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2009 Global Solar Report Cards

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2009 GLOBAL SOLAR REPORT CARDS



The time has come to harness the sun



The 2009 Global Solar Report Cards is produced by Global Green USA in conjunction with Green Cross International.

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Envision Solar's Solar Grove™ at the Kyocera U.S. Headquarters in San Diego, California. Photo courtesy of Envision Solar International, Inc.

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Executive Summary

Time is short, the climate crisis is real, and demand for electricity is rising. That is why – at the Copenhagen round of the climate talks – we urge world leaders and the private sector to swiftly make significant investments – \$50 billion and more in the next 2 to 3 years – in solar energy as a way out of the current economic crisis and as part of an emergency response to climate change.

Solar is a key strategic investment that can help combat energy poverty (2 billion people do not have access to modern energy services), create economic growth and help fight climate change. Governments need to urgently shift subsidies for oil, gas and coal towards solar and renewable technologies in order to create jobs, improve the lives of those in need, and reduce greenhouse gas emissions.

The government leaders gathered in Copenhagen – and back at home in their nations – must make long-term commitments to solar and enable the private sector to further reduce costs via economies of scale and technological advancements.

Every hour, enough sun hits the earth to meet the world's annual demand for energy. Today's solar technologies can cleanly meet annual demand four times over. Yet solar does not even account for 1% of our electricity portfolios.

In order to effectively compete with subsidized, fossil-fueled electricity, emerging technologies such as solar need to achieve economies of scale (the more solar deployed, the cheaper it gets). By enacting clear, long-term policies for solar energy deployment, governments help to create long-term stability and predictability and to encourage private sector participation.

In 2008, Global Green USA and Green Cross International published the inaugural Global Solar Report Cards, a first-of-its-kind country-by-country evaluation of solar energy policies. The study evaluated mechanisms such as financial incentives and regulatory infrastructure that encourage or inhibit the development of solar markets.

The aim of the Report Cards is to raise awareness among policy makers, media and the public-at-large by grading the effectiveness of each country's policies every year. The report can help governments create solar-friendly policies that give all players within the solar energy private sector increased opportunities to grow.

Energy is the lifeblood of our modern economies. However, current economic development is inextricably linked to energy consumption and environmental destruction. All countries must embrace clean and sustainable ways of generating electricity so that we can grow without destroying our habitat.

Matt Petersen
President and CEO, Global Green USA
Co-Chair, Energy Program, Green Cross International

2009 Summary of Grade Changes and Updates from 2008 Report Card

Countries Evaluated - Plans for Future

The countries evaluated remain the same: Australia, Canada, China, France, Germany, Greece, India, Israel, Italy, Japan, Poland, Russia, Spain, Switzerland, the United Kingdom, the United States and the state of California. In subsequent reports, Global Green USA will expand the list of countries to include developing nations, as well as include funding of solar by developed nations and/or removal of barriers for increasing solar in the developing world.

Grade Highlights

The highlights of the 2009 grades include the following:

- **Only one A in Germany** – Germany (A-) again got the highest grade.
- **Who doesn't love California and Italy?** – California and Italy (B-), which experienced almost 400% annual growth in installed capacity.
- **Who got an F?** – Poland and Russia, with governments focused marginally on other renewable energy sources and no PV-specific incentives in place, once again received failing (F) grades.
- **Who fell behind?** – Australia and India both fell from C to C-. Incentives are plentiful in both countries, but often lack cohesion or long-term predictability.
- **D grades - 3 countries walk into a bar ...** – China (despite new programs), the United Kingdom and Canada all scored a D, suffering from a lack of incentives that are sufficient in size or scope to encourage meaningful growth.
- **Going up** – Six (6) countries received higher grades relative to 2008: Italy, Japan, Greece, China, the United Kingdom and Switzerland, though for the last two countries, the higher grade was the result of a new grading scheme and *not* new or better incentives.
- **More of the same** – California (B), France (C+) and Spain (C+) did not implement any material changes in 2009.
- **New efforts - middle of the road so far** – Japan (C+) and Greece (C) are re-engaging their residential and small commercial sectors with new feed-in tariffs. The United States (C+) enhanced up-front subsidies and is considering more incentives.
- **Small nations, small programs** – Switzerland and Israel, the smallest nations evaluated, both scored a D-. Switzerland's program suffers from a lack of funding, and Israel's program is too limited.

Observations Based On Grades and Analysis

We make the following general conclusions for 2009 as important notes to consider:

- Despite the weak global economy, the countries evaluated installed over 5.4GW of PV capacity in 2008. Spain accounted for ~50% of the total, Germany ~30%. Italy and the U.S. were also major contributors.
- Federalist nations such as Canada and the U.S. continue to struggle with how federal governments can best help states/provinces develop solar markets.
- Designing sustainable, self-correcting programs is difficult – see Australia and Switzerland.
- Administrative barriers are becoming a major constraint on the effectiveness of feed-in tariffs, restricting growth in France, Italy, and especially Greece.

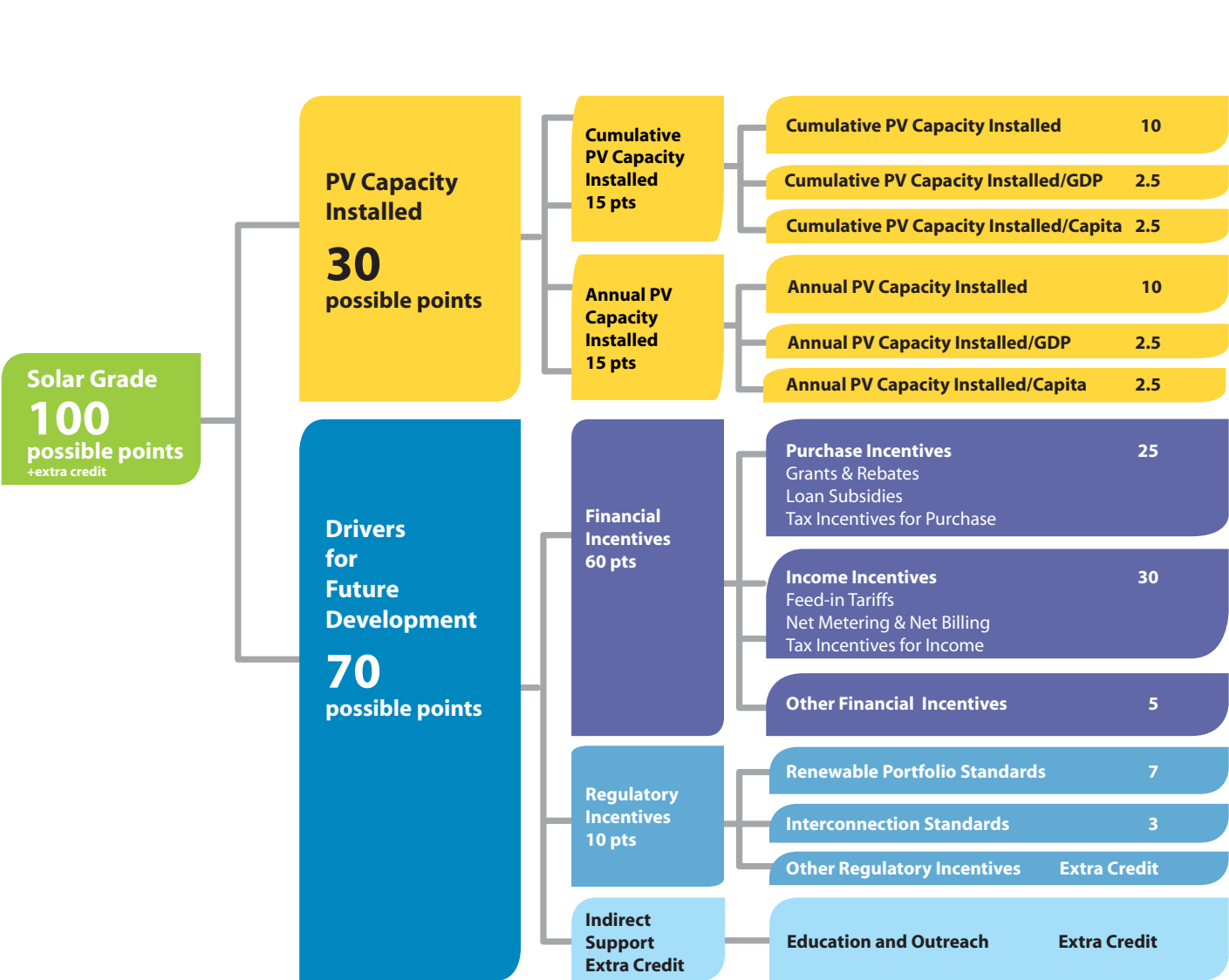
Changes/Notes

Two main changes have been made in the analysis, methodology, and therefore the grading of the 2009 Global Solar Report Card:

- I. First, while the criteria remain weighted at 30% for PV Capacity Installed and 70% for Drivers for Future Development, PV Capacity Installed now includes cumulative *and* annual totals to distinguish between countries presently experiencing greater growth and those with larger cumulative totals but fewer current installations. It is important to note that given the availability of data, PV Capacity Installed lags Drivers for Future Development by one year; thus the 2009 version evaluates incentives in place in 2009 and PV capacity installed through 2008.
- II. Second, Drivers for Future Development now evaluates *combinations* of incentives *by sector* (residential, commercial and industrial) instead of analyzing incentives individually. Financial incentives are grouped into 3 categories: Purchase Incentives such as grants, Income Incentives such as feed-in tariffs, and Other Incentives such as rental programs. Also, more transparency is provided regarding points awarded.

Please also note that some of the data in the Solar Energy Policy Context sections is *not* updated from the 2008 version.

Grading Scheme



Grading Scheme

PV Capacity Installed (30 possible points)

New for 2009 is the inclusion of annual PV capacity installed in order to distinguish between countries with historical cumulative growth but fewer current installations from countries with greater current growth.

Measurement	Possible Points	Description
Cumulative Capacity Installed	10	Size of cumulative installations in MW
Cumulative Capacity per GDP	2.5	Size of cumulative installations relative to income
Cumulative Capacity per capita	2.5	Size of cumulative installations relative to population (electricity demand)
Annual Capacity Installed	10	Size of annual installations in MW
Annual Capacity per GDP	2.5	Size of annual installations relative to income
Annual Capacity per capita	2.5	Size of annual installations relative to population (electricity demand)

Included in the full report (but not in the grading scheme) are growth rates that show recent market take-up, thus putting young markets in perspective.

Drivers for Future Development (70 possible points)

The study compiles information on financial incentives and aspects of the regulatory infrastructure available for PV at the national level. For countries with federal systems, state-level or provincial incentives are taken into account to the extent that they contribute to the overall market. A comprehensive and well-designed suite of incentives:

- Provides long-term assurance for the market,
- Is PV-specific or provides enough inducement to address the specific cost structure of PV,
- Supports growth across all sectors (residential, commercial and industrial), and
- Promotes market growth aggressively *and* sustainably at the least cost to electricity consumers and/or taxpayers.

Financial Incentives (60 possible points)

For this analysis, financial incentives are grouped into three (3) categories: incentives that alleviate the purchase costs of PV systems, incentives that generate income (or protect that revenue stream) as a result of the installation of PV systems, and other financial incentives or programs that are very specific or do not fit neatly into either of the first two categories.

Category	Incentives	Possible Points
Purchase Incentives	▪ Grants & Rebates ▪ Tax Credits ▪ Loan Subsidies ▪ Other Tax Incentives such as Sales Tax Exemptions and Accelerated Depreciation	25
Income Incentives	▪ Feed-in Tariffs ▪ Net Metering & Net Billing ▪ Tax incentives such as Income Tax Exemptions and Income Tax Credits	30
Other Financial Incentives	▪ Examples include demonstration projects and rental programs	5

Within each category, more points are awarded to incentives that historically have been more effective support mechanisms. In addition, each category is evaluated by sector to validate their effectiveness in encouraging a diversified use of PV technology. For this study, the sectors are defined as:

Sector	System Capacity
Residential	<= 10 kW
Commercial	> 10 kW, <= 200 kW
Industrial	> 200kW

The study evaluates the *cumulative effect of the combination* of incentives.

Financial Incentives (continued)

Purchase Incentives (25 possible points)

Grant and rebate programs provide one-time cash (or cash-equivalent) payments to investors in order to alleviate the burden of upfront system costs. Grants are considered more attractive by investors since the money covered by the grant is not paid out-of-pocket, whereas rebates require the investor to front payment. Grants and rebates are typically allocated on an installed capacity (per kW) basis. Performance-based incentives (per kWh) ensure the most efficient technology will be employed and that systems are more likely to be used at and maintained for optimal performance. Expected-performance incentives are a hybrid attempt to combine the benefits of an upfront rebate with a performance-based measurement.

Several forms of *tax credits*, such as Investment Tax Credits (ITC), Production Tax Credits, Accelerated Depreciation Tax Credits and Property Tax Credits are noted in the study. As with rebates, tax credits alleviate the burden of upfront system costs by providing a “refund” to the investor. However, the length of time between payment and refund is typically greater than rebates. And unlike refunds, only investors with sufficient tax liability are able to take advantage of tax credits. Thus when the economy is weak, the accessibility of tax credits is limited to fewer investors.

Loan subsidies are another incentive for governments to consider. Zero-interest or low-interest loans provide a funding vehicle for cash-poor-but-credit-rich investors to adopt solar. This study focuses on loan programs subsidized by national or regional/state/provincial governments, though “green loan” programs may also be offered by private financial institutions.

In addition to tax credits, there are other tax incentives that help with upfront costs. *Sales tax exemptions, reductions or deductions* can be valuable, especially for investors in countries with high VATs. *Accelerated depreciation* allows investors to recoup upfront costs sooner than standard depreciation schedules.

Not all incentives are created equal – certain incentives are more desirable than others. Also, the design of each incentive within the suite is critical for effectiveness. Ideally,

The Purchase Incentive	Should:
Grants (20 possible points)*	- Have generous transaction caps - Be degressive, with the rate of degression linked to market take-up - Cover all sectors and not be means-tested - Be performance-based or expected performance-based to encourage system efficiency - Have high (or no) program caps - Not prohibit the use of other incentives - Include provisions for non-taxable entities
Rebates (17 possible points)*	
Tax Credits (15 possible points)*	
Loan Subsidies (8 possible points)*	- Have generous transaction caps - Have fixed interest rates that are materially below market rates - Be long term - Cover all sectors and not be means-tested - Have high (or no) program caps - Not prohibit the use of other incentives
Other Tax Incentives (8 possible points)*	- Cover all sectors and not be means-tested - Have high (or no) program caps - Not prohibit the use of other incentives

*The total possible points for the Purchase Incentive category is 25. However, certain types of incentives may earn more points depending on design.

The study evaluates the *cumulative effect of the combination* of these incentives. For example, if the main component of a country’s suite of Purchase Incentives is a subsidized loan program, this incentive may receive a full eight (8) points depending on design; however, if the suite also contains a rebate program, the incremental effect of a subsidized loan program may be only two (2) points.

Financial Incentives (continued)

Income Incentives (30 possible points)

A *feed-in tariff (FiT)* guarantees owners of grid-connected PV systems that the electricity they provide to the grid will be bought at a fixed price over a long period (usually ~20 years). This incentive, which differs in design across countries, has been successful in accelerating the deployment of solar and the growth of the industry. The main advantage of a feed-in tariff, assuming funding comes from a surcharge on all electricity consumers, is that it provides a long-term commitment to the market that is not subjected to government budgetary fluctuations. However, there have been concerns about FiTs being too blunt an instrument and a costly policy; thus it is important that FiTs be carefully designed.

Net metering and net billing enable owners of distributed systems connected to the grid to be credited for the electricity they provide to the grid. Unlike a feed-in tariff, net metering and net billing may not carry a premium for electricity produced from a renewable, distributed source; however, these incentives either generate income or offset electricity expenses, thus reducing the pay back time for the system.

Certain *tax incentives* such as income tax exemptions preserve the income stream generated from feed-in tariffs and net metering.

As with Production Incentives, not all Income Incentives are created equal – certain incentives are more desirable than others. Also, the design of each incentive within the suite is critical for effectiveness. Ideally,

The Income Incentive	Should:
Feed-in Tariff (25 possible points)*	- Allow for reasonable profits to create meaningful growth without overheating the market - Be country-specific in its considerations of factors from investment climate to solar insolation - Be degressive, with the rate of degression linked to market take-up - Cover all sectors - Not control market growth using caps, which may result in boom and bust cycles - Be funded by electricity consumers, not government budgets (taxpayers) - Have simple and efficient application and approval processes to ensure that installations are not delayed by administrative barriers - Not prohibit the use of other incentives
Net Metering & Net Billing (5 possible points)*	- Have a premium for electricity generated by a renewable source - Cover all sectors - Have high (or no) program caps - Not prohibit the use of other incentives
Tax Incentives (5 possible points)*	- Cover all sectors and not be means-tested - Have high (or no) program caps - Not prohibit the use of other incentives

*The total possible points for the Income Incentive category is 30. However, certain types of incentives may earn more points depending on design.

The study evaluates the *cumulative effect of the combination* of these incentives. For example, if the main component of a country's suite of Income Incentives is net metering, this incentive may receive a full five (5) points depending on design; however, if the suite also contains a feed-in tariff, the incremental effect of net metering may be zero (0) points. Another example – the effect of a tax exemption on FiT income is greater for gross FiTs (vs. net FiTs).

Other Financial Incentives (5 possible points)

Additional points may be awarded for certain government-sponsored programs that promote solar PV use but is limited in scope or narrowly targeted in purpose, such as demonstration and pilot projects. Also included in this category are programs such as solar system rental programs.

Drivers for Future Development (continued)

Regulatory Incentives (10 possible points)

Well-designed regulatory incentives create an optimal environment for financial incentives to operate efficiently and effectively.

Renewable Portfolio Standards (7 possible points)

Renewable Portfolio Standards (RPS) or Obligations are mandates for utilities to source a set amount of their electricity sales from renewable sources, either by producing it themselves or by purchasing from another generator. Some standards specify percentages (known as “carve-outs”) to certain technologies. This policy instrument has been advocated as an efficient, market-based tool to promote the development of renewables by delegating responsibility to the market (power providers) to find the least-cost strategy to meet quotas. However, without a PV carve-out (or sufficient financial incentives), utilities will opt for options less costly than PV.

Some standards include one or more “buy out” options for power providers. Such options include the purchase of Renewable Energy Certificates (RECs), payment of non-compliance penalties for each unit of electricity not sourced from renewables, or both.

More points are awarded for a RPS that:

- Sets ambitious goals,
- Contains a PV carve-out, preferably mandatory, and
- Contains non-compliance penalties that are sufficiently punitive and enforceable

Interconnection (3 possible points)

The study considers whether a country facilitates the deployment of PV by setting uniform interconnection standards and/or mandating priority connection to the grid for PV systems. Interconnection standards define the requirements for connecting a system to the grid and are a crucial part of the regulatory infrastructure necessary for facilitating the uptake of renewables. Too often, these requirements vary from utility to utility and this lack of uniformity renders the process of connection to the grid tedious, time-consuming and costly.

Other Regulatory Incentives (2 possible points – extra credit)

Extra credit points may be awarded to countries with other regulatory measures that support solar market growth. For example, a country may require that new buildings contain a minimum amount of PV capacity to be installed.

Note that Net Metering is now evaluated in Financial Incentives.

Indirect Support (Extra Credit)

Education and Outreach (extra credit up to 2 points)

Finally, each country should support efforts to raise awareness about solar energy, either through campaigns, educational programs or at the very least a government website. Extra credit points may be awarded to those countries with exceptional programs.

Solar Energy Policy Context

The Solar Energy Policy Context section for each country addresses issues that provide a context for a country's solar market. However, because those indicators are either not directly related to solar or are a function of how much sun a country gets (which is beyond its control), they are included here but not evaluated as part of the country grade. Thus some of the data in this section of the 2009 Global Solar Report Cards has not been updated from the 2008 version.

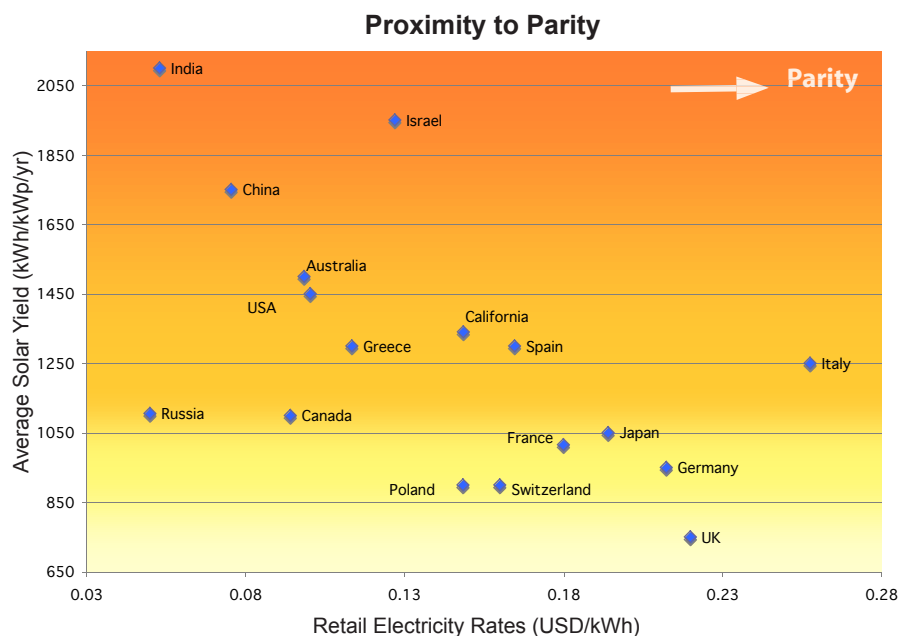
Grid-Parity Proximity / Solar Competitiveness

Grid-parity is the point at which the cost of electricity generated from solar equals that of electricity generated from prevailing sources. That point varies for each country, depending, notably but not exclusively, on average electricity rates and how much sun the country gets.

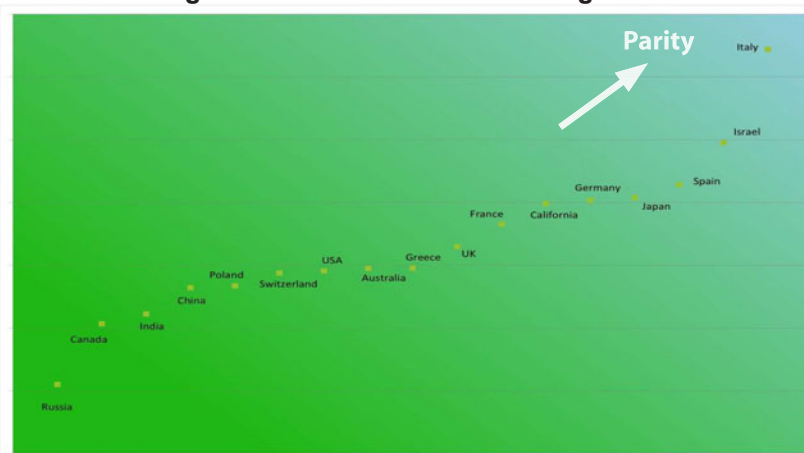
Holding constant the price of solar, the study looked at retail electricity prices and insolation rates as indicators of how close solar stands to being competitive with other sources of electricity in any given country. Because solar incentives are intended to bridge the gap between the price of solar and prevailing electricity rates, the higher the electricity rates, the lower the incentives need to be in order to make solar power competitive.

Therefore, in the graphs opposite, countries with the highest electricity rates and highest insolation rates (closest to the upper right hand corner) stand to gain the most from incentivizing solar.

It should come as no surprise to find that countries closest to the left edge of the graphs (with the cheapest electricity rates) such as India, Russia, China, Australia and the US are also notorious for heavily subsidizing fossil fuels. Countries that subsidize their electricity not only encourage higher electricity consumption, but also artificially keep solar energy from reaching grid parity.



Countries closest to the upper right hand corner stand to gain the most from incentivizing solar.



Solar Resources, Carbon Intensity and Proximity to Grid Parity

The table below shows the relative position of countries in terms of their solar resources, CO₂ intensity and proximity to grid parity.

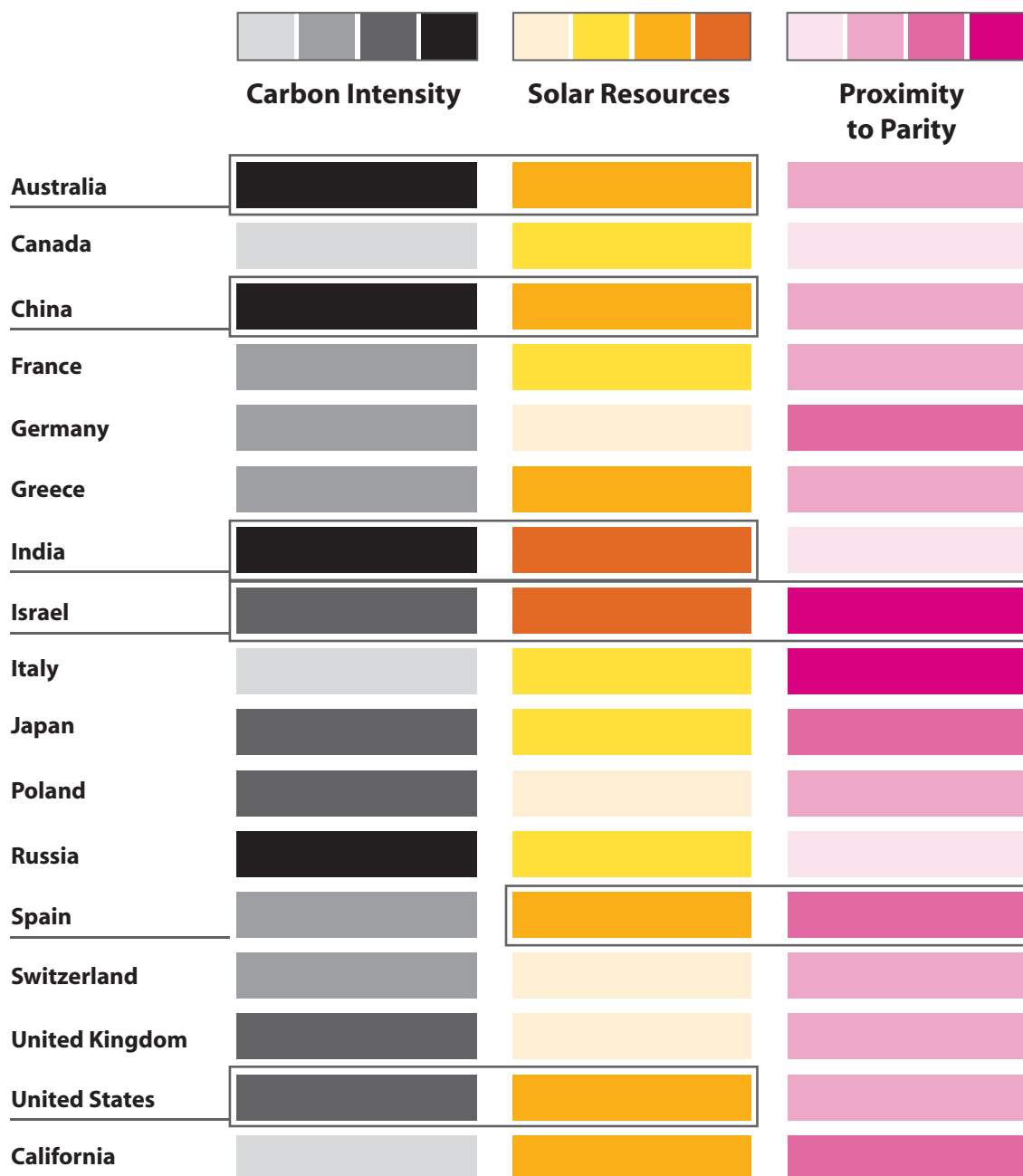
The darker the grey, the more CO₂ emissions the country contributes.

The darker the yellow, the more sun the country gets.

The darker the pink, the closer to grid parity, point at which the cost of solar equals the cost of other sources of electricity.

The table is a tool to highlight:

- countries that stand to gain the most from installing solar in terms of emissions reduction given their solar resources
- countries for whom financial support of solar can be least costly given their solar resources and cost of electricity.



Electricity Generation by Fuel

Countries' electricity portfolios were considered as a representation of their commitment to clean and renewable use of electricity to date.

Energy Subsidies and Public Budgets for PV

According to the latest estimates by the International Energy Agency, energy subsidies worldwide range from \$250 to 300 billion a year. Fossil fuels, the most polluting sources of energy are also the most subsidized at the tune of \$180 to 200 billion a year.

Renewable sources account for about a \$10 billion share of subsidies.

Subsidies are not inherently bad. In fact, the development of photovoltaics depends on important subsidies. But the allocation of electricity subsidies around the world is grossly biased towards fossil fuels and nuclear. The result is that fossil fuel prices are kept artificially low, which encourages an over-consumption of greenhouse gas emitting fuels and hinders the development of renewable sources by making them appear costlier. It is therefore important to place the discussion of the financial viability of renewables -and particularly photovoltaics- in this context. At the tune of \$210 billion a year, renewables too would be economically viable.

Unfortunately, there has been a notorious lack of transparency and dearth of recent studies on the topic of energy subsidies. This report attempts to compile the scattered data. When available, data on electricity subsidies was collected. More specifically still, R&D data per technology seems more accessible. However, while an essential parameter for emerging technologies such as photovoltaics, R&D amounts are only a particular type of subsidy.

R&D funding unfortunately follows the same pattern as electricity subsidies in general: a UNEP study estimated government R&D spending on renewable energy and energy efficiency at \$7.1 billion in 2007 (which represents 12% of government R&D funding on energy, compared to 40% for nuclear technologies). It also noted, "Energy R&D accounted for just 4% of total government R&D in 2005."¹

In fairness, it should be noted that a portion of fossil fuel R&D support is sometimes allocated to reduce emissions associated with fossil fuel use, which may also be an important part of the short-term solution.

¹ United Nations Environment Programme, "Global Trends in Sustainable Energy Investment", 2008.

Summary of Findings

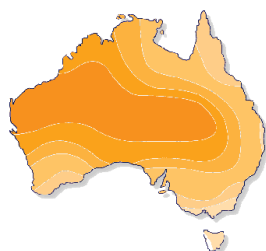
		Possible Points	Australia	Canada	China	France	Germany	Greece	India	Israel	Italy	Japan	Poland	Russia	Spain	Switzerland	United Kingdom	United States	California
PV CAPACITY INSTALLED																			
Cumulative	thru 2008	10.0	3.5	2.5	3.5	4.0	10.0	1.5	4.0	1.0	6.5	10.0	-	-	10.0	2.5	1.5	8.5	6.5
	per GDP	2.5	0.5	-	-	-	2.5	-	0.5	-	1.0	2.0	-	-	2.5	0.5	-	-	2.0
	per Capita	2.5	0.5	-	-	0.5	2.5	0.5	-	-	0.5	1.0	-	-	2.5	0.5	-	0.5	1.0
Annual	thru 2008	10.0	2.0	-	3.0	5.0	10.0	-	3.0	-	7.0	6.0	-	-	10.0	1.0	-	7.0	5.5
	per GDP	2.5	0.5	-	-	1.0	2.5	0.5	0.5	-	1.5	1.0	-	-	2.5	0.5	-	0.5	1.5
	per Capita	2.5	0.5	-	-	0.5	2.5	0.5	-	-	1.5	0.5	-	-	2.5	0.5	-	0.5	1.5
Total Points for PV Capacity Installed		30.0	7.5	2.5	6.5	11.0	30.0	3.0	8.0	1.0	18.0	20.5	-	-	30.0	5.5	1.5	17.0	18.0
DRIVERS FOR FUTURE DEVELOPMENT																			
Financial Incentives	Purchase Incentives: Grants & Rebates, Loan Subsidies, Tax Incentives	25.0	19.0	7.0	15.0	15.0	8.0	15.0	14.0	3.0	5.0	12.0	3.0	-	1.0	4.0	15.0	20.0	23.0
	Income Incentives: Feed-in Tariffs, Net Metering & Net Billing, Tax Incentives	30.0	5.0	12.0	2.0	20.0	30.0	20.0	10.0	12.0	26.0	12.0	-	-	15.0	5.0	2.0	7.0	11.0
	Other Financial Incentives	5.0	3.0	-	2.0	2.0	-	-	3.0	-	-	2.0	0.5	-	-	3.0	-	1.0	0.5
	Total Points for Financial Incentives	60.0	27.0	19.0	19.0	37.0	38.0	35.0	27.0	15.0	31.0	26.0	3.5	-	16.0	12.0	17.0	28.0	34.5
Regulatory Incentives	RPS	7.0	3.0	-	2.5	3.0	2.0	5.0	3.0	1.0	2.5	2.0	1.0	1.0	3.0	1.0	3.0	2.5	4.0
	Interconnection	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0	3.0	2.0	-	-	2.0	3.0	3.0	1.5	2.5
	Other Regulatory Incentives	Extra Credit	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	-	-	-	-
	Total Points for Regulatory Incentives	10.0	6.0	3.0	4.5	6.0	5.0	8.0	5.0	4.0	6.5	4.0	1.0	1.0	6.0	4.0	6.0	4.0	6.5
Indirect Support	Education & Outreach	Extra Credit	2.0	1.0	-	1.0	-	-	-	0.5	-	2.0	2.0	-	-	-	-	1.0	2.0
Total Points for Drivers for Future Development		70.0	35.0	23.0	23.5	44.0	43.0	43.0	32.0	19.5	37.5	32.0	6.5	1.0	22.0	16.0	23.0	33.0	43.0
TOTAL POINTS		100.0	42.5	25.5	30.0	55.0	73.0	46.0	40.0	20.5	55.5	52.5	6.5	1.0	52.0	21.5	24.5	50.0	61.0
GRADE			C-	D	D	C+	A-	C	C-	D-	B-	C+	F	F	C+	D-	D	C+	B
GRADE CHANGE FROM 2008			↓		↑			↑	↓		↑	↑				↑			

Summary of Findings (continued)

	Rank (based on points awarded)				Overall	Grade
	PV Capacity Installed (30%)		Drivers for Future Development			
	Annual Installed* (15%)	Cumulative Installed* (15%)	Financial Incentives (60%)	Regulatory Incentives (10%)		
Australia	T-9	T-7	7	T-4	9	C-
Canada	T-13	12	T-10	T-15	12	D
China	T-9	T-10	T-10	10	11	D
France	7	T-7	2	T-4	4	C+
Germany	T-1	T-1	1	T-8	1	A-
Greece	12	13	3	1	8	C
India	8	T-7	7	T-8	10	C-
Israel	T-13	15	14	T-11	15	D-
Italy	3	6	5	T-2	3	B-
Japan	6	3	9	T-11	5	C+
Poland	T-13	T-16	16	T-16	16	F
Russia	T-13	T-16	17	T-16	17	F
Spain	T-1	T-1	13	T-4	6	C+
Switzerland	11	T-10	15	T-11	14	D-
United Kingdom	T-13	14	12	T-4	13	D
United States	5	5	6	T-11	7	C+
California	4	4	4	T-2	2	B

*includes weighting for PV Installed per GDP and per capita

Rank	PV Capacity Installed		Drivers for Future Development		Overall
	Annual	Cumulative	Financial Incentives	Regulatory Incentives	
1	Germany, Spain	Germany, Spain	Germany	Greece	Germany
2			France	Italy, California	California
3	Italy	Japan	Greece		Italy
4	California	California	California	Australia, France, Spain, United Kingdom	France
5	United States	United States	Italy		Japan
6	Japan	Italy	United States		Spain
7	France	Australia, France, India	Australia, India		United States
8	India			Germany, India	Greece
9	Australia, China		Japan		Australia
10		China, Switzerland	Canada, China	China	India
11	Switzerland			Israel, Japan, Switzerland, United States	China
12	Greece	Canada	United Kingdom		Canada
13	Canada, Israel, Poland, Russia, United Kingdom	Greece	Spain		United Kingdom
14		United Kingdom	Israel		Switzerland
15		Israel	Switzerland	Canada	Israel
16		Poland, Russia	Poland	Poland, Russia	Poland
17			Russia		Russia



- Greater than 6.67 kWh/m²/day
- Between 6.38 and 6.67 kWh/m²/day
- Between 6.11 and 6.38 kWh/m²/day
- Between 5.56 and 6.11 kWh/m²/day
- Between 5 and 5.56 kWh/m²/day
- Between 4.4 and 5 kWh/m²/day

Solar Insolation: 1000-2000 kWh/kWp/yr Yearly Average Solar yield

3.75-6.75 kWh/m²/day Average Solar Radiation on collector surface

Source: Global Energy Network Institute

Grade

C-



as compared to 2008

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	Overall
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	4.5	3.0	27.0	6.0	2.0	42.5
Rank	7	9	7	4	N/A	9

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	70.30	82.50	104.51
Cumulative Growth Rate		17%	27%
Annual PV Capacity Installed (MW) ¹	9.70	12.20	22.02
Annual Growth Rate		26%	80%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Under Australia's federal system of government, regulation of the electricity market is covered by both federal (Australian Energy Regulator) and state-level jurisdiction.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- National – none
- State
 - Australian Capital Territory: Gross FiT @ .5005 AUD/kWh thru 6/30/2010 for systems ≤10kW; Gross @ .4004 AUD/kWh thru 6/30/2010 for systems >10kW and ≤30kW; rate adjusted annually for next 19yrs
 - New South Wales: *Effective 1/1/2010; Net FiT @ .60 AUD/kWh for 20yrs; systems ≤10kW; to be reviewed in 2012 or 50MW* ⁶
 - Northern Territory: Net FiT @ 0.4992 AUD/kWh for 20yrs; capped at 5 AUD/day, then reverts to .2311 AUD/kWh; capped at 1,825 AUD/yr; for 225 homes in Alice Springs Solar City only; systems ≤2kW
 - Queensland: Net FiT @ 0.44 AUD/kWh thru 6/30/2028; systems ≤10kW; to be reviewed @ 10yrs or 8MW
 - South Australia: Net FiT @ 0.44 AUD/kWh thru 6/30/2028; systems ≤10kW; to be reviewed @ 2.5yrs or 10MW
 - Tasmania: none
 - Victoria: *Effective 11/1/2009, Net FiT @ .60 AUD/kWh thru 10/31/2024; systems ≤5kW; 100MW cap* ³
 - Western Australia: *proposed net FiT effective 7/1/2010* ⁷

Financial Incentives (continued)

Grants & Rebates

- National
 - Solar Homes and Communities Plan (SHCP)
 - *Closed 6/8/2009*⁸
 - 8 AUD/W up to 1kW for new residential systems; means-tested since May 2008; capped at 6,000 households/yr
 - 5 AUD/W up to 1kW for extensions to existing systems; residential only
 - 50% of capital costs up to 2kW for community buildings
 - Funding: 150M AUD over 5yrs¹⁵
 - *REC Market & Solar Credits*⁹
 - *Effective 6/9/2009*
 - *RECs for systems eligible for Solar Credits: number of RECs based on insolation “zone”, rated power output, deeming period and multiplier; REC value based on market prices; multiplier applies only to first 1.5kW and is degressive beginning 7/1/2012; installations 6/9/2009 thru 6/30/2015; exclusions for systems >100kW, SHCP, RRP GP & NSSP*
 - *RECs for systems ineligible for Solar Credits: number of RECs based on insolation “zone” and rated power output; REC value based on market prices; limited to systems ≤100kW*
 - National Solar Schools Program (NSSP)
 - *Effective 7/1/2008 – 6/30/2015; Suspended until May 2010*¹²
 - 50K AUD for systems ≥2kW, 30K AUD for systems <2kW
 - State-registered primary or secondary schools
 - Renewable Remote Power Generation Program (RRP GP)
 - *Limited to Western Australia only as of 6/22/2009*¹⁰
 - Greater of 8 AUD/W (up to 8K AUD) or 50% of the capital cost of renewable generation and essential enabling equipment
 - *Solar Flagships Program*¹²
 - *1.6B AUD over 6 years; goal of producing 1gW from 4 solar power stations by 2015*
- State
 - Victoria
 - Solar in Schools Initiative – commenced 2007; 3-15K AUD for solar PV¹²; *Round 4 @ 5K AUD/applicant*¹³
 - Western Australia
 - Solar School Program – 2005-2012; up to 12.5K AUD for metropolitan schools and up to 13K AUD for regional schools for systems ≥ 950W¹²
 - Remote Area Power Supply Program – commenced 2001; 50% of capital cost up to 500K AUD¹²

Net Metering / Net Billing

- National – None
- State – Queensland, Victoria
- Utility – Western Australia

Tax Incentives

- None

Loan Subsidies

- Green Loans
 - Up to 10K AUD in low-interest loans for a period of up to 4yrs
 - Means-tested @ household annual income ≤250K AUD
 - Capped at 300M AUD or 3/31/2013

Other Financial Incentives

- Solar Cities Program¹⁷
 - Effective 2006-2013
 - Purpose: to trial new sustainable models for electricity supply and use
 - Scope: 7 separate electricity grid-connected areas
 - Funding: 94M AUD

Financial Incentives (continued)

- *Renewable Energy Demonstration Program (REDP) – 435M AUD to take proven pilot projects through to commercialization and stimulate more than 1B AUD worth of investment; applications accepted 2/20/2009–4/15/2009; initial grantees announced on 11/6/2009*^{4, 5}
- *Australian Centre for Renewable Energy (ACRE)*¹²
 - *To be established in September 2010*
 - *To promote development, commercialization, and deployment of RE technologies*
 - *Funding: 465M AUD, 100M AUD for new solar funding specifically*

Regulatory Incentives

Renewable Portfolio Standards

- National
 - Mandatory Renewable Energy Target (MRET)
 - 9,500 GWh/yr by 2020
 - No solar carve-out
 - Shortfall charge for utilities = 40 AUD/MWh
 - *Expanded Renewable Energy Target (RET) – Enacted 8/20/2009*²
 - *45,000 GWh/yr (representing 20%)*
 - *No solar carve-out*
 - *Shortfall charge for utilities = 65 AUD/MWh*
 - *Establishes REC market and Solar Credits Program*
- State
 - *South Australia – Increased to 33% by 2020*
 - *Victoria – Increased to 10% by 2016*

Interconnection

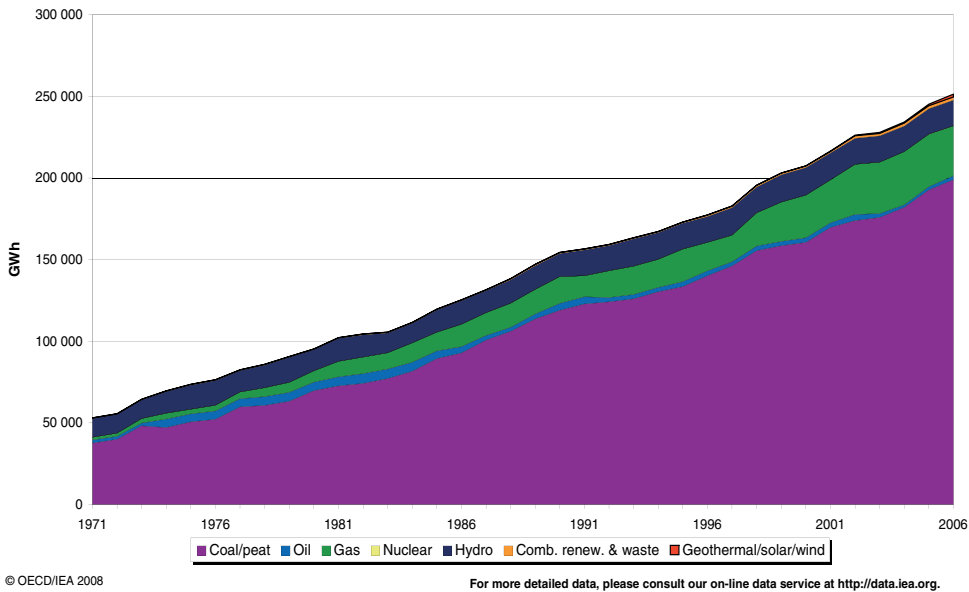
- Mandatory with standards

Indirect Support

Education and Outreach¹⁶

- Low Emissions Technology and Abatement (LETA) – 26.9B AUD to reduce GHG emissions through cost-effective abatement opportunities and the uptake of small scale low emission technologies
- National Action Plan for Education for Sustainability – to equip all Australians with the knowledge and skills required to live sustainably.
- 2008-2009 Education for Sustainability Grants Program – to support projects that facilitate changes in community attitudes and behaviors in support of sustainable development in Australia.
- United Nations Decade of Education for Sustainable Development (2005-2014) – Launched at the UN Headquarters in New York on 1 March 2005 with an address from UN Secretary General Kofi Annan
- Educating for a Sustainable Future – to provide the first ever nationally agreed description of the nature and purpose of environmental education for sustainability through all years of schooling. It also highlights a range of approaches to quality teaching and school administration to enhance sustainability within schools and their communities.
- Australian Research Institute in Education for Sustainability (ARIES) – to conduct research into how to move beyond simply raising awareness to achieve the attitudinal and behavioral changes necessary to live sustainably.
- Australia has launched a 5-year AU\$ 150 million Energy Innovation Fund (EIF) to offer grants to research centers and companies conducting clean energy technologies R&D. AU\$ 100 million of this have been allocated to the establishment of an Australian Solar Institute (ASI), which was launched in January 2009. It is expected to commence operations by July 2009. Key objectives of the Institute are to restore and maintain Australia's world leadership in solar energy R&D, retain local and attract international expertise in solar energy research; and establish Australia as a key player in the development of solar energy technologies in the Asia-Pacific region. The Institute will fund research primarily through competitive grants, encouraging projects in solar photovoltaic and concentrating solar thermal technologies, undertaken by both the public and private sectors.³²

Electricity Generation by Fuel ¹⁹



Energy Subsidies ²⁰

Fossil Fuel subsidies: AU\$9.7 billion (US\$ 7.3 billion) for 2005-06 or 97% of total energy subsidies.
Renewables subsidies: AU\$330 (US\$ 245 million) or 3% of total energy subsidies.

Electricity Subsidies (2005-2006):

2005-06 Support for:	Million Australian dollars	Million US dollars
Coal	1,091 - 1,866	821 - 1404
Oil	3	2.26
Gas	120	90.3
Total fossil Fuels	1,214 - 1,989	913 - 1,497
Renewable Energy and Energy Efficiency	110 - 119	83 - 90

Source: C. Reidy, "Energy and Transport Subsidies in Australia", Institute for Sustainable Futures, 2007.

Public Budgets for PV

Public budgets for PV R&D, demonstration and market development were AU\$ 64.9 million in 2007 ⁴, from AU\$ 23.5 million in 2006 and AU\$ 20 million in 2005.

PV research and development is undertaken across a range of university, government and industry facilities in Australia. University research groups primarily focus on system components, whilst industry based and collaborative research groups focus on manufacturing processes. ²¹

In 2006, AU\$ 7 million was spent on research at universities and institutes and AU\$ 0,6 million was spent on demonstration.

The government will be allocating 150 million AUD annually to 'clean' coal technology through the Global Carbon Capture and Storage Institute. ²²

Energy Efficiency Measures

Since 2006, Minimum Energy Performance Standards (MEPS) have been applied to all buildings. To complement MEPS, a nationally consistent House Energy Rating Scheme (NatHERS) was implemented to enable householders to assess the energy efficiency of houses and make informed choices about housing purchases and renovation. All new residential buildings in Australia since May 2006 have been 5 star-rated.

Since 2006 The Voluntary Building Industry Initiatives Programme of the Australian Greenhouse Office (AGO), has assisted the building industry in ensuring the energy-efficient practice of building and construction professionals.

In 2005, Australian governments and the Australian lighting industry committed to a target of reducing the energy consumption of lighting by 20% by 2015.

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 10th out of 17 - Cumulative thru 2008 per GDP Rank: 7th out of 17 - Cumulative thru 2008 per Capita Rank: 7th out of 17 - Annual 2008 Rank: 10th out of 17 - Annual 2008 per GDP Rank: 11th out of 17 - Annual 2008 per Capita Rank: 9th out of 17	7.5
Financial Incentives for Purchase (25 points possible)	For the Residential sector: - RECs with solar premium; transaction cap indexed to REC market prices; degressive; unable to combine with other national grant programs - Low-interest loans with short terms; means-testing for eligibility For the Commercial sector: - RECs for SMEs and community groups; transaction cap indexed to REC market prices; degressive; unable to combine with other national grant programs For the Industrial sector: - Grants for four power stations producing 1GW	19.0
Financial Incentives for Income (30 points possible)	For the Residential sector: - Feed-in Tariff: state-level only, though covering ~50% of population in 2009; mostly net (only one gross); long term; rate adjustment mechanisms in place, through nothing formal for market take-up or inflation - Net Metering / Net Billing: Available only in states with feed-in tariffs For the Commercial sector: None For the Industrial sector: None	5.0
Other Financial Incentives (5 points possible)	Three national programs	3.0
RPS (7 points possible)	- Absolute target, not a percentage of electricity generated/consumed - No PV carve-out - Increase to target and non-compliance penalty in 2009	3.0
Interconnection (3 points possible)	Mandatory with standards	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Several government-sponsored programs	2.0
Overall	Total points hurt by lack of attractive income incentives	42.5

Australia's "short-term policy thinking"¹⁴ has resulted in unstable boom and bust cycles in the solar market. A lack of self-correcting mechanisms (e.g., linking rebate amounts to system prices) in the primary national incentive programs has resulted in a rush of applications that either prematurely depleted program funding or forced the government to restrict eligibility. To create programs with long-term sustainability, Australia must better integrate its solar policies. For PV Capacity Installed, the country falls into the middle of the pack. Given its high insolation levels, Australia has the opportunity to utilize solar to a far greater extent.

Several new initiatives were implemented in 2009:

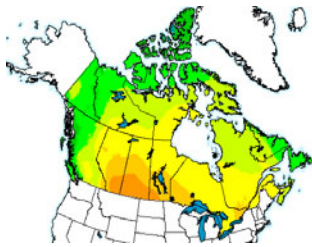
- The Solar Credits Program broadens the reach of up-front incentives to other sectors, but the program creates a level of unpredictability by linking the incentive level to the REC market.
- The enhanced Renewable Energy Target significantly raises targets, but is devoid of a PV-specific component.
- The Solar Flagships Program begins to address the lack of incentives for the industrial sector.

Despite the new incentives, Australia's grade is lower for 2009, primarily due to the new grading scheme and greater uncertainty of its new rebate program.

Moving forward, a long-term view should be taken towards policy and program design, and greater coordination with the states is required. In particular, the lack of a national gross feed-in tariff (or more robust feed-in tariffs at the state-level) and a solar carve-out in the RET mean markets will not have sufficient cause to adopt PV as an energy source. Any incentive that is designed without self-adjusting mechanisms will only create more uncertainty. Australia needs a long-term perspective to policy and program design, or it will remain in the middle of the pack.

Endnotes

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Photovoltaic potential
(kWh/kW)

800 - 900
 900 - 1000
 1000 - 1100
 1100 - 1200
 1200 - 1300
 1300 - 1400
 1400 +

Solar Insolation: ~800-1400 kWh/kWp/yr Yearly Average Solar yield
 2.50-5.0 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	Overall
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	2.5	-	19.0	3.0	1.0	25.5
Rank	12	13	10	15	N/A	12

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	20.50	25.80	32.72
Cumulative Growth Rate		26%	27%
Annual PV Capacity Installed (MW) ¹	3.80	5.30	6.94
Annual Growth Rate		39%	31%

Drivers for Future Development

Government Structure and the Effect of Energy Policy

Electricity policy is the purview of provinces; the constitution places natural resources under provincial jurisdiction. There are various different market structures, from completely deregulated (in Alberta) to monopoly provincially-owned power corporations. Most new renewable power is being developed through independent power producers in all Canadian jurisdictions. ³

Note: Policies enacted in and/or effective for 2009 in *italics*.

Financial Incentives

Feed-in Tariffs

- National – none
- Ontario
 - Renewable Standard Offer Program (RESOP) ¹¹
 - Effective November 2006, *Closed September 2009 and replaced by the Feed-in Tariff Program*
 - For residential, commercial and development projects
 - 0.42 CAD/kWh for systems $\geq 1\text{kW}$ $\leq 10\text{MW}$; rate reviewed every 2yrs
 - Term of 20yrs
 - FiT ¹⁰
 - *Effective October 2009*
 - *For residential, commercial and development projects*
 - *Gross FiT*

System Size	Rooftop (CAD/kWh)	Ground (CAD/kWh)
$\leq 10\text{kW}$	0.802	0.802
$> 10\text{kW} \leq 10\text{MW}$		0.443
$> 10 \leq 250\text{kW}$	0.713	
$> 250 \leq 500\text{kW}$	0.635	
$> 500\text{kW}$	0.539	

Financial Incentives (continued)

- *Term of 20yrs*
 - *Minimum domestic content levels required, 40-60% depending on system size and installation date*
- Prince Edward Island
 - Minimum Purchase Price Regulations ⁵
 - .0775 CAD/kWh for systems >100kW
 - Not PV-specific
- British Columbia
 - *Standard Offer Program (SOP) – PROPOSED through BC Hydro for systems >0.5MW and <=10MW; rates TBD, no premium for solar* ⁷
 - Note: BC Hydro is undertaking a review of the Standing Offer Program (“SOP Review”) for submission to the British Columbia Utilities Commission (BCUC) in Spring 2010. The purpose of this review is to examine the results of the Standing Offer Program to date and to identify any improvements that could be made to enhance the effectiveness of the existing program ⁷

Grants & Rebates

- National – none
- Northwest Territories
 - Alternative Energy Technologies Program (AETP) ⁸
 - Community RE Fund (CREF) – For government and non-profit; up to 50% of project costs, capped at 50K CAD
 - Medium RE Fund (MREF) – For businesses; up to 33% of project costs, capped at 15K CAD
 - Small RE Fund (SREF) – For residential; up to 33% of project costs, capped at 5K CAD
- Ontario
 - PowerHouse Program ¹²
 - 10% on first 5K CAD; 15% on next 15K CAD; 20% on next 30K CAD
 - Installed by 2/15/2009
 - In lieu of PowerHouse Loan
- Saskatchewan
 - Go Green Net Metering Rebate ¹⁴
 - Effective April 2007 – March 2011
 - 35% of costs up to 100K CAD for systems <=100kW
 - Funding: 350K CAD
- Alberta
 - Multiple programs for energy efficiency; not PV-specific
 - SunRidge BuiltGreen Rebate ¹⁷
 - New Home Builders' Rebate ²⁰
 - Strathcona Country Green Homes Rebate ²¹
 - City of Calgary Rebates for Green Homes ²¹

Net Metering / Net Billing

- National – none
- Net Metering in ²:
 - Alberta
 - Saskatchewan
 - Newfoundland and Labrador
 - Yukon
- Net Billing in ²:
 - British Columbia
 - Manitoba
 - Ontario
 - Quebec
 - New Brunswick
 - Nova Scotia
 - Prince Edward Island
- Complexity of application and approval process varies widely by province

Financial Incentives (continued)

Tax Incentives

- National
 - Accelerated Capital Cost Allowance (CCA) (accelerated depreciation)
 - 50% accelerated CCA on RE systems $\geq 3\text{kW}$
 - Budget: 25M CAD
- British Columbia
 - 100% Provincial Sales Tax (PST) Exemption on RE equipment ⁶
- Ontario
 - 100% Retail Sales Tax (RST) Rebate on PV systems purchased 11/26/2002-12/31/2009 for residential, commercial and development projects ⁹
- Prince Edward Island
 - 100% Provincial Sales Tax (PST) exemption on PV systems $\leq 100\text{kW}$ purchased since 4/8/2005 ¹³

Subsidized Loans

- National – none
- Ontario
 - PowerHouse Program ¹²
 - *Now Closed*
 - 0% up to 50K CAD for up to 10yrs
 - Installed by 2/15/2009
 - Available only in Mississauga, a suburb of Toronto ³
 - In lieu of PowerHouse rebate

Other Financial Incentives

- National
 - ecoENERGY for Renewable Power ⁴
 - Effective 2007
 - Target: 14.3TWh from RE sources
 - Funding: 1.48B CAD
 - For businesses, municipalities, institutions and organizations
 - 0.01 CAD/kWh for up to 10yrs on systems installed April 2007 – March 2011
 - *Has run out of money – closed prematurely due to popularity/uptake*³
 - Note: No Solar PV projects were developed³
 - CMHC Mortgage Insurance Refund ^{17,18,21}
 - 10% of the cost of CMHC mortgage insurance (e.g., approximately \$550 for a \$200,000 mortgage with a 5% down payment) and extended amortizations without regular premium surcharges (e.g. approximately \$1,200 for a \$200,000 mortgage amortized over 40 years).

Regulatory Incentives

Renewable Portfolio Standards

- National – none
- Nova Scotia – Renewable Energy Standard (RES) ¹⁶
 - Effective 1 February 2007
 - 18.5% by 2013, 25% by 2015; 5% annual increases until 2011; 10% annual increases until 2013
 - No solar carve-out
 - Mandatory
 - Penalty: Up to 500K CAD/day
- Prince Edward Island ¹⁵
 - Effective 2004
 - 15% by 2010, 100% by 2015

Interconnection

- National uniform standards

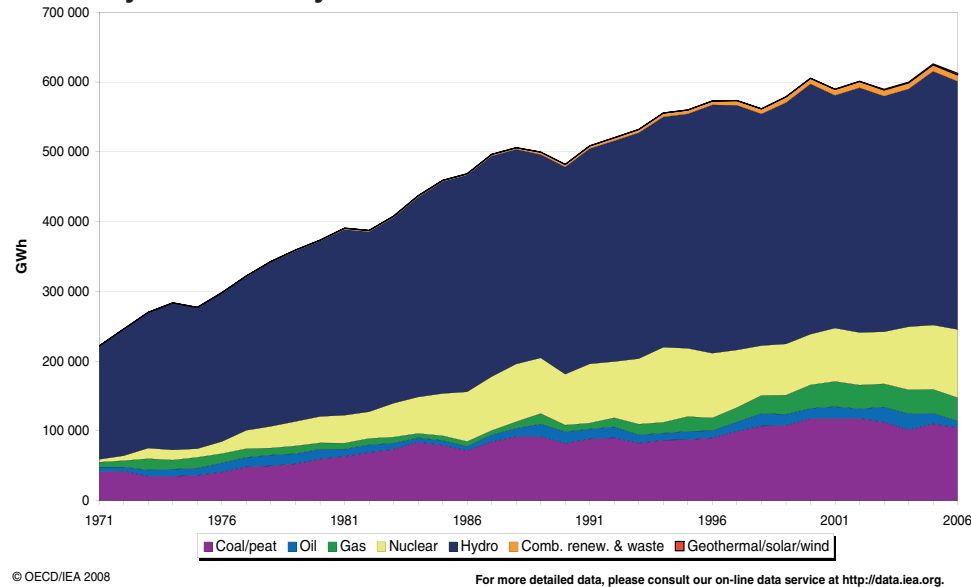
Indirect Support

Education & Outreach

- The Canadian government has extensive information on photovoltaics on its websites (CANMET Energy Technology Center and the Canadian Renewable Energy Network), including information for children
- Sustainable Development Technology Canada (SDTC) – a federally-funded non-profit established in 2001 to support the development and demonstration of innovative technological solutions²²

Solar Energy Policy Context

Electricity Generation by Fuel²³



federal government subsidies to Atomic Energy of Canada Limited were worth \$2477.8 million in 2006 (up from \$163 million in 2005).²⁶

2006 Renewables R&D budget: US\$ 53.21 million or 11.3% of total energy R&D budget:

Canada's 2005 and 2006 R&D budgets (in 2006 million US \$):²⁷

	2005	2006
Fossil Fuels	98.164	103.964
Nuclear	195.720	211.278
Renewable Energy	42.748	53.207
Solar	11.546	10.630
Photovoltaics	7.406	7.880
Total Energy R&D	448.058	469.416

Solar PV R&D

Federal and Provincial public budgets for PV R&D, demonstration / field trials and market stimulation in 2006 amounted to CAD 8.15 million up from CAD 7.7 million in 2005 (or about US\$ 7.2 and 6.36 respectively). CAD 6.35 million was the Federal portion in 2006 (~US\$ 5.6 M).²⁸

The report prepared by Canadian representatives for the IEA, explains, "Total public budgets for solar in Canada showed a slight increase of CAD 450,000 (6%) (~US\$ 396,000) in 2006, over the previous year. This is due to a large multi-year federal funding to the Solar Research Buildings Network as well as to a private sector project to develop and demonstrate high purity solar grade silicon."

Energy Efficiency Measures

Energy efficiency measures in Canada are based on national codes, such as the National Building Code for Canada 2005, and the Model National Energy Code for Building and Houses. These codes are implemented by Canadian provinces.

Energy Subsidies

Of the 2008 federal budget, the Canadian Broadcasting Corporation noted, "There is \$800 million for the auto, nuclear and coal-fired power industries listed under environmental initiatives in the budget, but very little to boost alternative energy."²⁴ The federal budget earmarked \$300 million to the Atomic Energy of Canada Limited. The budget makes no changes concerning alternative energies (except \$10 million over two years for research and analysis on biofuels emissions). No amount was set aside for solar.

Oil and gas sector subsidies are estimated at \$1.4 billion/year.²⁵

Tom Adams of Energy Probe reported

Evaluation of Incentives

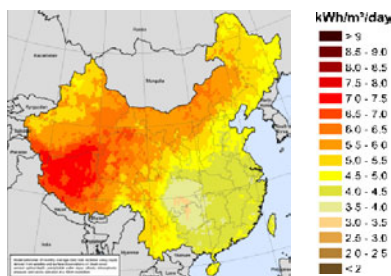
Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 12th out of 17 - Cumulative thru 2008 per GDP Rank: 13th out of 17 - Cumulative thru 2008 per Capita Rank: 11th out of 17 - Annual 2008 Rank: 13th out of 17 - Annual 2008 per GDP Rank: 14th out of 17 - Annual 2008 per Capita Rank: 11th out of 17	2.5
Purchase Incentives (25 points possible)	For the Residential sector: - Grants in Northwest Territories (<1% of national population) - Rebates in Saskatchewan (3% of national population) - Accelerated depreciation nationwide - Tax exemption in British Columbia, Ontario, Prince Edward Island (~50% of national population) - Net Metering or Net Metering available in almost all provinces For the Commercial sector: - Grants in Northwest Territories (<1% of national population) - Rebates in Saskatchewan (3% of national population) - Tax exemption in British Columbia, Ontario, Prince Edward Island (~50% of national population) - Net Metering or Net Metering available in almost all provinces For the Industrial sector: None	7.0
Income Incentives (30 points possible)	For all sectors in Ontario (40% of national population): Gross FiT; (overly?) generous premium; long term For the Industrial sector in Prince Edward Island (<1% of national population): FiT with low (non-PV specific) premium	12.0
Other Financial Incentives (5 points possible)	Two national programs: one closed, one minor	0
RPS (7 points possible)	Provincial only; covers 3% of population	0
Interconnection (3 points possible)	National uniform standards	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored websites and program	1.0
Overall	Low point total due to few installations and lack of federal incentives. Ontario accounts for almost half of total points.	25.5

Canada's federal government PV support measures are for all intents and purposes non-existent. The sole national financial incentive has run out of money, leaving a minor tax benefit, a demonstration program and a website as the only support measures in place. It is a challenge for federalist nations to figure out meaningful ways for federal governments to assist states or provinces in developing solar markets without usurping regional authority. Australia and the U.S. both grapple with this issue, yet still manage to advance and grow their solar markets.

In the absence of any meaningful federal support, some provinces are taking action with grants or rebates, tax incentives, net metering or net billing, and renewable portfolio standards. In 2009, Ontario replaced its production incentive with a newer, bigger and better feed-in tariff that significantly raises the premium (maybe too much) and expands coverage to all sectors. However, the vast majority of "green" programs are not PV-specific. Without subsidies, solar competes as an economically viable electricity source only in remote areas – thus off-grid applications account for about 85% of total PV installed²². Rankings for PV Capacity Installed are in the bottom half for all measurements used. With only Ontario making any significant effort to develop a solar market, Canada needs a stronger federal policy to move up in the rankings.

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Source: NREL, UNEP and SWERA



Zone	kWh/m2	(%)
I	1,750 (	17.4
II	1,400-1,750	42.7
III	1,050-1,400	36.3
IV	(1,050	3.6

Solar Insolation: ~1050-2450 kWh/kWp/yr Yearly Average Solar yield
 ~3.0-7.5 kWh/m²/day Average Solar Radiation on collector surface



as compared to 2008

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	3.5	3.0	19.0	4.5	-	30.0
Rank	10	9	10	10	N/A	11

The World Energy Council reports, “An estimated 2/3rds of the country receives solar radiation in excess of 4.6 kWh/m²/day. China’s annual solar power potential has been estimated to be 19,536,000 TWh. Capturing 1% of this resource, and utilizing it with 15% efficiency, could supply as much electricity as the whole world currently consumes in 18 months.”¹⁸

PV Capacity Installed

	2006 ²⁴	2007 ²³	2008 ⁷
Cumulative PV Capacity Installed (MW)	80.00	100.00	140.00
Cumulative Growth Rate		25%	40%
Annual PV Capacity Installed (MW)	10.00	20.00	40.00
Annual Growth Rate		100%	100%

Drivers for Future Development

Government Structure and the Effect on Energy Policy¹⁶

China’s policies on renewable energy development fall into three categories. Similar to the way renewable policies are set in the United States, China’s central government establishes the first two levels of policy. Local governments, including provincial, municipal, and county governments, establish the third level of policy with overall direction from the central government.

- *First-level policies:* provide general direction and guidance, and include speeches of state leaders about development of renewable energy and the Chinese government’s standpoint on the global environment.
- *Second-level policies:* specify goals/objectives and development plans, and focus on rural electrification, renewable energy-based generation technologies and fuel wood. These policies attempt to standardize the directions, focal points, and objectives of renewable energy development from different viewpoints. Some departments propose concrete policies and regulations. Second-level policies have played a very important role in promoting renewable technologies in China.
- *Third-level policies:* consist of practical and specific incentives and managerial guidelines. These outline specific supporting measures for developing and using renewable energy. These third-level government policies provide crucial support to help develop renewable energy in its early growth stages. Since the mid-1990s, many provinces and autonomous regions of China have adopted policies for developing renewable energy, including subsidies and tax reduction. The central government also issued several effective regulations.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- Renewable Energy Law
 - Establishes rules (but not details) for feed-in tariffs
 - Rates for solar are to be fixed by “the responsible pricing department of the State Council according to the principle of reasonable production costs plus reasonable profit”²²
 - Cost of feed-in tariff are to be redistributed over the whole grid electricity price
- Jiangsu province¹⁵
 - Announced 6/19/2009
 - Gross FiT (CNY/kWh)
 - 2.15 for ground-mounted
 - 3.70 for rooftop
 - 4.30 for BIPV
 - Annual declines in FiT for new systems
 - Target: 400MW between 2009-2011
 - Term not announced (speculation @ 20-25yrs)
- Taiwan¹⁷
 - Passed in June; effective January 2010
 - Rates TBD based on 10% IRR and level of up-front subsidies (grants or rebates)
 - Expected term: 20yrs
 - Degression TBD

Grants & Rebates

- National
 - 11th 5-Year Plan (2006-2010)¹⁸
 - Approved October 2004
 - 250MW for 2m households in remote locations
 - 50MW of rooftop and BIPV systems
 - 20MW demonstration plan in the Gobi desert
 - Brightness Rural Electrification Program¹²
 - Effective 2001
 - Overall target: 100W/person for 23m people in remote areas by 2010
 - Township Electrification Program¹¹
 - Effective 2001
 - Current phase: Village Electrification Program, 2005-2010; 20,000 villages in off-grid western region
 - New Grant Program⁹
 - Enacted 3/23/2009
 - Up to 20.0 CNY/W for rooftop and BIPV systems >50kW; adjusted annually
 - Caps: none announced
 - “Golden Sun” Demonstration Program⁸
 - Announced July 2009
 - Target: At least 500MW of solar farms over 2-3yrs; 20MW per province
 - Caps: none announced
 - 50% of system and connection costs for grid-connected systems >=300kW; 70% for off-grid systems in remote regions
 - Grid companies required to buy excess at rates similar to coal-fired tariffs
- Regional and Local
 - Shanghai’s “100,000 Solar Roofs” Project¹⁸
 - Announced October 2005
 - 70MW by 2010, with an eventual 360MW total
 - Jiangsu province announced 1B CNY of incentives to build 260 MW by 2011.⁵
 - Taiwan¹⁷
 - Passed in June; effective January 2010
 - Amount TBD based on 10% IRR and level of FiT
 - Beijing’s “Solar Road Lighting Project”: Beijing plans to supply road lighting with solar PV power in rural streets and some main roads using government funding. Hekou Village in Beijing’s Fangshan District has already gotten solar powered streetlights (funded by the Beijing Municipal Rural Affairs Commission).^{20, 21}

Financial Incentives

Net Metering / Net Billing

- None

Tax Incentives

- Renewable Energy Law, Article 26 – unspecified tax benefits for RE projects; no solar-specific provisions

Loan Subsidies

- Renewable Energy Law, Article 25 – unspecified preferential loans with financial interest subsidies for RE projects; no solar-specific provisions

Other Financial Incentives

- In 2006, China began imposing a surcharge to generate money for renewable energy development, and the fund could support 5GW of solar projects from 2009 to 2013, said the report. But that much development would happen only if the government doesn't use the money for wind, biomass or other renewable energy projects. The fund for 2009 is estimated at \$1.06 billion, and it could reach \$1.45 billion in 2013.⁷
- Desert PV Station: The Ministry of Science and Technology has arranged specific funding to build four pilot projects of desert PV station in Gansu, Tibet, Sichuan and one other location. *In the Gansu province, the following FiT applies¹⁵:*
 - Gross FiT @ 1.09 CNY/kWh for a 10MW ground-mounted system in Dunhuang City
 - Term: 25yrs

Regulatory Incentives

Renewable Portfolio Standards

- National
 - Passed 2007
 - Mandatory
 - 1% excluding hydro by 2010; 3% by 2020
 - Solar carve-out: 300MW by 2012⁷; 1.8GW by 2020^{1,7}
 - Pending:
 - 10% by 2010; 15-20% by 2020¹
 - Solar carve-out: 2GW solar by 2011²; 10GW solar by 2020^{1,4}
- Taiwan
 - Installed PV capacity goal for 2025 currently only set at 1GW¹⁷
 - 10% by 2010; 6.5-10GW in 20yrs¹⁷

Interconnection

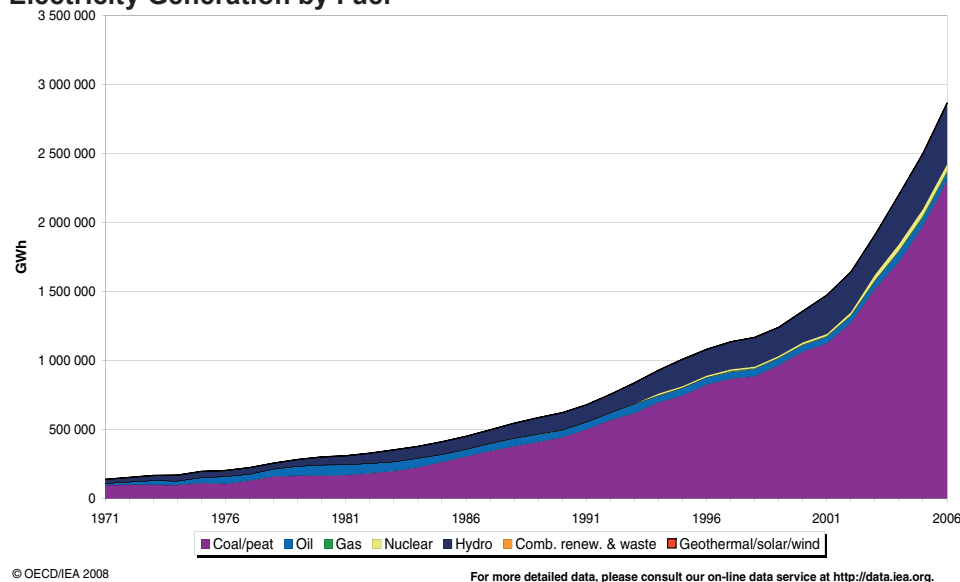
- Mandatory with priority connection
- Cost of interconnection are to be redistributed over the whole grid electricity price
- "If the power grid enterprises...fail to purchase renewable power in full, which results in economic loss to the renewable power generation enterprises, such power grid enterprises shall be liable for compensation...."¹⁹
- Grid interconnection is a major concern for newly installed generation capacity. It is highly likely that newly installed solar PV capacity will face significant delays (and some may be unable to connect to the grid). The reasons are two-fold: first, a lack of standard interconnection procedure across grid regions; and second, a general lack of experience on the side of the developers. Until the grid connection process becomes a more standardized and reliable process, there will likely be a dearth of independent project developers in the market, as their return is based on kWh they are able to deliver to the grid (assuming a national feed-in tariff).¹⁰

Indirect Support

Education and Outreach

- Government-sponsored website (<http://www.ccchina.gov.cn/en>) contains domestic actions, international news and laws and regulations, among other renewable energy information; not PV-specific.

Electricity Generation by Fuel ²⁵



Energy Subsidies

China's total energy subsidies have been estimated at over \$10 billion a year. ²⁶

The International Energy Agency reported a 58% drop in energy subsidies in 2006 from 2005 levels. Oil products received \$3 billion in 2006, coal more than \$4 billion and natural gas about \$2.5 billion. Around \$1.2 billion were allocated to electricity. ²⁶

It should be noted that consumption subsidies related to transport fuels have now been largely eliminated.

Another study ²⁷, which referred to the above IEA numbers as being consistent with its results, noted, "Subsidies to electricity in 2006 reached an all time high of \$385.44 million and from January through

mid-year 2007 were about \$215.88 million." It also reported that, "Subsidies to natural gas in 2005 reached an all time high of \$91.78 million and from January through 2007 mid-year, because of the supply problems, the loss of subsidies amounted to approximately \$27.51 million."

Finally, the IEA's 2006 World Energy Outlook reported that Chinese consumption subsidies expressed as percentages of 2005 reference prices, amounted to 45% for Natural Gas and 17% for coal. ²⁸

Figures cited in a Worldwatch Special Report on China relate that, "Renewable Energy R&D spending in the 10th Five-Year Plan (2001-05) reached 1 billion RMB over the five years, equivalent to \$25 million per year." ²²

Solar PV R&D

The government has provided various support schemes for the research and development of solar PV. These include:

- Basic R&D Support Scheme, that supports future solar PV technologies, including backing for the technical and theoretical development of thin-film and dye sensitized solar cells.
- High-tech R&D Support Scheme, that supports solar PV technologies which are about to become commercialized, including basic equipment and materials for solar power, cadmium telluride, copper indium germanium selenium and thin film silicon solar cells.
- Pillar R&D Support Scheme in 2006, which has helped lay down the foundations for commercialisation of solar PV in China.
- Commercialisation Support Scheme, which provides funding for the development of solar industries.

Energy Efficiency Measures

Within its 11th Five-Year Period, China plans to reduce the energy consumption of residential and public buildings by 50%. ²⁹ Current energy efficiency policies vary for different regions of China, however a national energy efficiency building code is expected to be issued this year.

This national code is being developed by the Central Ministry of Construction. The implementation and enforcement of the program will be the responsibility of regional governments. ³⁰

China has a green Building Rating System but is also establishing a labeling system for buildings to help ensure the efficiency of new buildings and the visibility of energy efficiency in the market place. ³⁰

Energy efficiency in new buildings in China is crucial; according to the Ministry of Construction, more than 2 billion are constructed in China every year, which accounts for more than 40% of all new constructions in the world. ³⁰

Evaluation of Incentives

Category	Results	Points
PV Installed (30 points possible)	- Cumulative thru 2008 Rank: 9th out of 17 - Cumulative thru 2008 per GDP Rank: 12th out of 17 - Cumulative thru 2008 per Capita Rank: 15th out of 17 - Annual 2008 Rank: 8th out of 17 - Annual 2008 per GDP Rank: 12th out of 17 - Annual 2008 per Capita Rank: 14th out of 17	6.5
Incentives for Acquisition (25 points possible)	For all sectors: Grant programs with high capacity goals for rural and urban (new) areas	15.0
Incentives for Income (30 points possible)	For Residential and Commercial sectors: New FiT in Jiangsu province (~6% population coverage); known terms promising for market take-up; many terms TBA: rate adjustors, terms, system size restrictions; taxpayer-funded For the Industrial sector: None	2.0
Other Financial Incentives (5 points possible)	Two national programs	2.0
RPS (7 points possible)	Modest overall goal, PV carve-out, mandatory	2.5
Interconnection (3 points possible)	Mandatory, though lacking standard process across grid regions	2.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored website, not PV-specific	0
Overall	Total points fueled by second consecutive year of 100% annual growth in installations and abundance of grant programs; hurt by limited scope of production incentives.	30.0

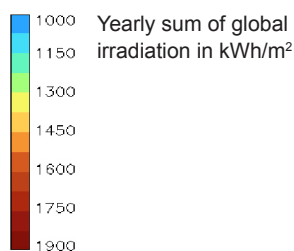
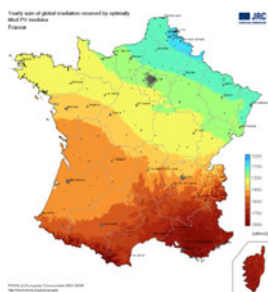
The structure of the electricity market in China is unique. Since electricity rates are set by the government, the market “does not allow for traditional grid parity economics for solar, at least in the near term.... Competition among generation providers is not as evident as it is in Western markets.... Because of the government’s heavy involvement in the electricity sector, power projects do not have to be immediately profitable to be built.”¹⁰ With the enactment of the Renewable Energy Law in 2006, China laid out a promising framework for renewable energy policies given this unique electricity market structure. Is this sleeping giant ready to wake up?

The country has been very deliberate in implementing programs that result in actual installations. New programs in 2009 broaden the reach of up-front incentives in both urban and rural areas and bolster domestic demand for modules to offset a fall in exports, but the new feed-in tariffs are limited in scope. Absolute PV Capacity Installed in 2008 is midrange for the countries evaluated, with low points awarded due to the nation’s size and economic might.

China is poised to become a major solar market. The government is considering a new RPS with significantly higher goals, including PV-specific targets. A recent tally of proposed installations total 12.5 GW by 2020.¹⁴ The true test will be whether China can turn good policies and goals into actual installations.

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Source: PVGIS © European Communities, 2001-2007

Solar Insolation on the Mainland: ~770-1260 kWh/kWp/yr Yearly Average Solar yield
~2.7-5.2 kWh/m²/day Average Solar Radiation

Solar Insolation in overseas departments: 4.11-4.93 kWh/m²/day

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	4.5	6.5	37.0	6.0	1.0	55.0
Rank	7	7	2	4	N/A	4

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	43.90	75.20	179.73
Cumulative Growth Rate		71%	139%
Annual PV Capacity Installed (MW) ¹	10.90	31.30	104.50
Annual Growth Rate		187%	234%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets energy policy nationwide

Note: *Policies enacted in and/or effective for 2009 in italics.*

Financial Incentives

Feed-in Tariffs

- Effective 7/1/2006²
 - For Continental France: *Gross FiT (EUR/kWh)*
 - 0.32823 for rooftop and ground-mounted
 - 0.60176 for BIPV
 - Capped at installed peak capacity x 1,500 full load hours, thereafter 0.05 EUR/kWh
 - For Corsica & Overseas Regions: *Gross FiT (EUR/kWh)*
 - 0.43764 for rooftop and ground-mounted
 - 0.60176 for BIPV
 - Capped at installed peak capacity x 1,800 full load hours, thereafter 0.05 EUR/kWh
 - Term of 20yrs
 - Non-degressive; revised annually for inflation
 - Target program @ 5400MW to 2020
 - *Administrative and technical process for connection contracts simplified to reduce connection time to 80 days from 155 days⁷; reduce procedural steps to 2 from 5²; administrative process for ground-mounted systems streamlined¹²*
 - 2008 statistics: of 105MW installed in 2008, 68.8MW is connected, 36.2MW waiting to be connected
- *Proposed, effective for 2010⁹:*

Financial Incentives (continued)

- For Continental France: Gross FiT (EUR/kWh)
 - 0.602 for fully BIPV for waterproof rooftop systems; capped at installed peak capacity x 1,500 full load hours, thereafter 0.05 EUR/kWh
 - 0.45 for simplified-BIPV (new category effective 6/1/2010) for rooftop on buildings ensuring the protection of humans, animals, goods and activities for systems $\geq 3\text{kW}^{5,6}$; capped at installed peak capacity x 1,500 full load hours, thereafter 0.05 EUR/kWh
 - 0.328-0.394 for non-BIPV and ground-mounted systems $>250\text{kW}$ based on regional insolation; no system size cap⁶; capped at installed peak capacity x 1,800 full load hours, or 2,200 full load hours if trackers systems, thereafter 0.05 EUR/kWh
 - 0.328 for non-BIPV and ground-mounted systems $\leq 250\text{kW}$; capped at installed peak capacity x 1,500 full load hours, or 2,600 full load hours if trackers systems, thereafter 0.05 EUR/kWh
- For Corsica & Overseas Regions: Gross FiT (EUR/kWh)
 - 0.602 for fully BIPV for waterproof residential rooftop systems; capped at installed peak capacity x 1,800 full load hours, thereafter 0.05 EUR/kWh
 - 0.47 for simplified-BIPV (new category effective 6/1/2010) for rooftop on buildings ensuring the protection of humans, animals, goods and activities for systems $\geq 3\text{kW}^{5,6}$; capped at installed peak capacity x 1,800 full load hours, thereafter 0.05 EUR/kWh
 - 0.43764 for non-BIPV and ground-mounted systems; capped at installed peak capacity x 1,800 full load hours, or 2,600 full load hours if trackers systems, thereafter 0.05 EUR/kWh

Grants & Rebates

- Regional and local subsidies based on resource conditions, costs and system size²

Net Metering / Net Billing

- No longer since 2005

Tax Incentives

- Credit: 50% of material costs up to 8,000 EUR/taxpayer (16,000 EUR/couple + 400 EUR/dependant); residential only for purchases 2005-2012. If the system is $<3\text{kWp}$, no production/consumption conditions; but if system $>3\text{kWp}$, production capacity has to be $<2\times$ consumption³
- Possibility to amortize PV investment costs over 12mos³
- No income tax the sale of electricity into the FiT for systems $<3\text{kW}$ (retroactive for 2008 filings)³
- VAT @ 5.5% (vs. 19.6%) for systems $<3\text{kW}$ on buildings $\geq 2\text{yrs old}^3$

Loan Subsidies

- "Green Loans" through financial institutions; terms vary by institution; interest rates @ 3-5% over 5-10, or 20yrs
- Poitou-Charentes – Plan Energie Solaire¹⁰
 - Effective February 2009-2012
 - Target: 65mW by 2012 (for the project); 270mW by 2015 (cumulative for region)
 - Funding: 400m EUR in loan credits

Other Financial Incentives

- ~95% of total costs for isolated dwellings unable to connect to grid; maintained by utility; owner pays annual rent (e.g., 193 EUR for a 1.8kW system)^{4,2}
- Other regions (e.g., Rhone-Alpes) considering PV support measures¹³

Regulatory Incentives

Renewable Portfolio Standards

- Optional, cumulative PV installed targets:
 - 1,100MW by 2012
 - 5,400MW by 2020

Interconnection

- Mandatory

Indirect Support

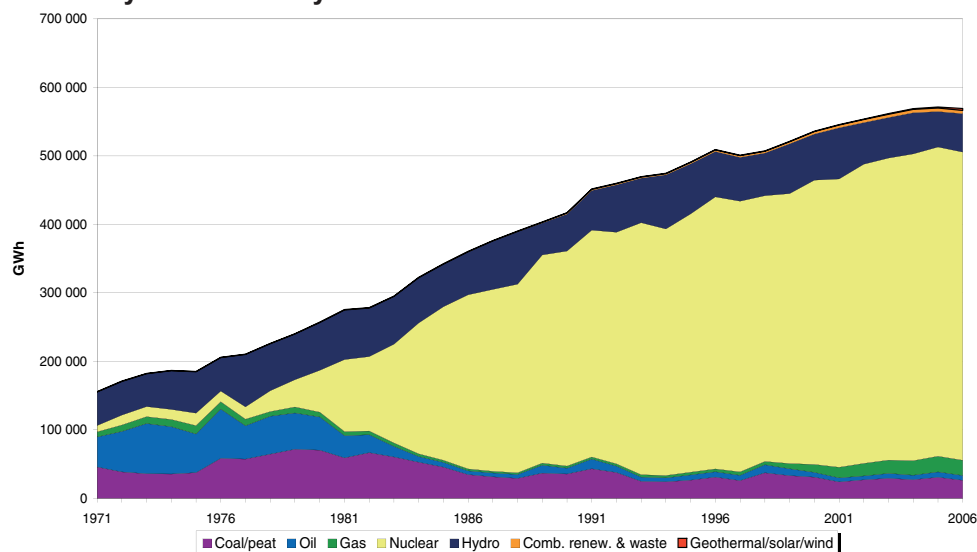
Education & Outreach

- In 2004 France introduced environmental education for sustainable development to all schools in its educational system.

14

Solar Energy Policy Context

Electricity Generation by Fuel ¹⁵



Energy Subsidies

France has phased out coal subsidies.

In 2005, total energy R&D amounted to €795.8 M (\$995 M). Nuclear energy R&D accounted for 62% of the total, while 18% and 5% (or \$53.25 M) were allocated to fossil fuels and renewables respectively.¹⁶

Public Budget for PV

The total budget for photovoltaics' R&D, demonstration and market development amounted to \$26.7 M in 2005¹⁷ and \$32.9 M (€26.2 M) in 2006¹⁸.

Energy Efficiency Measures

As a EU member state, France is bound by the EU Energy Performance of Buildings Directive. This directive was implemented in France in 2006 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. It is up to member states to decide the level of energy efficiency requirements, however these levels must be revised at least every 5 years and updated based on technological developments.¹⁹ Aspects of residential buildings that are taken into account include the building shell including air-tightness, heating and cooling installations, ventilation, the orientation and position of the building, passive solar systems and solar protection.¹⁶

In addition to EU requirements, France has implemented national energy efficiency initiatives. One such scheme commenced in 2007 and funds domestic energy conservation projects with low-interest loans.²⁰ This financial measure complements the 2005 tax credit scheme. Another national scheme is the White Certificates Trading program. This program requires suppliers of energy (electricity, gas, heating oil, LPG, heat, refrigeration) to meet government-mandated targets for energy savings. Suppliers can meet their objectives by informing customers how to reduce energy consumption, running promotional programs, and providing incentives to customers to save energy. Energy certificates can be traded between suppliers who exceed and undercut their objectives.

France has also created two energy efficient building labels, and has invested in a consumer energy efficiency education campaign.

Evaluation of Incentives

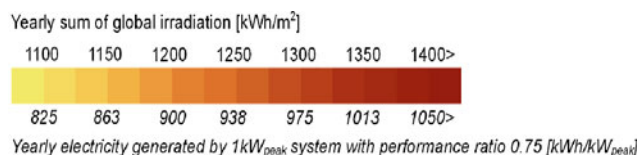
Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 7th out of 17 - Cumulative thru 2008 per GDP Rank: 10th out of 17 - Cumulative thru 2008 per Capita Rank: 9th out of 17 - Annual 2008 Rank: 7th out of 17 - Annual 2008 per GDP Rank: 6th out of 17 - Annual 2008 per Capita Rank: 6th out of 17	11.0
Purchase Incentives (25 points possible)	For the Residential sector: - National tax credit, accelerated depreciation, VAT exemption - National low-interest loans - Grants in selected regions For the Commercial sector: - National accelerated depreciation - National low-interest loans - Grants in selected regions For the Industrial sector: None	15.0
Income Incentives (30 points possible)	For all sectors: - Gross FiT with relatively low premium for continental non-BIPV; long term, inflation adjusted, but not digressive; transaction (buy-back) caps; administrative barriers For the Residential sector: - FiT income tax exemption	20.0
Other Financial Incentives (5 points possible)	Program for isolated dwellings	2.0
RPS (7 points possible)	New, higher targets with PV-specific goal, albeit optional	3.0
Interconnection (3 points possible)	Mandatory	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored school program	1.0
Overall	Solid contributions to point total from all categories	55.0

In 2009, France tinkered mostly around the edges of significant solar policy, committing to only a few noteworthy changes. The national government added incentives and streamlined application processing for feed-in tariff participants, and some regions began offering (or considering) incentive programs of their own. More significant from a long-term perspective, France adopted a more aggressive RPS and PV-specific targets. Under consideration are revisions to the feed-in tariff to address a deficient non-BIPV premium, which has been viewed as constraining overall market growth. France generally falls into the 2nd quartile in terms of PV Capacity Installed rankings; however, 58% of its cumulative capacity was installed in 2008, proving that an overly-complicated feed-in tariff with major bureaucratic hurdles is better than no long-term incentive at all.

France needs to further simplify the structures of its incentives and make them more comprehensive (e.g., add self-correcting adjustment mechanisms) in order to create long-term predictability if it wants to truly compete as a major solar market.

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Source: PVGIS © European Communities, 2001-2007

Solar Insolation: ~ 950 kWh/kWp/yr Yearly Average Solar yield
 ~ 2.4-4.4 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	Overall
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	15.0	15.0	38.0	5.0	-	73.0
Rank	1	1	1	8	N/A	1

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ⁸	2,863.00	3,862.00	5,444.00
Cumulative Growth Rate		35%	41%
Annual PV Capacity Installed (MW) ⁸	838.79	999.00	1,582.00
Annual Growth Rate		19%	58%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets national energy policy; supplemental regional policies

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs^{2,10}

- Renewable Energy Sources Act (EEG):
 - Effective since 2000, amended 2004 and 2008
 - Gross with rates on a sliding scale based on system size and placement

System	EUR/kWh	Term (yrs)
Freestanding	0.3194	20
<30 kW rooftop	0.4301	20
>30 kW <100 kW rooftop	0.4091	20
>100 kW rooftop	0.3958	20
>1,000 kW rooftop	0.3300	30
<30 kW Net Metered*	0.2501	20

**for on-site consumption; excess @ normal FiT (see Net Metering)*

- No BIPV bonus for 2009 and beyond
- No program cap
- Degression rate increased and indexed to targeted market growth "corridor"; base degression rates are:

Financial Incentives

System Type	2009	2010	2011	2012
Rooftop <100kW	8%	8%	9%	9%
Rooftop >100kW and ≤1,000kW	10%	10%	9%	9%
Rooftop >1,000kW	25%	10%	9%	9%
Ground-mounted	10%	10%	9%	9%

- +/-1% to base rate for the following year if market growth is outside corridor

Year	Corridor
2009	1,000-1,500 MW
2010	1,100-1,700 MW
2011	1,200-1,900 MW

Grants & Rebates

- National – none
- Bavaria – Up to 50% of costs for demonstration projects ⁶
- Rheinland-Pfalz – Up to 50K EUR for construction of energy-efficient houses ⁵
- Saarland – Up to 30% (capped at 100K EUR) for PV installations on schools ⁷

Net Metering / Net Billing

- Yes² – 0.2501 EUR/kWh (see FiT) for on-site consumption for systems <30kW; project owners are encouraged to consume energy produced onsite, reducing overall demand on the electricity system

Tax Incentives

- National ¹²
 - For commercial systems:
 - 20yr depreciation for investment costs including planning and installation
 - VAT exemption
 - Note: standard tax rate for FiT income

Loan Subsidies

- KfW Renewable Energies Programme – long-term, low-interest loans for renewable energy projects ⁴
- KfW Environmental Protection Program and the ERP Environmental Protection and Energy Saving Programme – 50-75% of investment costs >50K EUR at low-interest rates

Other Financial Incentives

- None

Regulatory Incentives

Renewable Portfolio Standards

- Governmental goal: 30% by 2020 (no solar-carve out), though no obligations for utilities to obtain a minimum percentage of power from renewable energy sources ²

Interconnection

- Mandatory; costs regulated

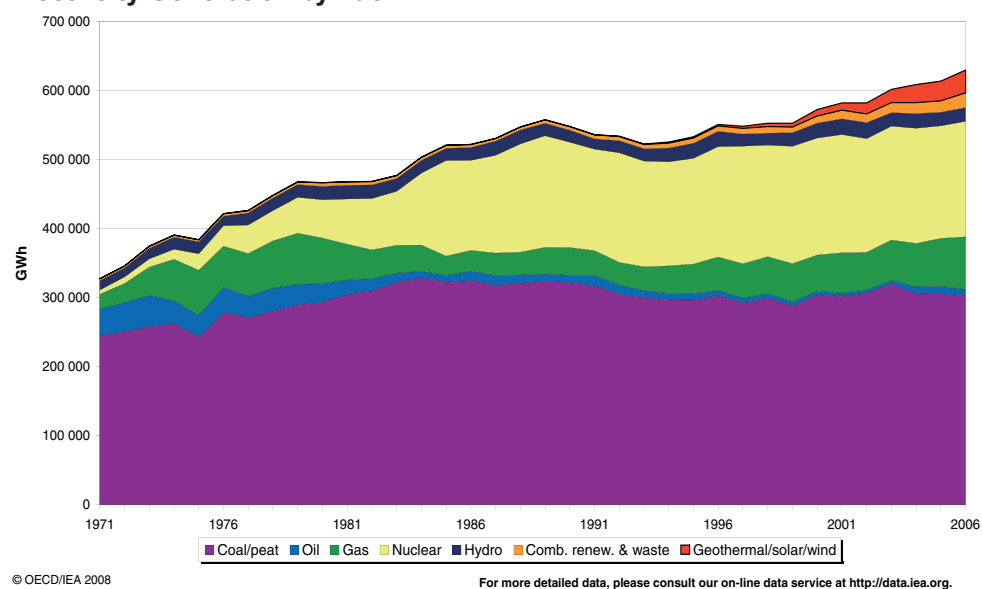
Indirect Support

Education and Outreach

- Due to the relatively mature PV market, industry focuses their activities on process optimization to reduce production costs and to increase the quality of their products. ¹

Solar Energy Policy Context

Electricity Generation by Fuel ¹³



Estimates cited by the OECD/IEA rate the amount paid to renewables through the Renewable Energy Sources Law (EEG) between 2000 and 2012 at €68 billion (20% to Solar PV).

In 2005, payments under the feed-in tariff (for all renewables) were about EUR 4.4 billion (for 44 TWh of clean electricity).¹⁵ However, it is important to note that while mandated by law, this payment does not come from the government's budget but is instead paid by the utilities and redistributed over all electric utilities customers.

2006 Energy R&D Budgets (in million USD)¹⁶

Fossil Fuels	28.88
Nuclear	176.26
Renewable Energy	113.51
Total Solar	63.42
Photovoltaics	51.15
Total Energy	534.81

Public Budgets for PV

in million €	2006	2007
Federal Ministry of the Environment (BMU) support for R&D projects on PV	38 ¹⁷	32.1 ¹⁸
Additional BMU Grants	43.4	41.7
Federal Ministry of Education and Research (BMBF)		22

Energy Efficiency Measures

As an EU member state, Germany is bound by the EU Energy Performance of Buildings Directive. This directive was implemented in Germany in 2006 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. It is up to member states to decide the level of energy efficiency requirements, however these levels must be revised at least every 5 years and updated based on technological developments.¹⁹ Aspects of residential buildings that are taken into account include the building shell including air-tightness, heating and cooling installations, ventilation, the orientation and position of the building, passive solar systems and solar protection.

In addition to EU requirements, Germany has implemented national energy efficiency initiatives. These include the 2007 Energy Conservation Legislation, which requires the introduction of energy certificates for existing buildings. This legislation will become mandatory for both residential and non-residential buildings on 1 January 2009.

Other programs include the KfW Build Ecologically Programme and the KfW Housing Modernization Program. These programs were implemented in 2005 and provide long-term, low-interest loans for the building of new energy-saving houses, and for improving the energy efficiency of existing houses.

In 2007, renewable sources provided 87.5 TWh (including 23.7% large hydro) or 14.2% of total gross electricity consumption.¹⁴ That is, excluding large hydro, 10.8% of electricity came from renewable sources in 2007, 3.5% from PV.

Energy Subsidies

While the German government has reached an agreement to completely phase out hard coal subsidies by 2018 (and shut down the remaining 8 plants), annual subsidies for coal remain on average at the €2.5 billion level (about a 50% cut from late 1990's levels).¹⁵

Germany also has plans to phase out nuclear power. All nuclear power stations should be out of service by 2022.¹⁵

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 1st out of 17 - Cumulative thru 2008 per GDP Rank: 2nd out of 17 - Cumulative thru 2008 per Capita Rank: 2nd out of 17 - Annual 2008 Rank: 2nd out of 17 - Annual 2008 per GDP Rank: 2nd out of 17 - Annual 2008 per Capita Rank: 2nd out of 17	30.0
Purchase Incentives (25 points possible)	For the Residential sector: - Grants in certain regions; not PV-specific - National low-interest long-term loans For the Commercial sector: - Grants in certain regions - National low-interest long-term loans - VAT exemption For the Industrial sector: - National low-interest long-term loans	8.0
Income Incentives (30 points possible)	For all sectors: - Gross FiT; long term, rate adjusters tied to market take-up; no program cap; mechanism to not overload grid - Net Metering premium to encourage on-site consumption	30.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	No solar carve out, optional	2.0
Interconnection (3 points possible)	Mandatory, costs regulated	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	No specific government-sponsored program	0
Overall	Full credit for a sophisticated, comprehensive feed-in tariff and installed capacity; talk of parity in 2012-2015, depending on sector	73.0

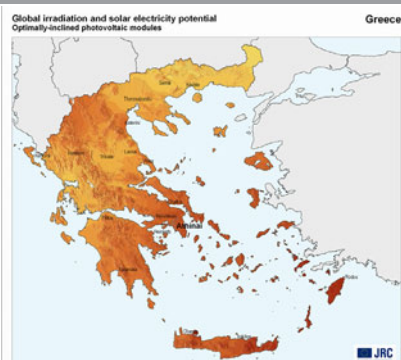
As the most mature solar market, Germany continues to lead the way with well-engineered incentives that are incrementally improved to create long-term predictability and certainty. Germany's market is such that the government does not need to offer grants and rebates to encourage adoption of solar; instead, policies focus on long-term incentives (a robust feed-in tariff and subsidized loans) to attract new investors.

Current projections indicate grid parity will be reached between 2012 and 2015 depending on sector.¹⁰ Such leadership does not come cheaply. "This year's [2009] new capacity alone will cost German power consumers 17.5 billion euros (\$26 billion) for power in the 20 years starting 2010...."⁹ However, the cost of "being green" is dwarfed by the cost of continued environmental degradation caused by the use of fossil fuels.

Policy enhancements implemented in 2009 include mechanisms to automatically adjust for market take-up and prevent grid overload. Changes under consideration for 2010 include even more aggressive degression to manage costs and preserve program sustainability. Usually ranked first by most measurements of PV installed used, Germany was temporarily replaced by an upstart Spain as the largest solar market in 2008. For 2009 installations, expect Germany to once again be head of the class.

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Source: PVGIS © European Communities, 2001-2007

Solar Insolation: ~1,150-1,500 kWh/kWp/yr Yearly Average Solar yield
~3.8-5.2 kWh/m²/day Average Solar Radiation on collector surface

↑ as compared to 2008

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	2.0	1.0	35.0	8.0	-	46.0
Rank	13	12	3	1	N/A	8

PV Capacity Installed

	2006 ¹⁶	2007 ¹⁶	2008 ⁷
Cumulative PV Capacity Installed (MW)	6.70	9.17	18.50
Cumulative Growth Rate		37%	102%
Annual PV Capacity Installed (MW)	1.25	2.47	9.33
Annual Growth Rate		98%	278%

Drivers for Future Development

Government Structure and the Effect on Energy Policy ⁶

- Parliamentary Republic with 13 administrative areas called Peripheries. The Peripheries are subdivided into Prefectures (51 or 54 in total). There is also one autonomous region called "Mount Athos". This region is a monastic state under Greek sovereignty. The administrative areas are represented in parliament.
- The beginning of RES entry into Greece was Law 1559/1985 "*Regulation of issues of alternative forms of energy and specific issues of power production from conventional fuels and other provisions*" (Government Gazette A 135) under which the PPC, leading the way with RES, installed 24 MW whereas local government organizations confined themselves to a meager level of 3 MW and the private sector was left out of the scene entirely. In spite of the small outcome, the effort showed the weaknesses and strengths of the sector and especially the initial failures paved the way for more mature implementations.
- The Regulatory Authority for Energy (RAE) was established by virtue of article 4 of Law 2773/1999 as an independent public authority entrusted with the monitoring and control of electricity market functioning and the delivery of opinions regarding the observance of the rules of genuine competition and the protection of customers. In addition, RAE formulates proposals to the Minister of Development with regard to the issue of power generation authorizations and thereafter monitors the implementation progress of the RES projects through quarterly reports and recommends the removal of those investors who exhibit unjustifiable slowness.
- Basic Laws introducing FiTs for PV: Law 3468/2006 & 3734/2009. ¹⁴

Note: Policies enacted in and/or effective for 2009 in *italics*.

Financial Incentives

Feed-in Tariffs ¹

- Old FiT
 - Effective June 2006 – December 2020
 - Net
 - 0.45 EUR/kWh (0.50 EUR/kWh on islands) for systems <100kW
 - 0.40 EUR/kWh (0.45 EUR/kWh on islands) for systems >100kW
 - Term: 20 years
 - Rate adjusted for inflation @ 25% of previous year's CPI
 - No program cap
 - Restriction: non-incorporated individuals unable to sell more than 20% of production
- Small Rooftop PV FiT ¹
 - Effective 4 June 2009
 - For Residential and Small Commercial
 - Net FiT @ 0.55 EUR/kWh for rooftop systems ≤10kW
 - Term: 25 years
 - Rate adjustors:
 - 5% annual degression starting 2012; (for newcomers. Existing contracts will continue high FiTs as per initial contract) ¹⁴
 - Inflation adjusted annually @ 25% of previous year's CPI
 - No Cap
 - Restrictions and Conditions
 - A Residence must also generate part of its hot water by some other renewable source (e.g. solar thermal)
 - Mainland grid areas only (islands with autonomous grids waiting for a second phase)
 - PV façades are not eligible for this new FiT. However, a PV façade on a commercial building can still benefit from the old FIT (i.e. 0.45 EUR/kWh for 20 years).
 - Note: A "small works permit" by the building authorities is the only license needed prior to installation.
- Commercial and Industrial PV FiT³
 - Effective 15 January 2009 (via new law 3734/2009 for RES)
 - Net ¹⁴
 - Term: 20 years
 - Rates:

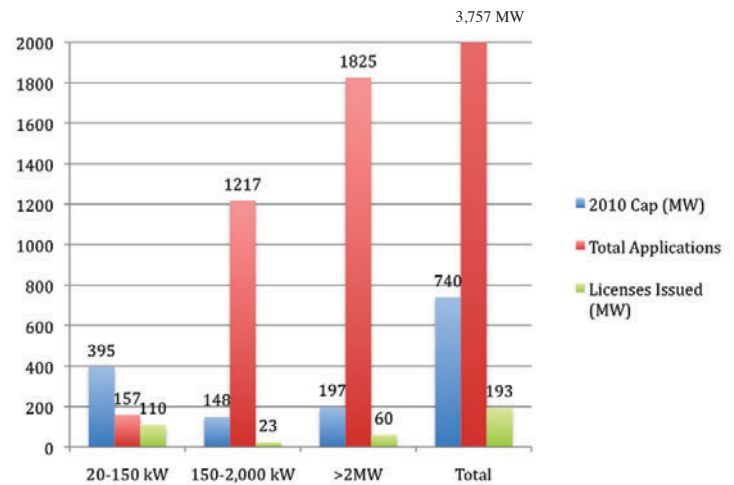
Year	Month	Mainland (EUR/MWh)		Islands (EUR/MWh)	
		>100kW	≤100kW	>100kW	≤100kW
2009	February	400	450	450	500
2009	August	400	450	450	500
2010	February	400	450	450	500
2010	August	392.04	441.05	441.05	490.05
2011	February	372.83	419.43	419.43	466.03
2011	August	351.01	394.88	394.88	438.76
2012	February	333.81	375.53	375.53	417.26
2012	August	314.27	353.56	353.56	392.84
2013	February	298.38	336.23	336.23	373.59
2013	August	281.38	316.55	316.55	351.72
2014	February	268.94	302.56	302.56	336.18
2014	August	260.97	293.59	293.59	326.22
Year 'n' from 2015 onwards SMC = System Marginal Cost		1.3 * SMC(n-1)	1.4 * SMC(n-1)	1.4 * SMC(n-1)	1.5 * SMC(n-1)

- Rate adjustors:
 - Degression of 10-12% beginning August 2010⁵
 - Inflation adjusted annually @ 25% of previous year's CPI beginning 2011
- Funding: Surcharge for electricity consumers in proportion to consumption; current average surcharge @ 0.30 EUR/MWh

Financial Incentives (continued)

- *Comment re Administrative Barriers:*
 - *Administrative Barriers are described as “major”. Lengthy authorization procedures. No deadlines set for authorities. Too many authorities involved. Ambiguous land use rules.²*
 - *The Regulatory Authority on Energy (RAE) reportedly has a waiting list of 3.7 GW (~8000 applications). And as of November 2009, it has only approved 450 MW of systems above 150 kW for production permits (a second environmental impact permit is required before construction can start). RAE has stopped accepting applications for systems over 20 kW (for systems below no application and approval process is required).⁸*

Bureaucratic Backlog



The graph does not include a 50 MW cap on systems under 20 kW, which do not require licensing.

Sources: HELPACO, 2008⁷, RAE 2008²³

Grants & Rebates

- For commercial, amount depends on company size and zone

Company Size ³	Investment Subsidy % of Total Installed Cost by Zone ^{3,4}		
	A	B	C
Very Small	40%	40%	40%
Small	40%	40%	40%
Medium	30%	40%	40%
Large	20%	30%	40%
Minimum investment = 100,000 EUR			



Zone A
Zone B
Zone C

Net Metering / Net Billing

- None¹⁴

Tax Incentives

- Tax Deduction: 20% capped at 700 EUR/system for small residential¹
- Tax Exemption: FiT Income - For small residential^{1, 14}
- Tax Exemption: FiT Income¹⁴ and VAT³ for small companies as long as they keep the income from PV as untaxed reserves.¹

Loan Subsidies

- Commercial and Industrial: Subsidized interest rate to 300-400 units lower than normal commercial loans.¹⁴
- The Credit Guarantee Fund of Small and Very Small Enterprises (TEMPME) is offering loan programs on-and-off.³

Other Financial Incentives

- None

Regulatory Incentives

Renewable Portfolio Standards

- Codified by Greek Law 3468/2006. Legally binding⁵
- Targets:
 - 20.1% of gross electricity consumption by 2010
 - 29% of net domestic power consumption by 2020.
- Solar Carve-out: at least 700MW by 2020 (500MW mainland, 200MW islands)¹³
- Ministry of Development says: Not on schedule to meet targets

Interconnection

- Mandatory per Law 3468/2006¹⁴

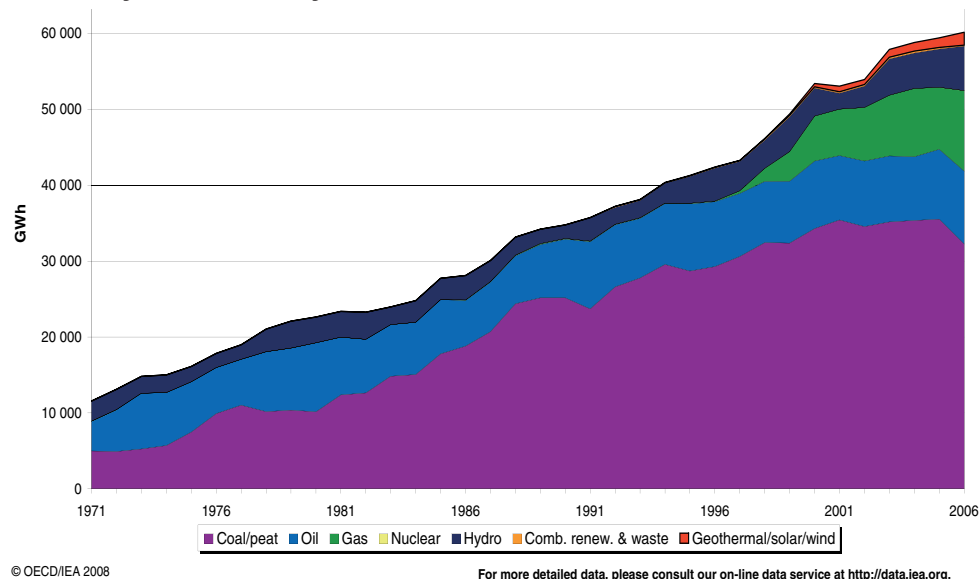
Indirect Support

Education and Outreach

- There have been government demonstration projects.¹⁵

Solar Energy Policy Context

Electricity Generation by Fuel¹⁷



The country is also heavily dependant on oil imports to satisfy its energy needs. So far, wind energy has been the focus for Renewable Energy (RE) development.

The current RE situation includes:¹⁸

- Installed wind capacity 890 MW;
- Installed capacity of small hydro plants >140 MW;
- More than 20% of households use solar water heaters

Energy Subsidies

Renewable energy R&D annual funding: According to the European Photovoltaic Technology Platform's 2005 information, "there is no specific budget for research in Renewable Energy Sources. Estimation gives an annual funding in the range of €2 to 3 million."¹⁹

R&D Energy Budgets (in 2002 €M)			
Fossil Fuels	Nuclear	Renewables	Total Energy R&D
0.60	1.08	3.25	8.8

*According to IEA statistics, no total R&D energy budget has been published since 2002. The main funding source has been EU Community Framework projects.²⁰

The Ministry of Development (MoD), recognizing the barrier that lack of credible research and information represents for RE development, has made a concerted effort to reorganize and improve the research and technology development system. The General Secretariat for Research and Technology within the MoD created Measure 3.3 to "improve the infrastructure and the scientific human resources of the country's universities, enterprises and other R&T organizations and help them to develop into centers of excellence and increase their competitiveness at national and international levels."²¹

Despite these efforts, lack of reliable data and information continues to be a major barrier to realizing the RE and PV targets.

Public Budget for PV

Current annual funding for PV R&D is estimated between 1 and 1.5 million Euros. PV program demonstration and deployment state support (in concert with the EU) amounts to about €3 million.¹⁹

The 2002-2006 total PV project budget was € 38.3 M with € 17.30 M in public expenditure co-financed from the EU 3rd Community Support Framework²², or about €4.2 million annually from Greece.

Energy Efficiency Measures

As an EU member state, Greece is bound by the EU Energy Performance of Buildings Directive. This directive was implemented in Greece in 2006 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. It is up to member states to decide the level of energy efficiency requirements, however these levels must be revised at least every 5 years and updated based on technological developments.²⁴ Aspects of residential buildings that are taken into account include the building shell including air-tightness, heating and cooling installations, ventilation, the orientation and position of the building, passive solar systems and solar protection.²⁵

The Greek Government has also established regulations on the thermal insulation requirements of buildings. This is in conjunction with the established minimum energy standards for new and renovated buildings, energy audits, and energy labeling of buildings.²⁰

In recent years, under the framework of Greek development laws and the partially EU-funded operational programs, there have also been several investment subsidies available in Greece for energy efficiency-related projects.²⁰

From 2000, new public buildings, and from 2004, all public buildings, were required to have an energy certificate stating the energy performance of the building based on an energy audit.²⁰

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 14th out of 17 - Cumulative thru 2008 per GDP Rank: 11th out of 17 - Cumulative thru 2008 per Capita Rank: 10th out of 17 - Annual 2008 Rank: 12th out of 17 - Annual 2008 per GDP Rank: 7th out of 17 - Annual 2008 per Capita Rank: 10th out of 17	3.0
Financial Incentives for Purchase (25 points possible)	For the Residential sector: - Tax Deduction For the Commercial sector: - Generous grants, though with high minimum investment requirement - Tax exemption for Small Commercial - Low-interest loans For the Industrial sector: - Low-interest loans	15.0
Financial Incentives for Income (30 points possible)	For the Residential sector: - New net FiT; generous premium, penalty for facades; long term; degressive, though not tied to market take-up; adjusted for inflation; no caps; island residential excluded until 2010 - Tax exemptions (with restrictions) For the Commercial sector: - For Small Commercial: - New net FiT; generous premium, penalty for facades; long term; degressive, though not tied to market take-up; adjusted for inflation; no caps - Tax exemptions (with restrictions) - For Large Commercial & Industrial: Net FiT for small commercial; generous premium; long term; degressive, though not tied to market take-up until 2015; adjusted for inflation; no caps For the Industrial sector: - For Commercial & Industrial: Net FiT for small commercial; generous premium; long term; degressive, though not tied to market take-up until 2015; adjusted for inflation Significant administrative barriers across all sectors	20.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	Mandatory with a PV carve-out	5.0
Interconnection (3 points possible)	Mandatory	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	A few demonstration projects	0
Overall	Points awarded for feed-in tariff would be higher if not for administrative barriers, which also affects points for installations	46.0

Evaluation of Incentives

Greece is an example of how reasonably well-designed incentives can be ineffective if the process is complicated and the infrastructure is not robust. The country's suite of incentives include feed-in tariffs with reasonable premiums covering all sectors, generous capital subsidies for installation, well-aligned tax incentives and loan subsidies, not to mention a mandatory RPS with a PV carve-out. The program has attracted many investors. Unfortunately, very little has translated into actual installations as applications have become stuck in the approval process. For PV Capacity Installed, the country consistently falls into the 3rd quartile, installing only 9.33 MW in 2008. While this represents a doubling of capacity in 2008 alone, it pales in comparison to the 3.7 GW⁸ awaiting approval. Talk about a bottleneck.

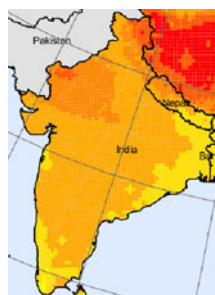
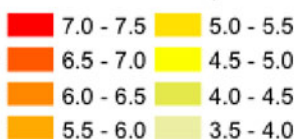
In 2009, the government bolstered its support for the residential and small commercial sectors with a higher premium, longer term and streamlined application process. But unless Greece improves throughput – by further simplifying application requirements for all sectors and improving the processing infrastructure – no amount of incentive tinkering will allow the country to meet its goal of at least 700MW by 2020.

Endnotes

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as compared to 2008

kWh/m²/day

Solar Insolation: ~1700-2500 kWh/kWp/yr Yearly Average Solar yield
6 kWh/m²/day Average Solar Radiation on collector
surface varies between 4-7 kWh/m²/day

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	4.5	3.5	27.0	5.0	-	40.0
Rank	7	8	7	8	N/A	10

PV Capacity Installed

	2006	2007	2008 ¹⁶
Cumulative PV Capacity Installed (MW)	~100.00*	132.00 ¹⁶	160.00
Cumulative Growth Rate		32%	21%
Annual PV Capacity Installed (MW)	Unknown	~32.00*	28.00
Annual Growth Rate			-13%

* Capacity in MW is only available for grid-connected installations; decentralized systems are expressed in numbers of home systems, villages, solar lanterns, etc.

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Policy is overseen by the Ministry of New and Renewable Energy (MNRE) and is implemented through the Indian Renewable Energy Development Agency (IREDA), the Ministry of Power (MoP), as well as a host of other smaller state nodal agencies.⁴

- 11th Five Year Plan (2007-2012)⁵
 - Comprised of 5 programs: (i) Grid-Interactive and Distributed Renewable Power; (ii) Renewable Energy for Rural Applications; (iii) Renewable Energy for Urban, Industrial & Commercial Applications; (iv) Research, Design & Development for New & Renewable Energy; and (v) Supporting Programmes.
 - Subsidy level of 25-33% of total system/device cost.
 - Goals:
 - Cumulative energy profile by 2012: 10% by 2012, with 4-5% of electricity mix
 - 11th 5yr Plan profile: 14.5 GW RE (of 70GW total installed)
 - Solar target: 50MW
 - Funding: 200cr INR, 50K/household

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- National
 - Grid Interactive Solar PV Power Generation Projects – Generation Based Incentive⁷
 - Effective 2008-2009
 - Net additive to state-approved FiTs and PPAs @ 12 INR/kWh (15 INR/kWh inclusive of state subsidies & PPAs) for systems ≥ 1 MW
 - Degression @ 5% starting 2010
 - Term: 10yrs
 - For utilities and developers
 - Caps: 5MW/developer/state, 10MW/state, 50MW total including solar thermal
 - Financed via government budget
 - Priority given to projects States with approved tariff for solar power
 - Exclusive of accelerated depreciation benefit
 - See *PROPOSED National Solar Mission (in Other Financial Incentives)*
- States
 - Gujarat – Solar Power Policy 2009¹⁵
 - Effective 2009 – March 2014
 - Term: 25yrs
 - Capped at 500mW, including solar thermal
 - For systems ≥ 5 mW
 - Obligatory PPA @ 13 INR/kWh for first 12yrs (on systems commissioned thru 2010), 12 INR/kWh for first 12yrs (on systems commissioned 2010-2014); 3 INR/kWh for next 13yrs
 - To be reviewed in 3yrs
 - Not be combined with MNRE Solar Power Generation scheme; accelerated depreciation allowed
 - Maharashtra, Andhra Pradesh, Madhya Pradesh, Karnataka, Uttaranchal, Uttar Pradesh, Haryana, Punjab, Rajasthan, Tamil Nadu, West Bengal¹

Grants & Rebates

- Solar Energy Programme¹⁸
 - 50% of BIPV system ≤ 5 kW costs up to 200K INR/kW
 - 50% of solar pack ≤ 1 kW costs up to 100K INR/kW
- Remote Village Electrification Programme (RVEP)⁸
 - Effective FY2009-2010
 - Up to 90% of system costs including cost any Annual Maintenance Contract (AMC) for 5yrs up to 18K INR/household
 - **Preference for small hydro, biomass, biogas and bio-fuel over solar**
 - Funding: 80cr INR for FY2009-2010, 867cr INR for 11th 5yr Plan¹⁴
- Solar Photovoltaic (SPV) Programme¹¹
 - Effective FY2009-2012
 - For home and street lighting, traffic signals, billboards, power packs, rooftop (off-grid and grid-connected) and other systems ≤ 100 kW
 - 75 INR/W up to 30% of system costs for for-profit entities availing depreciation benefits; 100 INR/W up to 40% of system costs for non-profit entities; grant amount varies for other PV applications
 - Funding: 375cr INR for 11th Plan, 85cr INR for 2009-2010
 - Targets: 17.75mW for 11th Plan, 5.5mW for 2009-2010
- Solar Lantern Programme¹⁰
 - Effective FY2009-2010 (resurrection of 2006-2007 programme)
 - 2,400 INR/solar lantern in un-electrified villages
 - Funding: 30cr INR

Net Metering / Net Billing

- None
- See *PROPOSED National Solar Mission (in Other Financial Incentives)*

Tax Incentives

- Accelerated (80%) depreciation on PV equipment³, unable to combine with feed-in tariff⁷

Financial Incentives (continued)

- Income tax exemption: for a contiguous 10yr period within 15yrs of project completion (per 2008 SRC)
- Import duty exemption²
- See *PROPOSED National Solar Mission*

Loan Subsidies

- *Solar Photovoltaic (SPV) Programme*¹¹
 - *Effective FY2009-2012*
 - *Aimed at expanding the commercial market for SPV products, so that the capital subsidies can be gradually phased out*
 - *Loans via International Renewable Energy Agency (IREDA)*
 - *Up to 80% of project costs @ 7% (commercial borrowers who avail depreciation benefits); 5% (entities not availing depreciation benefits)*
 - *Term: 3yrs with 1yr moratorium*
 - *Loans via banks*
 - *Up to 85% of project costs @ 5% for entities not availing depreciation benefits*
 - *Term: 5yrs*

Other Financial Incentives

- *Development of Solar Cities*⁹
 - *Goal: Minimum 10% reduction in projected total demand of conventional energy at the end of five years to be achieved through energy saving from energy efficiency measures and generation from renewable energy installations.*
 - *Consolidates various programmes in the Urban Sector, including Akshay Urja shops*
 - *60 Solar Cities proposed, 1-5 cities/state; city population >500k <5m*
 - *Up to 50lakhs INR/city*
 - *Funding: 30cr INR*
- *Aksahy Urja Shops*¹⁸
 - *Shops for renewable energy products sale and repair*
 - *7% loans up to 10lakhs INR for 85% of set up cost over 5yrs*
 - *Recurring monthly grants for operations for 2yrs*
 - *297 shops in 28 states (as of June 2009)*
- *National Solar Mission*¹⁷
 - *Proposed, to be announced mid-November 2009*
 - *Objectives*
 - *Decrease system costs to 4-5 INR/kWh by 2017-2020*
 - *20gW by 2020, 100gW by 2030, 200gW by 2050*
 - *Phase I (2009-2012): Selected deployments*
 - *Promotion of commercial-scale solar utility plants*
 - *Mandated PV on government and public-sector buildings*
 - *Net metering to meet peak usage requirements*
 - *Pilot projects for large-scale rural electrification*
 - *Incentives*
 - *Available*
 - *FiT set by state regulators*
 - *For rooftop systems >3kW*
 - *1.5 INR/kWh premium for grid-connection and BIPV*
 - *Term: 20yrs*
 - *Interconnection priority*
 - *Net metering*
 - *10yr tax holiday*
 - *Customs duty and excise duty exemptions*
 - *Not available*
 - *Capital subsidies*
 - *Accelerated depreciation*
 - *RPS: 1-3% solar obligation (depending on state's solar resources) by 2017; SRECs allowed*
 - *Funding: 85,000-105,000cr over 30yrs*

Regulatory Incentives

Renewable Portfolio Standards

- National
 - 5% by 2010, increasing 1% annually to 15% by 2020¹; no solar carve-out
 - Mandatory with non-compliance penalty
 - See *PROPOSED National Solar Mission (in Other Financial Incentives)*
- State
 - Gujarat – 10% (no target date specified), no solar carve-out; 12 INR/kWh penalty¹⁵
 - Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh, Orissa¹

Interconnection

- Only in context of Generation Based Incentive PPAs

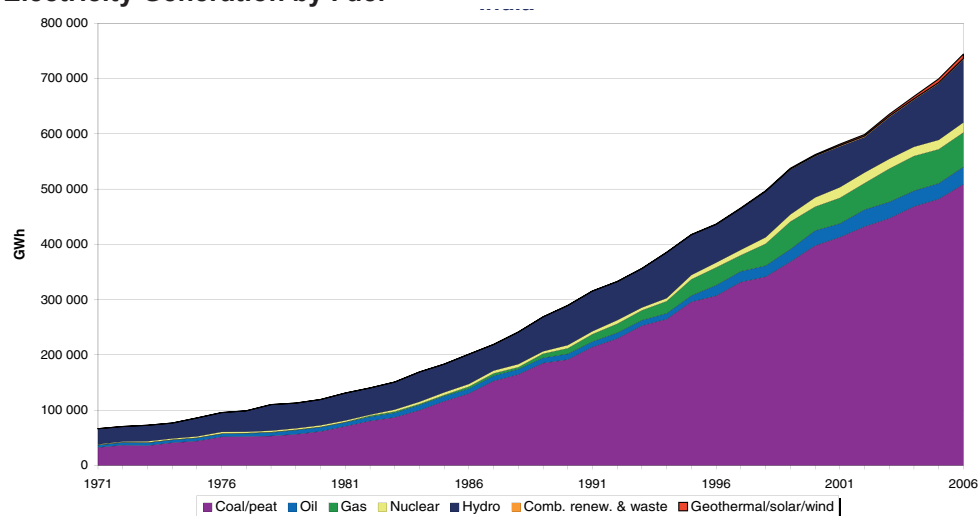
Indirect Support

Education & Outreach

- The ministry of New and Renewable Energy has a web page detailing all 'information and public awareness programs' geared towards generating "mass awareness of the non-conventional energy products and [their] benefits, ... and disseminating information on technological developments and promotional activities."¹⁹
- *Demonstration Programme on Tail-end grid connected Solar Power Plants*⁶
 - Effective 2009
 - 50% of system costs up to 10cr INR/MW for systems $\geq 25\text{kW}$ $\leq 1\text{MW}$ per plant, $\leq 4\text{MW}$ cumulative per site

Solar Energy Policy Context

Electricity Generation by Fuel¹⁹



Energy Subsidies

The International Energy Agency gauged the economic value of energy subsidies in India for 2005 at around \$20 billion, \$10 billion of which went to electricity.²⁰

Liquid Petroleum Gas

\$1.7 billion was spent in the first half of FY 2008 on Liquid Petroleum Gas subsidies in India, according to a report by the United Nations Environment Programme. While intended to get the fuel into poor households, the report notes, "LPG subsidies are mainly benefiting higher-income households...despite the ineffectiveness of the subsidy, the program is being extended until 2010."²¹

Renewables

The Ministry of New and Renewable Energy (MNRE) estimated the investment requirement for setting up 15,000 MW of grid interactive/distributed renewable power generation (2007-2012) at around Rs. 60,000 crore (US\$ 14.5 billion) which would amount to leveraging 15.5 times the proposed budgetary support of Rs. 3,925 crore (US\$ 950 million).²²

A report on the performance of previous efforts noted that out of \$1.8 billion (Rs. 7167 crore) allocated for the development of renewables during 2002-2007, only \$1 billion (Rs. 4000 crore) had been disbursed by 10/06; this in part because the cost of solar was deemed too high and not viable, and all subsidies for grid-interactive solar power were totally withdrawn.

Since, the MNRE had recommended holding subsidies for solar PV until technology improved, costs came down, and unit cost of generation was at par with small hydro power, however, this course of action was reversed with the implementation of a generation based incentive for solar in January 2008.

Research, Design and Development budget for renewables (2007-2012): Rs. 1,500 crore (US\$ 363 million) or \$75.6 million/yr.

Public Budgets for PV

A budget provision of Rs. 2.0 billion (US\$ 48.4 million) has been passed and is intended to support 50 MW of PV by 2012.²³

Research, Design and Development budget (2007-2012)²²

Total Solar: Rs. 400 crore (US\$ 96.8 million) or 19.4/yr.

Photovoltaic: RS. 220 crore (US\$ 53.24 million) or \$11 million/yr.

Demonstration and Promotion of Solar Photovoltaic Devices/ Systems in Urban Areas

\$6.63 million for urban solar Demonstration and Promotion 2005-06, same for 2007-08 (or Rs. 26.30 crore).²⁴

Energy Efficiency Measures²⁵

In June 2007, the first Energy Conservation Building Code was adopted in India. It addresses the design of new, large commercial buildings, and aims at optimizing the buildings' energy demand according to their location. It includes a prescriptive and an energy performance method, with a particular focus on shading (due to the high energy consumption of cooling in India).²⁶

Compliance with this code, however, will be voluntary until each state in India implements the code. The Ministry of Power has estimated that it would take 1 year for the code to become mandatory and further 1 - 2 years before sufficient control and sanction systems are in place.²⁶

The introduction and enforcement of a building code in India, particularly for large commercial buildings, is crucial due to the current and projected industrial and commercial growth. Since March 2007, large industrial energy consumers are required to undergo energy audits and report their consumption and energy conservation data annually.

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 8th out of 17 - Cumulative thru 2008 per GDP Rank: 6th out of 17 - Cumulative thru 2008 per Capita Rank: 14th out of 17 - Annual 2008 Rank: 9th out of 17 - Annual 2008 per GDP Rank: 10th out of 17 - Annual 2008 per Capita Rank: 15th out of 17	8.0
Financial Incentives for Acquisition (25 points possible)	For the Residential sector: - Grants with generous transaction caps; unable to combine with tax incentive - Import duty tax exemptions; accelerated depreciation For the Commercial sector: - Grants for SME and public infrastructure with generous transaction caps; unable to combine with accelerated depreciation - Import duty tax exemptions; accelerated depreciation - Low-interest loans; higher rate for combining with tax incentives; short term For the Industrial sector: None	14.0
Financial Incentives for Income (30 points possible)	For the Residential sector: None For the Commercial sector: - Tax exemption for 10yrs For the Industrial sector: - National net FiT; low premium is additive to state programs; degressive, though not tied to market take-up; shorter term; low caps (which include solar thermal); government-funded, unable to combine with accelerated depreciation - Tax exemption for 10yrs - New Gujarat FiT not compatible with national program	10.0
Other Financial Incentives (5 points possible)	2 national programs	3.0
RPS (7 points possible)	National and several states; mandatory with non-compliance penalty	3.0
Interconnection (3 points possible)	Available for FiT PPAs	2.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Web sites, demonstration program	0
Overall	Points buoyed by numerous grant programs, hurt by non-alignment of many incentives	40.0

India has a hodgepodge of PV support measures at the national and state levels, many of which target narrow sectors and often do not work together. The Generation Based Incentive is nationwide and additive to state generation programs, but is restricted to the industrial sector; indeed, the low cap would categorize the feed-in tariff as a demonstration program. Gujarat's new feed-in tariff – the very type of program targeted by the Generation Based Incentive – is exclusive of the national program. Tax incentives such as accelerated depreciation can be combined with the Gujarat feed-in tariff, but not with the national tariff. Grant programs tend to be very specific, such as funding solar lanterns in un-electrified villages only. It is no surprise that the off-grid sector (led by rural electrification programs and urban stand-alone back-up generators and comprised of state agencies, retailers, NGOs and rural banks specializing in micro-financing⁴) has dominated India's PV market. Absolute PV Capacity Installed rankings generally fall into the 3rd quartile, but points awarded suffer due to India's high population.

New or enhanced incentives for 2009 – a new state-level feed-in tariff, two grant programs, one loan program and a demonstration program – only add to the mélange. Despite the new programs, India's grade is lower for 2009 due to the new grading scheme which penalizes non-alignment of incentives. Adoption of the National Solar Mission with its suite of incentives including a PV carve-out would greatly help India improve its solar market. But absent better alignment between its PV support measures, India will soon be overtaken by China in cumulative power installed.

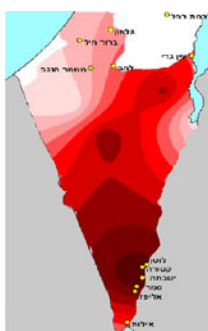
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kWh/m²/day

- 6.5 - 7.0
- 6.0 - 6.5
- 5.5 - 6.0

Source: NREL, UNEP and SWERA



Source: Arava Institute

- 2100-2200 kWh/m²/yr
(5.75-6.0 kWh/m²/day)
- 2200-2400 kWh/m²/yr
(6.0-6.6 kWh/m²/day)

Solar Insolation: 1700-2200 kWh/kWp/yr Yearly Average Solar yield
5.48 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	1.0	-	15.0	4.0	0.5	20.5
Rank	15	13	14	11	N/A	15

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	1.30	1.82	3.03
Cumulative Growth Rate		40%	66%
Annual PV Capacity Installed (MW) ¹	0.28	0.52	1.21
Annual Growth Rate		88%	133%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Centralized government sets national energy policy; limited to no local policies

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs²

- Effective July 2008
 - For 2009: Net @ 1.97 NIS/kWh for PV residential systems ≤15kW or for commercial systems ≤50kW; systems must be on a "built structure"
 - 0.92 NIS/kWh for PV & CSP systems 100kW ≤20MW
 - 0.73 NIS/kWh for PV & CSP systems >20MW
 - Rates based on a complicated formula taking into account monetary fluctuations¹; adjusted (including for inflation) annually through 2010, 4% annual digression for 2011-2015
 - Term: 20yrs
 - Capped at 50MW (15MW for residential, 35MW for commercial) or 7yrs; funded by surcharge (estimated at 1%⁷) for all ratepayers
- Proposed – 1.58 NIS/kWh for PV systems >50kW ≤5MW³*

Grants & Rebates

- None

Net Metering / Net Billing

- None

Financial Incentives (continued)

Tax Incentives

- Income tax exemption for private household systems (<4kW) participating in FiT up to 18K NIS⁵

Loan Subsidies

- None

Other Financial Incentives

- International tender for a 15MW PV power plan issued by the Government in April 2008. Ten international consortia have answered the PQ tender.

Regulatory Incentives

Renewable Portfolio Standards

- 5% by 2014, 10% by 2020; not mandatory⁷

Interconnection

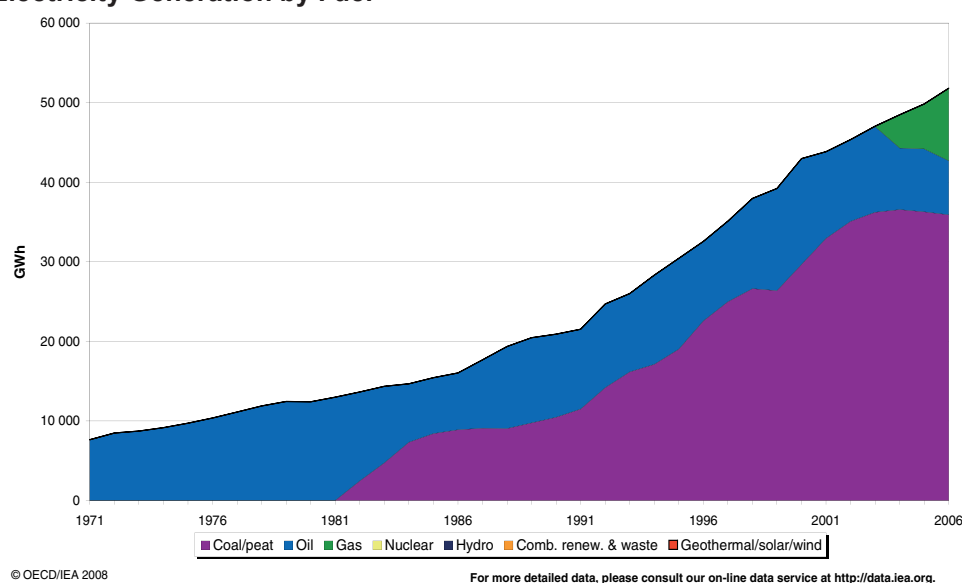
- Mandatory for FiT; however there are major bureaucratic hurdles at the municipal level
- *The National Council for Planning and Construction has recently approved rules to accelerate approval by local authorities and to exempt these systems from local fees.*⁹

Indirect Support

Education and Outreach

- Science Following the Sun Program – a education project brings to hundreds of school children the message of solar energy, including photovoltaics.⁹
- *IEC, the country's sole electricity provider has come out in favor of grid-connected PV, and is trying to encourage it by mailing information about it to customers.*¹

Electricity Generation by Fuel ¹⁰



- Coal and oil (or 88.6% of fuel for electricity) are imported.
- Israel has over 1.3 million solar water heaters producing the equivalent of over 4% of Israel's electricity consumption as a result of mandatory solar water heating installations¹¹

Energy Subsidies

According to Dr. H. Avraham Arbib of the Ministry of National Infrastructures, electricity is not subsidized in Israel.

Renewable Energy

The Resources Management Division (RMD) at the Ministry of National Infrastructures (MNI) and the Office of the Chief Scientist of MNI are in charge of renewable energy R&D, policy design and enforcement. RMD has staff of 5 and intervention budget of \$ 1.2M.¹²

Public Budget for PV

Public budget for R&D, demonstration/field trials and market stimulation in 2005: USD 470,000.

The Israel Ministry of National Infrastructures spent USD 75,000 on R&D in 2006.

In April 2007, the Israel Ministry of National Infrastructures announced a three-fold increase of the budgets allocated for support of new initiatives aimed at the development of alternative and renewable energy sources.

Energy Efficiency Measures

Government standards for energy efficiency have been in place since 1989, when Israel's parliament passed the Energy Resources Law.¹¹ Two new-building energy-rating standards were adopted for residential buildings (2005) and for office buildings (2007).¹²

The Ministry of National Infrastructure has implemented a diverse range of policies and programs to maximize energy conservation and efficiency in Israel. These include initiatives to educate Israelis and increase public awareness of energy efficient products, programs which give financial support to energy consumers for transforming buildings to meet EE standards, and regulations which cover energy labeling systems for electric heating and cooling devices. The Ministry of National Infrastructure continues to monitor energy consumption efficiency.¹³

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 15th out of 17 - Cumulative thru 2008 per GDP Rank: 14th out of 17 - Cumulative thru 2008 per Capita Rank: 12th out of 17 - Annual 2008 Rank: 15th out of 17 - Annual 2008 per GDP Rank: 13th out of 17 - Annual 2008 per Capita Rank: 12th out of 17	1.0
Purchase Incentives (25 points possible)	For the Residential sector: None For the Commercial sector: None For the Industrial sector: International tender for in progress	3.0
Income Incentives (30 points possible)	For all sectors: - Net FiT with reasonable premium for residential and SME, weak for other sectors; long term; degressive and adjusted for inflation, though based on a complicated formula tied to foreign currency, creating uncertainty; administrative barriers For the Residential sector: - FiT income tax exemption	12.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	New, though optional	1.0
Interconnection (3 points possible)	Mandatory for feed-in tariff	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored school program	0.5
Overall	Feed-in tariff with weak premiums for all but one sector is still responsible for the majority of points	20.5

Until recently, Israel's solar market has been driven more by the lack of reach of its grid than by the attractiveness of its solar policies. Off-grid systems have dominated as remote areas turned to solar as the best economic solution. A feed-in tariff instituted in 2006 was a false start given the weak premiums offered. Incentives for creating a viable grid-connected market did not appear until 2008, and targeted only the residential and small-to-medium commercial sectors. Given its size, absolute PV capacity installed will always be smaller than most other countries, yet measurements per GDP and Capita still rank Israel in the bottom half of countries evaluated.

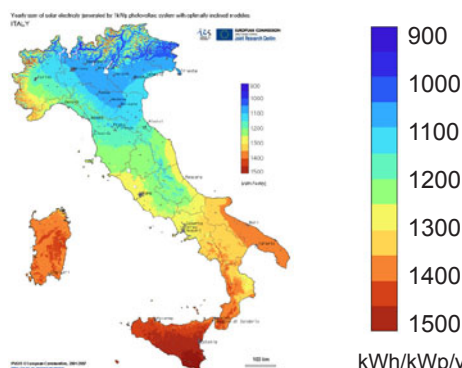
Yet Israel seems primed to shift into a higher gear. New policy measures effective in 2009 include a new RPS and incremental improvements to reduce administrative barriers. Even more important, new rates are under consideration for large commercial and small industrial systems, which will bring more balance across all sectors. However, by relying on long-term incentives – feed-in tariffs and income tax deductions – instead of grants, rebates or tax credits to alleviate up-front costs and kick-start widespread growth, getting up to speed may take a very long time.

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↑ as compared to 2008



Solar Insolation: ~1000-1500 kWh/kWp/yr Yearly Average Solar yield
~3.4-5.4 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	Overall
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	8.0	10.0	31.0	6.5	-	55.5
Rank	6	3	5	2	N/A	3

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	50.00	120.20	458.30
Cumulative Growth Rate		140%	281%
Annual PV Capacity Installed (MW) ¹	12.50	70.20	338.10
Annual Growth Rate		462%	382%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets energy policy for entire nation; limited regional policy.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

Conto Energia Programme⁵

Gross FiT (EUR/kWh)

System Size	Ground	Rooftop	BIPV
>=1kW and <=3kW	0.392	0.431	0.480
>3kW and <=20kW	0.372	0.412	0.451
>20kW	0.353	0.392	0.431

2% annual depression thru 2010

- Potential increase up to 30% in tariff for increased energy efficiency; must be certified
- 5% bonus premium for self-producers, public schools, public hospitals, small municipalities and asbestos roof replacement
- Rates fixed for 20yrs
- Program capped @ 1,200MW with a 14mo (for private owners) and 24mo (for public owners) grace period after cap is reached

Financial Incentives (continued)

- *Proposed effective 2011* ¹⁰
 - ASSOSOLARE- APER-GIFI Common proposal to Italian Government (Nov 2009)
 - Five Year duration (2011-2015)
 - Rate of degression (from 1/7/2011 FiT Vs 2010 FiT):

kWp	Ground	Building
1-6	5%	5%
6-20	7%	7%
20-200	9%	14%
200-1000	12%	16%
>1000	14%	18%
 - 15% bonus for BIPV
 - 10% bonus for waste locations (e.g., landfills)
 - 10% bonus for asbestos removal
 - 4% annual degression for 2012-2015
- Due to persistent delays in the grid-connection procedure, the regulatory authority Autorità per l'energia elettrica e il gas (AEEG) adopted new rules for the connection of a PV plant to the local grid which have applied since January 1, 2009. Although improved, this process is still long and cumbersome. ⁸

Grants & Rebates

- National – none
- Regional ¹³ – Up to 20% of PV system investment (including BIPV) depending on Regional Government decision. Examples:
 - Sardinia: 20% for residential use.
 - Regione Friuli: 20%

Net Metering / Net Billing

- Additive to FiT
- Systems ≤200kW
- 2 choices:
 1. Accrue credit for excess; *no expiration for credit*
 2. Sell at rate set annually by AEEG

Tax Incentives

- VAT reduction @ 10% (vs. 20%) ⁴
- Income tax exemption: FiT
 - 100% for residential owners
 - 0% for commercial/industrial owner
 - *For solar on agricultural land, agricultural rates for systems ≤200kW; commercial rates for systems >200kW*

Loan Subsidies

- National – Many Italian banks have decided to grant loans on industry-made conditions based on a 20-year agreement with the Gestore dei Servizi Elettrici (GSE). Loan agreements provide for a return scheme based on the incentives paid to the plant owner by the GSE. The plant owner executes a statement to transfer directly to the bank any right to the incentives to which his plant will be entitled. Plant shall be deemed to be activated and eligible to receive incentives at the time the plant and the electricity meters are connected and the electricity transfer agreement is executed. Process is long and detailed with many legislative procedures. ⁸ Recently banks reluctant to give out loans unless PV systems are already built and grid connected, making credit mechanism less accessible. ⁹
- Regional ¹³ – Milano County: 0% interest loan for privates

Regulatory Incentives

Renewable Portfolio Standards

- RPS effective since 2002
- Base @ 2% annually, with annual increases of 0.35% for 2004-2006, 0.75% for 2007-2012 ⁶
- Mandatory
- Buy-out option based on “Green Certificates” (or foreign equivalent); value/price determined by formula ⁶
- *Obligation for 2009 = 5.30%*

Interconnection

- Effective since 1999:
- Priority access ⁶
- Utilities to pay penalties (albeit low) for delays in connecting
- Streamlined contracting procedure

Other Regulatory Incentives

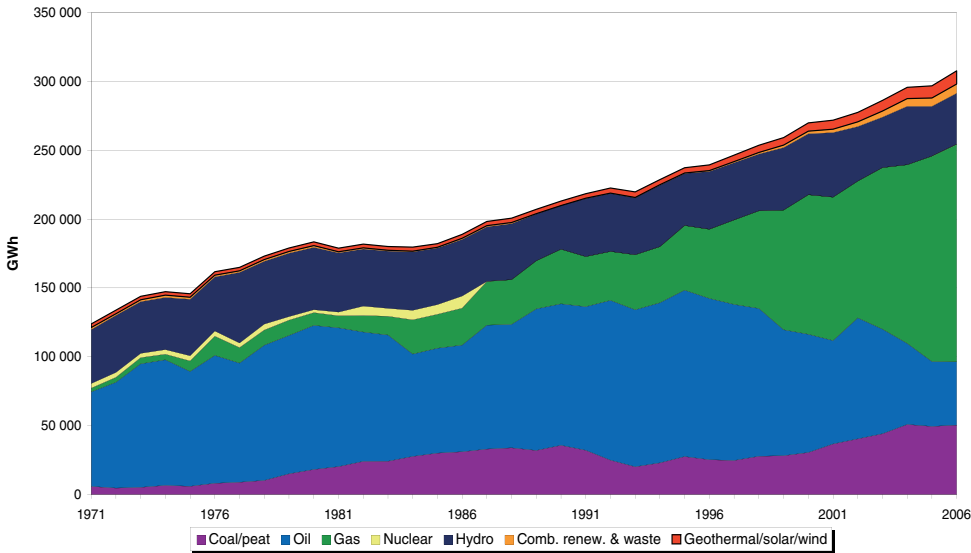
- Effective Jan 1st, 2010: At least 1kW PV for each apartment in new residential buildings. ³

Indirect Support

Education & Outreach

- None

Electricity Generation by Fuel ¹⁴



Energy Subsidies

Energy R&D Budgets (in million USD)¹⁵

	2005	2006
Fossil Fuels	17.28	53.95
Nuclear	102.38	125.47
Renewable Energy	63.35	67.75
Total Solar	60.66	62.74
Photovoltaics	13.18	20.08
Total Energy	330.17	505.4

Public Budget for PV

The International Energy Agency Photovoltaic Power Systems Programme report the public budget for Solar PV R&D, demonstration/field trials and market stimulation in 2005 was \$ 43.20M.¹⁶

In 2006, the public budget for R&D and market incentives totaled \$15M. In particular, expenditure on PV research and demonstration has been about \$6.8M, remaining essentially flat with respect to the previous years while the ones for market stimulation have been around \$8.2M.¹⁷

Energy Efficiency Measures

“If the consumption of energy of the building in which a photovoltaic plant is installed is reduced by at least 10 per cent, an increase in the incentive tariff is awarded in a percentage equal to half of the percentage of electricity saved, but not exceeding 30 per cent of the standard tariff.”¹⁹

As an EU member state, Italy is bound by the EU Energy Performance of Buildings Directive. This directive was implemented in Italy in 2006 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. Aspects of residential buildings that are taken into account include the building shell including air-tightness, heating and cooling installations, ventilation, the orientation and position of the building, passive solar systems and solar protection.¹⁸

In addition to the mandated EU directive, Italy has established national energy efficiency measures.

Indirect Policy Measures

An inter-ministerial decree has introduced tax credits for energy saving improvements as well as solar thermal utilization, up to 55% of capital cost.

A recent inter-ministerial decree (July 2008) has also determined that installation of a rooftop PV system which is parallel mounted on the roof and does not exceed the actual roof surface, should be considered a standard maintenance action, and consequently benefit from an expedited permitting procedure (no DIA required).

Evaluation of Incentives

Category	Results	Points
PV Installed (30 points possible)	- Cumulative thru 2008 Rank: 6th out of 17 - Cumulative thru 2008 per GDP Rank: 5th out of 17 - Cumulative thru 2008 per Capita Rank: 5th out of 17 - Annual 2008 Rank: 3rd out of 17 - Annual 2008 per GDP Rank: 3rd out of 17 - Annual 2008 per Capita Rank: 3rd out of 17	18.0
Incentives for Acquisition (25 points possible)	For the Residential sector: - Grants in certain regions with varying terms; modest transaction caps - GSE-subsidized loans; process is cumbersome and restricts eligibility For the Commercial sector: - GSE-subsidized loans; process is cumbersome and restricts eligibility For the Industrial sector: None	5.0
Incentives for Income (30 points possible)	For all sectors: - Gross FiT: 1.75-2.75x premium; potential 2.25-3x premium with certified EE; long term with high caps (and grace periods); degression not linked to market take-up; administrative barriers For the Residential sector: - Tax exemption on FiT income - Net Metering as additive to feed-in tariff For the Commercial sector: - Net Metering as additive to feed-in tariff	26.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	Mandatory, albeit with modest goals; no PV carve-out	2.5
Interconnection (3 points possible)	Priority connection	3.0
Other Regulatory Incentives (extra credit)	PV requirement in new residential buildings	1.0
Education & Outreach (extra credit)	None	0
Overall	Majority of points awarded for strong installation numbers (despite administrative barriers) and a reasonably well-designed feed-in tariff	55.5

The relatively mature solar market, especially in the residential sector, allows Italy to focus less on up-front subsidies and more on long-term incentives to attract investors. Most incentives, such as tax incentives, loan subsidies and net metering are structured to support the feed-in tariff. The primary system weakness lies in a cumbersome administrative process, be it for project approval, financing or connection. Italy's strategy of implementing programs through regional authorities has resulted in myriad processes with inconsistent eligibility requirements, complex permitting procedures and absurdly long connection times. Despite these hurdles, Italy installed enough PV in 2008 to rank 3rd by all measurements used, and is reinforcing its position as the 5th largest solar market of the countries evaluated, raising the country's overall grade.

Policy changes in 2009 were minor as the country debates more aggressive degression to avert possible overheating of the market. Moving forward, Italy needs to implement mechanisms to link incentives to market take-up and continue the removal of administrative barriers in order to maintain sustainable momentum in its march towards grid parity.

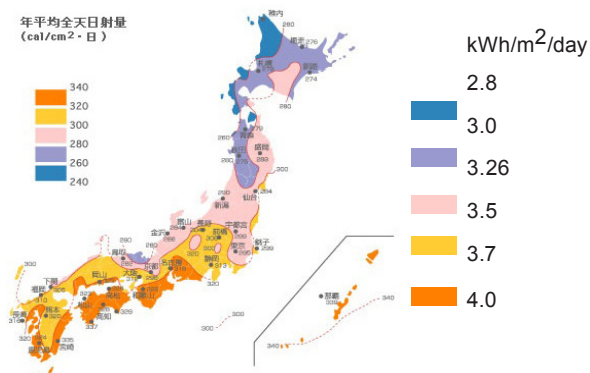
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as compared to 2008

年平均全日射量
(cal/cm²・日)



Solar Insolation: ~1051 kWh/kWp/yr Yearly Average Solar yield
~2.0-4.0 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	13.0	7.5	26.0	4.0	2.0	52.5
Rank	3	6	9	11	N/A	5

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	1,708.50	1,918.90	2,144.19
Cumulative Growth Rate		12%	12%
Annual PV Capacity Installed (MW) ¹	286.60	210.50	225.30
Annual Growth Rate		-27%	7%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government determines national energy policy, often implemented via local governments. Selected key policies:

- Basic Law on Energy Policy Making (2002)²
 - Securing stable energy supply
 - Conforming to environmental requirements
 - Utilizing market principles
- Action Plan for Achieving a Low-carbon Society (July 2008)³ – The “Fukuda Vision”
 - PV installation goals: ten-fold by 2020 (over 2005 levels), 40-fold by 2030; 14GW by 2020, 53 GW by 2030²
 - Reduce PV system costs by ~50%
- Action Plan for Promoting the Introduction of Solar Power Generation (Nov 2008)⁴
 - Supply-side measures – provide high-performance solar power generation systems at low cost
 - Demand-side measures – promote installation in individual sectors

Electricity Structure

Ten investor-owned regional monopolistic electric power companies provide regional services¹³

Selected Policy History¹⁰

- Residential PV System Dissemination Programme
 - Effective 1994-2005
 - Goal: create a self-sustaining PV market
 - 1,617MW installed (out of 1,709MW total), all residential

Drivers for Future Development (continued)

- 2005-2008 PV Market Contraction – Reasons
 - Perceived lack of political support; lack of effective policy
 - Decrease in demand for detached housing, the major market for residential systems
 - Shift to exporting given strong international (especially Europe) demand and favorable exchange rates
 - Lower cell production due to silicon shortage

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- National
 - Effective 1 November 2009^{18, 22}
 - *Net FiT @ 48 JPY/kWh for residential systems, 24 JPY/kWh for non-residential systems <500kW*
 - *Term: 10 years*
 - *Applied only for excess electricity and only for non-business purposes*
 - *Funding: (estimated) 0.1 JPY/kWh surcharge on electricity rates; note: equates to ~450,000 systems¹²*
 - *Degression: ~12.5% starting 2011*
 - *Note: Considering FiTs for other renewable sources and for business purposes²²*
- Local
 - *Tokyo Metropolitan Government^{19, 20}*
 - *Term: April 2009 – March 2011*
 - *“Feed-in tariff for self-consumption electricity”. “Subsidy” is paid for 10 years in green certificates; value of green certificates based on electricity produced and consumed on-site.*
 - *Able to combine with national subsidy*
 - *Feed-in type pilot project*
 - *Term: planned 3yrs from 2009; canceled due to introduction of national FiT*
 - *Additional subsidy of 30 JPY/kWh in Shibuya and 15 JPY/kWh in Musashino on top of 22 JPY/kWh (average) already paid by utilities for surplus generation*
 - *Program cap: 100 houses*

Grants & Rebates

- National
 - *Project for Promoting the Local Introduction of New Energy^{2, 5}*
 - *FY1998 – Open*
 - *For public buildings via local governments and non-profit entities*
 - *Lower of 50% installation costs or 300K JPY/kW, up to 20M JPY*
 - *For systems ≥10kW*
 - *Project Budgets: 4.15B JPY for FY2008, 36.4B JPY for FY2009 in sum of subsidy for New Energy Operators*
 - *Project for Supporting New Energy Operators^{2, 6}*
 - *FY1997 - Open;*
 - *For small and medium-sized enterprises (SMEs)*
 - *Up to 33.3% installation costs; loan guarantees (see “Loan Subsidies”)*
 - *For systems ≥10kW (lowered from ≥50kW)*
 - *Project Budgets: Project Budget: 35.3B JPY for FY2006, 36.4B JPY for FY2009 in sum of subsidy for local introduction*
 - *Grant for measures to support the introduction of residential solar power^{14, 15, 17}*
 - *Effective 2009–2010*
 - *For residential sector*
 - *70K JPY/kW for systems <10kW*
 - *Funding: 9B JPY (for Jan-Mar 2009), 29.1B JPY (for April 2009 – March 2010); note: equates to ~210,000 systems¹²*
- Local
 - *PV subsidies in 19 prefectures, 300+ local authorities; mostly 20-50K JPY/kW, up to 200K JPY/kW^{2, 7}*
 - *Tokyo Metropolitan Government^{19, 20}*
 - *Term: April 2009 – March 2011*
 - *100K JPY/kW for systems <10kW*

Financial Incentives (continued)

- *Funding: 45B JPY for FY2009 (not PV-specific)*
- *Able to combine with national subsidy*
- Federation of Electric Power Companies of Japan (FEPC) – 140 MW by 2020¹⁶

Net Metering / Net Billing

- Offered voluntarily by regional electric utilities since 1992; *ended 31 October 2009 (replaced by FiT)*
- Excess electricity only
- Time of use (TOU) available: sell at on-peak tariff rates (~30 JPY/kWh), buy at off-peak rates (~7-8 JPY/kWh)¹³

Tax Incentives

- National
 - Tax credit equivalent to 7% of the reference purchase value for owners of smaller businesses and others¹¹, or special depreciation that is not greater than 30% of the reference purchase value, in addition to the normal depreciation of the equipment¹¹.
 - Corporate tax reduction for 3yrs for systems >100kW; corporations and business individuals²¹
 - *100% accelerated depreciation for April 2009-March 2011*²²
- Local
 - Real property or real property acquisition tax deduction in some local governments²²

Loan Subsidies

- National
 - Financial Supporting Measures for Introduction of Energy Efficient Facilities (for SMEs)¹¹
 - “Special” interest loans for RE equipment
 - Term: <15yrs (includes 2yr grace period)
 - Funding: 270M JPY for RE (includes natural gas)
 - Project for Supporting New Energy Operators^{2, 6}
 - FY1997 - Open; FY2006 Project Budget: 35.3 billion yen
 - 90% of debt guaranteed jointly with project owner(s); grants (see “Grants”)
 - For systems ≥10kW
 - For small and medium-sized enterprises (SMEs)
- Local
 - Some local governments have interest subsidies (i.e., Bunkyo, Shinagawa, Edogawa district of Tokyo), enlargement of loan limit (in addition to loan subsidies) for housing (e.g., Kanagawa), and loan guarantees (e.g., Shinagawa district of Tokyo)²²
- Other
 - Many private banks have voluntary loan subsidies combined with loan programs for housing (Biwako Bank, Shiga bank, etc.)²²

Other Financial Incentives

- National²
 - Green Power Certificates (independent program) – A certificate-issuing body, certified by the Green Energy Certification Center, issues a Green Power Certificate for electricity generated using renewable resources, and these certificates can then be purchased mainly for CRS/green marketing purpose. Starting April 2010, officially counted as a measure for fulfilling the cap & trade regulation set by Tokyo Metropolitan Government (TMG).
 - Green Power Fund – Established 2000; subsidies for public facilities, funded by 500JPY/mo/utility customer with matching funds from utility. From its creation in October 2000 through the end of 2005, about 2.2 billion yen were invested in the building of about 12 MW of systems mostly on public facilities.

Regulatory Incentives

Renewable Portfolio Standards

- National^{8, 9}
 - Effective 1 April 2003 via Special Measures Law Concerning the Use of New Energy by Electric Utilities; amended 2007
 - Targets per fiscal year (tWh): 7.32 (2003); 7.66 (2004); 8.00 (2005); 8.34 (2006); 8.67 (2007); 9.27 (2008); 10.33 (2009); 12.20 representing 1.35% (2010); 13.15 (2011); 14.10 (2012); 15.05 (2013); 16.00 (2014) representing

Regulatory Incentives (continued)

- 1.6% of total electricity supply (excluding large hydro)
 - Obligations revised every 4yrs; next revision scheduled for 2010
 - Options for meeting Obligation: i) Generate electricity oneself; ii) purchase electricity generated from new energy from another party; or iii) purchase RPS Certificates
 - PV is recognized as twice its value for 2011-2014, but *effective 1 November 2009 PV electricity applied for new feed-in tariff is deducted*
 - *Note: New government plans to phase out RPS and enhance feed-in tariff for other renewable sources* ²²
- Local – RET in 43 prefectures, 18 w/ solar carve-outs ⁷

Interconnection

- Uniform standards under the “self-responsibility principle” of new entrant into the grid
- Most (regional monopolistic) electric power companies have set limitations on the amount of energy accepted from distributed generators (e.g., energy from wind power sources is limited to <5% of total capacity) ²²

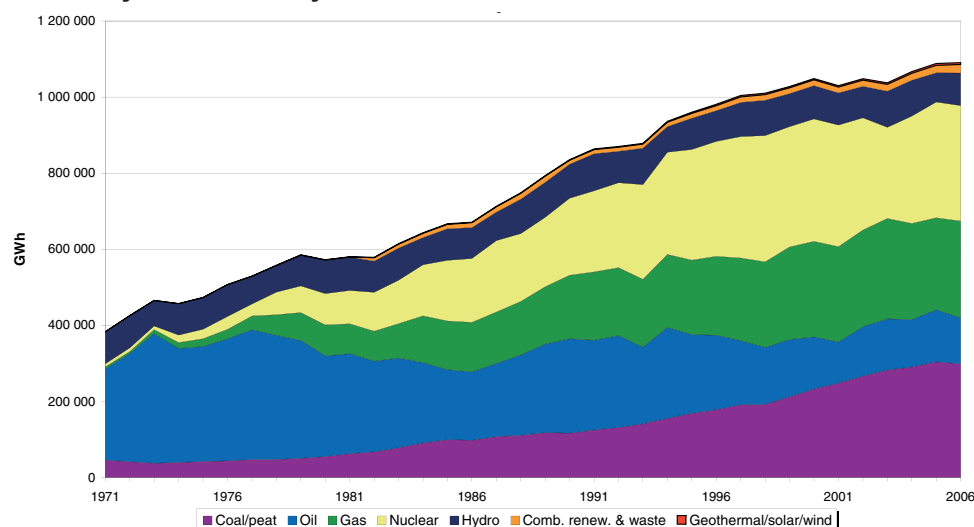
Indirect Support

Education and Outreach

- Eco Action Point Program¹²: Consumers collect points that can be exchanged for goods or other items by purchasing energy-saving products or services for environmental conservation, with the aim of encouraging consumers to protect the environment in a familiar and easy-to-understand way and to reduce greenhouse gas emissions from households; managed by the Ministry of the Environment (MoE)
- Green Buildings ² - Under the “Guideline for Planning Environmentally Friendly Government Buildings” as well as the Kyoto Protocol Target Achievements Plan, the construction of green government buildings, equipped with PV systems, has been promoted. In addition, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has started to utilize PV systems under several other specific measures: promotion of environment-friendly houses and building for global environmental conservation, introduction of navigation aids using clean energy and a program to reduce CO2 emissions in road projects.
- Eco-School Promotion Pilot Model Project ²: The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has continued this project, which was introduced in FY 1997 and promotes the introduction of new and renewable energy systems such as PV systems, facilities for energy conservation as well as using local building materials at elementary and junior high schools across the nation. By FY 2008, MEXT certified 781 schools as Eco Pilot Model Projects, of which 505 schools are promoting the installation of PV systems.

Solar Energy Policy Context

Electricity Generation by Fuel ²⁴



Total electricity generated and purchased: 964.93 TWh in FY2005, 971.33 TWh in FY2006, 100.35 TWh in 2007, and 100.29 TWh in FY2008.²⁵

Energy Subsidies

The Earth Policy Institute reported that Japan has phased out all subsidies for coal.²⁶ However, the International Energy Agency's data suggests that in 2006, US\$107 million were allocated for coal R&D.²⁷

2006 R&D budgets (in million USD)	
Coal	107.00
Oil and Gas	228.93
Total Fossil Fuels	359.92
Nuclear	2,253.08
Solar PV	152.97
Renewables	238.59
Total Energy R&D	3,620.41

Source: IEA.

Public Budgets for PV

As cited in the European Commission's PV Status Report 2007²⁸, METI's budget for PV increased by 31% from ¥ 18.758 billion (US\$ 161 million) in 2006 to ¥ 24.60 billion (US\$ 209 million) in 2007. The Ministry of the Environment has added another ¥ 8.1 billion (US\$ 69 million). Other ministries such as the Ministry of Land, Infrastructure and Transport, and the Ministry of Education, Culture, Sports, Science and Technology, have budgets allocated for PV but have not published them. In 2006, 319 local governments and municipalities implemented subsidy programs, budgets unknown.

Solar R&D

NEDO (New Energy and Industrial Technology Development Organization) is the public agency that, with a budget from METI, is responsible for "R&D project planning and formation, project management and post-project technology evaluation functions". NEDO promotes, among other things, the development of PV cost-effectiveness, performance and deployment through several programs.

PV Roadmap Toward 2030

This NEDO initiative was announced in 2004, and is dedicated to the realization of the mass introduction of PV systems across Japan. The Roadmap is a long-term strategy for PV R&D, with the over arching goal of PV technology generating 100 GW of power in Japan by 2030. PV would then supply 50 percent of Japan's residential electricity consumption (approximately 10% of total electricity consumption).

The PV Roadmap Toward 2030 has established financial milestones for PV, to achieve cost levels as that for residential use ~23 ¥/kWh by 2010, for business use ~14 ¥/kWh by 2020, and industrial use ~7 ¥/kWh by 2030.

- 4-Year Plan for Photovoltaic Power Generation Technology Research and Development (FY2006 - FY2009). FY2007 Project Budget: ¥ 2.38 billion (US\$ 21 million). As a result of this NEDO initiative, two large PV R&D projects developed in 2007, R&D for Next Generation PV systems, and Development of PV Systems Technology for Mass Deployment, Phase II.
- Field Test Project on New Photovoltaic Power Generation Technology (FY2007 - FY2014) (Installation work to be completed in FY2010); FY2007: Project Budget: ¥ 7.86 billion (US\$ 70 million). This program is intended to further promote the installation of PV systems and will provide 50% project costs subsidies to public facilities and industrial partners for medium and large-scale systems.

"Solar panels to go in 30% of houses by 2030"

In January 2008, the Government announced that the number of solar-powered households in Japan would increase to 14 million by 2030 (from 400,000 as at January 2008), with a capacity expanding 30-fold from the current 1.3 GW.²⁹ According to Government officials, this will be achieved through R&D into innovative PV technologies, which will drastically reduce the cost of panels, rather than through subsidies or other financial incentive policies. The government is seeking ¥2 billion (US\$ 19 million) in FY2008 to set up a new research institution.

Energy Efficiency Measures

The energy efficiency requirements of non residential buildings in Japan is determined by the 'Criteria for Clients on the Rationalization of Energy Use for Buildings', and the energy efficiency of residential buildings is determined by the Design and Construction Guidelines on the Rationalization of Energy Use for Homes.³⁰

There have been recent energy efficient policy developments in Japan. In 2006, targets for residential energy efficiency were mandated. 40% of houses in Japan must implement energy saving measures by 2015, (such as double-paned windows-18% as of 2003), and the average lifespan of a residential house must increase to 40 years (about 30 years as of 2003). In 2007, the Japanese Government announced an action plan to reduce GHG emissions from Government buildings. This involves the introduction of energy efficient appliances, as well as ensuring overall energy conservation actions in existing Government buildings.³¹

Renewable Energy Wholesaling

As of April 2009 the Japanese Electric Power Exchange (JEPX) will allow wholesaling of "green electric power", defined as power generated from a source that does not emit CO2 at the time of generation (including solar, nuclear, wind and hydraulic). METI believes this will facilitate the adoption of more solar power generation as output can be sold on the wholesale market by producers and retailed by electric utilities to consumers.³²

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 3rd out of 17 - Cumulative thru 2008 per GDP Rank: 3rd out of 17 - Cumulative thru 2008 per Capita Rank: 3rd out of 17 - Annual 2008 Rank: 5th out of 17 - Annual 2008 per GDP Rank: 5th out of 17 - Annual 2008 per Capita Rank: 5th out of 17	20.5
Financial Incentives for Acquisition (25 points possible)	For the Residential sector: - Grants with low transaction caps (except in Tokyo) - Low-interest loans with long terms - Plethora of local programs For the Commercial sector: - Grants with generous transaction caps for SME & public buildings - Low-interest loans for SMEs - Tax credit (7%) or special depreciation; accelerated depreciation For the Industrial sector: None	12.0
Financial Incentives for Income (30 points possible)	For the Residential sector: - Net FiT; 2-2.5x premium; shorter term; degressive For the Commercial sector: - Net FiT; 2-2.5x premium; shorter term; degressive - Tax reduction for Large Commercial For the Industrial sector: None	12.0
Other Financial Incentives (5 points possible)	1 national program, 1 independent program	2.0
RPS (7 points possible)	- Modest goals - Soon to be eliminated by new government?	2.0
Interconnection (3 points possible)	Uniform standards, though under the “self-responsibility principle”	2.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	3 government-sponsored programs	2.0
Overall	PV Capacity Installed contributes almost as many points as financial incentives	52.5

Once the leader in solar, Japan has for the past few years experienced negative growth after the expiration of its pioneering Residential PV System Dissemination Programme in 2005. Incentives for other sectors have been insufficient to encourage adoption (for commercial) or practically non-existent (for industrial). PV Capacity Installed in 2008 was predominately in the residential sector, a residual effect of its previous programs. And while cumulative PV Capacity Installed places Japan in the top tier, annual growth since 2006 has not kept pace with other countries, so much so that Spain has overtaken Japan in cumulative installations.

That trend may change next year due to Japan's new incentives targeted to rekindle growth in 2009. The bulk of these new programs target households and small-to-medium businesses; however, the new feed-in tariff includes larger commercial and smaller industrial applications, a good sign that the Japanese government wants to cultivate more balance among sectors. However, there is a lack of alignment between these incentives – the new equipment subsidy covers less than half the number of systems as the feed-in tariff¹⁸. Such lack of alignment is evident in other places as well. For example, while PV is an important component of the “Fukuda Vision”, the RPS does not contain a solar carve-out (according to Tetsunari Iida, Executive Director of ISEP, the new government plans to *phase out* the RPS).

If Japan is to reclaim its position as a world leader in solar PV, the government will need to further align incentives to encourage material growth in all sectors.

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Solar Insolation: 825-975 kWh/kWp/yr Average Annual Solar yield
3-3.56 kWh/m²/day Average Solar Radiation

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives (60.0)	Regulatory Incentives (10.0)	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)				(100+)
Points Awarded	-	-	3.5	1.0	2.0	6.5
Rank	16	13	16	16	N/A	16

PV Capacity Installed

	2006 ¹²	2007 ¹²	2008 ²
Cumulative PV Capacity Installed (MW)	0.44	0.64	1.01
Cumulative Growth Rate		45%	58%
Annual PV Capacity Installed (MW)	0.15	0.20	0.37
Annual Growth Rate		36%	86%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Centralized government determines energy policy.

Note: Policies enacted in and/or effective for 2009 in *italics*.

Financial Incentives

Feed-in Tariffs

- None

Grants & Rebates

- Ecofund ¹¹
 - Non-returnable grants of up to 50% of project costs
 - Only one PV installation financed, a 53kW system at Warsaw University of Technology
 - Will cease all activities soon*

Net Metering / Net Billing

- None, though a smart grid/smart metering project was discussed in an Energy Regulatory Office Conference in October 2009 ⁸

Financial Incentives (continued)

Tax Incentives

- Excise tax exemption since 2002 (at least 2% of the fuel in question must be produced from biocomponents.) ⁷
- Long Term Programme for promotion of biofuels or other renewable fuels include corporate income tax reduction since 2008; no provisions stated for PV ⁷

Subsidized Loans

- The National Fund for Environmental Protection and Water Management ⁷
 - Since 2001 for environmentally sustainable projects
 - Up to 80% of project costs; 2M PLN minimum loan amount
 - Interest rate depends on the reference rate set by the National Bank of Poland
- Provincial Fund for Environmental Protection and Water Management awards – soft loans for small and medium PV investments on new plant construction only ²
- The Environment Protection Bank ⁴
 - Since 2008 for renewable energy-related projects
 - Terms up to 7 years
 - Rates @ half the commercial rate
- *Environment Protection Bank and National Property Bank (in tandem)* ²
 - *Effective 2009 for energy efficiency upgrading using RE*
 - *5 year term*
 - *Rates usually @ 4.16% (½ of commercial rate); rates vary depending on sum, length and form of loan*
 - *Up to 25% of investment cost*
 - *Note: So far none have been given out for PV projects.*

Other Financial Incentives

- Green Certificates ²
 - Main financial incentive in place for renewables in Poland
 - Tradable titles granted to electricity suppliers for each MWh generated from renewables
 - *As of March 2009, the market rate was around 250 PLN/MWh, though the price is usually 10-20 PLN/MWh lower*
 - Penalty @ 258.89 PLN/MWh.
 - System owner also receives income for electricity produced
 - Rate is equal to average market price of electricity in the previous year (around 150 PLN/MWh). Price is calculated each year and is constant for one year.
 - Not solar PV-specific and unlikely to support solar development.
- Facilities producing electricity from renewable energy sources and cogeneration facilities of up to 5MW and with annual conversion efficiency of at least 70% are exempt from annual license fees (1997 Energy Law, amended 2005 & 2007)

Regulatory Incentives

Renewable Portfolio Standards

- *15% by 2020 and 20% by 2030; no solar-carve out, focus on biofuels* ¹
- Target for PV installed capacity: 2MW by 2010 (per The Strategy of the Development of Renewable Energy Sector) ⁶
- 2MW by 2020, 32MW by 2030 (per the Polish Energy Policy until 2030, Annex 2, Table 13)

Interconnection

- No standards; majority of systems are off-grid
- Only systems >10kW are connected to the grid and receive Green Certificates (per the Energy Regulatory Office, URE)
- Facilities producing electricity from renewable energy sources and cogeneration facilities of up to 5MW and with annual conversion efficiency of at least 70% benefit from a 50% reduced grid connection fee (1997 Energy Law, amended 2005 & 2007)

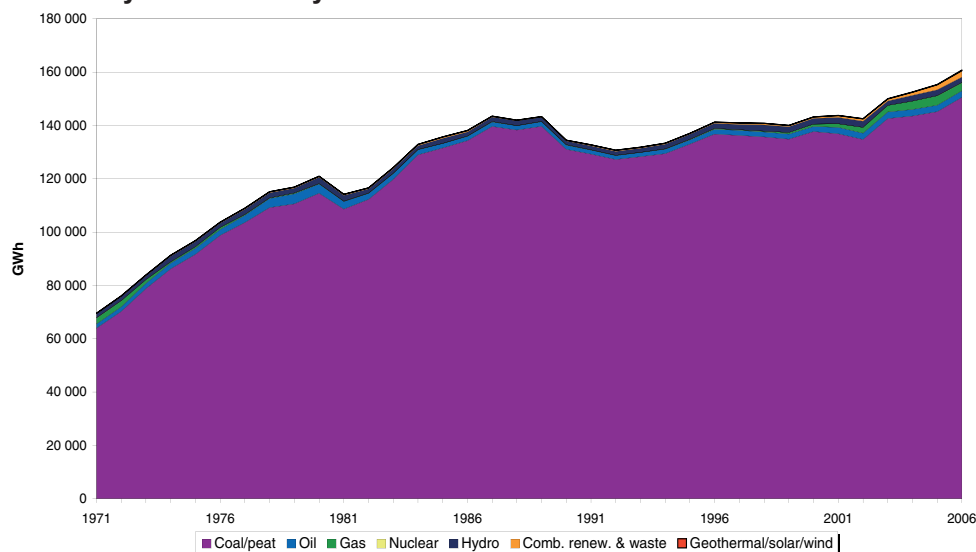
Indirect Support

Education and Outreach

- The Center for Photovoltaics is responsible for the bulk of the education and outreach programs within Poland, as it sponsors lectures, classes, laboratories and training programs designed to educate the public and students. The Photovoltaic Centre in Poland promotes the widespread use of solar photovoltaic (PV) energy as realistic, reliable, and economic energy sources, thus encouraging the integration of PV energy into Poland's research, economy and everyday life.¹⁰
- National Fund of Environmental Protection and Water Supplies Management provides some support for education initiatives and demonstration projects using Renewable Energy (not PV-specific)¹¹
- Environmental Education and Conservation through the NFEPWSM⁹
 - Program to promote education for sustainable development, including water management and health prevention for children and young people from areas that exceeded environmental quality standards.
 - Program to support the activities of environmental NGOs
 - Program for projects nature and landscape protection
 - Program for projects for the protection and development forests
 - Program for development projects in the Bialowieza Forest.
- The National Fund for Environmental Protection and Water Management (NFOSiGW)¹¹
 - For "new technologies" pilot projects undertaken by public, private and NGO entities
 - Terms depend on the category of the recipient
- The National Fund of Environmental Protection and Water Supplies Management does demonstration projects (not PV-specific)⁹

Solar Energy Policy Context

Electricity Generation by Fuel¹³



© OECD/IEA 2008

For more detailed data, please consult our on-line data service at <http://data.iea.org>.

According to the European Renewable Energy Council, the share of renewables in the gross electricity consumption was 2.99% in 2006.¹⁴

Energy Subsidies

Although difficult to quantify, substantial subsidies are provided to the producers of hard coal; not only does this industry represent a significant portion of Poland's own economy, but it is also a major export to Russia and other European countries.

Public Budget for PV

According to the Polish Center for Photovoltaics, annual budgets allocated to PV research and technology development, demonstration and dissemination activities between 2004 and 2006 varied between €400,000 and 600,000, with an additional 34% coming from foreign sources.³

Evaluation of Incentives

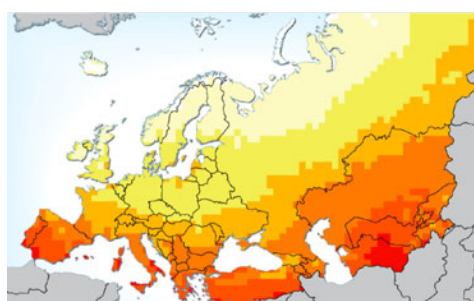
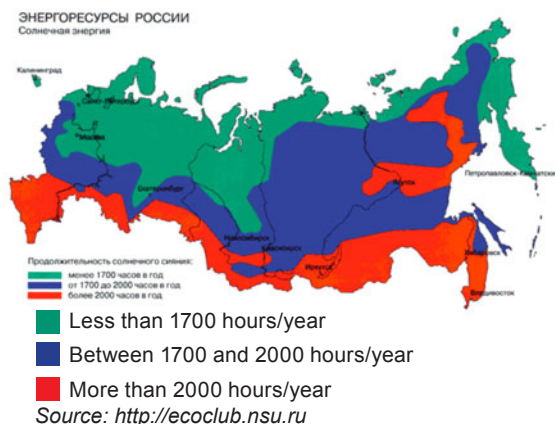
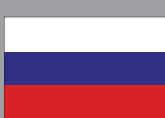
Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 16th out of 17 - Cumulative thru 2008 per GDP Rank: 16th out of 17 - Cumulative thru 2008 per Capita Rank: 16th out of 17 - Annual 2008 Rank: 16th out of 17 - Annual 2008 per GDP Rank: 16th out of 17 - Annual 2008 per Capita Rank: 16th out of 17	0
Purchase Incentives (25 points possible)	For all sectors: Low-interest loans	3.0
Income Incentives (30 points possible)	None	0
Other Financial Incentives (5 points possible)	Green Certificates Program	0.5
RPS (7 points possible)	- Higher targets, though focused on biofuels - No solar carve-out, mandatory but with lax enforcement	1.0
Interconnection (3 points possible)	No standards; system size restrictions	0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored programs	2.0
Overall	Points for loan subsidies, educational support and not much else	6.5

Policy support for PV in Poland remains practically non-existent, a startling contrast to its immediate neighbor Germany. The main incentive for renewable energy, Green Certificates, is not PV-specific and insufficient to attract investment. The majority of renewable energy support mechanisms ignore PV, focusing instead on biofuels (and solar thermal to a limited extent) in both program details and project funding. Enterprising entities that take the initiative to install PV face a bureaucratic maze of eligibility requirements and administrative procedures when connecting to the grid; hence off-grid installations outstrip grid-connected systems 5-to-1. PV installed capacity totals rank near the bottom of the countries evaluated.

Poland has several demonstration and educational programs in place, but education and awareness is just the first step. Government officials need to broaden current renewable energy support measures to specifically include and encourage PV as a viable alternative energy source. Only then can awareness turn into action.

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Source: UNEP/GRID-Arendal

Solar Insolation: ~ 810-1400 kWh/kWp/yr Yearly Average Solar yield
 2.22-3.84 kWh/m²/day Average Solar Radiation on collector surface;
 Seasonally: 1.69-11.41 kWh/m²/day

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	-	-	-	1.0	-	1.0
Rank	16	13	17	16	N/A	17

In spite of its general northern geographic location, Russia possesses considerable solar resources. Annually, the solar radiation energy incident on its territory is equivalent to 18.7°— 109 GWh. That exceeds significantly the power potential of any other available energy resources. Some areas of Russia receive more than 300 sunny days per year, and the cold temperatures also improve the efficiency of solar cells.¹⁶

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW)	0.15	Unknown	Unknown
Cumulative Growth Rate		Unknown	Unknown
Annual PV Capacity Installed (MW)	Unknown	Unknown	Unknown
Annual Growth Rate		Unknown	Unknown

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Policy structure seems to be mostly on the National level. Due to political and economical instability in Russia many renewable energy provisions have been put on hold or discarded thus causing the lack of progress for clean energy in Russia.

Note: Policies enacted in and/or effective for 2009 in *italics*.

Financial Incentives

Feed-in Tariffs

- None

Grants & Rebates

- None

Net Metering / Net Billing

- None

Tax Incentives

- *Companies that buy energy efficient equipment may be exempt from property tax for one year. A new law to this effect will be proposed by the government*⁵

Subsidized Loans

- None

Other Financial Incentives

- None

Regulatory Incentives

Renewable Portfolio Standards

- *Mandate: 4.5% by 2020 (no solar carve-out), 1.5% by 2010 and 2.5% by 2015*²

Interconnection

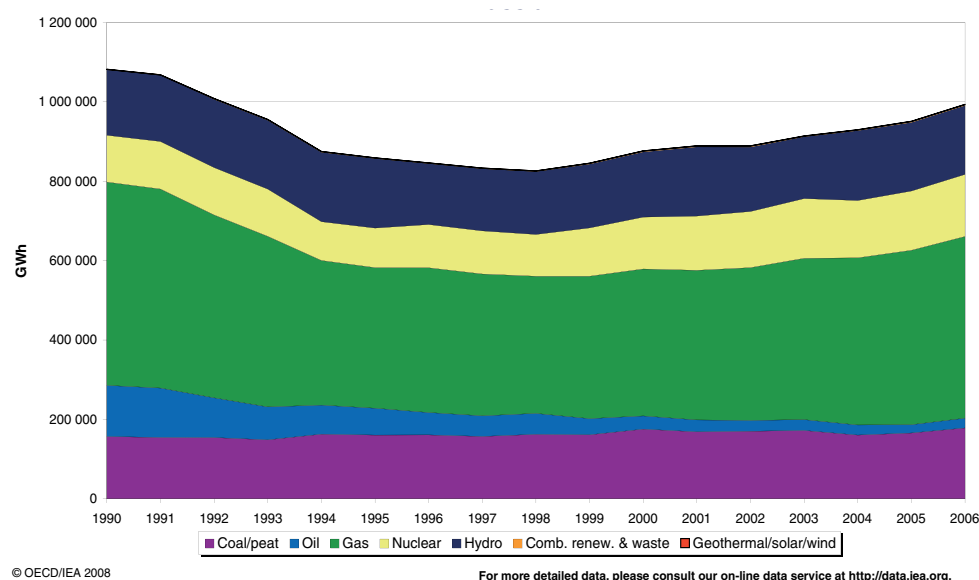
- None
- Despite recent reforms, Russia's utilities remain highly centralized and are not built to accept smaller input even if a local housing or environmental group did install solar panels and start to generate its own electricity.⁶

Indirect Support

Education & Outreach

- None

Electricity Generation by Fuel ⁷



government announced its intentions to build 40 new reactors by 2030 (4 of them by 2010 with a capacity of 4 GW), which would increase the proportion of nuclear-generated energy to 25% by 2030 and cost an estimated \$60 billion.⁹

A comparative review of G8 countries' climate change strategies reports Russia's energy plans, "In April 2007, the Industry and Energy Ministry unveiled the Draft General Scheme of Construction of Electric Energy Facilities until 2020. The Draft Scheme, which is subject to Cabinet approval, prioritizes the development of hydro and nuclear energy-generating facilities. [...] The development of other sustainable sources of energy does not feature prominently in the Draft Scheme."⁸

Indeed, between late 2006 and mid 2007, the government announced the construction of several hydroelectric power stations with a joint capacity of about 1,470 MW⁸ and in 2006 the gov-

Energy Subsidies

The IEA estimates total energy subsidies in Russia amount to \$40 billion a year (the largest in the world in dollar terms): "Most of these subsidies go to natural gas and the rest to electricity (which includes the underpricing of gas delivered to power stations). Subsidies of \$25 billion per year to final consumption of gas are alone more than twice the annual investment projected for the entire Russian gas industry."¹⁰

Russia started to decrease electricity consumption subsidies in 2000 and has come a long way. However, in 2005 the IEA noted Russian electricity prices were still very low by international standards, "Average prices for residential consumers and government agencies were about 2.3 US cents/kWh in 2003. Industrial users paid about 2.5 cents. By comparison, average prices in IEA countries in 2002 were about 11.4 cents for residential consumers and about 5.9 cents for large industrial users."¹¹

Total electricity allowances to households in 2006 were estimated at RUB 30 billion (~US \$1.3 billion). The Federal Law On the Federal Budget for 2007 provides for "the right of the Government to grant up to RUB 15 billion in subsidies to the constituent entities of the Russian Federation to eliminate interregional cross subsidies."¹²

34% of the true economic value of electricity consumption is subsidized in Russia.¹³

Support for Renewables

According to REN 21¹⁴, in late 2007, Russia joined the category of countries that offer some type of direct capital investment subsidy, grant or rebate, with legislation providing investment subsidies for grid interconnection of renewable electricity producers, along with renewable energy certificates and other measures.

Public Budget for PV

Subsidies are available for PV production but not deployment. The government has invested in silicon and module production factories.

Energy Efficiency Measures

Energy Efficiency has been of great concern in Russia as the country exhibits one of the most energy intensive economies in the world (2.3 times the world average) and twice as high as the US.

In February 2003, the national Thermal Performance of Buildings was revised. At this time, Russia mandated energy efficiency performance targets (corresponding to world levels), classified buildings according to their energy efficiency, created a mechanism for identifying low-performing buildings and mandated necessary upgrades. While these were national regulations, they were implemented at the state level.¹⁵ Russian states employed various techniques to ensure energy efficiency compliance, for example, some states introduced financial incentives for buildings that exceeded minimum energy efficiency requirements, and other states mandated energy audits.

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 17th out of 17 - Cumulative thru 2008 per GDP Rank: 17th out of 17 - Cumulative thru 2008 per Capita Rank: 17th out of 17 - Annual 2008 Rank: 17th out of 17 - Annual 2008 per GDP Rank: 17th out of 17 - Annual 2008 per Capita Rank: 17th out of 17	0
Purchase Incentives (25 points possible)	None	0
Income Incentives (30 points possible)	None	0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	Mandatory; no PV carve-out	1.0
Interconnection (3 points possible)	None	0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	None	0
Overall	Lack of data means lack of points	1.0

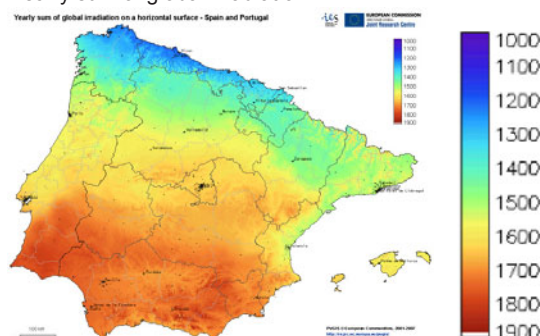
Russia lags far behind other countries in solar development. A token point is awarded for a new RPS that lacks a solar carve-out. No points are given for PV Capacity Installed; indeed, we are unable to find any data on installations more recent than 2006. Russia has launched efforts to promote solar module production, but not deployment. Since most energy policies are made at the top of the political system⁶, Russian leaders need to broaden their renewable energy horizons to include PV as a viable alternative energy source and more than just an exportable commodity.

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Yearly sum of global irradiation in kWh/m²



Source: PVGIS© European Communities, 2001-2007

Solar Insolation: ~1300 kWh/kWp/yr Yearly Average Solar yield
 ~3.33-5.20 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(100+)	
Points Awarded	15.0	15.0	16.0	6.0	-	52.0
Rank	1	1	13	4	N/A	6

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	145.00	693.00	3,354.00
Cumulative Growth Rate		378%	384%
Annual PV Capacity Installed (MW) ¹	97.00	548.00	2,661.00
Annual Growth Rate		465%	386%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets national energy policies in the form of Royal Decrees; limited to no regional policies.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- Royal Decrees 1578/2008 ^{1,6}
 - *Effective for 2009*
 - *Gross FiT*
 - 0.34 EUR/kWh for rooftop systems =<20kW
 - 0.32 EUR/kWh rooftop systems >=20kW <2MW; 66.75MW quarterly cap
 - 0.32 EUR/kWh for ground systems =<10MW; capped at 269MW ⁷
 - *Term: 25 years*
 - *Rate and cap adjustments:*
 - 10% max annual digression
 - Caps adjust in inverse proportion to rates
 - Rates adjusted quarterly according to demand in previous quarter: if at least 75% of the cap for the previous quarter is reached, rates decrease by a maximum of 2.5%, and the cap is increased the same

Financial Incentives (continued)

- amount; if less than 50% of the cap is reached, rates increase and caps decrease by the same amount; if between 50 and 75% of the caps are reached, incentive levels and caps remain the same* ^{2,11}
- *Funded by government (taxpayers)*
 - *Annual Caps*
 - 2009: 500MW (267MW for rooftop, 233MW for ground-mounted)
 - 2010: 554MW (296MW for rooftop, 258MW for ground-mounted)
 - 2011: 498MW (328MW for rooftop, 170MW for ground-mounted)
 - *Notes*
 - *Applications already submitted for ground systems installations will hit caps for the next 3 years; ground systems (type II) effective shut down (full) until 2012⁶*
 - *Royal Decree to be amended in 2012⁶*
 - *In February 2009 the Spanish Government approved 392 new projects for receiving tariffs at first round rates⁷*
 - *Out of all PV Spanish installations there is a preeminence of big PV plants.... 98 % of them were installed on the ground and only 2.2 % in the roof.* ¹

Grants & Rebates

- None

Net Metering / Net Billing

- None

Tax Incentives

- Law 35/2006 establishes a tax rebate equivalent to 6% (2008), 4% (2009), 2% (2010) of the PV investment deductible from the income, on company taxes of the investor^{2,12}

Loan Subsidies

- None

Other Financial Incentives

- The Royal Decree 314/2006 amended the Technical Building Code, which now requires the incorporation of PV in new construction on large buildings (offices, government buildings, hospitals) with minimum capacity of 6.25kWp ¹⁰

Regulatory Incentives

Renewable Portfolio Standards

- Contribution of renewable resources for gross electricity generation to reach 30.3% by 2010, 32% by 2012, and 37% by 2020 ⁸
- 12% of total energy consumption from renewables by 2010 and 20% by 2020 ⁹
- No solar carve-out
- Mandatory¹⁵
- According to Spain's Renewable Energy Fact Sheet the requirement for solar is 0% in the 2008 RES⁹
- A new PER is under review for the period 2011-2020. It will be ready by July 2010. No information is available yet, but it is expected a target of about 40% of Electricity demand in 2020 covered by renewables. ¹²

Interconnection

- Mandatory and as defined in context of Feed-in Tariff
- Simplification required for small installation procedures; more standardization required for installation and connection⁶

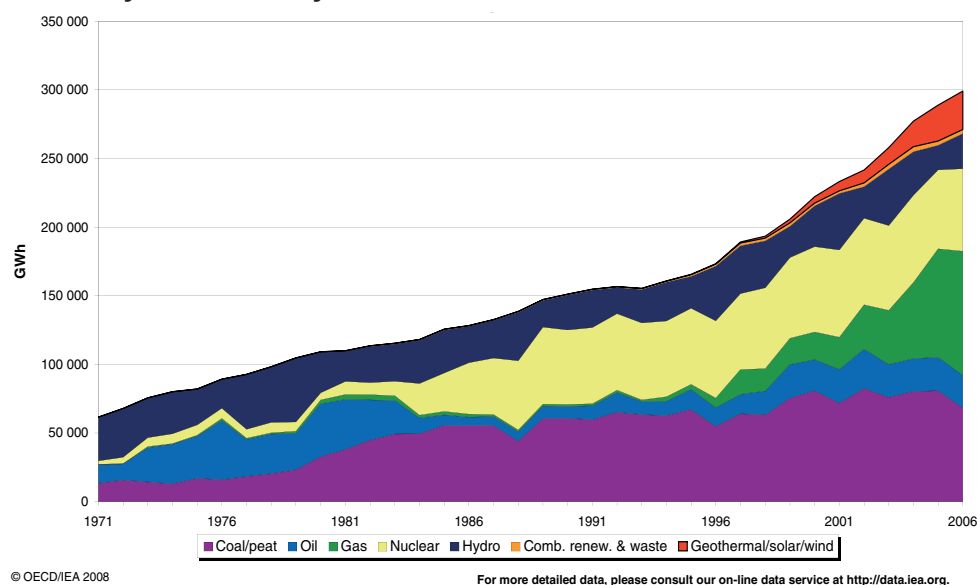
Indirect Support

Education and Outreach

- The Government supports a lot of public relation e.g. internet portals, conferences, events, Journals...in order to increase the awareness of photovoltaic energy. ¹

Solar Energy Policy Context

Electricity Generation by Fuel ¹⁶



Energy Subsidies

Spain subsidizes electricity.

2006 Energy R&D Budgets (in million USD) ¹⁷

Fossil Fuels	6.27
Nuclear	21.14
Renewable Energy	32.53
Total Solar	15.34
Photovoltaics	2.54
Total Energy	66.73

Solar PV Subsidies

According to the Renewable Energy Plan¹³, € 8.89 million were earmarked as solar PV subsidies for 2005, as well as € 3.80 for 2006 and € 4.97 for 2007.

National investment for 2008-2010: € 18.87 million¹⁸ (excludes the feed-in tariff)

Photon Magazine, citing Spain's National Energy Commission figures, reported, "In 2007, when the installed capacity was 576 MW, the government paid about € 200 million (\$311.2 million)."²⁰

Energy Efficiency Measures

As a EU member state, Spain is bound by the EU Energy Performance of Buildings Directive. This directive was implemented in Spain in 2007 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. It is up to member states to decide the level of energy efficiency requirements, however these levels must be revised at least every 5 years and updated based on technological developments.¹⁹ Aspects of residential buildings that are taken into account include the building shell including air-tightness, heating and cooling installations, ventilation, the orientation and position of the building, passive solar systems and solar protection.²¹

Additionally, in 2007 the Spanish government released an Energy Efficiency Action Plan for 2008-2012 to assist with implementation of the Spanish Energy Efficiency Strategy (E4) 2004-2012.¹⁰

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 2nd out of 17 - Cumulative thru 2008 per GDP Rank: 1st out of 17 - Cumulative thru 2008 per Capita Rank: 1st out of 17 - Annual 2008 Rank: 1st out of 17 - Annual 2008 per GDP Rank: 1st out of 17 - Annual 2008 per Capita Rank: 1st out of 17	30.0
Purchase Incentives (25 points possible)	For the Commercial sector: Tax rebate @ 4% of system cost	1.0
Income Incentives (30 points possible)	For all sectors: Gross FiT: degressive; mechanisms to balance growth between sectors; preference to manage via caps vs. rates; ground-mounted fully-subscribed until 2012; sector unbalance in installations	15.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	Mandatory, though no PV carve-out	3.0
Interconnection (3 points possible)	Mandatory within context of feed-in tariff, non-uniform standards	2.0
Other Regulatory Incentives (extra credit)	PV requirement in new buildings	1.0
Education & Outreach (extra credit)	Government support of public relations	0
Overall	Scoring more points for PV Capacity Installed (the past) than for Drivers for Future Development	52.0

Spain's taxpayer-funded feed-in tariff introduced in 2007 resulted in explosive growth in 2008, forcing the government to effectively shut down the program while it considered program modifications. Although comprising only 30% of the total possible points, PV Capacity Installed comprises 58% of the country's point totals (Spain ranked first in all measurements except cumulative total).

The resulting new feed-in tariff for 2009-2012 addresses many of the primary weaknesses of the initial program, in particular an overly-generous PV premium, lack of mechanisms to adjust for market take-up, and the imbalance between sectors. However, the program is still funded by taxpayers (vs. electricity consumers) and ultimately managed via caps. A more comprehensive suite of incentives, such as adding a net metering program (as suggested by Javier Anta, President of ASIF) and purchase incentives for the residential sector may alleviate some of the stress borne by the feed-in tariff.

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as compared to 2008

Global irradiation and solar electricity potential
Optimally-inclined photovoltaic modules

Switzerland



Source: PVGIS © European Communities, 2001-2008

Solar Insolation: ~850-950 kWh/kWp/yr Average Annual Solar yield

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	3.5	2.0	12.0	4.0	-	21.5
Rank	10	11	15	11	N/A	14

PV Capacity Installed

	2006 ⁵	2007 ⁵	2008 ³
Cumulative PV Capacity Installed (MW)	29.70	36.20	47.90
Cumulative Growth Rate		22%	32%
Annual PV Capacity Installed (MW)	3.14	4.40	11.70
Annual Growth Rate		107%	80%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Energy policy is set by both the federal government and the 26 cantons.

- Prior to 1990, energy policy was not included in the Swiss Federal Constitution. The Swiss Federal Constitution was updated in 1990 to include an Energy Article which stipulated that the federal and cantonal governments are obliged to use their competencies to ensure an adequate, broad-based, secure, economical and ecological energy supply, and the economical and efficient use of energy. To meet these requirements, the federal government passed the Federal Energy Act and the Federal Energy Ordinance on January 1, 1999, and all cantons drew up their own energy legislation and regulations.¹
- On May 1, 2000, the CO2 Act entered into effect. The CO2 Act, a federal act, defined binding targets for the reduction CO2 in Switzerland. The targeted reduction is primarily to be achieved through **voluntary** measures on the part of companies and individuals¹, however, since 2008, taxes have also been levied on CO2 (transportation fuels excluded), because the **voluntary** measures didn't reach the targets.¹⁴
- The SwissEnergy Programme was launched in 2001 (replacing the Energy 2000 Programme launched in 1990) on the basis of the Federal Energy Act and the CO2 Act. The SwissEnergy Programme is intended to promote energy efficiency and the use of renewable energy.²
- Approximately 75% of utilities are publicly owned³. Electricity industry structure and ownership is heterogeneous with both vertically integrated and separate generation, transmission and distribution. Both municipal and state owned as well as private organizations are involved³.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives (continued)

Feed-in Tariffs

Note: Called a compensatory feed-in remuneration (CRF or KEV)

- National – *The Revised Energy Act*
 - *Effective 1 January 2009; retroactive to systems installed (or with valid building and grid connection permits) 1 January 2006 – 30 April 2008 up to 20MW; and systems which had not been granted a construction permit by 30 April 2008 up to 5MW.⁸*

- *Rates*

2009 Feed-in-Tariffs in CHF/kWh ¹²			
System Size	Ground-based	Roof-mounted	Building Integrated
≤10 kW	0.65	0.75	0.90
≤30 kW	0.54	0.65	0.74
≤100 kW	0.51	0.62	0.67
>100 kW	0.49	0.60	0.62

- *Term: 25 years*
- *Quarterly payments⁸*
- *Digression: 8% beginning 2010*
- *Gross with options – “Recipients of the feed-in-tariff do not generate electricity for their own needs but sell their electricity at cost-effective prices that simultaneously also cover the ecological added value of the green electricity. Plant operators who do not want to or cannot (yet) profit from the FiT can opt to either use the electricity they produce to cover their own needs, market the ecological added value on the green energy market or on a green energy exchange, or sell their electricity at the market price. In the latter case, the advisory Commission for Connection Conditions for Renewable Energies (KAEE) will draw up guidelines for the energy providers.”⁸*
- *Program Cap: 16m CHF (5% PV allocation of 320m CHF)⁹*
 - *The cap is not a fixed sum but is influenced by the following four dynamically changing factors:*
 - *Market price of electricity: the additional costs of each technology which are not covered by the market price are to be financed with the FiT. Hence the higher the market price, the lower the costs to be covered by the FiT (additional costs = reference price - market price).*
 - *Electricity consumption: To finance the FiT costs, a maximum of 0.6 cents per kilowatt hour will be levied on Swiss electricity end consumption. The greater the volume of electricity consumed, the higher the total cost cap.*
 - *The number of plants registered but subsequently unrealized: if the deadlines for plant realization are not observed, swissgrid will revoke the decision and reallocate the place to another plant.*
 - *Number of “changeover plants”: Producers can switch from the FiT system to the free green electricity market and vice versa. On the free green electricity market, producers do not receive a fixed feed-in tariff; instead, they are at liberty to market the electricity themselves, for example to a green electricity exchange. In so doing, changeover plants can relinquish their FiT status to another plant.⁹*
 - *Financed by a electricity consumer surcharge*
 - *Max 0.6 Rp/kWh; set annually*
 - *For 2009 and 2010, 0.45 Rp/kWh → 265.5m CHF/yr (FiT allocation = 130m CHF/yr)*
 - *Note: The cap for the FiT was reached the first day after start of registration 1 May 2008.^{3,14} On 2 February 2009 the Swiss Federal Office of Energy (SFOE) announced that from the 1st of February onward, all new registrations for renewable energy production plants would be put on a waiting list. By November 2008, there were over 3,000 PV applications on the waiting list⁸. A 2009 add-on quota was set at 5 MWp, which allowed the first seven on the waiting list to move forward.⁷ Under the Energy Act, the freeze on photovoltaic can only be lifted if and when this technology is more cost-effective and the additional costs (additional costs = reference price - market price) of photovoltaics fall below 50 cents per kilowatt hour.⁹*

- *Cantons – Two cantons have FiT programs.¹⁴*

Grants & Rebates

- National – *The Stabilization Program 2009¹¹*
 - *2,500 CHF/kW for stand-alone installations up to 25K CHF*
 - *2,900 CHF/kW for additions to systems up to 29K CHF*
 - *3,500 CHF/kW for integrated installations up to 35K CHF*
 - *For systems 5-6kW*
 - *Capped at 20m CHF*

Financial Incentives (continued)

- *Note: Paid **exclusively** to new systems registered for FiT as of 31 December 2008 and which had to be placed on the waiting list due to the cap. By 10 April 2009, new applications were automatically delivered to those on the waiting list. Only applications completed by June 20, 2009 were accepted for the investment grant.*¹⁰

■ Cantons

- Up to 2,000 CHF/kW in selected cantons³
- Some Cantons have investment subsidies available.¹⁴

Net Metering / Net Billing

- Net Metering – Only with certain utilities,³ and only for small plants (<15 kWp)¹⁴.
- Net Billing – Only with certain utilities due to the new FiT scheme³

Tax Incentives

- National – Yes (no other detail provided)³
- Cantons – None

Subsidized Loans

- National – None
- Cantons – None

Other Financial Incentives

- National
 - The Swiss Federal Office of Energy (SFOE) is working on a 4-year project with the University of Neuchâtel with the goal of lowering of the costs of the cells. Several large utilities are operating a Solar Stock Exchange, which is expected to also provide a solar market increase.⁵
 - Green Power Marketing Scheme – Utilities offer product brands with a mix of different RE sources. Up to 5% of the customer base can be attracted to pay the comparatively high prices for solar electricity.¹⁵
- Cantons – None

Regulatory Incentives

Renewable Portfolio Standards

- National
 - Voluntary³
 - 2010 Targets¹³:
 - 3% or +3,000 GWh more heat produced from renewable sources (basis year 2000)
 - 1% or +500 GWh more electricity produced from renewable sources (basis year 2000)
 - Hydropower to be maintained at 2000 level
 - +5.4B kWh by 2030 (per revised Energy Act); corresponds to 10% of 2008 consumption (58.7B kWh)
- Cantons – None

Interconnection

- National Standards enforced by Cantons

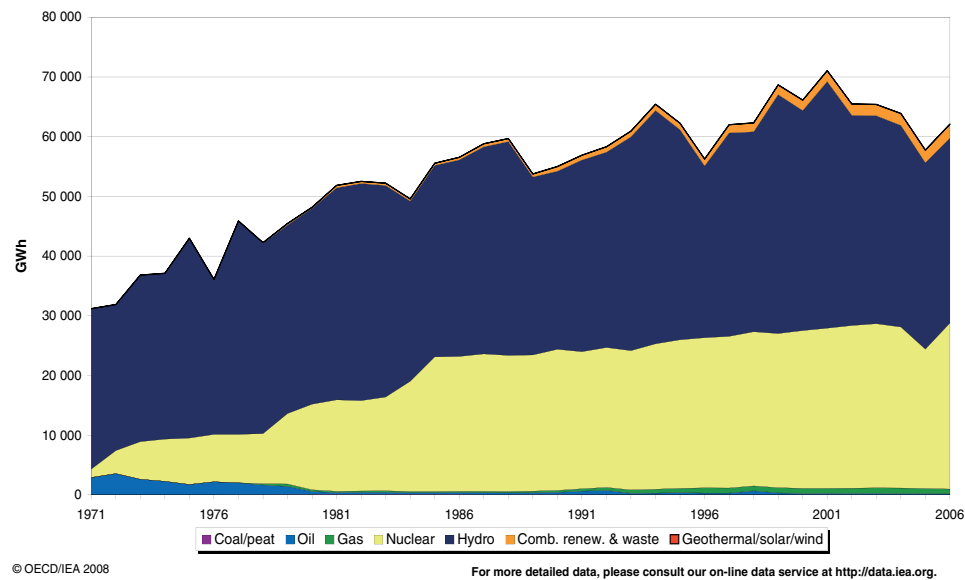
Indirect Support

Education & Outreach

- The Swiss Professional Solar Association (Swissolar) offers a brief one-day certification course for professionals (e.g., electricians). Swissolar is working on initiatives to increase the number of certification courses.
- Information is very clear and easy to find on the Swiss Federal Office of Energy government website. However, no campaign for solar energy directed at citizens can be found.

Solar Energy Policy Context

Electricity Generation by Fuel ¹⁶



As of June 2008, renewables accounted for 5.7% of Switzerland's electricity production, with 3.63% from biomass, 1.22% from incineration plants, 0.12% from solar energy and 0.003% from wind.¹⁷

Public Budgets for PV

At the moment about 10 Million CHF a year are available for R&D from public funds.

R&D is being led by the School of Engineering and Computer Science (Bern), the Institut de Microtechnique (Neuenburg) and the SUPSI/DACD (Canobbio).

Evaluation of Incentives

Category	Results	Points
PV Installed (30 points possible)	- Cumulative thru 2008 Rank: 11th out of 17 - Cumulative thru 2008 per GDP Rank: 8th out of 17 - Cumulative thru 2008 per Capita Rank: 6th out of 17 - Annual 2008 Rank: 11th out of 17 - Annual 2008 per GDP Rank: 9th out of 17 - Annual 2008 per Capita Rank: 7th out of 17	5.5
Incentives for Acquisition (25 points possible)	For the Residential sector: Rebates with generous transaction cap, very low program cap; for feed-in tariff participants only For the Commercial sector: None For the Industrial sector: None	4.0
Incentives for Income (30 points possible)	For all sectors - Gross FiT; 5-7x premium; long term; degressive; very low cap as a result of funding mechanism - Tax incentives (terms unknown) - Net metering or net billing only with certain utilities	5.0
Other Financial Incentives (5 points possible)	2 national programs	3.0
RPS (7 points possible)	Low target; optional	1.0
Interconnection (3 points possible)	Uniform; enforced	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Programs geared towards industry, not public	0
Overall	Low points awarded due to restrictive funding mechanism	21.5

Evaluation of Incentives (continued)

What comes first: the chicken or the egg? Or in Switzerland's case: a larger solar market or lower system prices?

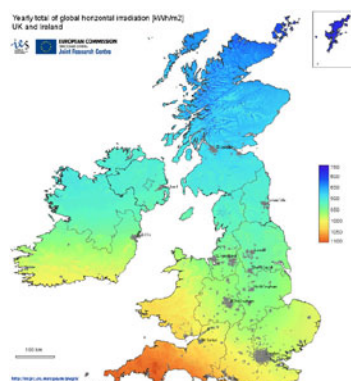
Incentives new for 2009 are reasonably well designed. The feed-in tariff is generous, has a long-term commitment, is degressive and includes all sectors. The grant program offers generous up-front subsidies for households – a good sector to target when kick-starting growth – and is aligned with the feed-in tariff. Interconnection standards are in place and enforced. Unfortunately, these incentives are capped by a funding mechanism that won't allocate more funding until system prices decrease. But system prices will decrease only with market growth, which will be slow with current caps.

The good news is that the problem is starting to be addressed – the parliament is considering the augmentation of the feed-in tariff cap for all renewables by 50% and doubling the cap for photovoltaics for 2011.¹⁴

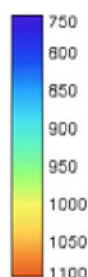
Despite being one of the smallest countries evaluated, Switzerland ranks in the 3rd quartile for absolute PV capacity installed, even higher per GDP and Capita measurements. The country receives a higher grade for 2009 due to the new grading scheme, but the overall point total remains low due to funding restrictions on its otherwise reasonably well-designed incentives. Policy advocacy for an increase in the incentive caps could make Switzerland a stronger competitor in 2010.

Endnotes

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- ¹⁷ Swiss Federal Office of Energy (SFOE). "Renewable Energy". <<http://www.bfe.admin.ch/themen/00490/index.html?lang=en>>



Irradiation in kWh/m²/yr



Source: PVGIS © European Communities, 2001-2007

Solar Insolation: 750 kWh/kWp/yr Yearly Average Solar yield
 2.4-3.4 kWh/m²/day Average Solar Radiation

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)		(100+)
Points Awarded	1.5	-	17.0	6.0	-	24.5
Rank	14	13	12	4	N/A	13

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	14.30	18.10	22.51
Cumulative Growth Rate		27%	24%
Annual PV Capacity Installed (MW) ¹	3.28	3.80	4.42
Annual Growth Rate		16%	16%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets national energy policy with authority delegated to selected regions (Northern Ireland); supplemental local incentives.

Note: Policies enacted in and/or effective for 2009 in italics.

Financial Incentives

Feed-in Tariffs

- Proposed (as of Sept 2009) effective April 2010 ¹²:
 - Gross FiT
 - Term of 25yrs (for PV only); 20yrs for other RE sources
 - 7% annual digression
 - Rates thru April 2011:
 - 0.31 GBP/kWh for systems <4kW on new buildings
 - 0.36.5 GBP/kWh for systems <4kW on existing buildings
 - 0.31 GBP/kWh for systems 4-10kW
 - 0.28 GBP/kWh for systems 10-100kW
 - 0.26 GBP/kWh for systems 100kW-5MW
 - 0.26 GBP/kWh for stand-alone (no on-site consumption) systems <5kW
 - 0.05 GBP/kWh (negotiable) bonus for excess exported

Financial Incentives (continued)

- **Eligibility:**
 - Systems installed after 15 July 2009
 - Systems installed before 15 July 2009 that are <50kW and registered for the RO
 - England, Wales and Scotland only; Northern Ireland excluded
- **Income tax and VAT:** TBD

Grants & Rebates

- **National**
 - Low Carbon Buildings Programme (LCBP)
 - Effective April 2006 – June 2010
 - Initially capped at 80m GBP, 30m GBP for Phase 1, 50m GBP for Phase 2; additional 6m GBP in March 2008 for Phase 1; additional 7m GBP in December 2008 for Phase 2; *Additional 45m GBP allocated April 2009*³
 - Phase 1: for residential, public and private organizations
 - 2,000 GBP/kW, capped at the lower of 2,500 GBP or 50% of eligible costs
 - Energy efficiency measures required¹⁶
 - Phase 2: for public sector buildings and charitable organizations³
 - 50% of eligible costs per installation, capped at 200k GBP/site (may have multiple installations); exclusive of VAT
 - Systems >0.5kW and ≤50kW; for larger systems, may contribute to the first 50kW
 - Exclusive of other national government or devolved administration programs; include of other public sources
 - Funding
 - 17.5m GBP reserved for PV
 - Additional 7m GBP allocated in December 2008 for PV²
 - *Additional 35m GBP allocated for Phase 2, with 9m GBP reserved for PV*³
- **Regional/Local**
 - Reconnect: Effective February 2006 – March 2008, 8m GBP for 2yrs, Northern Ireland only²
 - Switched on Schools: Northern Ireland only, PV and wind only, Phase 1 – 16 rural schools completed September 2007, Phase 2 – 1.3m GBP for 35 rural schools⁵
 - Community Sustainable Energy Programme (CSEP): Effective April 2008 – December 2010; for non-profit organizations only; 8m GBP for installations, 1m GBP for development; lower of 50% project costs or 50k GBP⁶
 - Gloucester Renewable Energy Grant Scheme: Effective April 2008 – March 2009; 1k GBP/installation for 110 installations in Gloucester county⁷

Net Metering / Net Billing

- Optional by utility
- Gross vs. Net vary by utility
- 2008 prices: 0.10 – 0.30 GBP/kWh depending on the utility

Tax Incentives

- VAT @ 5% (vs. 15%) on professional installations of PV systems since April 2000¹¹
- **Income tax and VAT:** TBD (see *Proposed FiT*)

Loan Subsidies

- None

Other Financial Incentives

- None

Regulatory Incentives

Renewable Portfolio Standards

- The Renewables Obligation (RO) ⁸
 - Effective April 2002 for England, Wales and Scotland; effective April 2005 for Northern Ireland; terminates March 2037
 - Targets: 10% by 2010 and 20% by 2020; rise annually from 6.7% in 2006/07 to 15.4% in 2015/16, then remains flat until 2027
 - *Effective April 2009: ROC value is “banded” dependent on generation technology type. PV will receive two ROCs per MWh generated from this time*
 - Buy-out price set by Ofgem per Retail Price Index (RPI) adjustments for each MWh of shortfall
 - For 2008-9:
 - RO @ 9.1%; 3% for Northern Ireland
 - *9.7 ROCs per 100MWh for England, Wales & Scotland*
 - Buy-out price: 35.76 GBP/MWh

Interconnection

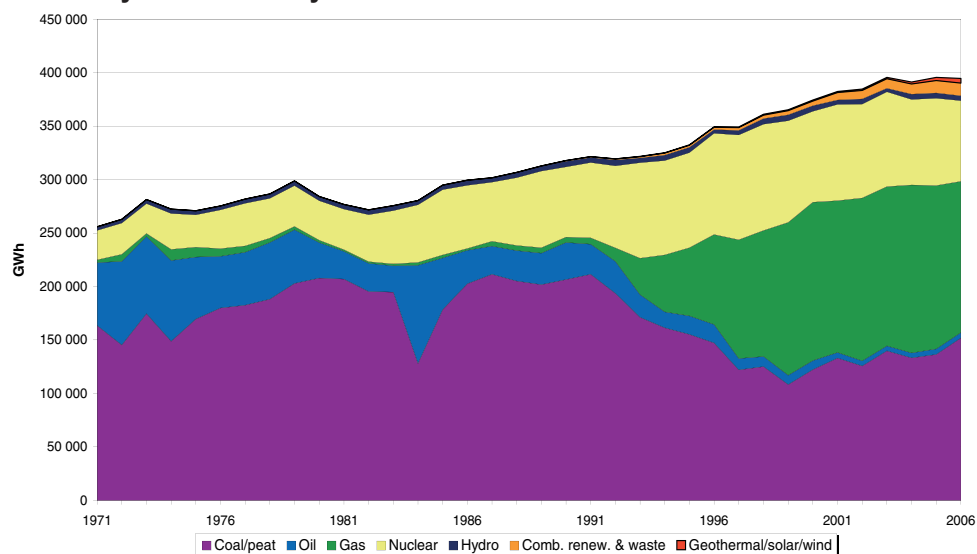
- Uniform

Indirect Support

Education & Outreach

The government information portal www.direct.gov.uk, contains a page explaining solar technology and an explanation of incentives available to people who wish to install PV systems. ¹⁵

Electricity Generation by Fuel ²⁵



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For more detailed data, please consult our on-line data service at <http://data.iea.org>.

The UK had 5,699.5 MW of renewable electricity capacity installed in 2007 (including 1358.7 MW from large hydro), which generated 19,664 GWh of electricity (4554 GWh from large hydro and 11 GWh from Solar PV).¹⁷

Energy Subsidies

Fossil Fuel subsidies: In 2003 it was reported that “every year the government gives some £6-8 (\$10-13) in fossil fuel subsidies for every £1 to support clean and renewable energy.”¹⁸

The European Commission reports that the UK allocated 45 million Euros in 2005 (and 0 in 2006) of aid to the coal sector.¹⁹

2005 Renewables R&D budget: US\$ 68.82 million or 51% of total energy R&D budget.²⁰

Solar PV R&D

Budgets for solar PV R&D and Demonstration Field Trials (Dept for Trade and Industry and The Engineering and Physical Science Research Council) £15.03 million in 2006 (US\$ 27.7 million); £12.06 million in 2005 (US\$ 22.3 million).²¹

A four-year £6.3 million (US\$ 12.5 million) solar research project has been launched in the UK. The goal of “the largest ever photovoltaic (PV) solar energy research project to take place in the UK”²² is to make a major contribution to achieving competitive photovoltaic solar energy.

Energy Efficiency Measures

In June 2007, the UK released the Energy Efficiency Action Plan (EEAP) 2007, which brings together all measures and policies adopted concerning Energy Efficiency, such as the EU directive and the 2006 Energy Efficiency Commitment (EEC), discussed below.

The Carbon Emissions Reduction Target (CERT) - which came into effect on 1 April 2008 and will run until 2011 - is an obligation on energy suppliers to achieve targets for promoting reductions in carbon emissions in the household sector by “promoting qualifying actions to domestic energy users”, pertaining to insulation, low-energy light bulbs, and high-efficiency appliances and boilers.²³

As an EU member state, the UK is bound by the EU Energy Performance of Buildings Directive (EPBD). This directive was implemented in the UK in 2005 and requires the creation of standards for energy efficiency in new buildings based on the energy performance of the building. It is up to member states to decide the level of energy efficiency requirements, however these levels must be revised at least every 5 years and updated based on technological developments.²⁴

In 2006, the UK government also published a rating system for the sustainability of new homes. This code gives buyers a clear, easy to understand measure of each house’s environmental footprint.

Evaluation of Incentives

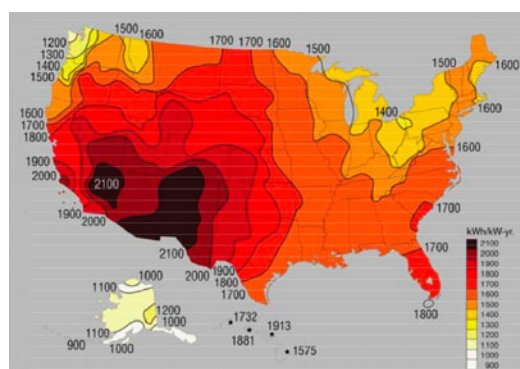
Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 13th out of 17 - Cumulative thru 2008 per GDP Rank: 15th out of 17 - Cumulative thru 2008 per Capita Rank: 13th out of 17 - Annual 2008 Rank: 14th out of 17 - Annual 2008 per GDP Rank: 15th out of 17 - Annual 2008 per Capita Rank: 13th out of 17	1.5
Purchase Incentives (25 points possible)	For the Residential, Small Commercial & public sectors: - Grant programs with generous transaction cap - VAT reduction For the Large Commercial sector: None For the Industrial sector: None	15.0
Income Incentives (30 points possible)	For the Residential, Small Commercial & public sectors: Net Metering voluntarily offered by certain utilities For the Large Commercial sector: None For the Industrial sector: None	2.0
Other Financial Incentives (5 points possible)	None	0
RPS (7 points possible)	Mandatory	3.0
Interconnection (3 points possible)	Uniform standards	3.0
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	Government-sponsored website	0
Overall	Grant programs account for the majority of points awarded	24.5

The United Kingdom's grade is driven primarily by the lack of a feed-in tariff and a low amount of PV installed. PV-specific incentives carried over from 2008 reduce installation costs, but are limited to the residential and small-to-medium commercial sectors. The introduction of "banding" in the Renewables Obligation boosts PV incentives for the industrial sector, but provides only part of the solution. For PV installed, the country is among the poorest performers by all measurements used.

That may all change in 2010 *if* the proposed feed-in tariff is implemented. Current provisions under consideration would enhance the economic viability of installing PV across all sectors and even encourage households to reduce consumption. In the meantime, funding for the national grant programs has been depleted. Unless new incentives are put in place (or more funding is allocated to existing incentives), growth in the United Kingdom PV market will likely slow from its already anemic pace.

Endnotes

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Source: SEIA

Solar Insolation: ~1000-2100 kWh/kWp/yr Yearly Average Solar yield
 ~3.0-7.0 kWh/m²/day Average Solar Radiation on collector surface

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(10.0)	(100+)
Points Awarded	9.0	8.0	28.0	4.0	1.0	50.0
Rank	5	5	6	11	N/A	7

PV Capacity Installed

	2006	2007	2008
Cumulative PV Capacity Installed (MW) ¹	624.00	830.50	1,168.50
Cumulative Growth Rate		33%	41%
Annual PV Capacity Installed (MW) ¹	145.00	206.50	338.00
Annual Growth Rate		42%	64%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government with broad powers to set national policies. However, most of the policies that impact the solar industry are created at the State level.

Note: *Policies enacted in and/or effective for 2009 in italics.*

Financial Incentives

Feed-in Tariffs

- National – none
- State – California (see California report)
- Local – 4 city or utility-level

Grants & Rebates

- National
 - Rural Energy for America Program (REAP) ⁴
 - Effective 2003-2012; *grant applications closed 7/31/2009*
 - 25% of costs
 - Commercial and government only
 - Funding: 115M USD for 2003-2007; 220.9M USD for 2008; 255M for 2009-2012

Financial Incentives (continued)

- *Renewable Energy Grants* ⁴
 - *Effective 2009-2011*
 - *30% of costs for PV, no cap*
 - *Commercial only; must be a taxable entity*
 - *May be taken in lieu of ITC*
 - *Administered by U.S. Treasury*
 - *Enacted as part of ARRA 2009*
- State – 27 states with grant programs, 28 states with rebate programs (see State Incentive Tables)

Net Metering / Net Billing

- National – none
- State – Available in 42 states and the District of Columbia, of which 3 are voluntary utility-level programs; terms vary by state ⁴

Tax Incentives

- National
 - Business Energy Investment Tax Credit ⁴
 - Effective 2006 – 2016 (an 8yr extension enacted October 2008)
 - 30% of costs for PV, no cap
 - Commercial only
 - Limited to projects also supported by “subsidized energy financing”; *limitation removed starting 2009*
 - *May be taken in lieu of grant; may be combined with tax-exempt financing*
 - Residential Renewable Energy Tax Credit ⁴
 - Effective 2006 – 2016 (an 8yr extension enacted October 2008)
 - 30% of costs for PV, capped at 2,000 USD; *cap removed in 2009*
 - *May be taken in lieu of grant*
 - Energy Efficient Commercial Buildings Tax Deduction ⁴
 - Effective 2006 thru 2013
 - 1.80 USD/sqft for energy efficient measures, including PV installation
 - Non-residential only
 - Modified Accelerated Cost-Recovery System (MACRS) + Bonus Depreciation (2008-2009) ⁴
 - Effective 1986
 - 5yr depreciation deductions for PV
 - Corporate only
 - *50% bonus deduction in 2008 and 2009; remainder depreciated over the ordinary depreciation schedule; enacted w/ ARRA 2009*
 - Residential Energy Conservation Subsidy Exclusion ⁴
 - Effective 1992
 - Energy conservation subsidies provided by public utilities are non-taxable
- State – 40 states with some form of tax incentive (see State Incentive Tables)

Loan Subsidies

- National
 - “Old” Clean Renewable Energy Bonds (Old CREBs) ⁴
 - Effective for issuances 2006-2008; *Effective for issuances thru 2009 (1yr extension via EIEA)*
 - Public-sector entities, primarily
 - Not PV-specific
 - 0% interest for borrower; 100% tax credits in lieu of interest for bondholder
 - Capped at 1.2M USD
 - Enacted via Energy Policy Act of 2005; amended via Tax Relief and Health Care Act of 2006
 - “New” Clean Renewable Energy Bonds (New CREBs) ⁴
 - Effective 10/08/2008
 - Enacted via Energy Improvement and Extension Act (EIEA) of 2008; *amended by American Recovery and Reinvestment Act (ARRA) of 2009*
 - Public-sector entities, primarily

Financial Incentives (continued)

- Not PV-specific
 - 0% interest for borrower; *70% tax credits in lieu of interest for bondholder*
 - *Capped at 2.4B USD; public power providers, governmental bodies, and electric cooperatives each reserved 33.3% of new allocation (1.6B USD added via ARRA)*
- Qualified Energy Conservation Bonds (QECBs) ⁴
 - Effective 10/03/2009
 - Enacted via Energy Improvement and Extension Act (EIEA) of 2008; *amended by American Recovery and Reinvestment Act (ARRA) of 2009*
 - Public-sector entities
 - Not PV-specific
 - 0% interest for borrower; *70% tax credits in lieu of interest for bondholder*
 - *Capped at 3.2B USD (2.4B USD added via ARRA)*
- Energy Efficient Mortgages ⁴
 - For RE and EE improves to new or existing homes
 - *Capped at 5% of the lesser of:*
 - *Property value, or*
 - *115% of the median area price of a single-family dwelling, or*
 - *150% of the conforming loan limit (417,000 USD in most states for 2009)*
- Rural Energy for America Program (REAP) Loan Guarantees ⁴
 - Effective 2003-2012; *grant applications closed 7/31/2009*
 - 25% of costs
 - Commercial and government only
 - Funding: 115M USD for 2003-2007; 220.9M USD for 2008; 255M for 2009-2012
- U.S. Department of Energy Loan Guarantee Program ⁵
 - *Announced July 2009*
 - *30B USD in loan guarantees*
 - *2 phases: (1) for Innovative Energy Efficiency, Renewable Energy and*
 - *Advanced Transmission and Distribution Technologies; and (2) for transmission infrastructure*
- State ⁴ – 34 states with subsidized loan programs (see State Incentive Tables)

Other Financial Incentives

- National – none
- State & Local
 - Green Power Programs: >850 utilities (~25% of total) in 47 states ²

Regulatory Incentives

Renewable Portfolio Standards

- National – *Proposed*⁶
 - The Waxman-Markey American Clean Energy and Security Act, which passed the House in June, 2009, has a 20% by 2020 target; although at least 25% of the percentage target in each year can be met with energy efficiency; *no solar carve-out*
 - *Extra credit (3x) for distributed systems ≤2MW*
- States ⁴ – 29 states plus the District of Columbia have mandatory RPS; 6 states have goals (see State Incentive Tables)
 - 13 states plus the District of Columbia have a solar carve-out

Interconnection

- Limited standards nationally
- Requirements vary by state and/or utility
- The Federal Energy Regulatory Commission (FERC) standards apply only to facilities subject to the jurisdiction of the commission; mostly, these are systems that interconnect at the transmission level. The standards generally do not apply to distribution-level interconnection, which is regulated by state public utilities commissions. ⁴

Indirect Support

Education and Outreach

- Solar America Initiative ⁸
 - Effective March 2007
 - Goal: make solar energy cost-competitive with conventional forms of electricity by 2015; 5-10GW by 2015
 - Strategies: R&D, model “solar cities”, education and training for solar installers and officials, codes and standards

State-Level Incentives

State Incentives by Type

State	Tax Incentives	Production Incentives	Grants	Rebates	Subsidized Loans	RPS
Alabama		X	X		X	
Alaska		X	X		X	
Arizona	X			X	X	X
Arkansas						
California	See California Report					
Colorado	X		X	X	X	X
Connecticut	X		X	X	X	X
Delaware				X		X
District of Columbia				X		X
Florida	X	X	X	X	X	
Georgia	X	X		X		
Hawaii	X	X			X	X
Idaho	X	X	X		X	
Illinois	X	X	X	X		X
Indiana			X			
Iowa	X			X	X	
Kansas						
Kentucky	X	X			X	
Louisiana	X				X	
Maine		X	X	X	X	X
Maryland	X			X	X	X
Massachusetts	X	X	X	X	X	X
Michigan	X	X	X	X		X
Minnesota	X	X	X	X	X	X
Mississippi		X			X	
Missouri	X				X	X
Montana	X	X	X		X	X
Nebraska					X	
Nevada	X			X		X
New Hampshire				X	X	X
New Jersey	X	X	X		X	X
New Mexico	X	X				X
New York	X		X	X	X	X
North Carolina	X	X	X		X	X
North Dakota	X					X (G)
Ohio	X		X		X	X
Oklahoma	X				X	
Oregon	X	X	X	X	X	X
Pennsylvania	X		X	X	X	X

State-Level Incentives (continued)

State	Tax Incentives	Production Incentives	Grants	Rebates	Subsidized Loans	RPS
Rhode Island	X	X	X		X	X
South Carolina	X	X			X	
South Dakota	X					X (G)
Tennessee		X	X			
Texas	X	X	X	X	X	X
Utah	X			X		X (G)
Vermont	X	X	X	X	X	X (G)
Virginia	X	X	X	X		X (G)
Washington	X	X	X	X	X	X
West Virginia	X					X (G)
Wisconsin	X	X	X	X		X
Wyoming	X			X	X	
Other Territories	X			X		X
TOTAL**	39	26	26	27	33	35*

*29 States and DC have mandatory RPS; 6 States have goals; (G) = Voluntary Goal

**Excludes California (see California report)

State Incentives – Descriptions

State	Description of Incentives (incentives new for 2009 in italics)
Alabama	- Grants: \$1,000 for system costs - Loans: 0% for up to \$500,000 for up to 10yrs for schools and local governments - Production: \$0.12/kWh above retail rate for RE systems $\geq 0.5\text{kW}$ and $< 1\text{MW}$
Alaska	- Grants: 250M USD (program-level) for 5yrs for RE - Loans: Low interest loans for up to \$1.8M for RE - Production: Up to \$1.5/kWh for RE systems $\leq 25\text{kW}$; no on-site consumption allowed
Arizona	- Loans: 3% for 5 or 10yrs; \$2/W up to 25% system cost; utility-specific - Property Tax: RE equipment assessed at 20% of depreciated cost or at 0% (no additive value) - Rebates: up to 60% of system cost; terms vary by utility - RPS: 15% by 2025 with credit (REC) trading - Sales Tax: 0% for solar equipment - Tax Credits: 10% of non-residential system costs up to \$50,000/yr, program capped at \$1M/yr; 25% of residential system costs up to \$1,000; <i>SB 1403</i>
Arkansas	None
California	See California Report
Colorado	- Grants: up to 50% of total project cost; for non-profit organizations: matching grant 50% of post-rebate cost, full grant 100% of post-rebate cost; \$2 million awarded on a competitive basis - Loans: 0% for 5 yrs, amounts vary; low interest loan up to \$50,000, low interest loan up to \$25,000 over 10 years, doesn't cover batteries, limited to systems 10kW or smaller - Property Tax: <i>\$1,128/kW for systems up to 2MW, \$421/kW for systems over 100MW, amounts vary for systems 2MW > 100MW; credits and rebates available</i>; financing for energy improvements (local option) - Rebates: \$2/W based on expected performance; <i>PV systems over 2kW get flat rate of \$1500</i>; \$2/W up to \$200,000 with REC customer owned (up to 10kW systems \$1.50/W, 10-500kW systems \$115/MWh of actual performance); \$3.75/W with a budget of <i>\$430,000 for 2009</i> (\$300,000 for 2008); \$2/W up to 50% or \$20,000 of cost; \$2/W DC up to \$3,000; \$1/W up to \$3,000; systems up to 500kW receive \$2/W capped at \$200,000, systems over 500kW determined through RFP capped at \$200,000, REC: customer owned: up to 10kW systems \$1.50/W; third-party owned: up to 10kW systems \$0.11/kWh of actual production, systems 10-100kW \$0.115kWh (actual), systems 100-500kW \$0.125kWh (actual); systems over 500kW determined through RFP - RPS: investor owned utilities 20% by 2020, electric cooperatives 10% by 2020, utilities serving over 40,000 customers 10% by 2020 (solar carve-out 4% of annual requirement and 0.8% of 2020 sales) - Sales Tax: <i>100% for PV</i>; commercial and residential 15% refund for solar installations

State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
Connecticut	- Grants: \$850,000 per project for PV - Loans: \$5,000-\$100,000 for 1-10yrs, 0-5% (<i>subject to change</i>); \$400-\$25,000 for 1-4 family units, \$2,000-\$60,000 for 5 or more family units at 1%, 3%, or 6% for 10 yrs - Property Tax: %100 exemption - Rebates: <i>residential on systems up to 10kW, \$1.75/W for first 5kW and \$1.25/W for next 5kW based on expected performance capped at \$15,000</i> - RPS: 20% by 2020 with credit trading (<i>was 23% in 2008</i>) - Sales Tax: %100 exemption
Delaware	- Rebates: up to 35% depending on utility, residential cap at \$31,500, non-residential cap at \$250,000 - RPS: 20% by 2020 (min 2.005% solar carve-out) with credit trading, triple credit for PV in 2008
District of Columbia	- Rebates: \$3/W for first 3kW, \$2/W for next 7kW, \$1/W for next 10kW - RPS: 20% by 2020 (min 0.4% solar carve-out) with credit trading
Florida	- Grants: \$15M for 2008-2009 - Loans: 5% for 10yrs up to \$20,000; residential \$1000-\$10,000 at 5% up to 5yrs; up to \$20,000 at 2-5.5% for 3-10yrs - Production: <i>FiT 20 yr contract: \$0.32/kWh for systems < 25kW and \$0.26/kWh for systems > 25kW; \$0.05/kWh with 5 yr agreement and auto renewal</i> - Property Tax: 100% exemption - Rebates: \$4/W, capped at \$20,000 for residential and \$100,000 for non-residential for systems >=2kW with budget \$5M for FY 2008-2009; <i>residential only \$1.50/W capped at \$7,500 for systems <=10kW (as of 2009 no longer accepts commercial rebates)</i> - RPS: 7.5% by 2015 - Sales Tax: 100% exemption - Tax Credits: \$0.01kWh (commercial)
Georgia	- Tax Credits: commercial 35% capped at \$500,000 for PV; residential 35% capped at \$10,500 for PV - Rebates: <i>up to 35% of cost of equipment or \$500,000</i>; \$450/kW installed capacity capped at \$4,500 on systems up to 10kW; \$300/kW capped at \$3000, residential systems <=10kW, commercial systems <=100kW - Production: 18.31 cents/kWh: residential systems <=10kW, commercial systems <=100kW; \$1000 + \$0.12/kWh above the retail rate
Hawaii	- Loans: Oahu, 0-2% for 7 yrs; Maui, 0% with \$1000 rebate; for farmers and aquaculturists 85% of project cost capped at \$1.5million at 1% (2008) for 40 years, <i>changed to 3% farmer and 5% aquaculturist in 2009</i> - Production: <i>FiT with 20 year contract, rates yet to be determined</i> - Property Tax: <i>exempt from property taxes for 25 years</i> - RPS: 20% by the end of 2020 (10% by 2010 and 15% by 2015); <i>40% by 2030 (25% by 2020)</i> - Tax Credits: 35% of actual cost with a cap for single family properties at \$2,250, multi-family properties at \$350 per unit, and commercial \$250,000 (or whichever is less)
Idaho	- Grants: 100% of costs for 1.1 kW systems for schools - Loans: 4% for 5yrs, residential capped at \$15,000, all others capped at \$100,000 - Production: \$0.02/kWh through 2009, <=50kW auto approved, >50kW approval varies - Sales Tax: 100% until 2011 - Tax Deduction: 40% in first year, 20% per years 2-4 capped at \$20,000
Illinois	- Grants: 25, 50, or 75% of costs capped at \$150,000; <i>through 2009 over 100 schools awarded up to \$10,000 to install 1kW systems</i>; non-profit & public sector 50% of eligible costs, for-profit businesses 30% of eligible costs, both capped at \$500,000 - Production: <i>\$0.065/kWh capped at \$15,000</i> - Property Tax: 100% exemption - Rebates: 30% capped at \$10,000 on systems of at least 1kW, <i>expires in 2009</i> - RPS: 25% by 2025, <i>solar carve-out of 6% by 2016 and thereafter and 1.5% of total sales in 2025 (with credit trading)</i> - Sales Tax: <i>commercial: 100% exemption of Retailers' Occupation Tax for building materials incorporated into the facility</i>
Indiana	Grants: 50% of project costs capped at \$100,000, <i>expires in 2009</i>

State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
Iowa	- Loans: 50% of financed project costs capped at \$1million at 0% for maximum 20 years, <i>capped at \$500,000 for non-rate regulated utilities limited to 1 loan every 2 years; aim to implement >\$500million for energy improvements</i> - Property Tax: 100% of project value - Rebates: residential only, \$1,000 per peak kW capped at \$5000 for systems 500W-10kW, with energy credits for grid-tied systems; \$2-\$3/projected annual kWh capped at \$10,000 - Sales Tax: 100% of sales tax on total cost - Tax Credits: <i>\$0.015/kWh or \$0.01/kWh for 10 yrs after production begins</i>
Kansas	- Property Tax: 100% exemption - RPS: <i>20% by 2020 with credit trading (no solar carve-out)</i>
Kentucky	- Loans: micro loan up to \$10,000 for 48 months, small loan up to \$35,000, large loan up to \$300,000 - Production: \$1000 + \$0.12/kWh above retail rate - Sales Tax: 100% of sales and use tax, capped at 50% of capital investment on systems >50kW - Tax Credits: \$3.00/W for PV capped at \$1000 for commercial and \$500 for residential, excess credits may be carried forward for 1 year; 100% state income or limited liability tax, 4% wage assessment, capped at 50% of capital investment, for up to 25 years, on systems >=50kW
Louisiana	- Loans: 50% of costs up to \$6,000 over 5yrs - Property Tax: 100% exemption - Tax Credits: corporate and personal, 50% of the first \$25,000, excess credit is refundable
Maine	- Grants: up to \$50,000 for non-profit, schools, rural electric, and quasi municipal - Loans: \$5,000-\$100,000 for 1-10yrs at 0-5% - Production: <i>choice of either 1.5 REC credit multiplier OR up to \$0.10/kWh for up to 20yrs</i> - Rebates: <i>25% or \$1000 capped at \$2000 with systems up to 100kW</i> - RPS: 30% by 2000, 40% by 2017, <i>new renewables 10% by 2017</i>
Maryland	- Loans: vary but capped at \$600,000 at 3% for 7yrs; vary at 0% with 1% admin fee, budget of \$3.8million - Property Tax: 50% of cost of materials and installation less any federal/state grants & state solar energy tax credits, capped at \$2500; 100% of total real property taxes for 1 yr capped at \$2500; 50% of eligible costs, capped at \$5,000 with credit carried over for 2 yrs; <i>100% property tax exemption for solar</i> - Rebates: \$0.005/kWh, residential capped at 20,000kWh/yr, commercial capped at 400,000kWh/yr; \$0.25-\$1.25/W capped at \$10,000 for systems up to 20kW - RPS: 20% by 2022 (solar carve-out of 2% by 2022) with credit trading - Sales Tax: <i>100% exemption for grid-tied systems</i> - Tax Credits: \$0.0085/kWh with \$2.5million total during 5 yr period; 20-25% without exceeding \$3.00/W, excess credits carried for 10 yrs
Massachusetts	- Grants: Matching Grants for Communities, matching premiums up to \$2.5million annually, <i>has been discontinued after June 30, 2009</i> - Loans: \$5,000-\$100,000 for 1-10yrs at 0-5% - Production: \$0.03/kWh for a 3yr contract - Property Tax: 20 year market value added exemption - Rebates: residential \$1/W capped at \$20,000, commercial \$2/W for first 25kW, \$1.70/W for next 75kW, \$1/W for next 100kW, budgeted at \$68million, <i>applications are no longer being accepted as of October 9, 2009</i>; \$1000/kW capped at \$10,000 for systems <=10kW; \$1.00-\$4.40/W cap is lesser of \$20,000 or incentive based on a 5kW system - RPS: 15% by 2020 with +1% annual increase; <i>New Resources 15% by 2020 +1% annual increase, Existing Resources 7.1% by 2009 and thereafter (3.6% renewables and 3.5% waste-to-energy) with credit trading</i> - Sales Tax: 100% exemption - Tax Credits: residential 15% capped at \$1000, excess may be carried forward three years - Tax Deductions: 100% for 5 yrs for corporate and personal
Michigan	- Grants: State grant program, \$8.1million for financing, \$5.5million for investments only applicable for commercial, non-profit, schools, local government, state government - Production: <i>residential \$0.65 or \$0.525/kWh, non-residential \$0.45 or \$0.375/kWh with a fixed rate up to 12 yrs</i> - Property Tax: 100% exemption - Rebates: \$2.4/W for new systems capped at \$48,000; \$2-\$3/projected annual kWh capped at \$10,000 on systems 20kW or less - RPS: 10% +1,100MW of new RE for specific utilities by 2015

State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
Minnesota	- Grants: for local government, \$10,000-\$150,000 capped at lesser of 75% of installed cost or \$150,000; \$22.6million for 22 projects in 2008 - Loans: residential, \$2,000-\$35,000 for 1-20yrs at fixed rate of 6.25%, maximum household income of \$93,100; up to \$40,000 per farm family or \$160,000 for joint projects at 3% for 7 years; RFA provides up to 45% of loan up to \$40,000 for a max of 8yrs - Production: max of \$1/kWh on systems 40kW or less - Property Tax: 100% value added exemption, however land remains taxable - Rebates: \$1.75/W or \$2.00/W for NABCEP certified installations, residential capped at \$8750 or \$10,000 (NABCEP), commercial capped at \$17500 or \$20,000 (NABCEP); \$2/W or \$2.25/W (NABCEP) capped at \$4,000 or \$4,500 (NABCEP); small business or residential, \$2/W capped at \$4,000 on systems at least 0.5kW - RPS: 25% by 2025; for Xcel Energy 30% by 2020 (<i>for wind and solar 25% by 2020</i>) with a maximum of 1% from solar (<i>with credit trading</i>) - Sales Tax: 100% exemption
Mississippi	- Loans: \$15,000-\$300,000 at 3% below prime rate for 7 years - Production: \$1000 + 0.12/kWh above retail rate (<i>for solar</i>)
Missouri	- Loans: up to \$1million at 0.5% below the 20-Bond Index interest rate for up to 15 yrs - RPS: 15% by 2021 with 2% solar carve out and credit trading - Tax Deduction: 100% of cost of improvements, maximum of \$1000 per return and \$2000 cumulatively per taxpayer
Montana	- Grants: \$3/W up to \$6,000, RECs cannot be sold, only retained by customer or donated to Northwestern Energy - Loans: up to \$40,000 for 10 yrs at 3.5% (2009) - Production: \$0.02/kWh thru 2009 - Property Tax: corporate, 100% exemption for 5 yrs; residential, 100% exemption for 10 yrs based on investments of \$20,000; non-residential, 100% exemption for 10 yrs based on investments of \$100,000 - RPS: 15% by 2015 with credit trading - Tax Credits: personal & corporate, 35% on investments greater than or equal to \$5,000, credit carried forward 7 years; personal, 100% or up to \$500 carried forward for 4 yrs
Nebraska	Loans: residential, \$35,000-\$75,000, non-residential, \$75,000-\$175,000 at 5% or less for 10-15 years
Nevada	- Property Tax: 100% exemption - Rebates: <i>schools and public property \$4.2/W, residential and small business \$2.1/W, with caps of \$126,000 for public, \$200,000 for schools, \$10,500 for residential, and \$63,000 for non-residential</i> - RPS: 20% by 2015 with 1% solar carve-out; 25% by 2025 with solar carve-out of 5% through 2015 and 6% from 2016-2025, with credit trading - Sales Tax: everything above 0.6% (variable dependent upon county) for 3 years
New Hampshire	- Loans: \$5,000-\$10,000 for 1-10yrs at 0-5%; \$10,000 minimum for 7 yrs, interest is prime rate -1% - Rebates: \$3/W up to \$6,000 or 50% of costs on systems <5kW - RPS: 23.8% by 2025 with 0.3% solar carve-out by 2014 (with credit trading)
New Jersey	- Grants: \$100,000-\$500,000 (with at least 50% matching required), <i>budgeted at \$6million for 2009</i> - Loans: 0% for 10 yrs, budgeted at \$25.7million; PSE&G Solar Loan Program residential – 10yrs at 6.5%, non-residential – 15 yrs at 11.11% - Production: Solar Renewable Energy Certificates (SRECs) - \$230/MWh, up to \$711/MWh; <i>SRECs - \$490/MWh up to \$693/MWh (on systems registered with NJ Board of Public Utilities)</i> - Property Tax: 100% of value added - RPS: 22.5% by 2021 with 2.12% solar carve-out and credit trading - Sales Tax: 100% exemption
New Mexico	- Production: \$0.13/kWh for RECs on systems 10kW or less for 12 years, \$0.15/kWh for RECs on systems greater than 10kW for 20 years; on systems between 0.5kW and 100kW \$0.20/kWh on new systems and \$0.10/kWh on existing systems, on systems between 100kW and 2MW determined through RFP, 14 year contract on systems 0.5-10kW, 10 year contract on systems 10.1-100kW, 100.1kW-2MW competitive contract - RPS: 20% by 2020 for investor-owned utilities (10% by 2020 for co-ops) with 4% solar carve-out; 0.6% distributed generation by 2015, with credit trading - Sales Tax: 100% on gross receipts from sale and installation - Tax Credits: 6% against gross receipts on systems 1MW or greater capped at \$60million; \$0.027/kWh on first 200,000MWh annually for 10 years on systems 1MW or greater; 10% of purchase and installation costs up to \$9,000

State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
New York	- Grants: general – up to 50% of costs capped at \$10,000, national grid gas customers – up to 60% of costs capped at \$12,000; funding available for 100% of project costs capped at \$1million, systems 50kW or less must be approved by NYSEERDA - Loans: up to \$12,000 with 3% admin fee; \$20,000-\$2.5million at 3-6.5% depending on building for 10 years, expired 10/30/09; up to 100% or \$2,500-\$20,000 at 5.99% APR for 3, 5, 7, or 10 years - Property Tax: 15 year exemption, expires in 2010; residential, 100% of added value - Rebate: flat rebate of \$2500 on systems 5kW or larger; \$1.5/W-\$4/W with caps of \$24,000 for residential, \$200,000 for non-residential, and \$112,500 for non-profit, government, and schools - RPS: 25% by 2013 with 0.1542% customer-sited solar carve-out; 24% by 2013 - Sales Tax: 100% exemption - Tax Credits: variable credit distributed over 5 yrs capped at \$2million per building; 25% for PV up to \$5000
North Carolina	- Grants: \$100,000 from Green Business Fund, <i>program budget at \$5million for FY 09/10</i> - Loans: <i>interest rate no more than 8% for no longer than 15 years</i>; up to \$500,000 at 1% or 3% for 10 years - Production: residential receive \$0.15/kWh from NC GreenPower + \$0.04/kWh from utility company; <i>\$0.18/kWh for 20yrs on systems 10-250kW</i>; \$1000 + \$0.12/kWh above retail rate - RPS: 12.5% by 2021 for investor-owned utilities (10% by 2018 for co-ops and munis) with 0.2% by 2018 solar carve-out and credit trading - Tax Credits: corporate and personal, 35% of cost of PV system with residential cap of \$10,500 and commercial cap of \$2.5million
North Dakota	- Property Tax: 100% exemption for 5 years - RPS: 10% by 2015 with credit trading - Tax Credits: 15% (3% per year for 5 years for systems installed after 2000)
Ohio	- Grants: non-residential – traditional ownership up to \$150,000, third-party ownership up to \$200,000; \$3/W of installed capacity up to \$25,000/residence - Loans: up to \$50,000 at 3% below market rate for 5yrs; 3% rate deduction for first \$25,000 for 5 years (on systems less than 100kW) - Property Tax: 100% abatement up to \$500,000; 100% exemption with no limit - RPS: 25% by 2025 of alternative energy resources, with 12.5% renewables and 0.5% solar carve-out and credit trading - Sales Tax: 100% exemption
Oklahoma	- Loans: government average of \$60,000/applicant at 3% for up to 6 years capped at \$150,000; schools 100% of costs up to \$200,000 at 3% for 6 years; institute of higher education \$300,000 at 3% for 1-6 years - Tax Credits: corporate \$0.0025-0.0075/kWh for 10 years with credit carry over for 10 years; personal \$4,000 with credit carry over for 4 years
Oregon	- Grants: schools 100% of costs for 1.1kW systems, 33% for larger systems - Loans: residential \$1,000-\$50,000, small business \$5,000-\$100,000, rates vary up to 15 year terms; \$20,000-\$20million terms vary, generally 5-15 years; low interest, fixed-rate, and long term; \$500-\$10,000 at 5% for 12-60 months; \$500minimum at 6% for up to 84 months - Production: \$0.076-0.12/kWh for 10 years on systems 10kW-1MW; \$0.02/kWh thru 2009 auto approval on systems up to 50kW; <i>FiT, rates to be determined on April 1, 2010, capped at 25MW or on March 31, 2015 (whichever comes first), systems must be grid connected</i> - Property Tax: 100% exemption, expires 2012 - Rebates: Pacific Power \$0.90-2.00/W, PGE \$1.15-2.25/W, capped at \$20,000-\$800,000 (all dependent on sector); \$125-\$8,400 dependent on energy type and efficiency, expires 2009; residential \$2.25/W, non-residential \$1/W, up to \$10,000; \$500/kW capped at \$1,500 on systems 25kW or smaller; \$500/kW; \$600/kW for first 3kW, \$300/kW for each additional kW, capped at \$10,000 or 50% of costs (whichever is less) on systems up to 25kW; net-metered systems – residential \$2,00/W up to \$10,000, non-residential \$1/W up to \$25,000 - RPS: 25% by 2025 for large utilities (5-10% for small utilities), solar carve-out – 20MW by 2020 on systems sized 500kW-5MW, with credit trading - Tax Credits: corporate 50% of project costs distributed over 5 years capped at \$20million for renewable energy equipment manufacturing facilities and \$10million for all other project, unused credit may be carried forward up to 8 years, projects under \$20,000 may take credit in one year, credit amount based on \$3/W of installed PV capacity; personal \$3.00/W up to 50% of project costs capped at \$6,000 over a period of 4 years (\$1,500/year)

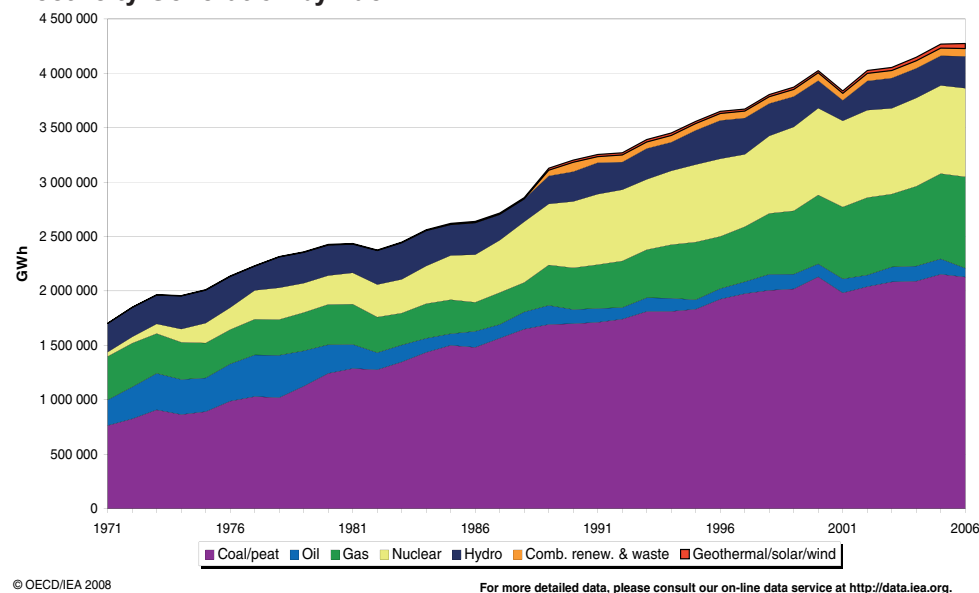
State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
Pennsylvania	- Grants: \$25,000 limit, varies among project; <i>10% of costs or \$500,000 (projects must achieve LEED Gold Certification)</i>; schools \$200,000 annually, projects must achieve LEED silver certification; maximum of \$1.5million per project (<i>now expired</i>); maximum of \$500,000 for schools, non-profit, local government, institutions; LEED certified \$5,000, LEED Gold or better \$10,000 - Loans: \$500,000 limit, amounts vary, terms vary; \$35,000-\$750,000, terms vary; <i>residential capped at \$100,000, small business capped at \$2million, both at 4% for 10 years (projects must achieve LEED Gold certification)</i>; up to \$5million for 5% up to 15 years - Rebates: <i>residential \$2.25/W capped at \$22,500 or 35% of project costs on systems of at least 1kW, commercial \$1.25-1.75/W capped at \$277,500 or 35% of projects costs on systems of at least 3kW, low-income 35% of installed cost</i> - RPS: 18% by 2021 with 0.5% solar carve-out and credit trading - Tax Credits: corporate and personal - 15% of project costs up to \$1million/ tax payer with credits carried forward for up to 5 years
Rhode Island	- Tax Credits: corporate and personal 25% of cost based on maximum system cost of \$15,000 with PV system size minimum of 24sqft - Production: \$0.03/kWh for 3 years - Property Tax: exemption from value added - Sales Tax: 100% exemption - Grants: up to \$750,000 dependent on sector - RPS: 16% by 2019 with credit trading - Loans: \$5,000-\$100,000 at 5% for 1-10years
South Carolina	- Loans: 100% of project costs from \$25,000-\$500,000 at fixed rate for 10 years; up to \$40,000 at 0% for net-billing customers and at low interest for non net-billing customers, for max term of 10 years - Production: premium payments for customer-owned, grid-tied systems of up to 5kW in size; <i>\$0.18/kWh for 20 years on systems 10kW-250kW in size</i> - Tax Credits: corporate and personal 25% of costs capped at \$3,500 or 50% of tax liability, credit may be carried forward for up to 10 years;
South Dakota	- Property Tax: residential 100%, commercial 50%, both for 3 years, % decline after 3 years - RPS: objective of 10% by 2015 with credit trading
Tennessee	- Grants: 40% of costs with minimum of \$5,000 and maximum of \$75,000 - Production: \$1,000 + \$0.12/kWh above the retail rate
Texas	- Grants: for FY 2010 program budget \$500,000, amounts per project vary - Loans: for schools, local government, state government, and hospitals – cap of \$5million at 3% APR for maximum of 10 years - Production: first 500kWh/month at Renewable Rewards retail rate, beyond 500kWh/month at 50% of retail rate, for systems 25kW or less - Property Tax: 100% exemption - Rebates: <i>\$2.50/W, residential cap at \$25,000, non-residential cap at \$180,000, on grid connected systems sized 2MW; \$2.50/W, residential cap at \$25,000, non-residential cap at \$90,000, on grid connected systems sized 2MW; \$2.50/W capped at \$15,000 for home installations and \$50,000 per site on systems 1-20kW in size; \$4.00/W capped at lesser of 80% of invoice cost or \$12,000 per site and limited to the first 3kW; \$3.00/W with residential cap at \$30,000 or 50% of costs and non-residential cap at \$100,000 or 50% of cost; \$2.00/W residential cap at \$25,000, non-residential cap of \$125,000; \$3.00/W capped at \$15,000 per structure on systems 10kW or less; \$2.46/W with residential cap at \$24,600 and non-residential cap at \$246,000 on systems sized 2MW; \$2.50/W with residential cap at \$25,000 and non-residential cap at \$25,000 for 2009 and \$90,000 for 2010; \$2.50/W with cap of \$25,000</i> - RPS: 5880MW by 2015, 10,000MW by 2025 with credit trading; Austin – 30% by 2020 with solar carve-out of 100MW; San Antonio – 20% by 2020 with solar carve-out of 100MW - Tax Deduction: 10% of amortized cost
Utah	- Rebates: \$2,000/kW with residential cap of \$6,000 and commercial cap of \$20,000 on systems 1-10kW; \$2/W with residential cap of \$6000 and commercial cap of \$30,000; \$2/W with residential cap at \$6000 and non-residential cap of \$30,000 on systems up to 25kW - RPS: 20% of adjusted retail sales by 2025 with credit trading - Sales Tax: 100% exemption on systems 20kW or greater, and on expansions of systems 1MW or greater - Tax Credits: corporate and personal 25% for residential up to \$2,000, 10% for commercial up to \$50,000

State-Level Incentives (continued)

State	Description of Incentives (incentives new for 2009 in italics)
Vermont	- Grants: \$5.07million awarded in 2009 now closed until January 2010 - Loans: \$5,000-\$100,000 for 1-10 years at 0-5%; fixed 2% available to individuals, companies, non-profits and municipalities for purchase and installation, loans \$50,000-\$1million may not be used for more than 90% or project costs - Production: \$0.06/kWh for solar on systems up to 250kW - Property Tax: exemption - Rebates: \$3.50/W for residential and low-income capped at 50% of costs or \$35,000, \$1.75/W for non-residential capped at \$8,750 - RPS: goal of 20% by 2017 - Sales Tax: 100% of sales tax for purchase - Tax Credits: 30% for property placed in service on or before 12/31/2010, 7.2% for property placed in service on or after 01/01/2011 and on or before 12/31/2016
Virginia	- Grants: \$4.5million/yr solar manufacturing grant (SMIG), \$0.75/W for panels sold in a calendar year, with a maximum of 6MW - Production: \$1,000 + \$0.12/kWh above the retail rate - Property Tax: exemption for solar, amounts vary - Rebates: \$2/W for first 10kW, \$1.75/W for next 10kW, \$1.50/W for next 10kW, \$1.25/W for next 10kW, \$1/W for each additional Watt, capped at \$225,000 or 200kW; \$2,000/kW capped at \$20,000 on systems up to 10kW - RPS: 15% of base year (2007) sales by 2025
Washington	- Grants: \$20,000-\$30,000, 50% of grant upfront, 50% after project is completed; schools – 100% of costs for 1.1kW systems, 33% of costs for larger systems - Loans: up to \$30,000 at 5.25% for 84 months; amounts vary for off-grid customers at 0% for 20 years; residential up to \$10,000 at 3% APR; up to \$25,000 at 2.9% APR for 10 years - Production: \$0.15-\$0.432/kWh; \$0.22/kWh-\$1.50/kWh on systems up to 25kW; \$0.02/kWh, auto approved on systems up to 50kW, approval varies on larger systems; \$0.198/kWh-\$1.00/kWh capped at 25kW; \$0.21/kWh-\$1.08/kWh capped at \$5,000/year - Rebates: \$500/kW of capacity; \$500/kW on systems of at least 1kW; \$400/kW capped at \$1200; \$1.50/W capped at \$4,500 on systems up to 100kW; \$500/kW of installed solar capped at \$2,500; \$500/kW of installed solar with residential cap of \$2,500 and commercial cap of \$10,000 on systems up to 100kW - RPS: 15% by 2020 with double credit for distributed generation - Sales Tax: 100% exemption on systems >200W, on systems >1kW
West Virginia	- RPS: 25% by 2025 with credit trading - Tax Credits: 30% up to \$2000, excess credit may be carried forward until exhausted
Wisconsin	- Grants: \$10,000-\$100,000 or up to 50% of project's total installed cost - Production: \$0.25/kWh on systems 1-10kW with 10 year contract; \$0.30/kWh with 10 year contract, \$1/mo metering charge; \$0.25/kWh with 10 year contract, customers must enroll in Second Nature green pricing program; rates vary with technology, 10 year contract on systems 20kW-1MW in size - Property Tax: 100% exemption - Rebates: systems up to 20kW: \$1.50-2.00/annual kWh capped at \$35,000-45,000 or 25-35% of cost, systems over 20kW: \$1.00-1.50/annual kWh capped at \$50,000-75,000 or 25-35% of cost - RPS: 10% by 2015, requirement varies by utility, credit trading with limitations - Sales Tax: 100% exemption from sales and use tax for eligible purchases
Wyoming	- Loans: maximum of \$2,500/year at 0% for 36 months - Rebates: open from the first to the third Monday in June each year until 37 application have been approved up to 50% capped at \$2,000 - Sales Tax: 100% exemption
Other Territories	- Guam RPS: 25% by 2035 - Puerto Rico - Property Tax: 100% exemption - Sales Tax: 100% exemption - Tax Credits: 75% FY 08/09, 50% FY 09/10 & 10/11, 35% FY 11/12, capped at \$15million for all corporate taxpayers per year and \$5million for all individual taxpayers per year, with a 10 year carry over period - Tax Deduction: 30% up to \$500 - Virgin Islands Rebates: \$3.50/W capped at 1kW

Electricity Generation by Fuel ⁹



Summary of GAO findings for FY 2007 (In Billion USD):

	R&D	Tax-Related Expenditures	Total (%2007)
Fossil Fuels	0.531 (24%)	2.7	3.231 (51%)
Nuclear	1.235 (56%)	0	1.235 (19.6%)
Renewables	0.305 (13.4%)	0.790	1.095 (17.4%)
Solar	0.203		
Total	2.2 (100%)	4.1	6.3 (100%)

Renewable Energy and Energy Efficiency DOE pledges

At the Washington International Renewable Energy Conference (WIREC) in March 2008, the Department of Energy committed to issuing \$10 billion in loan guarantees for renewable energy and energy efficiency systems and reiterated the Solar America Initiative's goal of making Solar PV cost -competitive by 2015.

Public Budgets for PV

The GAO study cited above notes that the Solar program (see Policies below), which made up the largest share of renewable R&D funding, more than doubled between fiscal year 2006 and 2007, rising from \$99 million to \$203 million.

Solar America Initiative FY 08 Appropriations: \$138M (DOE)

FY 09 Request: \$137M (DOE)

Future funding is subject to Congressional appropriations.¹²

In November 2007, the U.S. Department of Energy (DOE) announced that it would invest US\$21.7 million over three years in researching the next generation of photovoltaic solar cell technology.¹³

Energy Efficiency Measures

Most of the Federal government's stipulations about the energy efficiency requirements for buildings focuses on Federal Buildings, as it leaves it to the States to establish frameworks and codes for EE in new and existing construction.

The Energy Independence and Security Act of 2007 calls for several energy efficiency improvements for government buildings and public housing projects. It also establishes the "Zero Net Energy Commercial Buildings Initiative", which seeks zero net energy requirements for any newly constructed commercial buildings in the U.S. by 2030; 50 percent of the commercial building stock by 2040; and all commercial buildings in the U.S. by 2050.

The Federal government does provide incentives though for EE improvements such as a tax deduction for a maximum \$1.80/sq.ft to owners of new or existing buildings who install energy saving systems that reduce the building's total energy and power cost by 50% or more. The Federal government also backs loans for energy efficiency improvements in homes, and grants a corporate tax credit for builders of new energy-efficient homes.

Energy Subsidies

A study of U.S. subsidies in the energy sector estimated federal support for 2006 at between \$49 and \$100 billion per year. Fossil fuel subsidies amounted to \$49 billion per year (or 66.2% of an averaged \$74bn of total energy subsidies), against \$6 billion (7.5%) for renewables (excluding ethanol).¹⁰

Energy R&D

Another study by the Government Accountability Office¹¹ (GAO) focusing on the Department of Energy's (DOE) appropriations in the form of R&D and tax-related expenditures estimated that in 2007 alone these amounted to \$6.3 billion, 51% of which were allocated to fossil fuels against 17.4% to renewables combined.

According to GAO figures, the 2007 Renewables R&D budget was US\$ 305 million or 13.4% of total energy R&D budget for that year.

Evaluation of Incentives

Category	Results	Points
PV Capacity Installed (30 points possible)	- Cumulative thru 2008 Rank: 4th out of 17 - Cumulative thru 2008 per GDP Rank: 9th out of 17 - Cumulative thru 2008 per Capita Rank: 8th out of 17 - Annual 2008 Rank: 4th out of 17 - Annual 2008 per GDP Rank: 8th out of 17 - Annual 2008 per Capita Rank: 8th out of 17	17.0
Purchase Incentives (25 points possible)	For the Residential sector: - Grant programs in 27 states; rebate programs in 28 states - Loan programs in 34 states - Tax credits in 18 states, sales tax exemption in 18 states, property tax exemption in 27 states, tax deduction in 2 states - National loan subsidies (via mortgages); 34 states with loan programs For the Commercial sector: - National tax credit or grant with generous transaction cap; tax deduction for EE; accelerated depreciation - Tax credit in 18 states; sales tax exemption in 19 states, property tax exemption in 27 states 34 states with loan programs For the Industrial sector: - National Loan subsidies (via bonds)	20.0
Income Incentives (30 points possible)	For the Residential sector: 1 state, 4 city or utility-level FiTs - Income tax credits in 2 states - Net Metering, Net Billing or other production incentive available in 42 states For the Commercial sector: - Income tax credits in 2 states - Net Metering, Net Billing or other production incentive available in 42 states For the Industrial sector: - Tax credit in 1 state - Net Metering, Net Billing or other production incentive available in 42 states	7.0
Other Financial Incentives (5 points possible)	State and Local: Green Power Programs with ~25% of utilities	1.0
RPS (7 points possible)	- National: none - States: 29 mandatory, 6 voluntary	2.5
Interconnection (3 points possible)	Limited national standards; variation by state and/or utility	1.5
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	1 national program	1.0
Overall	Strong contribution to total points from PV Capacity Installed; federal government (via stimulus package) and states combine for a plethora of purchase incentives; states go it alone on income incentives	50.0

In the past, the federal government has largely left responsibility for the development of solar markets to the states. Direct assistance to the residential and commercial sectors was limited primarily to tax incentives; assistance to states was primarily long-term financing vehicles in the form of tax-free bonds. The result is a plethora of state and local programs, many of which are similar, short-term, government-funded and vulnerable to political vagaries. Greatest success has come in states with broad programs funded by electricity consumers with incentives that create certainty and predictability over the long-term. Two models

Evaluation of Incentives (continued)

are the California Solar Initiative (see California report) and New Jersey's Clean Energy Program, which this year launched a SREC program.

The hands-off approach of the federal government changed in 2009, prompted by a new administration and the economic downturn. New or enhanced national initiatives added a grant program (in lieu of tax credits), raised transaction and program caps, and extended coverage to the public and industrial sectors. PV capacity in the U.S. increased by 44% in 2008, with California leading the way (63% of all grid-connected installations in the country) followed by New Jersey, Colorado, Nevada, Hawaii, New York and Arizona.² Despite the increase in federal involvement, the grade for the United States remains the same for 2009 primarily due to the new grading scheme.

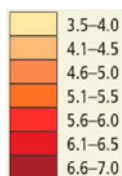
Given that electricity generation and distribution are the purview of the states, the most effective role for the federal government is that of coordinator and mediator. In particular, uniform standards and procedures for interconnection and net metering at the national-level would create infrastructure stability and financial predictability, enhancing many state programs and attracting more investors. The establishment of a national RPS, especially one with a solar carve-out, would boost state REC programs. Even though electricity policy rests primarily with the states, the federal government should still lead. Policies such as the American Recovery and Reinvestment Act (ARRA) are a good start toward focusing investment and economic development on clean energy technologies, but an even more aggressive and broad set of policies is needed to shift the United States to a clean energy economy.

Endnotes

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- 12 REN21. "WIREC 2008 Pledge: Increase renewables investment to USD 6bn by 2010". <<http://www.ren21.net/wiap/detail.asp?id=28>>
- 13 Global Renewable Energy: Policies and Measures Database. "Investment in Next-Generation Solar Cell Research". <<http://www.iea.org/textbase/pm/?mode=re&id=3772&action=detail>>



Yearly Solar Insolation
Average in kWh/m²/day



Source: Energy Atlas; California

Solar Insolation: ~1,338 kWh/kWp/yr Yearly Average Solar yield²
~6.0 kWh/m²/day Yearly Average Solar Insolation

Grade Breakdown

	PV Capacity Installed		Drivers for Future Growth			Overall
	Cumulative	Annual	Financial Incentives	Regulatory Incentives	Indirect Support (Extra Credit)	
Points Possible	(15.0)	(15.0)	(60.0)	(10.0)	(Extra Credit)	(100+)
Points Awarded	9.5	8.5	34.5	6.5	2.0	61.0
Rank	4	4	4	2	N/A	2

PV Capacity Installed

	2006 ¹⁷	2007 ¹⁶	2008 ¹⁴
Cumulative PV Capacity Installed (MW)	220.00	307.00	488.00
Cumulative Growth Rate		40%	59%
Annual PV Capacity Installed (MW)	62.59	87.00	181.00
Annual Growth Rate		39%	109%

Drivers for Future Development

Government Structure and the Effect on Energy Policy

Strong centralized government sets statewide energy policy, including delegation to local governments; national-level policies and incentives apply

Note: Policies enacted in and/or effective for 2009 in *italics*.

Financial Incentives

Feed-in Tariffs³

- Effective September 2006, enhanced February 2008
- Gross or Net FiT (customer choice)
- Tariff based on Market Price Referent (MPR), the predicted annual average cost of production for a combined-cycle natural gas fired baseload proxy plant, and Time of Use (TOU), peak vs. off-peak hours; rate is not PV-specific; *effective 1/1/2010, special, higher-level rate is provided for solar electricity generated 8am-6pm¹*

	10 year	15 year	20 year	25 year
2009 MPR ¹⁵	0.10043	0.10537	0.11126	0.11480

- For systems <=1.0MW or <=1.5MW depending on utility; *effective 1/1/2010, for systems <=3MW¹*
- 10, 15 or 20yr terms
- Capped at 498.5MW, allocations for each utility; *effective 1/1/2010, capped at 750MW*
- Green attributes, including RECs owned by utility
- Exclusive of CSI, RPS other ratepayer funded generation incentive program, including net metering tariffs

Financial Incentives (continued)

Grants and Rebates

State

- Go Solar California Program ¹³
 - Effective 2007-2016
 - Target: 3,000MW
 - Budget: 3.351B USD funded by California electricity consumers
- California Solar Initiative (CSI) ^{13,2}
 - Effective 2007-2016
 - Target: 1,940MW
 - Budget: 2.167B USD
 - For all systems in investor-owned utilities (IOU) except new homes
 - For systems ≥ 100 kW, performance-based incentives (PBI) paid monthly for 5yrs; for systems < 100 kW, expected performance-based buydown (EPBB) paid 1x up-front; systems < 100 kW may opt for PBI
 - Incentives reduced in 10 steps based on aggregate capacity of solar installed (demand); separate steps for utility and customer class (residential, commercial, non-taxable entity); 7% annual digression projected; special rates for low-income properties; in steps 4-6 as of October 2009 ⁵

Step	Statewide MW in Step	EPBB Payments (per watt)			PBI Payments (per kWh)		
		Res	Non-Res	Non-Tax	Res	Non-Res	Non-Tax
1	50	\$2.80	\$2.80	\$2.80	**	**	**
2	70	\$2.50	\$2.50	\$3.25	\$0.39	\$0.39	\$0.50
3*	100	\$2.20	\$2.20	\$2.95	\$0.34	\$0.34	\$0.46
4	130	\$1.90	\$1.90	\$2.65	\$0.26	\$0.26	\$0.37
5	170	\$1.55	\$1.55	\$2.30	\$0.22	\$0.22	\$0.32
6	190	\$1.10	\$1.10	\$1.85	\$0.15	\$0.15	\$0.26
7	215	\$0.65	\$0.65	\$1.40	\$0.09	\$0.09	\$0.19
8	250	\$0.35	\$0.35	\$1.10	\$0.05	\$0.05	\$0.15
9	285	\$0.25	\$0.25	\$0.90	\$0.03	\$0.03	\$0.12
10	250	\$0.20	\$0.20	\$0.70	\$0.03	\$0.03	\$0.10

* Total target for SB1 initiatives is 3,000 MW. The POU component and NHSP combined target is 1060.

- RE credit remains with customer/generator
- New Solar Homes Partnership (NSHP) ^{13,7}
 - Effective 2007-2016
 - Target: 400MW and 50% of new homes by end of 2016
 - Budget: 400M USD
 - For new homes in IOUs with systems ≥ 1 kW
 - PV-specific
 - Incentive determined by level of applicant's commitment to solar, energy efficiency and expected performance
 - Incentive reduced by 10% when MW targets reached
 - Expected performance-based incentive (EPBI) @ 2.50-2.60 USD/W in 2007; special rates for low-income properties
 - RE credit remains with system owner
- Publicly-Owned Utilities (POU) Component ²
 - Effective 2008-2016
 - Target: 700MW
 - Budget: 784M USD
 - For all systems in POU areas
- School Facility Program (SFP) – Modernization Grants ¹
 - Amount based on number of students housed in over-age facilities
 - 60% of modernization costs, financial hardship considerations
- Local and Utility
 - Municipality Rebates ¹
 - Terms vary by city or county
 - Selected areas: Marin County, City of San Francisco

Financial Incentives (continued)

- SREC Program ¹
 - \$50/MWh for SRECs associated with their solar installations from commercial and industrial customers of City of Palo Alto Utilities (CPAU)
 - Systems >100kW
 - Contracts capped at 20yrs and 600K USD
- Utility Rebates – terms vary by utility ¹

Net Metering / Net Billing¹

- Utilities are required (with one exception) to offer net metering to all customers for PV systems ≤1MW
- Net excess generation (NEG) is carried forward to a customer's next bill; at the end of each 12-month period, NEG is granted to utility; *Effective 2010, customer has options for NEG: (1) grant to utility; (2) roll over from month-to-month indefinitely; or (3) receive financial compensation from the utility; RECs remain with the customer-generator. However, if customer chooses to receive financial compensation for NEG, the utility is granted the RECs associated with the NEG purchased*
- Not available to feed-in tariff participants

Tax Incentives

- State
 - Property Tax Exemption ¹
 - Effective 1999-2016
 - 100% for solar system, 75% for pipes, ducts and dual-use equipment
 - 100% of interest paid on loan for residential EE and RE equipment

Loan Subsidies

- State – Power to allow RE and EE loans paid via special tax assessment delegated to local authorities
- Local
 - Property Tax Financing ¹
 - Enacted 7/21/2008
 - RE and EE loans paid via special tax assessment, which remains with the property regardless of owner (power delegated by State)
 - Terms vary by city or county
 - Selected regions: City of Berkeley, *City of Palm Desert*, *Sonoma County*
 - Utility Loan Program ¹
 - 100% financing for PV by Sacramento Municipal Utility District (SMUD)

Other Financial Incentives

- State – None
- Local – Expedited permitting process and/or permit fee waivers in selected counties ¹

Regulatory Incentives

Renewable Portfolio Standards

- State ⁸
 - Established 2002
 - Requires electric corporations to increase procurement from eligible RE sources by at least 1% of retail sales annually, until they reach 20% by 2010; 33% by 2020 (*enacted 9/15/2009*)
 - *Proposed: Require California utilities to purchase 1% of retail sales from small renewable generators per year until California reaches a 33% RPS*
 - Non-compliance penalty: 0.05 USD/kWh up to 25M USD/yr
 - Flexible compliance, including allowances for banking excess renewable procurement and applying it to deficit years, within certain limitations
 - *Proposed: Establish a tradable renewable energy certificate (TREC) market as part of the RPS flexible compliance system*

Regulatory Incentives (continued)

Interconnection

- For FiT, must follow FERC-approved small-generator interconnection procedures if interconnecting to the transmission grid, or CPUC Rule 21 if interconnecting to the distribution grid. In all cases, the utility must respond to an interconnection request on a timely basis and without unreasonable delay.
- Not required, but PV systems <10kW qualify for net metering and “simplified interconnection,” under which no supplemental review or interconnection studies are necessary¹

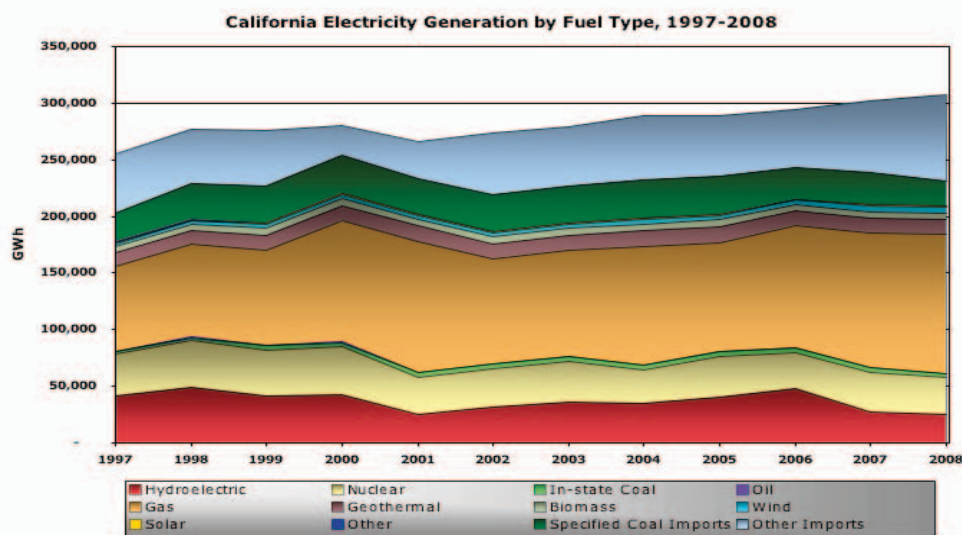
Indirect Support

Education & Outreach

- California Energy Commission’s website contains several pages (including a somewhat kid-friendly page) dedicated to facts about solar and the kinds of incentives available to people wishing to install solar systems, including a database of registered retailers and installers.

Solar Energy Policy Context

Electricity Generation by Fuel¹⁸



Source: http://energy Almanac.ca.gov/electricity/electricity_generation.html

In 2004, 10.2 percent of all electricity came from renewable resources such as wind, solar, geothermal, biomass and small hydroelectric facilities.¹⁹

Solar provided 495 GWh in 2006 (or 97.85% of US generation from solar).²⁰

Energy Subsidies

California disbursed \$771 million for 809 MW from renewable sources between 1998 and 2007, and has \$750 million allocated to renewable sources for the period 2007-2012.²¹

Public Budget for PV

\$3,350,800,000 for 2007-2017 (programs operating under SB1)

\$ 50 million are also set aside for Research, Development, Deployment and

Demonstration (RD&D) in the context of the California Solar Initiative for 2007-2016.²²

In 2006, California accounted for 60% of state tax credits for PV systems in the US or \$180 million.

Energy Efficiency Measures²³

California has aggressively pursued energy efficiency goals, which have enabled the state’s electricity consumption to remain essentially flat.

The California Public Utilities Commission has launched what it describes as “the most ambitious energy efficiency and conservation campaign in the history of the utility industry in the U.S.”. It has provided \$2 billion in funding for 2006-2008 for utilities’ energy efficiency plans.

California has incorporated building energy efficiency measures in its State Energy Code and has set energy standards for public buildings (the Green Building Action Plan): state-owned buildings are required to reduce their energy use by 20 percent by 2015 (from a 2003 baseline).

The California Energy Commission will provide up to \$26 million in low and fixed interest rate loans to schools, hospitals, and local governments for the installation of energy-saving measures or for energy audits and studies. There are also \$3 million available in similar loans for the agricultural and food processing industries to purchase proven cost-effective energy efficient and renewable emerging technologies (including PV).

Finally, California also offers a personal tax deduction on the interest paid on loans used to purchase energy efficient products or equipment for a residence in California.

Evaluation of Incentives

Category	Results	Points
PV Installed (30 points possible)	- Cumulative thru 2008 Rank: 5th out of 17 - Cumulative thru 2008 per GDP Rank: 4th out of 17 - Cumulative thru 2008 per Capita Rank: 4th out of 17 - Annual 2008 Rank: 6th out of 17 - Annual 2008 per GDP Rank: 4th out of 17 - Annual 2008 per Capita Rank: 4th out of 17	18.0
Incentives for Acquisition (25 points possible)	For all sectors: - Rebate with generous transaction caps; degression mechanisms; high program caps; able to combine with national programs; PBI or EPBB For the Residential sector: - Tax exemptions mainly based on real estate value - Authority to finance RE & EE via property tax assessments delegated to local authorities (of which few have exercised)	23.0
Incentives for Income (30 points possible)	For all sectors (except Large Industrial): - Gross (or net) FiT; short or long term; mechanism to preserve premium relative to retail, though indexed to a fluctuating source (increases uncertainty); reasonably high cap; not PV-specific in 2009; exclusive of other state incentive programs - Net Metering required for all utilities except one; exclusive of feed-in tariff	11.0
Other Financial Incentives (5 points possible)	Program for permit processing and fee waiver	0.5
RPS (7 points possible)	- No PV carve out - Non-compliance penalty - Proposed: distributed generation requirement, REC market	4.0
Interconnection (3 points possible)	- Priority connection not mandatory - Uniform standards - Expedited processing for small systems	2.5
Other Regulatory Incentives (extra credit)	None	0
Education & Outreach (extra credit)	State-supported public relations	2.0
Overall	Many points for installations and up-front incentives; fewer points for income incentive points due to lack of a PV-specific rate in feed-in tariff for 2009	61.0

California's suite of incentives is quite extensive: a feed-in tariff, direct capital subsidies, tax incentives, loan subsidies, net metering, education programs and a RPS. PV Capacity Installed rankings fall into the top quartile by most measurements used.

So why doesn't California have a higher score?

First, the feed-in tariff effective in 2009 does not include a PV-specific rate, which makes solar less competitive than other RE technologies, and is indexed to a volatile source which adds to uncertainty. Second, incentive design has led to sector imbalance – systems larger than 1MW are uncommon¹², and many long-term incentives (critical to the industrial sector) have a system size cap of 1MW. Third, incentives are not always properly aligned. For example, while the feed-in tariff will include a PV-specific rate in 2010, the newly enhanced RPS still does not contain a solar carve-out.

In 2009, California took steps to address some of these deficiencies, though most enhancements are not effective until 2010. Further changes are under consideration. Criticisms aside, California continues to lead the way in the U.S. market.

Endnotes

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Appendix I - PV Capacity Installed Rankings

Country	Cumulative PV Capacity Installed thru 2008 (MW)	Cumulative Rank	Annual PV Capacity Installed 2008 (MW)	Annual Rank	2008 Population (millions)	Cumulative W/Capita	Cumulative per Capita Rank	GDP 2008 (billions USD)	Cumulative W/GDP (*1M)	Cumulative per GDP Rank
Australia	104.51	10	22.02	10	21.6	4.8	7	1,013.5	103.1	7
Canada	32.72	12	6.94	13	33.3	1.0	11	1,499.6	21.8	13
China	140.00	9	40.00	8	1,327.7	0.1	15	4,327.4	32.4	12
France	179.73	7	104.50	7	62.3	2.9	9	2,867.0	62.7	10
Germany	5,444.00	1	1,650.00	2	82.1	66.3	2	3,673.1	1,482.1	2
Greece	18.50	14	9.33	12	11.1	1.7	10	357.5	51.7	11
India	160.00	8	28.00	9	1,186.3	0.1	14	1,206.7	132.6	6
Israel	3.03	15	1.21	15	7.1	0.4	12	202.1	15.0	14
Italy	458.30	6	338.10	3	59.3	7.7	5	2,313.9	198.1	5
Japan	2,144.19	3	225.30	5	127.7	16.8	3	4,910.7	436.6	3
Poland	1.01	16	0.37	16	38.1	0.0	16	527.9	1.9	16
Russia	0.15	17	Unknown	17	142.0	0.0	17	1,676.6	0.1	17
Spain	3,354.00	2	2,661.00	1	45.6	73.5	1	1,602.0	2,093.7	1
Switzerland	47.90	11	11.70	11	7.3	6.6	6	500.3	95.8	8
United Kingdom	22.51	13	4.42	14	61.3	0.4	13	2,680.0	8.4	15
United States	1,168.50	4	338.00	4	304.4	3.8	8	14,441.4	80.9	9
California	488.00	5	182.00	6	36.8	13.3	4	1,846.8	264.2	4

Sources:

For cumulative and annual PV Capacity Installed: see individual Country Reports

For national GDP and population: International Monetary Fund, World Economic Outlook Database, October 2009

For California GDP and population: Bureau of Economic Analysis, US Department of Commerce, <http://www.bea.gov/regional/gsp/action.cfm>

	Cumulative as of 31 December 2008			Annual for 2008			Total Points for PV Capacity Installed
	MW Installed	Per GDP	Per Capita	MW Installed	Per GDP	Per Capita	
Australia	3.5	0.5	0.5	2.0	0.5	0.5	7.5
Canada	2.5	-	-	-	-	-	2.5
China	3.5	-	-	3.0	-	-	6.5
France	4.0	-	0.5	5.0	1.0	0.5	11.0
Germany	10.0	2.5	2.5	10.0	2.5	2.5	30.0
Greece	1.5	-	0.5	-	0.5	0.5	3.0
India	4.0	0.5	-	3.0	0.5	-	8.0
Israel	1.0	-	-	-	-	-	1.0
Italy	6.5	1.0	0.5	7.0	1.5	1.5	18.0
Japan	10.0	2.0	1.0	6.0	1.0	0.5	20.5
Poland	-	-	-	-	-	-	-
Russia	-	-	-	-	-	-	-
Spain	10.0	2.5	2.5	10.0	2.5	2.5	30.0
Switzerland	2.5	0.5	0.5	1.0	0.5	0.5	5.5
United Kingdom	1.5	-	-	-	-	-	1.5
United States	8.5	-	0.5	7.0	0.5	0.5	17.0
California	6.5	2.0	1.0	5.5	1.5	1.5	18.0

