactly that type of analysis, and could easily be used as an objective 3rd party, as long as regulators compel incumbent utilities to provide full disclosure so that an objective discussion of the marginal economics of the local grid as well as the relation to the overall grid can take place with an honest appraisal of the cost/benefit analysis for the commons.

- “Does DG save costs compared to other sources of generation because DG is placed more closely to the point of consumption? How can we value these cost savings?” (p. 4)
 - In theory it does save cost, however, the issue of reliability has to be considered, and today it is ignored. It is not easy to value this reduction, exactly because of the “insurance” aspect, which says there is value (reliability) in still having the grid as a backup, if need be for 100% of power needs. Unless the consumer can achieve the same reliability, or make an acceptable trade off, they have to pay their fair share for their connection.

An alternative approach in some situations may be an explicit agreement where the rate payer contracts for a lesser service for emergencies, so they can count on the grid for say 30% of their previous demand, and have to scale back in a case of a system outage at their end, but at least remain operational during such outage, even if at a reduced level.
- “What other benefits does solar DG provide to the grid? For example, does solar DG improve power quality, reliability, and/or resiliency? How can we value these benefits?” (p. 4.)
 - The most obvious benefit is peak-shaving, but that must be tied to accurate assessment of marginal economics of local grid, and not distorted tariff regulations. As a diversification of generation it potentially provides reliability,

but it supplies low quality power (intermittency, harmonics), saddling the commons with a problem. A complete cost benefit analysis is needed, and a great deal of customization of solar permitting is needed, plus utilities should be held to stand behind their deals or else no permits should be issued.

- “What are the environmental benefits and costs of solar power?”
 - The benefits are less GHG emissions, and especially peak-shaving, for the economic cost of peak power is huge.
 - The costs include the cost of intermittency, and low power quality from harmonics generated by the inverters (anything electronic generates lots of harmonics, and deteriorates power quality).
 - The costs also include lots of electronic wastes. Notice e.g. how First Solar at one point made significant reserves for the eventual disposal costs. Many home owners will end up getting stuck with these in the end when their providers go out of business.
- “What other technologies (e.g., battery storage of solar-generated electricity) are relevant to the future of solar DG?” (p. 4)
 - It should be noted that the cheapest forms of energy harvesting are solar water heaters, as is practiced by many electrical coops, and even by SolarCity in Hawaii, harvesting as much hot water as they can, and using chemical batteries (LithiumIon) as secondary storage, which at \$0.40/kWh is becoming economical.
 - Second hand (Li-Ion) car batteries, see references.
 - New chemical batteries, but it should be noted that the value of compactness matters more for cars than for home applications, and any technologies that do not bring dangerous chemicals into the home will have preference, so in the long run it may be dubious of Lithium-Ion batteries will remain acceptable.

- “Is net metering good policy? At the retail rate? At a different rate?” (p. 4)
 - Net metering is reasonable, but it should be fair to the commons, and not be a hidden subsidy by non-solar customers to customers with solar panels.
- “Does retail net metering result in cross-subsidization? For example, if the fixed costs associated with building and maintaining the electricity grid are incorporated into the price per kilowatt hour (volumetric pricing), do non-solar customers end up crosssubsidizing solar DG customers because the latter do not pay a full share of fixed costs when they choose to rely on self-generation?”(p. 5)
 - Indeed it does, and as suggested above a fair pricing model is necessary, and there needs to be a commitment that the utility must honor its rates for the life of the panel, lest the investment is at risk. If not, no permits should be issued.
- “Does cross-subsidization of one form or another always occur when retail rates are based only on volumetric charges and are time-invariant? Does cross-subsidization caused by net metering differ in any way from other forms of cross-subsidization inherent in regulated retail rates? “ (p. 5)
 - Yes, the cross subsidization of the normal tariff structure is a very different phenomenon from the cross subsidization of solar by non-solar customers, and, again, the tariffs need to reflect the value of DG solar to the commons and balance the interests of both solar and non-solar customers.
- “Does it make sense for PUCs to target net metering for reform, or should they focus on reforming retail rates more generally to better reflect the varying costs of supplying electric power?” (p.5)
 - In general, all forms of DG requires a new way of regulation, where tariffs may need to be structured with floors and ceilings, so that retail customers do not end up arbitraging arbitrary rate structures that can be changed at a moment's notice.

- One of the reasonable things is requiring a negotiated and partial backup from the grid, so that a system with 95% long term uptime, does not need the full grid backup 100% of the time. In many cases there is a trade-off that can be made to only pay for a partial backup from the grid, say for 20, 30, 40 or 50% of capacity, statistically that may provide adequate service reliability, but in turn it also needs to be priced fairly.
- “Does the analysis change when the distribution utility is vertically integrated? When the utility is investor-owned, municipally-owned, or a co-op? When consumers have retail choice? When retail pricing is time-variant?”
 - Of course. And the regime for allowing investment in SPV DG, or any other form of DG, should include this consideration, and regardless of how the utility is organized, there are objective ways via economic modeling to arrive at a pareto optimal solution for property owners as well as the utility.
- “To what extent does the optimal approach depend on penetration levels for solar DG?” (p. 5)
 - Indeed it does, and rate structures should provide accurate price signals, and be isolated from arbitrary changes, lest investment is impaired.
- “Should environmental externalities affect retail pricing?” (p. 5)
 - The optimal model seeks a pareto-optimal solution between the benefit to the commons (reducing GHG emissions), and maximizing property values.
- “Is solar DG a competitive threat to distribution utilities? Does this depend on whether the distribution utility owns generation assets?” (p. 5)
 - Only because of regulatory inflexibility. What regulators should see to is fairness in the economic interactions, so that retail customers can realistically participate, but the utility benefits as well.
- “How does regulation affect entry decisions by solar DG firms? What regulatory

policies support or discourage entry?" (p. 5)

- Obviously, if regulatory changes can damage or undo the validity of DG decisions at any time, this is an uncertainty for vendors and customers. Fairness in the regulatory regime becomes different under any DG.
- "Are there barriers to entry not related to regulatory policies? If so, is antitrust enforcement an appropriate tool to address them?" (p. 5)
 - If incumbent utilities use their market power to arbitrarily prevent DG of any kind (solar or otherwise), it seems reasonable that they should be forced to deal on equitable terms with customers who are interested in having DG.
- "If regulatory policy affects entry conditions, is there a role for antitrust enforcement or competition advocacy to encourage entry? Is antitrust an appropriate tool to police efforts by utilities to maintain or strengthen regulatory barriers to entry from solar DG firms? Can such efforts by utilities be characterized as exclusionary conduct under the antitrust laws? Or is regulation the preferred tool to shape electricity distribution going forward? Are regulated distribution utilities protected from antitrust suits through any immunity or exemption? Should they be?" (p. 5)
 - Forcing a 'fair' market for SPV or any other DG technology is pointless unless the tools are provided for consumers to make intelligent decisions, and not be taken advantage of, like is presently routinely being done.
- Should utilities be permitted to offer rate-paying customers utility-supplied solar PV panels or access to community solar installations? Does it make a difference if, instead, it is an unregulated subsidiary or affiliate of a regulated utility that is offering the solar PV panels? Are anti-discrimination rules for utility affiliates effective in achieving a competitive landscape?
 - Sure why not, if it makes any financial sense. In practice it probably does not,

and customers who are wanting to go green are better of negotiating the lowest possible rate and buying offsets. They should be aware of those choices, and equally customers who do choose TPO solar should be made aware they are not getting green power, because the SRECs are being sold off.

- “What is the state of competition among solar DG firms? Are there geographic areas where competition is particularly lacking between solar DG firms?” (p. 6)
 - The competition between firms is a minor part, leveling the playing field by enabling consumers to make informed decisions is the major point. Right now, consumer deception is the primary marketing tool.
- “What is the state of competition between solar DG firms and regulated utilities? How is competition affected by whether the utility offers distribution service only, electricity supply only, or both?”(p. 6)
 - SPV DG is about both supply and to a lesser degree about distribution, it should not be allowed to 'compete' on distribution, unless it can offer the same reliability as the utility.
 - This supposed competition exists only because of dysfunctional (de-)regulation.
- “How is this competition affected by the fact that regulated utilities earn revenues that are based, in part, on regulated rates of return?” (p. 6)
 - Again, what is needed is a collaborative approach with 3rd party verification of the benefits, to ensure a pareto-optimal solution that is fair to all stakeholders.
- How do consumer protection issues such as comparative price information or disclosures of regulatory risk affect competition among solar DG firms and competition between solar DG firms and utilities?
 - They are just one element in the deceptive sales tactics of the industry. There should be clear disclosures by the utility regulators, and solar contractors

- should be held to disclose them or risk deals being invalidated.
- “How do consumers obtain information about installing solar PV panels?” (p. 6)
 - Probably mostly from vendors, and therefore very slanted.
 - There must be mandatory disclosures that are enforced by the state, most simply by make it possible for consumers to rescind the deal if such disclosures were not made, and require contractors to fix the damage to roofs, etc. in that case.
 - “What information is most important to consumers’ decisions to install rooftop solar?” (p. 6)
 - A comprehensive energy audit.
 - A 30-year approximate capital budget for on-premises energy plant, both passive and active, and a probative analysis of mutually exclusive solutions.
 - An NPV model with reasonable assumptions to verify that the rooftop SPV has a high positive SPV. (Hint: in better than 50% of cases it does not, and usually numerous other projects offer higher returns.)
 - “What information is available about regulated retail electricity rates? What are solar DG firms telling consumers about expected future retail rates?” (p.6)
 - My experience suggests that usually scary projections are used without substantiation. It is to be noted that the industry association has a code of ethics that says only to use official, verifiable price forecasts for energy.
 - They usually speak of rates going up in order to sell their escalation clauses, which have been as high as 2.9%. This has already resulted in consumers being under water on solar PPAs and leases, even without the problem of moving.
 - Who typically assumes the risk that regulators in a given jurisdiction will change net metering and/or reform compensation rates paid for solar DG – consumers or solar DG firms?

- Usually it's the consumer, but either the utility regulators should mandate that the utility tariffs protect consumers for the life of their investment or else the vendor should be held responsible if indeed the arrangements is a long term financing of any sort. Clearly, if the consumer buys outright and finances it themselves, they are responsible, so the information needs to be widely disseminated.
- “Do consumers understand the payments they will make for solar PV panels and electricity, based on whether and how they finance or lease a system, or obtain a power purchase agreement? Do consumers understand whether their payments may escalate under some agreements?” (p. 6)
 - In my experience, typically no. Sales people usually talk past these terms.
- “Do consumers understand any permissions that may be needed to install rooftop solar?” (p. 6)
 - I am unaware of problems in this area.
- “Do consumers understand the implications of having rooftop solar if they sell their homes, including disclosures to prospective homebuyers? Do solar DG firms make disclosures about how a home sale may affect the consumer’s contract for solar generation? Should they be required to make such disclosures? Do the disclosures vary depending on whether the consumer purchased or leased the solar PV panels or used a power purchase agreement, and depending on the specifics of how the consumer is compensated for the electricity he or she generates? If so, how and why?” (p. 6)
 - This is one of the biggest problem areas. Most consumers are unaware of this problem, and besides they don't usually think about moving, or else they would not be looking at a solar panel, but when life forces them to move, the consequences of solar PPAs and Leases have often been dire (see references),

and at a minimum they may take a discount on their property that in many cases negates all the presumed 'savings.'

- The experience of these negative impacts highlight the fact that the 'savings' by comparing a monthly utility bill to the payment under a Solar PPA or Lease is a misrepresentation. I cancelable monthly bill cannot be compared to the capital decision of a 20-year lease or PPA.
- “Do consumers or solar DG firms bear the risk of structural damage to homes from solar panel installations? What is needed for clear and conspicuous disclosures about damage or loss relating to rooftop solar?” (p. 7)
 - Obviously this will vary from contract to contract, but the experience of increased fire risk and other structural risks is a knowable factor at this point, with insurance data based on a growing installed base. See article on the fire risk from solar in references.
- “What gaps are there in information for consumers and businesses that are considering rooftop solar?” (p. 7)
 - Most consumers are hard pressed to pick a comparative energy contract, and these decisions require the sophistication of a seasoned energy executive or project financier. A comprehensive support system for consumers is needed, so they are not pressured into bad deals.
- “Is it standard practice for solar DG firms to retain renewable energy credits (RECs) when selling or leasing solar PV panels to consumers? Do solar DG firms make disclosures to consumers concerning the sale of RECs on a secondary market? Is information about RECs material to a consumer’s decision to install rooftop solar?” (p. 7)
 - Even the solar ethics code, honored more in the breach than in the observance, points out that SRECS cannot be claimed twice, yet most solar customers are

shocked to learn they are not using green power, but selling it off to other users, so that in reality they use green power only at the rate of the RPS for their particular state.

- “What types of disclosures are solar DG marketers or others providing to consumers? Are marketers using a standard format for such disclosures? Have standard disclosures to consumers been developed by solar DG firms or others? If so, are there any additional disclosures that would be useful to consumers?” (P. 7)
 - I am unaware of any standardization in disclosures, although the industry association could presumably mandate that. The tendency is to protect sellers from liability, and not to protect consumers meaningfully.
- “Do solar DG marketers or others use robocalls to promote solar PV panel sales to consumers? If so, are there practices that raise issues for consumers?” (p. 7)
 - The usual misrepresentations, like 'free' solar panels, etc.

References

Note: Besides myself, another author on this site, EnerTuition, as well as several others have repeatedly demonstrated that the business model of Solar PV TPO was a complete farce. However, my articles were typically more focused on the fact that the investor deception was ultimately rooted in the consumer deception of the TPO model, selling the payments, not the investment. Note (first article (last Seeking Alpha reference) – in reverse chronological order) that I accurately predicted that the Vivint Solar acquisition could kill

SunEdison, which it did.

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<http://www.seia.org/policy/consumer-protection/code-ethics>



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Scribd: <https://www.scribd.com/doc/313305167/FTC-SolarElectricityProject-No161200>