

SOLAR 3.0: ACCELERATING MARKET ADOPTION OF PHOTOVOLTAIC TECHNOLOGY

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ABSTRACT

Solar 3.0, an activity funded by the U.S. Department of Energy's (DOE's) SunShot Initiative and managed by SolarTech, is an outreach and educational initiative delivering process innovation through standardization of local land use, zoning code ordinances, permitting processes and interconnection rules for distributed solar photovoltaics (PV). The Solar 3.0 team comprises non-profit organizations, private companies, professional associations, and solar advocacy groups, creating a unique cross-section of expertise to support the team's activities.

The goal of Solar 3.0 is to achieve a 50% reduction in non-hardware balance of system (BOS) costs, or "soft costs," in identified U.S. communities by 2014. Solar 3.0 will achieve this objective by identifying and implementing innovative, scalable regulatory approaches and process enhancements across multiple levels of government and industry.

Total funding for the Solar 3.0 project is \$2.5M.

1. INTRODUCTION

The primary objective of the Solar 3.0 program is to reduce identified "soft costs" of residential and small commercial PV installation by 50% (from baseline costs established in 2011) within identified U.S. communities by the end of calendar year 2014. Solar 3.0 will achieve its soft cost reduction objectives using a two-pronged strategy:

1. Establish a soft cost reduction platform consisting of best practices, standards, published materials, and

curriculum developed by and emerging from the U.S. solar industry.

2. Develop a process of cross-industry, interdisciplinary collaboration that enables rapid dissemination and adoption of Solar 3.0 platform materials in markets served.

The Solar 3.0 program is being rolled out in four phases, as illustrated in Figure 1. Phase 1 (September 1, 2011 – August 31, 2012) focused on a needs analysis of the solar PV market in terms of soft cost reduction opportunities. Phase 2 (September 1, 2012 – August 31, 2013) focuses on developing tools, events, and processes to achieve the program goals. Phase 3 (September 1, 2013 – August 31, 2014) will focus on the implementation and expansion of successful strategies as the program penetrates deeper into the marketplace. Phase 4 represents the resulting market impact: an improved, post-Solar3.0 soft cost landscape, with a higher penetration of distributed solar in the electricity system.



Fig. 1. An overview of the Solar 3.0 soft cost reduction process.

The specific soft costs the Solar 3.0 program addresses are:

- Solar permitting preparation, evaluation, and approval
- Installation labor
- Code compliance
- Inspection techniques
- Community rules, regulations, and ordinances
- Utility interconnection rules
- Solar financing and ownership models



Fig. 2. Specific areas of PV project development targeted for soft cost reduction

The Solar 3.0 program has established communication channels and tactics at the national, state, regional, and local/municipal levels to facilitate dissemination of model tools and materials to target audiences. Solar 3.0 operates across the U.S. market, engaging with both private and public solar industry stakeholders, and incorporates feedback loops to inform DOE and the solar industry of the market impact of the program.

The Solar 3.0 program evaluates and selects materials and tools from reputable sources including DOE-funded initiatives, private industry, public utility commissions, states, and cities that have pioneered the solar market. Best practices, case studies, reports, software links, and other tools are published on the Solar30.org website, and these tools are subsequently promoted through Solar 3.0 partner channels and networks.. In all cases, the focus is on selecting and promoting materials and programs that have demonstrated effectiveness at reducing soft costs.

2. PROJECT SCOPE AND TEAM COMPOSITION

The prime project awardee and program manager for Solar 3.0 is SolarTech, a San Jose, Calif.-based initiative of the Silicon Valley Leadership Group. SolarTech and its partners on the Solar 3.0 team are creating an open source, collaborative, scalable, national platform to deploy/apply model codes, standards, rules, and processes to reduce cycle times and deployment costs for distributed PV installations. Solar 3.0 employs an implementation strategy that encourages adoption of these standards by the appropriate level of government or utilities in all active solar states, and by more than 500 companies by 2014.

The Solar 3.0 project focus is on the “distributed generation” market, with particular focus on local property (homes/businesses) zoning, building codes and ordinances, fire and electrical codes, permitting and inspection processes, and interconnection standards and rules. The project leverages model guidelines, best practices, and proposed standards that have a demonstrated ability to reduce solar soft costs.

In 2012, Solar 3.0 concentrated its effort on 25 of the largest U.S. metropolitan areas, with a total engagement goal of 100 communities (Figure 3.).

Top 100 Targets in 2012

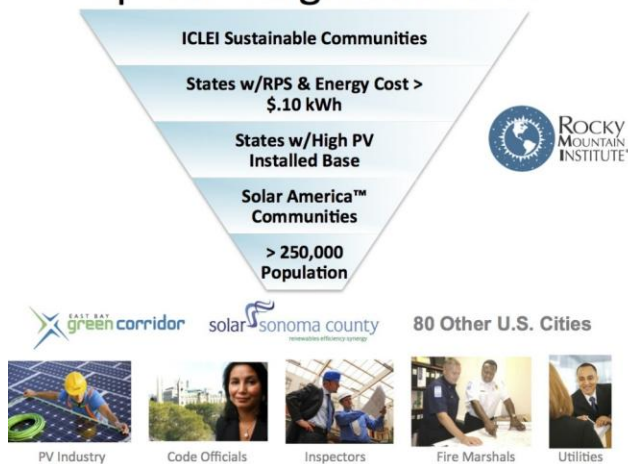


Fig. 3. The process for selecting the first 100 target markets for Solar 3.0

In 2013 and 2014, the program is being expanded to reach over 1,000 U.S. communities, 1,600+ code officials, 90+ utilities, 500+ PV installers, and more than 30,000 industry stakeholders across the country. More detail on how target communities are evaluated can be found on the Solar 3.0 website (<http://solar30.org/communities/community-evaluation-criteria/>).

Solar 3.0 uses a cross-disciplinary approach to reach its target stakeholders. The team comprises representatives from:

- Solar industry supply chain
- Building official, electrical inspector, and fire safety professional associations
- Research and educational foundations
- Public advocacy organizations
- Solar industry associations
- Regulatory and safety organizations
- Public universities

A Steering Committee comprising representatives from each of the sub-award recipients helps guide Solar 3.0 activities. The Steering Committee meets monthly via teleconference and is encouraged to provide feedback and ideas on an on-going basis. The entire Solar 3.0 team meets approximately three times per month to coordinate, gauge progress, and adjust program activities as necessary.

3. PHASE I ACCOMPLISHMENTS

Solar 3.0 made significant headway in Phase 1 of the program. The major accomplishments are highlighted in the proceeding paragraphs.

In Phase 1, Solar 3.0 collaboratively developed numerous online and on-site training curricula. Solar 3.0 assisted with the development of the PV Online Training (PVOT) project with the Interstate Renewable Energy Council (IREC) and its partners, and developed the on-site companion course to PVOT. The on-site companion course presentation is instructed by the International Association of Electrical Inspectors (IAEI) and Underwriters Laboratories (UL). Nationwide Continuing Education Units (CEUs) can be issued for on-site course attendance. Solar 3.0 facilitated the accreditation process for both pieces of curricula and served as a distribution partner for PVOT via the Solar30.org website.

Solar 3.0 developed and produced the National Survey of Solar Installation Practices, which received 550 responses from all areas of the country, and completed a summary report of results. The survey received strong responses from primary target Solar 3.0 audiences, as shown below (percentage of total responses received):

- Electrical/Combination inspectors - 62%
- Building officials – 17%
- Owners/managers/supervisors - 10%
- Plan reviewers - 6%
- Other – 5%

This survey facilitated the gathering of key metrics pertaining to 2012 permitting, installation, and inspection costs and established a control group for future information gathering and analysis.

Phase 1 saw the development and production of the Web-based Solar PV Toolbox using a collaborative, integrated approach across the Solar 3.0 partners and outside experts. This Toolbox is the foundation of the Solar 3.0 program and includes accepted best practices and standards selected from across the country. The Toolbox covers numerous solar PV soft cost areas including:

- Permitting
- Local rules and regulations
- Planning and zoning
- Financing and procurement
- Installation and inspection
- Interconnection
- Third party software

The content format follows a consistent *Problem/Solution/Example/How To* methodology across all topics and is revised and updated monthly. The Solar 3.0 Toolbox can be found at: <http://solar30.org/toolbox/>.

In Phase 1 Solar 3.0 developed, produced and maintained the Solar30.org website (<http://www.solar30.org>), which includes essential content pertaining to soft cost reduction such as:

- Solar 3.0 process description
- Target community profiles and evaluation criteria
- Solar 3.0 Toolbox
- News and Events page with event management system

The website also features several cutting-edge sub-systems:

- Community survey system
- Utility survey system
- User registration system
- Dynamic publishing and user feedback engine

The website was developed and is consistently maintained by a team of information technology, communications, and solar industry experts.

In Phase 1 the Solar 3.0 team also developed and produced a detailed event program. The program is composed of a mix of online and offline informational and workshop-formatted events containing Solar 3.0 specific and third-party generated content. In Phase 1, Solar 3.0 delivered 13 events including:

- Six on-site workshops at various locations around the country.
- Four webinars on topics related to soft cost reduction.
- 3 informational seminars at various industry events.

Phase 1 also saw the development of a Model Solar Access Ordinance produced to address the issue of future limitations to solar energy production due to tree growth or construction on property neighboring a solar installation. The Ordinance would augment privately negotiated solar easements, and prior zoning building height ordinances and appropriation-based laws. Where implemented, the Model Solar Access Ordinance would reduce the financing risk of solar development and thereby reduce soft costs.

Solar 3.0 also contributed to the development of the California Permitting Handbook by participating in workshops and contributing key materials and guidance pertaining to residential permitting. The guidebook implements best practices and standards endorsed by Solar 3.0 and represents a best practice for state policy and solar permitting and inspection.

In Phase I, Solar 3.0 developed and produced a comprehensive solar PV soft cost model which incorporates inputs from three major soft cost surveys:

- The Solar 3.0 survey of solar installation best practices (550 responses)
- The International City/County Management Association survey of local governments regarding solar installation trends and attitudes (2,500 responses)
- The National Renewable Energy Laboratory (NREL) survey of solar soft costs (90 responses)

This cost model updates and augments prior work done by NREL, the Rocky Mountain Institute (RMI), and others, and defines a roadmap for soft cost reduction programs and cost reduction analysis.

4. OBJECTIVES FOR PHASES 2 AND 3

In Phase 2, Solar 3.0 will expand its scope in the following ways:

- Engage equally with the solar industry supply chain and state/regional/local Authorities Having Jurisdiction (AHJ's) to disseminate the best practices, tools and curricula developed during Phase 1, while continuing to add resources that serve these stakeholders in achieving PV soft cost reductions.
- Expand the subject-matter focus of Phase 1 (permitting, installation, and inspection) to include interconnection; installation labor cost reduction; and state/regional rules, regulations, and policies.
- Market and promote the PV Online Training program on a national basis.
- Expand distribution channels for Solar 3.0 program materials to include other national/state/regional professional membership associations.
- Expand the workshop and webinar program to cover five times as many U.S. cities (e.g. Phase 1 targeted 100 communities, and Phase 2 will target up to 500 more active solar markets/communities for more intensive program delivery).
- Evaluate effectiveness of Phase 2 activities on achieving soft cost reduction goals.

In Phase 3, Solar 3.0 plans to:

- Expand the subject-matter focus to include the remaining identified areas of soft costs.
- Leverage online media and social networks to engage a national audience.

- Syndicate, publish, and disseminate Solar 3.0 program materials through distribution channels in order to reach 1,000 or more additional communities.
- Evaluate effectiveness of Phase 3 activities on achieving soft cost reduction goals.

5. CONCLUSION

The development of PV installations involves a complex matrix of financial, regulatory, and operational processes that can often lead to elevated project costs, an increase in the cost of generated power, and, in some cases, project failure. However, innovative approaches in cities and regions throughout the country demonstrate that some of the soft costs associated with the PV installation process can be reduced or avoided altogether. Solar 3.0 aims to identify those cost reduction opportunities, note the best practices under which they are successful, and collaborate with industry, AHJs, utilities, and other stakeholders to make those reductions a reality throughout the US.

6. ACKNOWLEDGEMENTS

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