

# **A Roadmap for Reducing Rooftop Solar Costs by 50%**

**Less Paperwork = More Solar**

*A Solar Freedom Now White Paper*

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## Executive Summary

The solar industry got what it wanted over the last five years: a dramatic reduction in the cost of solar panels. In 2008 the panels for a typical house cost \$16,000. Now these same panels can be purchased for less than \$3,000. Equipment for a complete solar installation is quite affordable. Indeed, in Germany the price for an average rooftop system is about \$10,000 and can be installed in less than a week with a single page of regulatory paperwork. If these were the prices in the U.S., rooftop power would be cheaper than utility power for most homeowners.

But in the U.S., the price of the average rooftop system is still about \$20,000. These higher prices are almost exclusively related to the localized regulations and requirements necessary to “officially” install a standard rooftop system, U.S. solar installers are faced with a virtual blizzard of paperwork and red tape to install a system – everything from complicated permitting requirements to formalized interconnection permission from the local utility to multiple redundant inspections to exhaustive incentive applications. These “soft costs” -- essentially non-hardware costs -- effectively double the price of a rooftop installation in the U.S. compared to Germany. The nascent rooftop solar industry is literally suffering death by a thousand papercuts. Homeowners pay twice as much as they should, and in many cases have to wait six months or more to get a simple system installed.

Numerous efforts have been made to reduce and simplify this paperwork. But like a nationwide game of mutant “whack a mole,” regulations and requirements are expanding. With 18,443 cities, 3,273 utilities and 50 states – all of which have some jurisdiction over rooftop solar systems – localized efforts to simplify solar installation paperwork are not scalable across the country. This paperwork is a brick wall impeding the solar industry’s cost reduction goals.

*Solar Freedom Now* is committed to taking a national approach towards reducing these soft costs. It is a policy problem, one that new solar technologies, better software or less expensive solar panels cannot solve. We recommend the implementation of a single national policy that would grant homeowners the right to install a standardized, under 10kw system, using UL listed components, following National Electrical Code standards, installed by a qualified contractor and subject to a single local inspection.

We can cut the price of rooftop solar by 50% if we **eliminate** this burdensome paperwork and red tape. Homeowners will benefit from cheaper electricity, and we will simultaneously reduce solar incentives, create more localized jobs and improve our country’s energy independence.

## 1. What Makes Rooftop Solar Expensive?

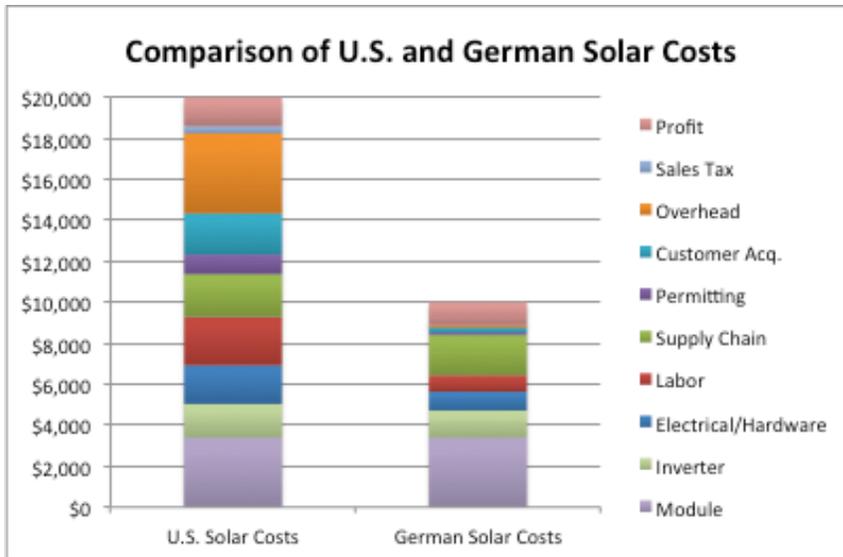
Just a few years ago, solar panels were very pricey: \$16,000 for the panels alone for a typical 4,000 watt residential rooftop system. But a not-so-surprising thing happened as worldwide manufacturing capacity increased and demand slowed down: pricing for solar panels plummeted by a factor of five. Now these same rooftop panels can be purchased for \$3,000. With some additional electrical equipment, professional installation labor and reasonable profit, the total price for a typical rooftop system should be about \$10,000 (before incentives).

These prices make sense. In the third quarter of 2012, the average price of a small (under 10kw) system in Germany was \$2.51/watt<sup>i</sup>. With prices this low, the solar market in Germany has taken off, even though their solar resources are much less than the U.S.<sup>ii</sup>

At these prices, rooftop solar generates electricity for less than \$0.17/kwh – without any incentives at all. In many U.S. locations, electricity from rooftop solar is already less expensive than electricity sold by local utilities. According to John Farrell, Senior Researcher and Director of Democratic Energy at the Institute for Local Self-Reliance (ILSR): “By 2021, 100 million Americans could install solar at less than grid prices – without subsidies. Together, unsubsidized residential and commercial solar at price parity could provide 9 percent of total U.S. electricity by 2022.”<sup>iii</sup>

But the average price of a residential system in the U.S. is about \$20,000. Why are rooftop solar systems in the U.S. twice as expensive as those in Germany? Studies by the National Renewable Energy Laboratory<sup>iv</sup> and others have found that these higher prices are almost exclusively related to the localized regulations and requirements necessary to “officially” install a standard rooftop system in the U.S. That’s right, government red tape -- local, state and federal.

The following comparison of U.S. solar costs to Germany illustrates the extent of this paperwork burden. The solar industry refers to these non-hardware costs as “soft costs” – paperwork, engineering, permits, inspections, labor, selling and marketing costs, and associated overhead. The U.S. Department of Energy’s SunShot program has focused on the reduction of these soft costs as a primary goal. Data for this chart was extracted from previously cited studies, and adjusted for 2013 solar panel prices.



Unless one has hands-on managed a residential installation, the burden of paperwork and red tape is almost inconceivable<sup>v</sup>. The figure below summarizes the documentation necessary for a simple rooftop installation in northern California in 2013 – a total of 95 pages of paperwork taking 43 hours of clerical, designer and engineering time (not including sales, financing, installation and overhead activities).

#### Simple Rooftop System Paperwork Requirements

- Business processes and documentation** – 10 pages, 6 hours
- Incentive application and claim forms** – 45 pages, 16 hours
- Building permit, design and engineering** - 19 pages, 14 hours
- Interconnection requirements** – 21 pages, 7 hours

Why is there so much paperwork? As rooftop solar systems have become more commonplace over the past twenty years, more and more localized regulations were created to cover all conceivable risks and requirements: building departments (roof loads and electrical safety) fire departments (shock hazards and rooftop venting), utilities (power quality and grid integration), incentive administrators (completeness and accuracy), policymakers (shading and energy efficiency). The result is a system that meets all the regulators' concerns – but effectively doubles the price of solar to homeowners.

### Just Ask Why?

**Why** does a homeowner need utility permission to install a simple 3kw rooftop solar system? No utility permission is needed to install a 3 ton air conditioner - which draws a tremendous amount of power from the grid on hot, sunny days.

**Why** is a structural analysis needed for a rooftop solar installation? Virtually all homes can support the relatively low 3 pound per square foot weight of a rooftop solar system.

**Why** does a customer need an energy audit before they install a rooftop solar system? In almost every home, a rooftop solar system will save more electricity than conventional energy efficiency retrofits.

Now that rooftop systems are standardized, safe and widely accepted, we do not need this stifling umbrella of regulation. Bringing U.S. soft costs down to the same level as Germany has the potential to reduce system prices by half, saving \$10,000 per residential system.

Of this \$10,000 potential reduction, \$7,000 is achievable immediately by eliminating solar-specific paperwork and red tape; the remaining \$3,000 difference compared to Germany may require changes to existing sales tax, licensing, insurance and regulatory requirements that apply generically to businesses in the U.S.

When you buy a \$10,000 used car, all you need to do is register with your state department of motor vehicles. When you buy a \$10,000 rooftop solar system it should be just as easy – just get a final inspection from your local building department.

## 2. Impact on the U.S. Solar Market

Residential solar customers generally make rational economic decisions<sup>vi</sup>. As the installed price of solar power systems has declined, adoption has steadily increased. System prices were approximately \$10/watt (\$40,000) in 2001; according to a recent study by Greentech Media and SEIA<sup>vii</sup>, system prices were \$5.21/watt (\$20,800) in Q3 2012. Recently, however, the industry has experienced a plateau in cost reductions. Although solar panel and other hardware costs have declined dramatically, there has not been a commensurate reduction in soft costs in the U.S.

For many solar customers, incentives (both federal and state) are helpful to bring the net installed costs down to where a system makes obvious economic sense. To continue the industry's rapid growth path, we can either increase incentives (possibly with a national Feed-in Tariff or additional state incentives) or reduce soft costs.

The biggest incentive in the U.S. is the federal Investment Tax Credit (ITC), which amounts to 30% of the total cost of a system. For a typical \$20,000 system in the U.S., homeowners are credited \$6,000. Hypothetically, if U.S. installation costs were the same as those in Germany, a system would cost only \$10,000 – resulting in a \$3,000 ITC to the homeowner. In 2012, approximately 450 MW of residential systems were installed in the U.S at \$5.21/watt (assuming a cash purchase, this implies a residential market size of \$2.3 billion). The 30% ITC contribution (not including financing costs) could be reduced from \$700 million to \$350 million if U.S. installation costs were the same as Germany's.

### **3. Existing Soft Cost Reduction Approaches Have Not Worked**

There are 18,443 cities, 3,273 utilities and 50 states that have jurisdiction over rooftop solar systems. In many cases there are multiple and conflicting regulations that apply to systems – for example, city building departments, national and local electrical codes, utility requirements, and state fire codes. Moreover, these regulations are constantly changing as new circumstances arise.

Intensive efforts have been made by a number of industry groups (SolarTech, IREC) to standardize these requirements, or at least create an accurate and current database<sup>viii</sup>. Unfortunately, there is little motivation for the jurisdictions involved to standardize or simplify their respective requirements. For example, utilities may be opposed to rooftop solar since proliferation of these systems will reduce their revenues. Their understandable response to this revenue loss is to increase the cost of an installation with more paperwork and more restrictions (such as limitations on net metering<sup>ix</sup>). Local governments are in favor of the environmental benefits of solar, but are reluctant to forego the permitting fees<sup>x</sup> and the municipal jobs that are necessary to regulate and inspect systems. Even state governments appreciate the jobs that are created as incentive programs are administered.

Efforts to “automate” these processes with software have not demonstrated a reduction in net costs. The value of the time savings from automating paperwork is often less than the additional costs for the software license, maintenance and training. Not surprisingly, automating bad solar processes potentially increases rather than reduces costs. Software is expensive to develop and is challenged with keeping up with the diverse and dynamic nature of localized solar installation requirements.

### Even with “Automation,” Solar Paperwork Explodes from 2001 to 2013

**2001** – 1 page incentive application, 1 page payee registration, 1 page incentive claim form submitted with completed building permit.

**2013** – The above requirements were automated, necessitating computer data entry, printout of computerized forms for homeowner signature, and then uploads of the same signed forms. Additional requirements include submission of entire customer contract and financing documents, rooftop shading analyses using specialized instruments, insurance requirements, energy audit results, documentation of energy audit completion, minimum kwh load calculations, design factor calculations, kwh output calculation, system performance test, utility permission to operate letter.

*Solar Freedom Now* appreciates and supports all the hard work that continues on both the local and state level to simplify solar regulations. Although there have been some notable successes, from an overall perspective it is apparent that these localized and ad hoc efforts will not succeed at the scale and within the timeframe the solar industry needs. It is impossible to expect that a significant percentage of cities, states and utilities will adopt voluntary measures to eliminate solar paperwork.

Lobbying by the solar industry on a state-by-state, utility-by-utility and city-by-city basis is extraordinarily expensive. Realistically, the solar industry simply does not have the hundreds of millions of dollars it takes to engage in utility rate cases in every Public Utilities Commission<sup>xi</sup>, and successfully lobby in every single state. The reality is that the solar industry is barely hanging on to the local net metering and incentive successes it has already achieved.

#### 4. The *Solar Freedom Now* Approach to Reducing Solar Installation Costs

Our goal is to **eliminate** the paperwork that contributes to very high “soft costs” for standard rooftop solar systems. Not to reduce or simplify this paperwork, not to create a new bureaucracy to administer this paperwork, and not to transition to a computerized system – but to completely eliminate the paperwork and red tape. Germany has a one page permit-incentive-financing-interconnection form (now on a single web page); this system works, saves money, and has not resulted in unsafe installations. We can do the same in the U.S.

Now that rooftop solar is more widespread we can establish a simplified “lowest common denominator” of solar installation standards that will apply to the vast majority of residential rooftop systems. For example, systems under 10 kw that use UL-listed components, follow National Electrical Code standards and are installed by a qualified contractor (who accepts liability for a poorly installed system) should require only a

single final verification inspection by a local inspector. Buying a rooftop solar system should be as easy as installing a gas hot water heater or registering a car.

Simplified federal policies have been implemented to improve telecommunications competitiveness and energy distribution. The satellite dish industry advocated for the Over-The-Air-Reception-Device provision of the Communications Act, which was added as part of the Telecommunications Act of 1996. This act pre-empts any local ordinance or landlord restriction on the use of a satellite dish on property under the sole control of the tenant. The result of this Act was that the satellite dish industry grew rapidly, improving everyone's access to TV and internet communications. Competition in communications was enhanced and customer costs were reduced.

The Rural Electrification Act of 1936 (REA) is another federal policy that was put in place to improve customer access to a new technology: residential electricity. By the 1930s nearly 90% of U.S. urban dwellers had electricity, but 90% of rural homes were still without power. Investor-owned utilities often denied service to rural areas, citing high costs and low profit margins. The REA established long-term loan programs for rural electrification, and also provided technical, managerial, and educational assistance. By 1939, the REA had electrified 288,000 rural households.

#### **Vermont's Ten Day, One Page Solar Registration Process**

Vermont has enacted a first-in-the-nation registration process<sup>xii</sup> for small solar systems, providing a national model for mitigating costly local solar engineering, permitting and interconnection. In Vermont, utilities are required to automatically interconnect standard rooftop solar systems in ten days or less, no building permit required, with a one-page registration form<sup>xiii</sup>.

In today's political climate it is indeed challenging to get almost anything done. Nevertheless, these paperwork and red-tape elimination goals are non-partisan -- attractive to both sides of the political aisle. Except for incumbent energy providers, there is widespread support for efforts to streamline solar business processes, eliminate paperwork and red tape, and reduce the costs of solar installations.

"I've been trying to put solar panels on my house for the last five months. And the regulatory process -- you can't get through it. What's going on here? Why is there regulatory opposition to solar energy?"  
George Schultz, former Secretary of State, September 5, 2007.

"... we can shape an agenda that says we can create jobs, advance growth and make a serious dent in climate change and be an international leader, I think that's something that the American people would support," President Barack Obama, February 2013.

## 5. Four Step Action Plan

Eliminating the paperwork and red tape that burdens rooftop solar can reduce rooftop solar costs by 50%. Installing solar should be as easy as installing a gas hot water heater or registering a car. Homeowners will benefit from cheaper electricity, and we will simultaneously reduce solar incentives, create more localized jobs and improve our country's energy independence.

*Solar Freedom Now* has a four-step action plan to achieve these goals:

1. Communicate this paperwork and red tape problem to the solar industry
2. Develop grass roots support and partner with like-minded organizations
3. Establish a set of national policies to eliminate solar paperwork and red tape
4. Advocate and pass these policies on a national scale

## 6. About *Solar Freedom Now*

*Solar Freedom Now* (SFN) is a grass roots initiative to make solar power more affordable and accessible for all Americans. SFN's goal is to establish national policies that eliminate the paperwork and red tape that burdens rooftop solar installations.

*Solar Freedom Now* is backed by an Advisory Board of solar industry veterans, including:

**Jim Callihan** - is the President and Co-Founder of Renewable Energy World. His company is the World's #1 Renewable Energy Network that publishes daily news online and offers several technology-focused e-newsletters, podcasts, webcasts, videocasts, plus, lead generation and brand-focused banner and e-newsletter advertising.

**Barry Cinnamon** - is a long-time advocate of renewable energy and is a widely recognized solar power expert. In 2001 Mr. Cinnamon founded Akeena Solar – which grew to become the largest national residential solar installer by the middle of the decade. His engineering team at Akeena Solar developed the first plug and play AC solar panel. He partnered with Westinghouse to create Westinghouse Solar in 2010, which he merged with an Australian company in 2012.

**Ron Kenedi** - has spent more than 30 years in the Solar Power industry, bringing to life his core belief that "Solar Power should be a vital part of the mainstream energy solution." Today, with the Solar Power industry simultaneously experiencing turmoil, uncertainty and explosive growth, it is the right time for an experienced visionary to be available to help organizations and enterprises navigate the challenging pathways to

success. Throughout his corporate career, Mr. Kenedi oversaw the successful operation of industry-leading solar energy corporations in the U.S., Canada, Australia, Africa and Latin America. Corporations include; LDK Solar, Sharp Electronics Solar Division, Kyocera Solar Inc. and Photocomm, Inc.

**Tom McCalmont** - is the President of McCalmont Engineering – which provides design and engineering services for large-scale solar PV power plants. He is also Cofounder and Chairman of the Board of SolarTech. Previously, Mr. McCalmont founded and served as CEO of ReGrid Power, which grew to become one of the largest solar design, services and installation companies.

**Paula Mints** - is the Founder and Chief Market Research Analyst of Solar PV Market Research. Ms. Mints began her solar market research career in 1998 with Strategies Unlimited. In 2005 she left Strategies Unlimited for Navigant where she continued her practice until October 2012, when she founded SPV Market Research. Ms. Mints provides classic market research products based on primary research and focused on the supply and demand sides of the solar industry and its technologies. She publishes often with Renewable Energy World and Renewable Energy Focus. Recently her chapter, Overview of Photovoltaic Production, Markets and Perspectives, was published in the Fraunhofer/Elsevier book Advances in Photovoltaics Volume 1, edited by Dr. Gerhard Willeke and Dr. Eicke Weber.

**Jesse Pichel** - is the CEO and founder of Pichel Cleantech Advisors, LLC – which provides consulting services in the Clean Technology and Electronic Technology sectors. He has over a dozen years of experience as an equity research analyst covering new technologies; he was one of the first analysts to start covering Solar and Cleantech beginning in 2004. He co-founded Piper Jaffray’s Clean Tech Practice in 2004, which had been one of the top underwriters in the sector, and moved to Jefferies in 2010. Mr. Pichel completed 47 cleantech transactions, with particular focus on China, photovoltaics, power electronics, inverters, and LED lighting. He is ranked as the top analyst by Institutional Investor in 2012 within Alternative Energy sector, and was runner up two times previously. He is the recipient of 2008 WSJ Best of the Street awards in both Electronics and Semiconductor Equipment.

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<sup>i</sup> “Why Are Residential PV Prices in Germany So Much Lower Than in the United States?,” Joachim Seel, Galen Barbose, and Ryan Wiser; Lawrence Berkeley National Laboratory; February 2013 revision

<sup>ii</sup> “Fox Cedes Solar Industry to Germany,” <http://mediamatters.org/blog/2013/02/07/fox-cedes-solar-industry-to-germany/192568>

<sup>iii</sup> “Rooftop Revolution, Changing Everything with Cost-Effective Local Solar,” John Farrell, Institute for Local Self-Reliance; March 2012

<sup>iv</sup> “Tracking the Sun – An Historical Summary of the Installed Price of Photovoltaics in the United States from 1998 to 2011,” Galen Barbose, Naim Darghouth, Ryan Wiser; November 2012; Lawrence Berkeley National Laboratory

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- <sup>vi</sup> “Diffusion of Environmentally-Friendly Energy Technologies: Buy Versus Lease Differences in Residential PV Markets,” Varun Rai and Benjamin Sigrin, LBJ School of Public Affairs, February 2013
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- <sup>xii</sup> <http://www.renewableenergyworld.com/rea/news/article/2011/05/vermont-enacts-first-in-nation-solar-registration>
- <sup>xiii</sup> <http://psb.vermont.gov/sites/psb/files/orders/2011/2011-2/219a%20Registration%20Form.pdf>