A CERTIFICATION MODEL FOR SOLAR SALESPEOPLE

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ABSTRACT

Solar salespeople are the largest source of preventable PV system performance loss. Salespeople are uniquely positioned in the design and presentation process to preserve or dramatically diminish PV system performance. A few seemingly small errors or oversights in the selection of array location, affecting tilt, orientation and shading, can have a large effect on system performance. The author presents a certification model for solar salespeople with the goal of maximizing system performance.

1. INTRODUCTION

The PV industry has excellent certification standards (NABCEP & CoSEIA) for both experienced installers and installers in training, covering design, installation, troubleshooting, safety, etc., however in the larger and more rapidly growing markets there are a lot of companies that have separate dedicated sales staff who aren't installers. These sales professionals are rarely NABCEP Certified PV Installers, nor could most of them even qualify to sit for the exam, much less pass it. However, these are typically the people that the customers trust to design and recommend appropriate systems. By the time the certified installer gets to the site, the customer is already convinced that the best system should be upside down facing north inside the garage.

Ok, usually it isn't as bad as the above illustration, however, the author has inspected several systems that were clearly miss-designed, attempting to avoid one factor, but misunderstanding and underestimating another. The author also personally knows salespeople who, before the new California Solar Initiative requirements, wouldn't go on any roof and who would routinely eyeball the shading analysis, because anything more than that "gets in the way of the sale", either in time required or in providing "unhelpful" information.

Major shading problems can cause 40-60%+ in lost energy. The proposed certification that follows won't eliminate fraud and chicanery, but a well publicized sales certification and sworn code of ethics will go a long way to tightening up sales presentations.

2. SOURCES AND MAGNITUDES OF PERFORMANCE LOSS IN PV SYSTEMS

There are many sources of performance loss in typical PV systems. Most of these are more or less unavoidable as they are set by the technology and manufacturing limitations, or by the soiling conditions of the locale. However some loss factors are somewhat more under the control of the system designer. Installers have some control over wire losses, allowing up to approximately 5%, or minimizing it at usually no less than 2%. See Table 1 for an illustration of the relative performance loss factors.

The significant controllable loss factors are the array orientation and shading. The existing roof presents some limitations to which locations and orientations are possible without creating aesthetic monstrosities, however, which roof face is chosen – East or West, North or South, will have a large impact on the results. Choosing the West roof on 4:12 pitched San Jose home will cost 13% of performance compared to only 3% on the South roof (compared to the ideal installation at a steeper pitch facing south).[1] This 10% variation is more than double the entire wiring loss factor allowed by the National Electric Code.

Loss Variable	*Loss Factor*	*Performance Factor*
Module Temperature	9-12%	88-91%
Inverter Efficiency	4-11%	89-96%
Dust & Dirt	5-15%	85-95%
Manufacturer Production Tolerance	0-10%	90-100%
Module Degradation over 20 years	2-10%	90-98%
Module Mismatch	1.5-2.5%	97.5-98.5%
Wiring (AC & DC sides)	1.5-5%	95-98.5%
Orientation & Tilt	0-40%	60-100%
Shading	0-100%	0-100%

Table 1: Relative Performance Loss Factors in PV Systems.

Interestingly, the East roof would cost about 18% performance – the extra 5% loss is due to morning vs. afternoon cloud patterns.[2] If the North roof were chosen by a soon to be ridiculed system designer – the loss factor for a 4:12 pitched roof in San Jose would be about 30%.[2] These losses get worse as the roof gets steeper, so it is clearly important to be aware of the tilt and orientation of the array.

However, Even more important is the loss of performance due to shading of the array. It is not uncommon to have a "small" amount of shading on an array costing up to 20% of output. "Some" shading might be up to 30%, and "major" or "substantial" shading could be 50% or more. In areas where there the trees are frequently taller than the homes, this is not unusual. Unfortunately "small" shading is routinely dismissed, "eye-balled", and often not even factored into the performance or economic analysis, yet this factor alone dwarfs all other factors by far. Picking the right roof can have a huge impact on the results.

The question might then become, does the installer put the PV system on the South roof with 35% shading, the West roof with 25%, or the North roof with 0% shading? It turns out the best answer in this case is the North roof, for two reasons: 1) It will yield the most total energy production, and 2) The Time-of-Use value of that energy production may further exaggerate the benefit because most of the production from a North roof comes during the summer peak energy production season and time of day when the sun is highest in the sky and the energy is most valuable. The exact difference in results will depend on the impact of the South roof shading on Time-of-Use net metering of the system's output.

The point is, the answers aren't obvious, and the quick rules of thumb used by many salespeople have lead to underperforming systems compared to what they could have done if they had considered all the issues in greater depth. Even "relatively small" errors in shading guesstimations of 10 to 20% are huge compared to the small amount of design control the installers have over wire size (1-5%), and to a lesser extent, tilt & orientation.

To put the relative magnitude of the loss due to sales errors in perspective, think of the incredible effort inverter manufacturers expend to improve their product's efficiency by 0.5% or 1.0%, or the amount of research needed to raise a solar cell's efficiency from 20% to 21% (a 5% increase in relative performance). Now compare that to a 10% or 20% (or more) preventable loss due to quick but poorly thought out sales decisions made in the field.

3. DON'T INSTALLER CERTIFICATION PROGRAMS ENSURE GOOD DESIGNS?

The top-level system designer usually has some control over array orientation and shading by working with the customer to choose the best tradeoff of system performance and aesthetic concerns. Ideally this involves analyzing estimated performance on each of the potential roof candidates and discussing location on those roofs with the customer, culminating in the customer choosing which roof location to place the array, balancing performance and aesthetics.

As the PV industry matures, companies are growing and adding specialist job functions, including sales specialists, who have only limited exposure to actual roof working conditions, installations, or the design classes and theory behind those installations – the kind of theoretical and practical knowledge most experienced installers have picked up over the years. Sales specialists are more likely to receive "sales training" rather than "design & installation training", since the former more directly improves their income and advancement.

As it stand now, there are no sales standards whatsoever in California, other than the "Home Improvement Salesperson" registration that only requires the applicant

not have been found guilty of a violent felony in the recent past.[3]

Unfortunately, these specialized sales professionals are the only people from the company the customer is likely to encounter before a contract is signed. Often the salespeople have substantial, if not total, control of the top-level design. Usually product choice, mounting type, tilt, orientation, and most importantly location (determining shading) are decided at the time of sale as part of the presentation and negotiation with the customer.

Once the installer receives the signed and closed sales contract for a system to be installed facing north-east behind the chimney (because that was the poorly informed customer's choice in the compromise between performance and aesthetics), it is usually to late. Minor (5-20%) errors may not even be noticed by the installation crew – they just put it close to where they were told, even if they use a shading analysis device to "fine tune" it. Major errors will be difficult or embarrassing for the salesperson and the company to try to correct. It may cause cancellation of the sale, or it may make the company look incompetent, hurting the chance for referral sales. In the worst cases, it goes unaddressed.

4. CURING PREVENTABLE PERFORMANCE LOSS

The author proposes a salesperson's certification comprising site analysis (tools, techniques, interpretations, estimation techniques), energy efficiency analysis, economic analysis where there are rate differentials (tiers, time of use, demand charge offsets, energy efficiency economic analysis), a code of ethics regarding shading analysis and making proposals, and safety while conducting site visits and inspections.

The certification would require an examination of knowledge of the above factors, and possibly some small amount of experience. There could be several levels of certification, with higher levels awarded upon demonstration of greater knowledge and experience. The certification might also include follow-on training, complaint resolution and periodic recertification.

4.1 Industry Support for Sales Certification

The author has raised the concept in various fora to a variety of installers & sales professionals (experienced and inexperienced) and has received unanimous positive support.

5. CONCLUSION

The quality of sales design and analysis, has a major impact on the quality of systems being presented and sold to customers. An improvement eliminating even some of the preventable loss would raise performance many systems performance more than if we could create 100% efficient inverters and eliminate wiring loss. Adopting sales standards similar in quality to the installer standards would go a long way in boosting system performance, customer satisfaction and industry maturation. It will be a proud day when every customer can be sure of getting what they are promised.

6. REFERENCES

(1) *A Guide To Photovoltaic (PV) System Design And Installation*, http://www.abcsolar.com/pdf/2001-09-04_500-01-020.pdf, June 2001
(2) Calculations from *PVWatts: A Performance Calculator for Grid-Connected PV Systems*, http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/ March 2008
(3) *Application For Registration As A Home Improvement Salesperson*, http://www.buildersbook.com/pdf/licensecenter/apphis.pdf, January 2006