

# International Motivations for Solar Photovoltaic Market Support: Findings from the United States, Japan, Germany and Spain

Joanna Lewis,<sup>1</sup> Amber Sharick<sup>2</sup> and Tian Tian<sup>1</sup>

Prepared for the Center for Resource Solutions and the  
Energy Foundation China Sustainable Energy Program

January 13, 2009

## Overview

PV has a number of important characteristics that, depending on the local conditions, enable the shift to a more sustainable energy system. Policy makers, governments, utilities and customers are the major stakeholders for PV, and there are different motivations and arguments for PV deployment among each stakeholder group. Five primary groups of benefits can be identified:

- **Fossil fuel avoidance or displacement benefits** (including energy security and avoided fuel cost, fuel scarcity, and fuel price volatility benefits);
- **Environmental benefits** (reduction of greenhouse gas emissions and air pollutants, as well as the avoidance of associated external costs);<sup>3</sup>
- **Cost reduction benefits** (including learning by doing benefits within the local supply chain and labor market);<sup>4</sup>

---

<sup>1</sup> Georgetown University, Washington, DC, USA

<sup>2</sup> Zentrum für Sonnenenergie und Wasserstoff-Forschung (ZSW) Baden-Württemberg, Germany

<sup>3</sup> Common motivations for supporting renewable energy utilization include the substitution for fossil fuels and avoidance of related environmental externalities. For PV, however, the subsidies proposed are in many cases larger than the potential environmental externalities. (Bentham et al, 2008)

<sup>4</sup> A common motivation is technology spillover effects from learning by doing, and the associated cost reductions with cumulative experience with the technology. The problem is that some of the benefits related to production today leading to a lower production cost in the future will benefit all consumers in the global market, potentially undercutting the unique rationale for domestic support. Learning in the cost of PV modules, for example, is usually based on global experience, since most modules are manufactured and sold around the world in a global market. As such, it is hard to argue for domestic support regimes for the sole purpose of driving down module costs; those module cost reduction occur as a result of aggregate global support for PV, and the cost reductions benefit all buyers of PV modules globally. In contrast, learning that occurs in the cost of installing solar PV systems, marketing, and managing the installations and supply chain appears to build knowledge and lower costs at a much more local level. As a result, it has been suggested that while learning-by-doing in solar PV module costs is a global phenomenon, learning-by-doing in solar PV *balance-of-system* (BOS) costs is a local phenomenon. BOS costs would include the cost of labor, potentially the inverter, management, and marketing, but not the module cost. The possibility of driving these costs lower has been a significant motivator for some of the PV deployment programs established worldwide (Bentham et al., 2008).

- **Electric utility benefits** (including decentralized supply that avoids certain transmission and distribution expenditures, and peak power generation that helps avoid the construction and use of other peaking generation plants);
- **Industrial development and employment benefits** (including the establishment of jobs and domestic growth industries); and
- **Customer benefits** (including green pricing programs and perceived green characteristics).

This memo explores the motivations for supporting the development of domestic solar PV markets in **the United States (focused on California), Japan, Germany, and Spain**. It briefly details the nature of the supporting policies, and explores the benefits of the support system to date. A selective list of citations is offered at the end of the memo for those interested in more details.

## **Case 1: United States: California**

### ***PV Market and Policy Framework***

Since much of US solar PV capacity is located in California, this case study focuses on the rationale for policy support in the California context. California aims to build a self-sustaining solar industry that is able to compete with conventional generation options by 2016, without significant additional state incentives. Although solar energy makes up only 0.3% of the total electricity supply in California, solar PV has experienced rapid growth since 2000, with under 5 MW installed in 2000 and nearly 198 MW installed at the end of 2006. This rapid growth is primarily the result of state incentive programs: solar *rebates* (a dollar amount per installed Watt) and production-based *incentives* (a dollar amount per MWh generated). It is also supported through the State's net metering program without which the two incentive programs would have been much less effective. Federal tax incentives have also played a major role in deployment, as has a solid net metering program in the state.

The California Solar Initiative (CSI) recently (2007) put forth a goal to create 3,000 MW of new, solar-produced electricity by 2016 (SB1). The CSI statewide budget is \$3.3 billion over 10 years, distributed between three distinct program components: The California Solar Initiative (\$2.167 billion/1940 MW); the New Solar Homes Partnership (\$400 million/360 MW); and the Publically Owned Utility Programs (\$700 million/700 MW). The CSI also encompasses the January 2004 "Million Solar Roofs Initiative," which set the goal of one million solar homes in California by 2015. These incentives are focused on residential and commercial PV, though the RPS is also separately supporting larger, utility-scale projects (NYTimes, August 2008).

### ***Motivations and Arguments for PV Deployment***

Key motivations for PV support in California include:

- Local industry development and job creation, expanding on the competitive industrial advantage of the region (particularly silicon valley);

- The need to drive costs down through learning by doing, both through global learning and local learning;
- The ability to offset higher cost power than other renewable sources given possible avoidance of transmission and distribution (T&D) costs, T&D losses, and the locational and temporal value of the power generated;
- Reliability and security of a local, distributed/dispersed energy supply;
- The need for solar to assist in meeting state level climate change, renewable energy and environmental/air quality goals.

A key motivation for promoting solar in California is the creation of local solar industries and the associated employment benefits that brings. The goal of the CSI is “moving the state toward a cleaner energy future and helping lower the cost of solar systems for consumers.” Assembly Bill (AB) 2267 (2008) in particular requires the California Public Utility Commission (CPUC) to grant additional incentives to eligible California-technology manufacturers to build on the state's “green economy.” This bill also requires the Energy Commission to give priority to California-based companies when granting awards, and is intended to not only create jobs for Californians but also to attract more clean-tech and green-tech companies to the state. According to the organization *Next 10's* "California Green Innovation Index," California patents account for 44 percent of all U.S. patents in solar and 37 percent in all U.S. patents in wind technologies (Next10, 2008). The 10-year commitment provided by the state's CSI establishes a long-term time horizon to shape investment decisions, and provides a signal to manufacturers and other industry participants that encourages innovation and development.

One study prepared for the California Energy Commission estimates the economic and job creation impact of the 2001 CPUC Self-Generation Incentive Program (SGIP). The program promotes distributed generation technologies under 5 megawatts (MW), and has led to 1,200 projects totaling 300 MW were on-line by the end of 2007. About half of this capacity is PV – the rest is cogeneration. The program is estimated to have created between 14,090 and 15,467 full time equivalent (FTE) worker years over 30 years that result in \$765 to \$855 million in employee compensation (CEC, 2008).<sup>5</sup> In total, the net present value of expenditures for SGIP installations between 2001 and 2006, \$2.6 billion, resulted in between \$1.6 and \$1.7 billion of value added benefits to the state. (CEC SGIP Evaluation, 2008).

California has also long been a leader in environmental policy, and in many areas California's environmental standards are more stringent than those in other states, or those imposed at the federal level. A key motivation for promoting solar energy in CA is the potential to reduce demand for fossil fuels and investments in more traditional energy resources, and provide environmental benefits. The ability of solar to contribute to near-term and long-term carbon reduction goals – established through AB32 - is especially important for the state.

---

<sup>5</sup> FTE represents the number of total hours worked divided by the maximum number of compensable hours in a work year. For example, the work year is typically defined as 2,080 hours; so one worker occupying a paid full time job all year would consume one FTE. Two employees working for 1,040 hours each would consume one FTE between the two of them.

Another area as highlighted by the CPUC (CPUC, Decision (D.) 05-12-044) is the important role they believe that solar power can play in assuring the reliability of the state's electricity system, and the ability to offset higher cost power than other renewable sources given possible avoidance of transmission and distribution costs, T&D losses, and the locational and temporal value of the power generated.

Finally, the CSI program is intended to help drive the cost of solar down over time, making the PV industry sustainable without significant government support by 2016. A recent study by Benthem et al (2008) confirms the local, learning-by-doing theory that is behind this motivation, and initial analysis by the authors suggests that the CSI program may be well designed to achieve this goal.

## **2. JAPAN**

### ***PV Market and Policy Framework***

Japan's PV market is supported through policies that either target the industry through R&D, target PV technology deployment, or establish aggressive targets as part of the country's broader climate change mitigation strategy.

PV industry support began with the 1974 "Sunshine Project" established by MITI in response to the 1973 oil crisis. It provided long-term R&D regarding the supply of clean energy. While the R&D at that time did include PV cell fabrication research, the vast majority of the budget went to solar thermal technologies (Kurokawa and Ikki, 2001). In 1993, the "New Sunshine Project" was established to integrate the Sunshine, Moonlight (Energy-saving tech R&D), and the Global Environment Technology Projects. It was focused on PV, and established the Residential PV System Monitor Program, providing consumer subsidies to offset the initial cost of residential PV systems. In 1994, a typical 3-kW PV system cost about 5 million yen (\$50,000), and more than half the cost was subsidized. Then, in 1997, this program was succeeded by the Residential PV system Dissemination Program with the goal of deploying residential PV systems on a large scale. A net-metering policy was implemented, allowing consumers to sell their excess energy back to the grid. In addition, significant funding for PV research was given to the national R&D labs (Ikki, 2003). Subsidies for residential solar installations declined over time and, in 2005, subsidies were an average of ¥60,000 to ¥70,000 per household. This program brought Japan to the forefront of global PV deployment over this period of time.

In 2006 household PV subsidies at the national level were removed, causing domestic solar power demand growth to fall substantially. The impact was immediately felt on Japan's domestic PV manufacturers. In 2007, Germany's Q-Cells AG overtook Japan's Sharp Corp as the number 1 supplier of solar cells, and China's Suntech took Kyocera's third place. There is ongoing discussion on whether to reintroduce residential PV system subsidies beginning in 2009, as was recommended in June 2008 by a METI advisory panel. To meet the 2020 and 2030 PV targets, it is estimated that 70% of newly built homes need to employ solar power generation systems. In addition, it is hoped that a

new subsidy would generate demand at home and consequently restore Japan as the largest installer of PV cells (Reuters, 2008).

More recently, Japan announced a target of increasing the amount of solar power generation by 10 times the current level by 2020 and 40 times by 2030, which is “expected to help create new industries and jobs and thereby both invigorate the Japanese economy and usher in the new era of solar energy” (BBC, 2008;). In November 2008, Japan introduced *The Action Plan for Promoting the Introduction of Solar Power Generation*, implemented by the Ministry of Economy, Trade and Industry (METI) The Ministry of Education, Culture, Sports, Science and Technology; the Ministry of Land, Infrastructure, Transport and Tourism; and the Ministry of the Environment. Building upon other programs, it subsidizes 50% of the cost of installing solar power generation systems at public facilities, including airports, railway stations, and highway rest areas (METI, 2008a) in addition to the current 50% subsidies for solar power generation systems installations in public schools and other facilities managed by local governments. Additionally, many of Japan’s local governments continue to offer modest subsidies to residential solar systems, using local government budgets.

Moreover, Japan’s Cool Earth Initiative (Cool Earth 50), launched by the Prime Minister in May 2007, set the long-term goal of reducing worldwide greenhouse gas emissions by 50% from the current level by 2050. The initiative also focuses on the development of innovative technologies with 21 innovative energy technologies, including research on “innovative solar cells to develop a high-efficiency, low-cost solar cell that offers the conversion efficiency of 40% (3-4times the current level) and generates power at ¥7/kW (compared to the current ¥40).” (METI, 2008a) METI has also launched a 7-year technology development project called the “Project to Develop International Research Centers for the Innovative Solar Cells” aimed at commercializing by 2050 innovative solar cells that use new materials and new concepts. Two centers of excellence (COEs) have been selected (the Research Center for Advanced Science and Technology of the University of Tokyo, and AIST Tsukuba) to cooperate with domestic universities, companies and international research institutes abroad. This program is supervised by the New Energy and Industrial Technology Development Organization (NEDO) (METI, 2008b).

**Table 1. Policies and Programs on PV promotion during the 1990s**

---

1991	▲ Electric Power Companies announced “PV introduction project” that PV systems were going to be installed 2400 kW by 1995 (Results: 2659 kW)
1992	▲ Buy-back system, which electric power companies should buy back the surplus power by PV from their customers at the selling price, has been implemented (continued) · “PV Field Test Project for Public Facilities” started (continued)
1993	· “Guideline of the Technical Requirements for Grid-interconnection” was prepared
1994	· “Residential PV System Monitor Program” started (continued) · “Basic Guidelines for New Energy Introduction” came to a decision at the Cabinet meeting. The target capacity for PV introduction was set 400 MW by 2000 and 4600 MW by 2010
1995	· Local governments got their own planning on “Vision for Regional New Energy” started (continued)
1996	· In MITI’s Economic Structure Plan “ Program for Reform and Creation of Economic Structure”, the target of emerging industry in the field of new energy was focused on fostering PV industry
1997	· “Law on Special Measures for Promotion of New Energy Utilization (Law for New Energy Promotion Introduction)” was enacted · “Residential PV System Dissemination Program (former Residential PV System Monitor Program)” started to deploy residential PV system on a large scale · Subsidy system for entrepreneurs who plan to introduce new energy started (continued) · “Regional New Energy Introduction Projects” started (continued)
1998	· “Long-term Energy Supply and Demand Outlook” was revised. The target capacity for PV introduction was set 5000 MW by 2010 · “PV Field Test Project for Industrial Use” was initiated ◆ “Law Concerning Promotion Measures to Arrest Global Warming” was enacted
1999	· New Energy Subcommittee under MITI’s Advisory Committee for Energy was established and new energy introduction in the medium and long terms started being deliberated (continued) ◆ PV module was approved as building material by Minister of Construction
2000	· Subcommittee on International Cooperation under MITI’s Advisory Committee for Energy was established and thereby suggested the issues of policy on supporting to developing countries for the introduction of new energy and energy efficiency · Residential PV System Dissemination Program will be extended to FY 2002 · Supporting Project for Regional Activity on New Energy was established ◆ Law concerning the Promotion of Procurement of Environmental Commodities by Government and Agencies (Green Purchase Law) was established ▲ “Green Power Fund” was established by Electric Power Companies

---

Source: Ikki (2003)

### **Motivations and Arguments for PV Deployment**

Key motivations for PV support in Japan include:

- Climate change and greenhouse gas mitigation
- International leadership
- Building on national competitive advantage
- Cost reduction
- “Greening” the image of the private sector.

Japan recently announced an *Action Plan for Achieving a Low-Carbon Society* at its July 2008 cabinet meeting, that set a goal to reduce greenhouse gas emissions by 60-80% below current levels by 2050 (a 50% increase over its previous target). Japan has ratified the Kyoto Protocol and has a binding international greenhouse gas reductions target—part of which it hopes to meet through increasing the use of solar power. This Action Plan includes targets for substantial increases of solar power installations: 10-fold by 2020 and 40-fold by 2030.

It also states the goals of making Japan the world leader in solar generation, and of reducing the current price of solar power generation system by half within three to five years (Office of the Prime Minister of Japan, 2008).

Japan's support of the PV industry is also based upon Japan's desire to maintain what it perceives as its competitive advantage in green energy industries, and the attendant export opportunities for Japanese companies. This expertise builds upon the other Japanese electronics and semiconductor industries (Takemoto, 2008). For example, Japan has announced investment of approximately 30 billion dollars in innovative technology development over the next five years. This includes far-reaching support for the installation of solar power generation facilities in the domestic, industrial, and public sectors, support for the research and development of innovative solar cell technology, and support for planning the construction of mega solar power generation facilities by electricity companies. In addition, the program hopes to make further use of private-sector capital such as tradable green certificates or citizens' investment, and encourage collaboration between solar systems manufacturers and construction companies.

### **Case 3: Germany**

#### ***PV Market and Policy Framework***

More than 80% of PV installations in the 27 countries comprising the European Union are in Germany. In 2007, Germany was again the largest PV market in Europe with 1100 MW. This success stems from the policy and investment framework provided in the German Feed-In Tariff, the German Renewable Energy Sources Act of 2000 (Erneuerbare-Energien-Gesetz, EEG). The EEG is an important driving force in the expansion of renewable energy in the electricity sector. After the EEG was amended in 2004, the annual PV installation rate increased 282% over 2003. The latest version of the EEG, passed on June 6, 2008, reduces tariffs by more than 12% from 2008 to 2009 and the degression rate for new PV systems has also increased to roughly 9% per year. Degression rate refers to the rate at which the electricity tariff (feed-in tariff) is reduced each year. To limit costs to consumers, the law also includes a provision increasing the degression rate if the PV market growth is above 1500 MW in 2009, 1700 MW in 2010 or 1900 MW in 2011; likewise should the PV market fall below 1000 MW in 2009, 1100 MW in 2010 or 1200 MW in 2011, the degression rate will be decreased. The upper limits allow for an annual growth rate of approximately 10% without further reduction of remuneration. Predicted growth rates are therefore below what they have been in recent years.

The change from a sellers' market to a buyers' market in the coming years means that companies that do not already have a foothold in the major solar markets may be at a disadvantage. The financial crisis has already hit PV company valuations hard and has slowed expansion plans for some firms. Obtaining corporate and project finance for young companies and newer technologies will be a major challenge in this environment. As module prices drop, well-positioned thin-film suppliers and brand-name silicon PV suppliers with sizable balance sheets may be in the best position to succeed. Due to the strategic decision of the German government to support PV, German companies are likely to remain amongst the success stories.

### **Motivations and Arguments for PV Deployment**

For utilities, the availability of PV, especially in the summer months when demand increases, can result in peak shaving and avoided purchases on the spot market; it can also drive the real-time price of wholesale power lower. Moreover, in the European Union, PV reduces the cost burden associated with CO<sub>2</sub> certificates and helps to create a "green" corporate image. The benefits to customers include savings on building material costs and electricity.

Germany's goal is to increase the share of renewables in total electricity consumption to at least 30 percent by 2020. In 2030 around half of Germany's electricity consumption should be covered by renewables. In Germany, the support of PV has been largely motivated by a commitment to reduce greenhouse gas emissions in the electricity sector and to provide German companies with the opportunity to become global leaders in manufacturing—thereby, creating a number of localized benefits such as jobs throughout the supply chain. In terms of environmental benefits, PV primarily replaces hard coal and lignite in the German fuel mix and results in reduced emissions of greenhouse gasses, particularly CO<sub>2</sub>, as well as reduced emissions of acid rain causing pollutants NO<sub>x</sub> and SO<sub>x</sub>. Avoided external costs have been estimated at 7.60 EUR-Cent/kWh.

According to the German Association of Solar Energy, about 3500 PV companies exist in Germany and 50 of these manufacture cells, modules and other components. Not only has investment in new, domestic installations continued to increase every year, but also the turnover of the installation manufacturers reached a new high of more than 3 billion Euro in 2007. It is estimated that 70% of market turnover remains in Germany. Jobs in the PV sector were estimated to be around 26,900 in 2006. This rose to 38,600 in 2007.

Significant R&D investment is being made in Germany, by both the government and private companies, to complement ongoing PV deployment efforts. Most R&D seeks to increase solar cell efficiency and reduce manufacturing costs. German research institutes are heavily involved in silicon wafer, thin-film, concentrating power and systems optimization research. The potential for profit, in large part, motivates these efforts. Other arguments for R&D investment include long-term industrial development, maintaining or creating a competitive market position and capacity building.

Another motivation for PV deployment in the German context is that it is seen as a means to implement the phase-out of nuclear energy. On 26 April 2002 the "Act on the Structured Phase-Out of the Utilization of Nuclear Energy for the Commercial Generation of Electricity" (Gesetz zur geordneten Beendigung der Kerenergienutzung zur gewerblichen Erzeugung von Elektrizität) entered into force. It made fundamental amendments to the 1959 Atomic Energy Act: instead of aiming to promote nuclear energy, the purpose of the Act is now to phase out its use in a structured manner. While grid-connected PV does not currently replace base load nuclear power, the peak shaving benefits help remove the need for new plants. Additionally, large-scale concentrating solar installations and regional super-grids, particularly connections with the Mediterranean and northern Africa, are being proposed as long-term alternatives to nuclear power.

Other potential benefits of PV are yet to be realized, but continue to motivate PV deployment in Germany. For example, with intelligent load management utilities can control their loads. The project “Waschen mit der Sonne,” or Doing Laundry with the Sun, demonstrates how PV can be used more efficiently. In this project, willing customers received a message on their cell phones alerting them, typically between 10 a.m. and 1 p.m., that their PV systems were producing substantial amounts and anyone that responded to this call to smooth out peaks in power demand was rewarded financially (50 Euro-Cent/response). The results were broad participation and reduced peak demand in the morning and evening hours.

## **Case 4: Spain**

### ***PV Market and Policy Framework***

Spain is a fast growing economy and can be characterized by increasing electricity demand, comparatively high fuel prices and generally less efficient power plants. In 2007, the Spanish PV market grew to 340 MW of annual installations and in 2008 almost 1 GW is expected to be installed. Spain's Feed-In Tariff, which allowed the PV market to expand dramatically in 2007 and 2008, will be reduced significantly in 2009, and is capped at 500 MW per year—just one-third of the expected Spanish PV market in 2008. The government was reacting to a run on permits to install multi-megawatt free-field<sup>6</sup> solar PV systems, that resulted from the 2007 Royal Decree 661/2007 that had increased the previous cap to 1200 MW, when it approved the new amendments. A severe drop in annual additions in Spain between 2008 and 2009 is expected.

### ***Motivations and Arguments for PV Deployment***

Since 1999, the majority of investments in solar cell production facilities in Europe were made in Germany and Spain—the conclusion being that the framework conditions established through well-designed feed-in tariffs provided a stable investment environment. Spain's high growth rate in the PV market has been motivated, in part, by the government seeking socio-economic benefits, such as jobs, and investors seeking profits. The employment figures resulting from PV deployment in the European Union were estimated at nearly 70,000 in 2007; a figure that corresponds with numbers reported from Spain that put the national employment estimates at 26,500. In terms of profit-seeking, Spanish tariffs are quite high in comparison to German tariffs, if taking the higher insolation into account. The average annual insolation in central Europe is 1000 kWh per m<sup>2</sup>. In southern Europe, the insolation is 1700 kWh per m<sup>2</sup>. Based on 2007 tariff levels, this leads to significant differences between annual potential yields in Germany and Spain, 395.28 Euro per kWp and 598.40 Euro per kWp respectively, and is the likely result of the Spanish solar boom.

International and national obligations are also a motivating factor in the push to deploy PV. The original target for the cumulative PV capacity installed in the EU by 2010 was set at about 3000 MW, or a 100-fold increase of the capacity in 1995. Electricity generation from these PV systems would then range from 2.4 to 3.5 TWh, depending under which

---

<sup>6</sup> Free-field means ground-mounted (e.g. in a field), rather than on a rooftop or other location.

conditions the systems are installed. In March 2007, the European Council endorsed a binding target of a 20% share of renewable energy in the overall EU energy consumption by 2020. Under the subsequent 2008 EU Directive, Member States must achieve national targets and submit National Action Plans containing sectoral targets and measures to meet them. At the national level, the objectives of the Spanish "Plan de Energias Renovables en Espana" (PER), approved in 2005, were to cover 12.1% of Spain's overall energy needs and 30.3% of total electricity consumption with renewable energy sources by 2010.

Environmental benefits related to PV are also a strong motivator for PV deployment. In Spain, it is assumed that PV replaces hard coal in the fuel mix. The environmental benefits include significant reductions of NO<sub>x</sub> and SO<sub>x</sub> emissions. The avoided external costs attributable to PV—in terms of climate change, health damage, crop losses and material damage—are estimated at 9.95 Euro-Cent/kWh.

All European countries, even southern European countries such as Spain, can be characterized as "winter peak" countries and the security of electricity supply policy is typically focused on winter peak demands. However, in southern Europe there is also an increased summer demand—due to air conditioning and tourism. From a utility's point of view, there is a need to reduce these peak demands, particularly in summer when thermal plants often undergo maintenance or have to reduce their generation due to a lack of cooling water. Looking at the Spanish spot market, it is clear that during the summer months, April to September, PV electricity is produced during times of highest demand when conventional electricity prices are also highest.

## References and Further Information

### USA

CEC SGIP Evaluation. <http://www.energy.ca.gov/2008publications/CEC-300-2008-010/CEC-300-2008-010-F.PDF>

CPUC Regulatory Decisions (2006).  
[http://docs.cpuc.ca.gov/word\\_pdf/FINAL\\_DECISION/52898.pdf](http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/52898.pdf)

GoSolar Website: <http://www.gosolarcalifornia.ca.gov/>

Next10 Press Release, November 14, 2008. "Californians Spend Less on Electricity, Save Billions More than Rest of Country Due to Green Innovation."  
[http://www.next10.org/pressrelease/Next10\\_business\\_%20release.pdf](http://www.next10.org/pressrelease/Next10_business_%20release.pdf)

SB 1: CA's solar legislation: [http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb\\_0001-0050/sb\\_1\\_bill\\_20060821\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_0001-0050/sb_1_bill_20060821_chaptered.pdf)

SGIP Evaluation Reports: SGIP funded PV prior to the CSI, and the evaluation reports

provide some clues on the motivation of supporting solar (e.g., coincidence with peak demand, etc): <http://www.cpuc.ca.gov/PUC/energy/sgip/> [only look at most recent docs, executive summaries]

Van Benthem, Arthur, *Kenneth Gillingham and James Sweeney*. Learning-by-Doing and the Optimal Solar Policy in California *The Energy Journal*, Vol. 29, No. 3. 2008

Wald, Matthew L. "Two Large Solar Plants Planned in California." August 14, 2008 New York Times. <http://www.nytimes.com/2008/08/15/business/15solar.html?fta=y>

## **JAPAN**

BBC Monitoring Asia Pacific (November 11, 2008). Japan unveils action plan to promote solar power. [http://www.solid-state.com/display\\_news/169838/5/HOME/Japan\\_unveils\\_action\\_plan\\_to\\_promote\\_solar\\_power](http://www.solid-state.com/display_news/169838/5/HOME/Japan_unveils_action_plan_to_promote_solar_power)

Bihn, Dan. "Japan Takes the Lead". *Solar Today*. (Published by the American Solar Energy Society) [Solartoday.org. http://www.jascolorado.org/Japan\\_bihnJF05.pfd](http://www.jascolorado.org/Japan_bihnJF05.pfd).

Ikki, Osamu. "Present status and future prospects of PV activities in Japan" *Solar Energy Materials and Solar Cells*. Volume 75, Issues 3-4, 1 February 2003, Pages 729-737

Kurokawa, Kosuke and Osamu Ikki. "The Japanese experiences with national PV system programme". *Solar Energy* Volume 70, Issue 6, 2001, Pages 457-466.

METI press release Nov 11, 2008.  
[http://www.meti.go.jp/english/press/data/nBackIssue20081111\\_01.html](http://www.meti.go.jp/english/press/data/nBackIssue20081111_01.html)

METI 2008a, Press Release July 2, 2008:  
[http://www.meti.go.jp/english/press/data/nBackIssue20080702\\_01.html](http://www.meti.go.jp/english/press/data/nBackIssue20080702_01.html).

Meti, 2008b. Cool earth initiative:  
[http://www.meti.go.jp/english/newtopics/data/nBackIssue20080305\\_04.html](http://www.meti.go.jp/english/newtopics/data/nBackIssue20080305_04.html) and  
Outline of <http://www.meti.go.jp/english/newtopics/data/pdf/031320CoolEarth.pdf>

Office of the Prime Minister of Japan, 2008. Action Plan for Achieving a Low Carbon Society. July 29, 2008. <http://www.kantei.go.jp/foreign/policy/ondanka/final080729.pdf>

Reuters, 2008. Japan aims to restart solar subsidies next year. Tue Jun 24, 2008  
<http://www.reuters.com/article/environmentNews/idUST20760420080624>

Takemoto, Vice Minister for Global Environmental Affairs, Ministry of the Environment, Japan (2008). Japan's Country Statement at the 6<sup>th</sup> Policy and Implementation Committee Meeting of the Asia-Pacific Partnership on Clean Development and Climate. [http://www.asiapacificpartnership.org/6thPIC/CountryStatement\\_Japan.pdf](http://www.asiapacificpartnership.org/6thPIC/CountryStatement_Japan.pdf)

## **GERMANY**

2009 EEG Payment Provisions, German Federal Environment Ministry.

[http://www.bmu.de/erneuerbare\\_energien/downloads/doc/42033.php](http://www.bmu.de/erneuerbare_energien/downloads/doc/42033.php)

Gross Employment 2007: Short- and Long-Term Impacts of the Expansion of Renewable Energy on the German Labour Market, German Federal Environment Ministry.

[http://www.bmu.de/english/renewable\\_energy/downloads/doc/41977.php](http://www.bmu.de/english/renewable_energy/downloads/doc/41977.php)

PV Status Report 2008. Arnulf Jaeger-Waldau, Joint Research Centre, Renewable Energy Unit, European Commission.

<http://re.jrc.ec.europa.eu/refsys/pdf/PV%20Report%202008.pdf>

Analysis of PV System's Values Beyond Energy – by Country and Stakeholder, Photovoltaic Power Systems Programme, International Energy Agency, Report IEA-PVPS T10-02:2008.

[http://www.iea-pvps.org/products/rep10\\_02.htm](http://www.iea-pvps.org/products/rep10_02.htm)

## **SPAIN**

PV Status Report 2008. Arnulf Jaeger-Waldau, Joint Research Centre, Renewable Energy Unit, European Commission.

<http://re.jrc.ec.europa.eu/refsys/pdf/PV%20Report%202008.pdf>

Analysis of PV System's Values Beyond Energy – by Country and Stakeholder, Photovoltaic Power Systems Programme, International Energy Agency, Report IEA-PVPS T10-02:2008.

[http://www.iea-pvps.org/products/rep10\\_02.htm](http://www.iea-pvps.org/products/rep10_02.htm)