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POLICY WHITE PAPER

Bringing an Effective Feed-In Tariff to California

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Executive Summary

This Policy White Paper on Bringing an Effective Feed-In Tariff to California has been prepared by Solar Santa Monica¹ to advance the discussion of renewable energy policy. It presents a position on Feed-In Tariffs (FITs) for the November 14, 2008 Solar Cities meeting and accompanies a draft act, the California Solar Cities Act that will be discussed at the meeting.

The Solar Cities seek to increase the levels of distributed solar in the urban environment.

The “Solar Cities” are an unofficial coalition of California cities who have come together to promote distributed solar – both photovoltaic and solar thermal -- in the urban environment to achieve energy and environmental commitments. Building an infrastructure of solar systems in the cities creates jobs, builds energy security through independence, tackles tough environmental

¹ This paper was produced by the Solar Santa Monica Advisory Board FIT Subcommittee.

issues, fulfills local to global mandates, and will save tens of billions of dollars through smart investments in a clean and green energy future.

America invented the solar “photovoltaic” cell and California has bountiful solar exposure. The confluence of these might spell world-wide market dominance. Despite its legally mandated commitments to renewable energy, California’s production of electricity from solar is falling behind its own goals and is much less than other countries, notably Germany and Spain. Just last year, the Spanish installed eight times as much solar as California.

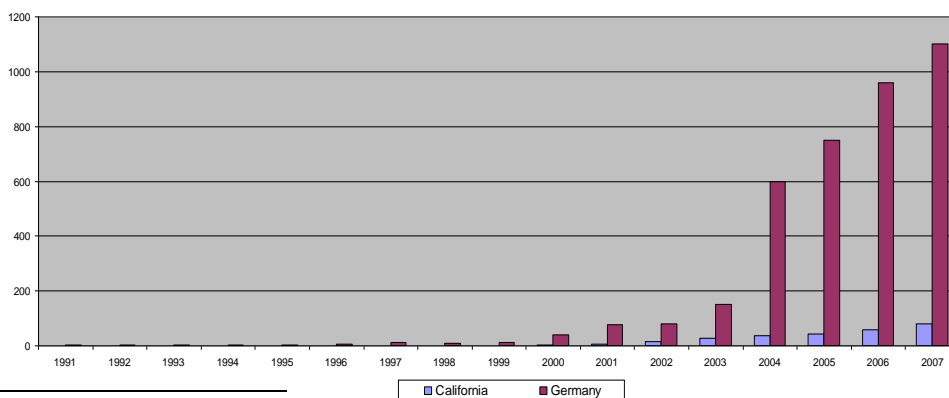
This White Paper examines the policy instruments available to achieve municipal energy and climate protection goals and to concurrently catalyze California’s solar industry. It examines two “solar support systems” for solar in the urban environment, and concludes that California’s solar generation and renewable production goals can be achieved on schedule by incorporating the successful Feed-In Tariff (FIT) model into the California Solar Initiative.

There are two basic approaches to support solar system installations.² The first uses a quota whereby utilities must achieve a specific percent or absolute amount of capacity by a set date. California’s Renewable Portfolio Standard (RPS) requires the State’s investor-owned utilities to get 20% of their electricity from renewable sources by 2010. By the end of 2007 investor-owned utilities report achieving only 12.7%; Edison leads the IOUs with 15.7% of renewable capacity.³

The second approach to promote renewable energy is through a “price tender.” In this model, a standard price or set of prices are presented for solar power production, and often for other forms of renewable energy. Germany has led the world in solar using this model and is realizing over ten times the solar capacity additions of California while creating tens of thousands of green collar jobs. Germany and Spain are fulfilling European Union CO2 mandates ahead of schedule.

The California Solar Initiative (CSI) is having mixed results. In 2007, the CSI program produced only 81 MW of solar capacity statewide while Germany installed 1,100 MW of capacity. In the first half of 2008, 93 MW was installed. California’s solar capacity is rising. Germany and Spain, with roughly comparable land areas and populations to California, show the dramatic results of what an effective policy can create in short order and with robust results for all.

Annual PV Capacity in California and Germany (MW)



² <http://wind-works.org/>

³ California Public Utilities Commission, 2007 RPS Data by Utility and in Aggregate, www.gosolarcalifornia.org

The European model for solar incentives – commonly known as “Feed-In Tariffs”-- is successful for a number of reasons: It’s simple and can be explained in one sentence: Anyone -- a homeowner, farmer, businessman church, school, or other institution -- can install a solar system and receive about three times the retail rate for every solar kilowatt-hour it produces for the next 20 years. In Spain, with considerably more solar “insolation,” the FIT is lower and for 25 years.

This White Paper advocates Feed-In Tariffs so all property owners and third party investors can earn for solar investments on buildings from 1 kW - 1 MW in size. It is a transparent program designed to provide investors with a reasonable return over 20 years. Adding the FIT option to the CSI approach has several benefits:

1. It will allow and encourage significant blocks of solar capacity to be expeditiously installed in instances where the CSI has here-to-date been ineffective.
2. It will allow California cities to achieve their energy and climate protection goals.
3. It will allow the State of California to achieve Renewable Portfolio Standard mandates on schedule.
4. It will catalyze an industry, creating sustainable green collar jobs and to achieve the next RPS and climate protection goals.

Why is California Behind?

California is known for its abundant sunshine, a carbon-free and secure energy source with enormous potential to unlock multiple benefits and to fulfill mandates. But the CPUC reports that solar in California is providing less than a half a percent of the State’s power requirement. At the end of 2007, solar contributed only 2.86% of the investor-owned utilities’ combined Renewable Portfolio Standards of 12.7%.⁴ The California Solar Cities Act will help utilities achieve these mandates.

Solar is barely scratching the surface of how we generate power in California. Even very environmentally conscious cities like Santa Monica are having trouble penetrating the community with distributed solar systems. The economics just don’t pencil out, and the “rules of the solar road” are numerous, complex, and limiting. The recent increase in tax credits will help, but will be insufficient to meet local, state, national, and global goals.

California is behind because there are limitations in the California Solar Initiative, and they are making it hard for the Solar Cities to achieve their goals. The California Solar Initiative is difficult to understand and even more difficult to use. While there are “sweet spots” in the

⁴ www.gosolarcalifornia.com

initiative's incentives that provide for attractive solar deals, the CSI excludes many potential participants and provides insufficient incentives to encourage the necessary level of participation.

Five variables cloud the CSI solar deal

- 1. The inadequacy and decline in CSI incentives**
- 2. CSI program complexity and administrative inefficiencies**
- 3. Net energy metering**
- 4. Federal tax credits and depreciation**
- 5. Solar renewable energy credits**

This section explores five variables that “cloud” the solar deal.

The Inadequacy and Decline of CSI Incentives

CSI incentives are too small to encourage the level of participation desired. Furthermore, the incentives are designed to automatically decrease (“degress”) over time. The incentive for a residential solar system served in the CSI model has already dropped from \$2.80 to \$2.50 to \$2.20 a watt, while the cost of panels has increased due to material and module shortages.⁵ While the CSI has resulted in significant activity -- the commercial incentives are in Step 5 in the Edison territory -- installations have lagged behind reservations.

One of the fundamental flaws of the CSI's program design is that much of its 3,000 MW capacity goal is unfunded. In fact, at 1,750 MW of installed capacity there are no more buy-downs. Program designers projected that solar system costs would fall enough that subsidies will no longer be required. In reality, panel prices for residential systems increased by about 5% in 2008 as CSI incentives dropped by approximately 14%.

Perhaps even more fundamental, and indicative of the inherent limitations of current solar policy, SB 1 marginalizes solar in state policy. It states that when distributed capacity reaches 2.5% of generation that “a review will be conducted.” This questions the durability of the entire CSI. With a limited solar view in sight, California will miss a major economic development opportunity. Cities will not be able to attain the levels of distributed solar they need to fulfill climate protection commitments.

CSI Program Complexity and Administrative Inefficiencies

The CSI program is very difficult to understand and to explain. For prospects and participants, it is complicated and confusing. It is difficult to compute the amount of incentive, the payback period, and the overall economic benefits of the deal. Once a property owner decides to go forward, the paper work, application, and interconnection processes are complicated and time consuming, raising costs and causing long delays.

⁵ Program Handbook, California Public Utilities Commission, California Solar Initiative, January 2008.

Net Energy Metering

Net energy metering further limits solar installations and greatly complicates the investment analysis, particularly in the urban environment. To participate in the CSI, the solar installation must offset a specific meter and the system must be sized to generate no more power than is used by that meter on site. The rules limit the size of the solar system to the consumption on site. Because of the CSI meter restrictions, virtually all multi-family buildings and multi-metered commercial buildings are excluded from participation.

Sectors where the CSI does not work

- 1) Multi-family buildings**
- 2) Multi-metered commercial properties**
- 3) Properties that can generate excess power**
- 4) Industries, businesses and institutions on low-cost rates**

Payback of the net system costs for photovoltaics installed under the CSI comes from reducing the owner's electric bill. That reduction is based on avoiding the purchase of conventional power. Its value is a function of the rate at that meter, which varies. Consequently, buildings that have very low electric rates will not benefit sufficiently from the net metered savings to make their projects economically viable. A low rate -- in addition to retarding investments in energy efficiency -- devalues the output of a solar system.

Many of the best roofs for solar in the urban environment are on buildings that are multi-metered or pay very low rates, making them unsuited for CSI participation. Time of use rates complicate the situation further.

Federal Tax Credits

The CSI incentives assume the continuation of the federal tax credits for solar energy. Those credits can be removed at any time; they almost did expire this year, once again putting the solar industry in a very precarious position. The uncertainty of the federal tax credits can affect participation in the CSI. Depreciation schedules for commercial solar systems involve complex accounting. The rules allow for five-year accelerated depreciation and provide a number of options -- some of which were recently eliminated -- complicating the solar investment calculation.

Renewable Energy Credits

The nascent and uncertain Renewable Energy Credit market adds greater uncertainty to the equation. One REC is earned for every megawatt-hour generated. Everyone wants them, and that's without understanding their value, or even a set value. Some municipal utilities -- such as Los Angeles Department of Water and Power -- are paying additional incentives to "bank the RECs," \$0.50/watt of solar capacity installed.⁶

⁶ Los Angeles Department of Water and Power, Solar Program Guidelines, January 2008 [ck citation]

The limitations of the CSI program design are holding back the solar market and making it harder for Solar Cities to attain their goals. Today in California, solar is a marginal investment that only makes sense in circumstances where customers have combined assets of roof, metering arrangements, rate structures, and capital to invest wisely. As a result of its complex rules for participation, many “fertile” rooftops in the Solar Cities “lie fallow.”

Impact or Investment?

The Feed-In Tariff model is so effective, and simple, that it’s hard to ignore. This policy opens up multiple benefits that just get better with time.

Imagine a California FIT program that:

- Employs 50,000 people in green collar jobs
- Drives the successful achievement of California renewable goals
- Leads the fulfillment of global climate protection goals
- Saves ratepayers tens of billions in avoided power purchases

So what’s holding us up? One issue only: Namely, the rate impact associated with a significant investment in distributed solar generation. Let’s put this in perspective: Any capital expenditure – a power plant, a transmission line, upgrading the distribution system, upgrading customer services, public benefits programs, etc. – causes a rate impact. These capital and operating expenses are spread across ratepayers who repay the cost plus a profit margin to the utility.

All utility investments – from power plants to customer services – cause rate impacts.

The FIT proposed in the accompanying California Solar Cities Act will actually not cause a significant rate increase. EcoMotion estimates that adding a gigawatt of solar to California’s mix in 2009 will cause an average residential bill to increase by \$1.20 a month⁷, less than a 4% gross rate impact⁸ put in perspective by Edison’s historical 6.4% average annual rate increase.

In Germany, successful investments in wind and solar caused by the FIT have caused rates to rise by 3 – 4%, costing the average family about “an extra loaf of bread” a month. (With California’s sunshine, perhaps it will be half a loaf here.) According to the German Ministry of the Environment, the added monthly cost for a household was 1.63 Euros in 2005.⁹ The German Solar Energy Association projects that this will increase to 2.14 Euros by 2014. The actual rate impact was 3.4% in 2005 and 3.9% in 2006.¹⁰ In return, Germany has met its international

⁷ EcoMotion preliminary analysis by Dave Henderson, Senior Energy Specialist, November 2008.

⁸ This estimated gross cost only takes the entire solar system cost and amortizes it across all rate classes and energy sales. It does not net out the value of the sale of conventional energy sources. The actual rate impact will likely be less.

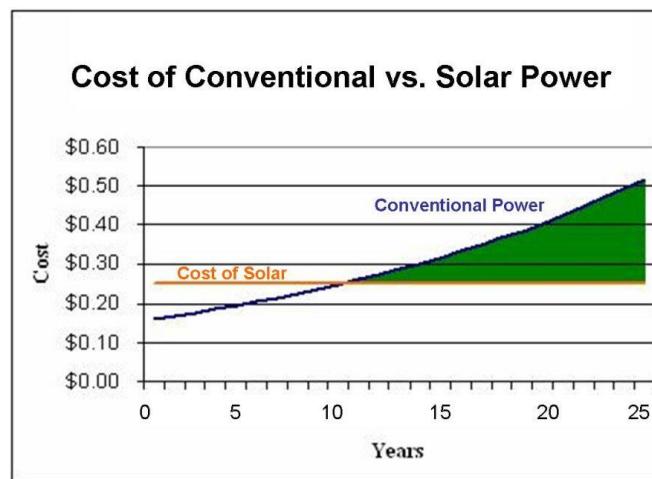
⁹ The New York Times reported in May 2008 that “At the moment, solar energy adds 1.01 Euros a month to the typical home electricity bill.

¹⁰ German Ministry for the Environment

climate commitments and become a world leader in the solar industry, creating tens of thousands of green collar jobs and exports. And solar prices will come down.

The benefits far outweigh the rate impact. California can create tens of thousands of green collar jobs.

In very short time, the marginal costs of solar power will shrink. Just this past week, the Chairman of Edison International commented that Edison’s rates might double in five years. [tk citation] Carbon caps will put additional pressure on conventional power rates. Depending on how fast conventional power prices escalate, the cross-over with solar prices will occur. Many experts believe solar will be the cheapest source of electricity in 10 – 15 years.¹¹ Since solar systems will generate power for 25 – 40 years, the net benefit of solar investments (shown below in green) will far exceed the short-term marginal costs of solar.



By taking strong action today, California will reap multiple benefits sooner. Then a new and positive question comes into play: “How much capacity will we get?” Projections are hard to make especially given current market conditions and fortunately California has tools to address uptake. If we get too much capacity, FIT prices can be decreased for new projects. Caps are an option now exercised in Spain.

California will benefit from others’ experiences. Germany set unusually high prices and has had unusually remarkable results. Spain got far more solar capacity than it bargained for. In hindsight its experts believe that the country set FIT prices too high. This caused explosive growth of really large PV systems, many times more than expected. Now Spain, like Germany, has lowered incentives to match the market and policy directions. These lessons can be used to craft FIT prices for California that provide investors a fair profit and that do not overpay for capacity.

Putting Tariffs in Perspective

Utilities have been buying and selling power for many years. Independent power producers and other qualifying facilities have been “feeding” power into the grid for decades. Neighboring

¹¹ Abengoa Solar predicts – and has made sizable investments based on this – that solar will be the cheapest form of electricity in 10 – 15 years.

utilities and power pools often “shunt” power to one and other, receiving payments for the energy and capacity. “Feed-in tariffs” are a generic utility term for prices paid for power.

Buying renewable power from independent power producers dates back to 1978 in America, when President Carter signed the National Energy Act and the Public Utilities Regulatory Policy Act. The acts encouraged energy conservation and the development renewables such as wind and solar. PURPA spawned a movement of “qualifying facilities” operated by independent power producers.

Standard Offer contracts for renewable power development were introduced in California in the early 1980s. The California Public Utilities Commission ordered utilities to offer standardized contracts; Standard Offer No.4 had fixed prices. By the mid-1980s, private power producers had installed 1,200 MW of wind capacity in California.

Background on Feed-In Tariffs

“Feed-In Tariffs” have taken on a new meaning in the past five years, now commonly known as sets of prices for independent renewable energy production. Different tariffs are paid for different renewables – wind, solar, biomass, geothermal, etc. – and for different-sized systems. Generally, the tariffs paid per kilowatt-hour are 2 – 3 times the retail rate, well above utility avoided costs and the wholesale rates traditionally paid for power purchases. Feed-In Tariffs are proven policy instruments that accelerate uptake of societally beneficial forms of energy, proven also to catalyze the development of entirely new solar industries and markets.

Wikipedia defines “feed-in tariffs” as an incentive structure to encourage the adoption of renewable energy through government legislation. Electric utilities are obligated to buy renewable power such as solar, wind, biomass, and geothermal at above-market rates set by the government.¹² Incentive levels are built around the requirements of solar investors.

Without question, the German FIT model presented below in brief has proven to be the world’s most effective practice for boosting adoption of renewable energy technologies. The model has been used for wind and solar, with wind developments providing many times more power than solar. More than 41 nations – from Portugal to France, Italy, Denmark, the Czech Republic, and South Korea, and states and utilities are now emulating the German model, using FITs to stimulate renewable power production.

European Solar Successes

Germany: The German Solar Feed-In Tariff has resulted in Germany’s preeminence in photovoltaics. In a matter of years, Germany has installed 52% of the world’s total solar-electric capacity. Despite relatively low “solar insolation” – about equivalent to Anchorage, Alaska -- Germany has created a solar industry that has attracted billions of dollars of public and private-sector investment, and that currently employs 55,000 Germans who work in all facets of solar R&D, poly-silicon manufacture, wafer and cell production, and photovoltaic module assembly.¹³

¹² Wikipedia, “Feed-In Tariffs,” http://en.wikipedia.org/wiki/Feed-in_Tariff

¹³ Flanigan and Tay, The Results Center, Case Study #127, “The German Solar Feed-In Tariff,” December 2007.

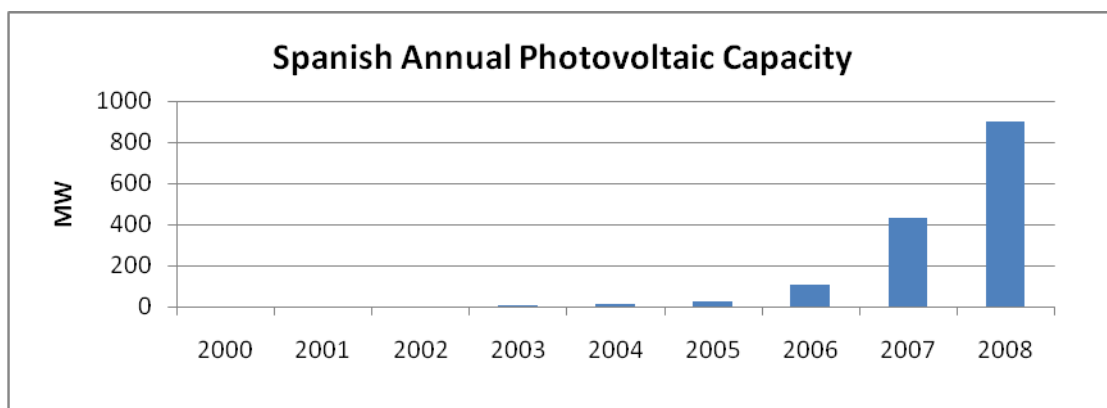
The year 1991 marked the inception of the FIT mechanism whereby homeowners and businesses can feed as much renewable electricity into the grid as they can and want. Spurred by the European Union's commitment to climate protection and the Kyoto Protocol, the German government legally regulated the "feed-in" of electricity from independently generated renewable energies to the electric power grid under the auspices of the Electricity Feed Act.

In April of 2000, the German government passed the Renewable Energy Sources Law that provided highly attractive incentives for different forms of renewable energy. The law dramatically stimulated the German photovoltaic market. In fact, it led to Germany's solar capacity and worldwide leadership. Unlike the "net metering" provisions that are common in the United States, and that limit solar system size to annual consumption of a particular meter, the feed-in tariff allows for participants to maximize solar production at a particular site. Furthermore, the rate is fixed for 20 years, making the economics of each investment clear to investors and clearly profitable for all participants.

In 2004, the German law was further enhanced with an increased tariff structure, resulting in the installation of 600 MW of photovoltaics, followed by 750 MW in 2005, and 960 MW in 2006. For comparative purposes, total U.S. installations in 2006 were on the order of 140 MW, about 15% of the German total. As a result of Germany's experience, many other countries have instituted similar tariff mechanisms while even more are examining the policy for adoption.

Spain: In Spain, the development an electricity policy and the birth of the Feed-In Tariff began in 1997. The Electricity Act 54/1997 resulted in regional and national amendments to adjust tariff levels, the prices paid by utilities for power, and regulations to spur the solar market.¹⁴

After a number of unsuccessful solar program iterations, Royal Decree 661 in 2007 became the driving force of the huge upsurge in solar installed capacity in Spain. Its timing and direction put all the relevant forces -- investors, government, contractors, and public -- in alignment.



¹⁴ Flanigan and Tay, The Results Center, Case Study #128, "The Spanish Solar Feed-In Tariff," DRAFT, October 2008

The Feed-In Tariff policy result has been better than expected: Since 2007, about 1 GW of solar capacity has been installed, representing a ten-fold increase in installed solar capacity. The national goal for solar capacity in 2010 was reached over a year early.

In Germany, periodic reviews are stipulated in the national law so that FIT prices can be adjusted to market conditions. As the FIT catalyzes demand, product prices – panels, inverters, balance of system, installation costs – go down. A year ago Germany completed a review of its program and reduced FIT prices by about 8%. [ck]

Simplicity and Price

The complexity of the CSI stands in contrast to the simple elegance of FIT programs. In the FIT approach, an investor gets a set price for every solar kilowatt-hour generated over 20 – 25 years. The success of the German and Spanish models is based on levels of incentives that have clearly been attractive. Suitable returns for investors have resulted in significant solar uptake, and have spun-off many other benefits through infusions of venture capital and jobs.

The California Feed-In Tariff: California has had recent experience with a FIT program. A feed-in tariff for 480 MW of renewable power generation that was enacted by the CPUC in February 2008. Originally designed for water and wastewater facilities, it was expanded to include some “non-water” customers. The CPUC noted in its proceedings that the intent of the program opportunity is, “... to present a simple mechanism for small renewable generators to sell power to the utility at pre-defined terms... without contract negotiations.¹⁵”

The rationale is good, but the incentive levels are tied to the avoided costs of conventional generation. Its payments are too low to stimulate the market. Edison reports no uptake in the first six months of 2008. Furthermore, its “Market Referrant Price” (MPR) is difficult to compute, based on system size, location, and time of delivery. In contrast, this White Paper advocates FIT payments for distributed solar designed to provide reasonable returns to investors; at least sufficient to amortize the cost of the system over 20 years, plus an annual return of 10%.”

Next Steps for Solar Cities

How can one read about Spain and Germany and not want to emulate their solar success here? With California’s abundant sunshine, it’s shameful to be ignoring the power of the sun. This is the most abundant, indigenous, free energy source we have.

European countries are ahead of schedule in meeting their RPS and climate protection goals. They’ve invested in stable power prices, hedged against future price volatility of conventional fuels, and created dynamic solar industries within their borders. These industries are robust and forward-thinking, ranging from cutting-edge research and development that will make solar economics that much better in time, to equipment manufacture, installation, and export. Why can’t California have that too?

¹⁵ California Public Utilities Commission Decision Regarding Feed-In Tariffs in Rulemaking 06-05-027, Feb. 14, 2008.

The City of Santa Monica intends to meet its environmental commitments of a 15% city-wide reduction, and 20% municipal reduction, of CO2 levels from a 1990 baseline by 2015. The production of building-attached photovoltaics must be a major element in this reduction. Santa Monica launched its Community Energy Independence Initiative and Solar Santa Monica program to accelerate the uptake of renewable energy and advanced distributed generation and to encourage improved energy efficiency, with a goal of being electricity self sufficient by 2020. To accomplish this goal, fully 17,500 rooftops will have to carry solar systems. For the City of Santa Monica to fulfill its energy and environmental goals, there needs to be greater policy support for solar energy at the State level, either through legislative and/or regulatory actions. To adorn rooftops throughout the community with solar systems, the rules need to be amended.

The Solar Cities have come together to address their needs related to solar energy. What will it take make solar prevalent in California? The Solar Cities need to be able to maximize solar in their communities. This can be addressed with a) policies that serve sectors that have been “boxed out” of the equation, and b) prices that make solar investments reasonably profitable.

Specifically, Santa Monica will need a solar policy in Sacramento (Governor and legislature) and carried out in San Francisco (PUC and CEC) that makes solar a sound and predictable investment. The Solar Cities need to reach out to key sectors: apartment buildings, multi-metered commercial buildings, warehouses and industrial facilities, and publically owned structures. In each case, the owners of the photovoltaic systems need to earn an easily understandable and reasonable profit.

The successful German and Spanish FIT examples used high prices to spur the market. And how it has worked! Instead of pegging “acceptable prices” to projections of proxy gas plants as we do in California, these models first determine reasonable profit and then provide incentives accordingly. California, on the other hand, is getting what it pays for: By limiting available incentives, the State has had limited program success. Now is time for Californians to step forward to promote solar energy. This will require an ‘above market’ investment – paid by ratepayers – that will pay off in multiples over time.

Conclusion

The CSI is a valuable program. Its subsidies and net-metering program have produced significant results. But the CSI excludes many potential participants and its incentives are not sufficient to catalyze the level of solar installation California needs to meet renewable energy goals.

The CSI is particularly unsuited to encouraging solar installations in the urban environment because it excludes virtually all multi-metered properties and properties with large roofs and small consumption. Solar Santa Monica is not suggesting scrapping the CSI; instead it should be retained and improved. Solar Santa Monica proposes adding a tool to the CSI to facilitate the annual installation of hundreds of additional megawatts of distributed solar PV generation.

Specifically, the attached California Solar Cities Act of 2009 provides Feed-In Tariffs for distributed solar generation. The Act limits the size of FIT installations to no larger than one

MW capacity, specifically available for PV systems that are attached to (or part of) buildings. These are the installations most relevant to the urban environment and to the Solar Cities.

The proposed Act creates a very simple system. Based on the methodology presented in the ACT, the CPUC will determine the average installation cost and electricity production levels of various types of photovoltaic systems in various regions in California. Except for tax exempt and governmental entities, the cost basis for FIT computation is reduced by the amount of federal tax credit available at the time the system is operational. The Commission would then adopt FITs for each region designed to produce a reasonable return on the property owner's investment.

California utilities would be required to buy each kWh delivered to the grid by participating solar systems, measured through a separate, on-site output meter, at the FIT price fixed for 20 years. After 20 years, the utility will pay a discounted rate for the power it receives. The power purchased by the utilities under the Act will be credited toward the utilities' RPS requirements, and the utilities will own the REC's.

The added cost of the FIT payments and all of the other program costs will be spread among all ratepayers, maintaining utilities' profit margins. The successful European feed-in tariff programs have caused very small rate increases; in Germany the program costs the average homeowner about the costs of a loaf of bread per month. As solar prices fall, and conventional prices rise, the premiums will decline and will ultimately be eclipsed. The Act requires that the CPUC establish a simple, fast, low cost and efficient application process, standard contract and overall administration.

The Solar Cities are drawn together to accelerate the use of solar power and to make renewable energy a significant platform for sustainability. The Solar Cities, seek to build on the California Solar Initiative to achieve common economic and environmental goals. By continuing the California tradition of standard offers for renewable power, California can take a leadership position with the energy source – solar power – that many believe will be the cheapest and predominant energy of the future.

The California Solar Cities Act of 2009 will help the Solar Cities and all of California to go solar at no cost to taxpayers and at a low cost to ratepayers. It is an investment in California's future that will pay off in lower rates, less pollution, reduced greenhouse gases, and more renewable energy. Any customer who chooses to do so could opt for FIT payments. This would open up solar to apartment building owners, commercial property owners, sets of investors, institutions, warehouses, parking structures, residential rooftops... all driven by clear and consistent basis for payments with incentive levels sufficient to unleash the solar market.