SEIZING THE SOLAR SOLUTION:

Combating Climate Change through Accelerated Deployment

SOLAR POWER
MORE ENERGY
LESS CO_2

A Joint Report by the Solar Trade Associations from Around the World

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MORE ENERGY
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INTRODUCTION

Solar Energy Policy is Climate Policy

The danger of climate change threatens every nation and therefore every nation faces the daunting task of choosing how to respond. However, with this crisis comes a significant opportunity – the opportunity to change the energy direction of the entire planet.

Although countries have gathered at the 15th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties meeting to negotiate a path toward cutting emissions of greenhouse gases from fossil fuels, many countries have already chosen a guaranteed pollution-reduction policy: they are actively increasing the deployment of solar technology.

When it comes to near-term solutions on climate change, the verdict is clear. For the next 10 to 15 years, countries that want to generate pollution-free energy and enjoy the benefit of the jobs that come with renewable energy, the best option is solar energy.

By 2020, the European PV industry is ready to provide up to 12 percent of the EU electricity demand and the United States solar industry is committed to provide 15 percent of electricity, together reducing CO_2 emissions by nearly 1 billion metric tons and creating 6.3 million jobs.

Solar energy is emerging as a major power source due to its numerous environmental and economic benefits as well as its proven and reliable technologies.

We are at a crossroads in relation to our energy future, the design of which will be fundamental also to get the global economy back on track. World leaders have the choice between the path of sustainability, energy security, clean air and water, which would strengthen our economies and reduce our dependence on imported fuels or continue the inefficient business as usual.

Solar technologies are ready NOW. The technology's fuel is unlimited and the technology can be deployed fast enough to meet both increasing demand and aggressive climate goals. This can be done in a centralized and in a distributed way and at any scale, from kilowatt to megawatt. If we really want to tackle the general future of the environment, we have to acknowledge solar as a key tool in the fight against climate change.

Solar Is an Economic Engine

Renewable energies, and especially solar energy, represent an exciting opportunity to reshape the economy in a more sustainable way while generating added value and employment. Policies that favor solar energy can save billions of tons of CO_2, create thousands of jobs, draw billions in investment, and drive economies. Germany, Spain, Italy, China, India, Japan and the United States—all key to solving climate change—have all invested in solar energy and, as a result, have already created tens of thousands of jobs and paved the road to future employment in the solar sector.

While an all encompassing climate change treaty is proposed, negotiated, and worked out in detail over the next months and years, there is a step that every country in the world can take toward reducing global warming pollution and growing the economy: enact strong solar energy policies.

Solar Capacity Around the Globe

This report summarizes the surveys from industry leaders from the world's leading solar countries. The entries show how much solar capacity is currently installed, the targets that the industry associations from those countries have set for solar installation, which policies will be needed to reach the target(s), how many jobs will be created, and how much CO_2 emissions will be avoided.

Four areas to highlight are: the European Union (EU), the United States, India, and China. The EU has committed to raise the share of energy consumption provided by renewable sources to 20 percent by 2020 and the European PV industry is ready to provide up to 12 percent of the EU electricity demand by then. This will mean 5,500,000 jobs in Europe and a reduction of at least 220 million metric tons of CO_2-e per year by 2020. Europe will reach that goal if a number of conditions are created by European policy makers, national governments, including the establishment of sustainable support mechanisms such as Feed in Tariffs.

The United States has met the challenge of their European counterparts by setting a scenario for 15 percent of electricity met with 12 percent from photovoltaics and concentrating solar power (CSP) and an added 3 percent of electricity avoided by the use of solar thermal technology. This will mean 880,000 jobs in the U.S. and a reduction of at least 570 million metric tons of CO_2-e per year starting in 2020.

In no way missing the opportunity for bold targets, India will install 20 gigawatts of solar by 2020. And China is one of the countries with the largest PV potential, with a target of 20,000 MWp of cumulative capacity by 2020.

The Policies that Move the Markets – Strong Commitment for Feed-In Tariffs

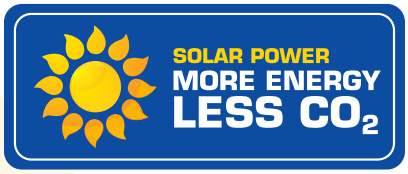
Different policies have proven their ability to trigger the solar market in different countries. In the United States, the solar investment tax credit (ITC) has been the sole driver of the American market. At the same time, in China, government procurement will be a major driver for China's solar industry ramp-up. Among other examples in the European Union, the case of Germany's optimally designed feed-in tariff can be seen as a good example of a support framework perfectly adapted to its market situation.

In order to meet the ambitious targets set by the European Union for renewable energies, the EU photovoltaic industry will continue to support adapted policy frameworks in order to reach its ambitious but realistic targets (www.setfor2020.eu). The U.S., emboldened by an eight-year expanded tax credit, has identified eight policy areas to focus on in order to raise itself up to the level of its European counterparts (www.solarbillofrights.com). The new subsidies policy in Japan restarted their solar market in 2009 and the rest of world is looking for effective models to stimulate their solar markets while contributing to the economical growth, and generate more employment in a carbon-free energy paradigm.

This report showcases the paths - in some cases accelerated - that the EU, US and other solar-friendly countries have chosen to reach their goals of growing the solar market, combating climate change, and creating jobs and economic opportunities through 2020. Besides the industry vision for accelerated EU solar growth, a number of country-specific baseline scenarios are included in an annex to this report.

Letter from the Solar Industry to the United Nations

In light of all these positive benefits from solar energy, solar trade groups from around the world have called on the Secretary General of the United Nations (UN) and the Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) to recognize the contribution that solar energy can make to the pillars of climate negotiations identified within the Bali Action Plan. These four pillars include mitigation, adaptation, technology transfer, and finance. The letter and all signatories can be found in the following pages of this report.



His Excellency Ban Ki-Moon
Secretary-General of the United Nations
The United Nations
1 United Nations Plaza
New York, New York 10017-3515 USA

His Excellency Yvo de Boer
UNFCCC Executive Secretary
Haus Carstanjen
Martin-Luther-King-Strasse 8
53175 Bonn GERMANY

December 1st, 2009

Re: The Solar Energy Industry Message to the 15th United Nations Framework Convention on Climate Change Conference of the Parties

Dear Mr. Secretary-General:
Dear Mr. Executive Secretary:

Solar energy is a key solution to reducing greenhouse gas emissions now. Leading experts estimate that a significant portion of greenhouse gas emissions could be eliminated through an accelerated deployment of solar energy. By expanding solar, nations can protect the climate as well as grow their economies and create jobs. For this reason, representatives from the solar energy sector around the world have come together in one united voice to present this message to country leaders and delegations as they strive to reach a climate agreement in Copenhagen. While countries are challenged to make a larger commitment to combat climate change, solar energy offers a concrete way forward through the following basic pillars of climate negotiations:

1. Mitigation: Solar energy is the single cleanest form of energy generation and the technology is ready now. Solar technology's fuel source is unlimited and can provide energy at any scale, from the kilowatt to megawatt.

2. Adaptation: Solar energy provides the opportunity for heating, cooling, and electricity to be generated anywhere there is sunshine, from large utility-scale power plants to distributed generation on rooftops and fields. Many types of solar electricity generation do not use water during the generation phase, and dry cooling technologies are applied in solar thermal power generation, as opposed to fossil fuels. This is a positive in light of anticipated water shortages due to climate change.

3. Technology Transfer: Solar provides the opportunity for developing countries to leapfrog traditional energy dependence on fossil fuels to producing energy with clean solar energy. Distributed solar energy is appropriate for developing rural regions as the traditional infrastructure associated with fossil fuels is unnecessary. Moreover, solar power is the best suitable option for centralized generation wherever appropriate and necessary. This also addresses the UN Millennium Challenge Goals of developing a global partnership for development and ensuring environmental sustainability.

Continued

4. Finance: Solar technology is becoming more affordable in every nation. Not only does deploying solar energy bring clean energy, but it also creates jobs. Solar can quickly transform the quality of life and economic conditions in developing countries by providing electricity, and thus access to light, communications, computers, and machines, which allow modern education, agriculture, health care, commerce, and industry. Given the scalable solutions and the solar resources around the world, these technologies can be deployed faster, with local labor, at comparable cost to traditional fuel sources.

With the right policies and support from governments, and given the rich solar resources around the world, solar energy presents a unique opportunity for all countries. As a global climate deal moves forward, we call on the Secretary General, the UNFCCC, and country delegations to recognize the contribution that solar energy can make as part of the climate negotiations.

We thank you for your work and look forward to a successful meeting in Copenhagen.

Sincerely,

Rhone Resch
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USA

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Switzerland

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Managing Director
Solar Energy Uganda, Uganda Renewable Energy Agency (UNREA)
Uganda

Cc: Ms. Liana Bratasida, Chair of the Subsidiary Body for Implementation (SBI)
Ms. Helen Plume, Chair of the Subsidiary Body for Scientific and Technological Advice (SBSTA)

Australia

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	4% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	10 MT/an (metric tons CO_2-equivalent)
Jobs Potential from PV target:	15,000 (FTE)
Solar Thermal (heating and cooling) Target	1.2% of all energy OR 5.5% of all heat from solar thermal by 2020
CO_2 Reduction Equivalent:	8.6 MT (metric tons CO_2-equivalent)
Jobs Potential from solar thermal target:	13,000 (FTE)
Economic Benefit:	AU$43,000 Million (Cash investment between now and 2020 in order to meet goal)

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

KEY POLICIES:

- **Renewable energy target, feed-in tariff**
- **18.6 MT/year CO_2 emissions avoided from solar targets**
- **28,000 new jobs created**

Growth of Solar Market in Australia: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 150 megawatts

Thermal: 2.5 million*

Cumulative Capacity needed by 2020 to meet target:

PV: 6,000megawatts

Thermal: 23 million*

*(Square meters of collector aperture area.)

Assumptions: PV: Australian electricity demand 297,000 GWh by 2020 (ABARE); 0.9 T CO_2 per MWh by 2020; 5 MWh/MWp/day; 200MWp per year on residential rooftops; 20,000 X 5 kWp schools, community buildings; 500 X 200 kWp electric car charging stations; 50 X 50 MWp regional power plants; 500 X 1 MWp warehouse roofs; 2 X 250MWp PV Flagships. Av 600 MW installed per year @ 25 jobs/MW. Av cost $5000/kW.

Thermal: 1 sq m/ person = 23 million sqm @ 600kWh/ sqm =50PJ pa. 50% solar water heaters and 50% larger industrial scale systems. Jobs = 8 X current levels. Av cost $700 per sq m.

Policies to Achieve Solar Target(s):

- Renewable Energy Target
- Carbon Pollution Reduction Scheme
- Solar Water Heater Rebates
- Mandatory installation of solar water heaters in new buildings
- Solar Flagships
- Solar Schools program
- Diesel replacement programs for off-grid and mini-grid applications
- Feed-in Tariffs
- Accelerated depreciation for business use
- Building rating schemes
- Zero net energy home targets
- Solar Research and Development support
- Training, Accreditation and Standards.

Bushlight PV System in New Bore, NT.

Photo courtesy Australia PV Association

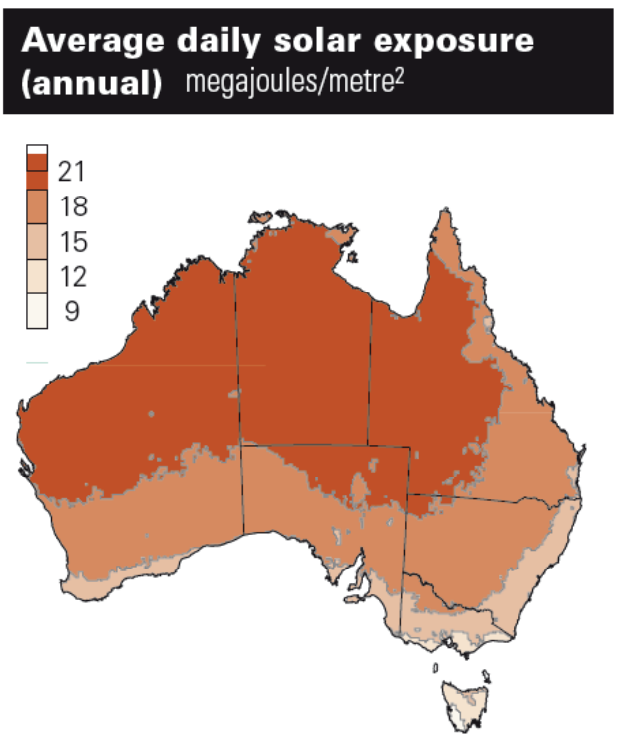
Solar PV panels on the roof of the Crown Plaza Alice Springs. Photo courtesy Sunpower.

Workers installing panels on a school. Photo courtesy Ergon Energy

Typical Australian solar water heaters.

Photo Courtesy of Australian PV Association.

Graph of Solar Potential:



Links to Helpful Documents:
www.apva.org.au/drupal-6.3/

Canada

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	10% of all new energy requirements by 2025
Solar Thermal (heating and cooling) Target	10% of all new energy requirements by 2025

Growth of Solar Market in Canada: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 33 megawatts (2008)

Thermal: 185,000*

*(Square meters of collector aperture area.)

Policies to Achieve Solar Target(s):

- National Climate Change Policy
- National Renewable Energy Program (including Solar Thermal and Solar Photovoltaics)
- Strong transmission policy
- Solar Investment tax credit
- Manufacturing tax credit
- Loan guarantee program
- Building Industry Capacity (i.e. Green Worker Training Programs)
- Provincial Feed in Tariffs Programs for PV

Graph of Solar Potential:

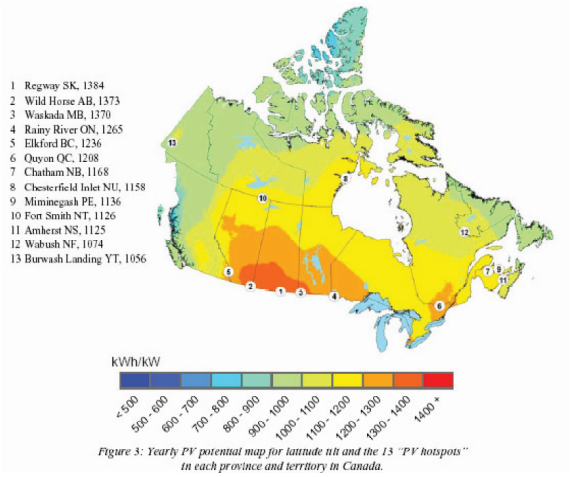


Figure 3: Yearly PV potential map for latitude tilt and the 13 "PV hotspots" in each province and territory in Canada.

KEY POINTS:

- **10% of all new energy from PV by 2025**

KEY POLICIES:

- **Climate change program, renewable energy program**
- **Provincial feed-in tariff programs welcome**

Links to Helpful Documents:

Photovoltaic Resource Map for Canada (NRCan/CanMET) - http://www.cansia.ca/Content/Documents/Document.ashx?DocId=45728

National Survey Report of PV Power Applications in Canada 2008 (NRCan, IEA PVPS) http://www.cansia.ca/Content/Documents/Document.ashx?DocId=78675

Survey of Active Solar Thermal Collectors, Industry and Markets in Canada 2007 (NRCan, SAIC) http://www.cansia.ca/Content/Documents/Document.ashx?DocId=41710
http://www.cansia.ca/

China

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	During the summit held in New York, in the USA in September 2009, President Hu Jintao promised that the proportion of non-fossil energy will be 15% of total energy consumption in China by 2020, but he did not disclose the proportion of Solar PV electricity.
CO_2 Reduction Equivalent:	unclear
Jobs Potential from PV target:	1.6 million (Calculated by annual total production value of 1.6 trillion Yuan and per capita production value of 1 million Yuan)
Economic Benefit:	**difficult to estimate and there are various opinions**

KEY POINTS:

- 1.6 million new jobs created

KEY POLICIES:

- Renewable energy law and feed-in tariff
- BIPV applications widely supported

Growth of Solar Market in China: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: In 2008, the output of solar cells in China was 1088MWp and the installation capacity was 20MWp; the total cumulative installation capacity was 200MWp by the end of the year

Cumulative Capacity needed by 2020 to meet target:

PV: some experts forecast that the installation capacity will be more than 20000 MWp by 2020

Assumptions: the Solar PV is a promising industry with great potential in many areas such as the economy, society, etc.

Policies to Achieve Solar Target(s):

- Renewable Energy Law
- Guidelines on National Mid-term and Long-term Program for Science and Technology Development. (2006-2020) (No. 44 [2005] of the State Council)
- Medium and Long Term Program of Renewable Energy Development (No. 2174[2007] of Energy Division of Reform and Development Committee)
- Interim Measures on Special Fund Management for Development of Renewable Energy (No 237 [2006] of Ministry of Finance and Ministry of Construction)

Further detail on policies:

- Government policy has been to provide assistance to solar industry participants to grow their business, provide quality products and specify and install to best practices.
- Monitoring of actual performance and reporting publicly on results
- Auditing to ensure industry best practice is being achieved.
- Demonstration projects encourage others.
- Accreditation of solar specialists to emphasis their experience and training compared to general plumbers.

A researcher of the Shanghai Institute of Electric Power installs China's first family rooftop solar power system. Photo courtesy of SNEIA.

China's first thin-film cells also served as a sound barrier in an elevated rail bridge. Photo courtesy of SNEIA.

Workers install electricity generation equipment based on new embedded rooftop BIPV technology. Photo courtesy of SNEIA.

This photo shows the eco-friendly Suntech building—China's single largest building with integrated PV installation. Photo courtesy of SNEIA.

Links to Helpful Documents:

Regulations on Accelerating Building Integrated Solar PV Applications and the Views of Implementation, MOF & MOHURD [2009] No. 128
http://www.mof.gov.cn/mof/zhengwuxinxi/caizhengwengao/2009niancaizhengbuwengao/caizhengwengao200904/200906/t20090630_173343.html

The MOF Notice Regarding Issuance of Interim Measures on Financial Subsidies for Building Integrated Solar PV Applications ,MOF Construction [2009] No. 129
http://jjs.mof.gov.cn/jinjijianshesi/zhengwuxinxi/zhengcefagui/200903/t20090326_126489.html

Notice of Implementing Golden Sun Demonstration Project, MOF, Science and Technology Ministry and NEB [2009] No. 397
http://sx.mof.gov.cn/bennyzhu_shanxig/lanmudaohang/zhengcefagui/200907/t20090731_189197.html

www.sneia.org

P.R. China

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	0.7% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	48 million (metric tons CO_2-equivalent)
Jobs Potential from PV target:	400,000 direct and indirect jobs (FTE)
Solar Thermal (heating and cooling) Target	2.8% of energy needs from solar thermal by 2020
CO_2 Reduction Equivalent:	228 million (metric tons CO_2-equivalent)
Jobs Potential from solar thermal target:	10 million direct and indirect jobs (FTE)
Concentrating Solar Power (CSP) Target	0.1% of electricity needs from CSP by 2020
CO_2 Reduction Equivalent:	6.4 million (metric tons CO2-equivalent)
Jobs Potential from CSP target:	40,000 direct and indirect jobs (FTE)
Economic Benefit:	**$60 billion (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- 450,000 new solar jobs created
- 283,000 million metric tons CO_2-equivalent emissions avoided

KEY POLICIES:

- Renewable Energy Law, Golden Sun Demonstration Program, government subsidies

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in P.R. China: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 200 megawatts

Thermal: 125 million*

CSP: 1 megawatts

Cumulative capacity needed by 2020 to meet target:

PV: 30,000 megawatts

Thermal: 750 million*

CSP: 3,000 megawatts

Assumptions: By 2020, total energy demand in China will be 4 billion Tce, the installed power capacity will reach 1680GW, and the total electricity output will be 6500 billion kWh.

*(Square meters of collector aperture area.)

Policies to Achieve Solar Target(s):

- Renewable Energy Law of China
- Golden Sun Demonstration Program
- Executive Management Rules for Government Subsidies of PV Building Projects

Further detail on policies:

Renewable Energy Law of China
The China Renewable Energy Law was approved by the National People's Congress (NPC) Standing Committee on February 28th, 2005. The policy went into effect on January 1st, 2006 followed by a series of regulations and implementation procedures. The law requires all utilities to purchase electricity generated from renewable sources at a standard-offer fixed price. If the market price of renewable energy is greater than conventional generation, the difference will be shared among all electricity customers of that utility.

The standard-offer price for wind and biomass electricity has already been established, but the price of solar power generation hasn't been set. The current incentive structure for solar PV bases the subsidy on the size of the initial investment, with a cap on overall capacity. However, in the long-term the program will likely move towards a model in which the subsidy is based on the cost of generation, guarantees a reasonable return on project investment and declines over time. This policy will be particularly beneficial for stand-alone PV systems in remote areas.

At present, the renewable energy policy has not received enough funding to support even the currently-proposed wind and biomass projects. The central government should arrange more funding to support large-scale solar deployment in the near future.

Solar thermal projects in China do not traditionally receive any direct incentives from the government. Increased demand for hot water systems and the favorable economics and reliability of solar thermal systems have led to the widespread commercial deployment in China. Increasingly, however, both the central and local governments are requiring solar thermal systems in cities, and implementing incentives for rural users, schools and hospitals.

Basic R&D and technology commercialization programs are both important to expanding solar deployment and reducing production costs, and should include all solar technologies such as emerging PV technologies, solar thermal (including solar space heating and cooling), and concentrating solar technologies.

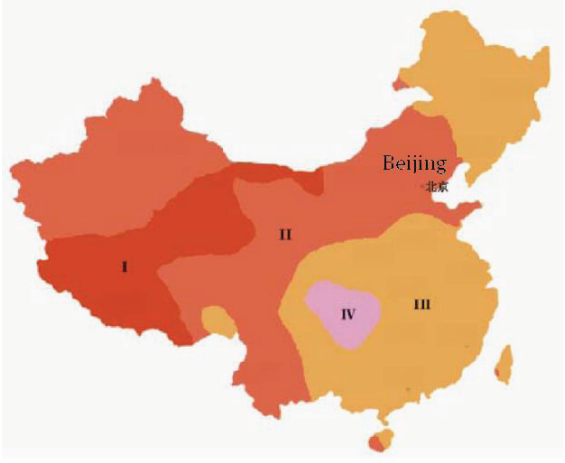
PV Building Project by MOF and MOC
On March 23 of 2009, the Executive Management Rules for Government Subsidies of PV Building Projects were issued by Ministry of Finance (MOF) and Ministry of Construction (MOC) (MOF[2009] No.129). The document establishes that building integrated PV (BIPV) projects are preferred and encouraged, and establishes a subsidy of 20Yuan/Wp. For building attached PV (BAPV), the subsidy is 15Yuan/Wp. This project is aimed to develop domestic PV market for buildings.

Nearly 600 applications were received from 30 provinces for a total capacity of 600 MW.
In October 2009, after evaluation by MOF and MOC, 111 projects were approved. The total approved capacity is 91 MW, for a total cost to the government of 1.27 billion Yuan.

Golden Sun Demonstration Program by MOF, MOST and NEA
On July 21 of 2009, the Ministry of Finance (MOF), Ministry of Science and Technology (MOST) and National Energy Administration (NEA), jointly announced the "Golden Sun Demonstration Program" (MOF [2009] No.397). The project calls for at least 600MW of PV to be installed within 3 years and at least 20MW in each province. Grid-connected solar systems will receive a 50% subsidy from the central government; off-grid projects will receive 70%. Local governments are also encouraged to provide additional support. The program includes off-grid PV, BIPV and large-scale PV. Key components such as panels, inverters, and batteries must be certified by authorized institutions, and the systems must meet the requirements issued by the National Grid Company.

MOF announced the approved project list for the Golden Sun Program in November 2009. 314 projects were approved, with over 630 MW of installed capacity. Of these projects, 261 are building-integrated with over 290 MW of capacity. Off-grid PV makes up 18 projects and just over 46 MW. The 35 approved large-scale projects will represent over 295 MW of installed capacity.

Graph of Solar Potential:



Links to Helpful Documents:
www.creia.net

This is a typical village power supply in Tibet, with an output of 50kWp. There are more than 1000 installed PV power stations for villages in China, similar to this one. Photo courtesy of CREIA.

This is 1.28MWp BIPV system at Yiwu, Zhejiang Province. There are more than 120 BIPV systems installed in China. Photo courtesy of CREIA.

This is 500kWp LS-PV at Wuwei, Gansu Province. There are eight 10MWp LS-PV plants that will be completed by the end of 2009. Photo courtesy of CREIA.

This picture shows the Dianximingzhu Hotel, in Yunnan province in China. The solar water heating system supplies hot water and space heating. Photo courtesy of CREIA.

西藏拉萨凯拉斯酒店太阳能热水

Here the Kailasi Hotel in Tibet, China uses a solar water heating system to supply hot water. Photo courtesy of CREIA.

European Union Countries, EU-27, represented by EPIA*

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	12% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	220 millions (metric tons CO_2-equivalent)
Economic Benefit:	**Cumulative EU benefits range up to 291 Billion EUR (Net present value of PV investments between now and 2020 in order to meet goal.)**

KEY POINTS:

- 12% of electricity needs from PV by 2020
- Economic benefit of 291 billion EUR

KEY POLICIES:

- building integration mandates, net metering and feed-in tariffs

Growth of PV Market in the EU: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 9583 megawatts

Cumulative Capacity needed by 2020 to meet target:

PV: 390,000 megawatts

Assumptions: Total PV electricity produced and consumed in 2020 based on SETfor2020, the EPIA report for EU27. CO_2 avoidance based on: the share of PV in the electricity consumption by 2020 in the region, the average CO_2 emissions by kWh in this region given a projected energy mix in 2020, the average CO_2 emissions embedded in PV systems. We assume that PV installations will provide electricity that would have been produced by non-renewable energy sources. We will assume that the growth of RES share will not modify the average CO_2 content of the non-renewable sources. For PV systems, IEA-PVPS Task 12 gives emissions ranging from 6g to 12g (depending on the technology) by 2025. We will consider a value of 15g / kWh. Please see www.setfor2020.eu for in depth details on the assumptions.

** European Photovoltaic Industry Association*

Policies to Achieve Solar Target(s):

- R&D and Demonstration and Deployment
- Building integration policies
- Net metering
- Policies to ensure high quality standards
- Policies for grid integration
- Education and Training Programs
- Implementation of EU Directive on Renewable Energy Sources
- Implementation of Third EU Energy Package
- Sustainable feed-in tariffs

Further detail on policies:

In order to achieve the target of 12% of electricity needs coming from PV by 2020, policies at the EU level as well as the individual Member state level are needed.

At the EU level, adequate funding mechanisms for R&D but also for demonstration and deployment of PV must be developed, with a focus on accelerated cost reduction. There must also be integrated approaches to make the necessary changes in the power distribution system. In this regard, continuous support is needed from the European Commission and Member States, in particular for the concrete implementation of the Solar Europe Industrial Initiative, announced as part of the EU Strategic Energy Technology Plan.

Also at the EU level, legislation related to the integration of on-site renewable energy sources, such as PV, in new and refurbished buildings must be improved. Action must be taken to facilitate PV integration into the building environment, as the housing sector is featured among the major GHG contributors in Europe. PV can play a key role in reducing the carbon footprint of buildings, helping to turn conventional buildings into net zero energy buildings or even energy positive buildings. Such integration, in combination with energy efficiency measures, should be strongly promoted; policies can be shaped in the framework of the EU Energy Performance of Buildings Directive. Demonstration projects such as “smart cities” that integrate solar PV energy in the urban environment across Europe should be strongly promoted as well.

Other measures at the EU level include promotion of time-of-use electricity billing and net metering to facilitate the penetration of renewable energy sources, along with ways to incentivize self-consumption and use of electrical storage. With this, policies are also needed that will facilitate PV integration into the grid, in particular via smart grids and the development of grid codes that take into account the specificity of PV generation. Demonstration projects such as virtual power plants that demonstrate the feasibility of managing distributed renewable energy sources could help with grid integration.

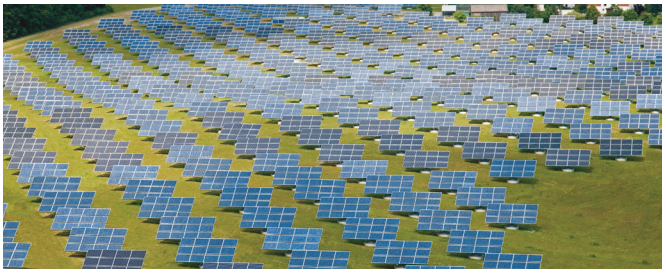
Policies that support and promote high quality European standards are also necessary. Education and training programs to deploy a skilled PV workforce are needed, too. Finally, policies that facilitate the investment in EU-based production capacities are needed, which will boost the European export potential of PV technology. Any promotion of E-mobility powered by renewables will also help to spur solar deployment.

At the individual Member State level, each Member State must implement the new EU Directive on the promotionof use of energy from Renewable Resources (RES). Renewable Energy Action plans must be developed by June 2010 by each Member State in order to reach the countries’ individual binding target and the overall EU target of 20% RES by 2020. These plans are essential to ensure the timely setting of appropriate targets and measures, thereby fostering a strong deployment of PV at the national level over the next decade. Furthermore, Member States must take measures to implement the Third Energy Package by March 2011 to enhance competition within the internal electricity market and improve its functioning. This should facilitate fair access to the grid for new entrants on the EU electricity market, such as renewable energy producers. Finally, sustainable feed-in tariffs should be developed and adopted by all Member States. Well-designed support schemes at the national level are essential to ensure an effective and continuous PV deployment.

Links to Helpful Documents:

SET FOR 2020 EPIA has released a study, SET For 2020, demonstrating how PV could become a mainstream power source in Europe by 2020. The most progressive scenario (Paradigm Shift Scenario) sets the target of up to 12% of EU´s electricity demand to be supplied by PV by 2020. More information on www.setfor2020.eu.

www.epia.org



These solar panels track the sun as it moves across the sky. Photo courtesy of Solon SE.

The Munich Airport has installed solar panels on many of its roofs. Photo courtesy of BP Solar.

Solar panels on a barn in Southern Germany. Photo courtesy of Kyocera/ Stromaufwärts.

Solar panels are shown here next to a field with sheep showing the possibility of using land for multiple purposes, not just for PV use. Photo courtesy of SolarPlus.

Solar panels are on display outside of the Vatican. Photo courtesy of SolarWorld.

EPIA is launching a PV Observatory to monitor the state of the national policy frameworks concerning Photovoltaic (PV) energy in EU 27. Within this framework, an EPIA PV Observatory Policy Report will be issued on a regular basis, providing comparative, transparent, and up-to-date information regarding current applied support mechanisms, administrative processes, and grid connection frames in order to open the PV market sustainability.

European Union Countries, EU-27, represented by ESTELA*

Solar Category	Accelerated Target
Concentrating Solar Power (CSP) Target	3% of energy needs from solar thermal electricity by 2020 (EU)
CO_2 Reduction Equivalent:	41million metric tons CO_2-equivalent (EU) 29 million metric tons CO_2 equivalent (Mediterranean Solar Plan)
Jobs Potential from CSP target:	352,000 (FTE) (EU) 235,000 (FTE) (Mediterranean Solar Plan)
Investment:	**150 billion EUR (EU)** **100 billion EUR (Mediterranean Solar Plan)**

KEY POINTS:

- 3% of energy needs from solar thermal electric by 2020
- 70 million metric tons of CO_2 equiv. reduced

KEY POLICIES:

- Strategic Energy Technology Plan for Solar Thermal Electric, feed-in tariffs

Growth of Solar Market in ESTELA: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

CSP: 184 megawatts in Spain (November 2009)

Cumulative Capacity needed by 2020 to meet target:

CSP: 30,000 megawatts (EU)
20,000 megawatts (Mediterranean Solar plan)

** European Solar Thermal Electricity Association*

Policies to Achieve Solar Target(s):

- 2009/28/EC Directive on the promotion of the use of energy from renewable sources http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF
- 2009/29/EC Directive amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:EN:PDF
- EU Strategic Energy Technology Plan (SET Plan) - Solar Thermal Electricity Initiative
- Mediterranean Solar Plan
- Feed-in Tariffs

Further detail on policies:

The EU Strategic Energy Technology (SET) Plan was created to align technology development with the main EU energy policy goals. The European Commission proposes three mechanisms to achieve an effective implementation of the SET plan:

- The European Industrial Initiatives, which will foster strategic technological alliances.
- The European Energy Research Alliance, which will strengthen European energy research capacities.
- The Trans-European Energy Networks and Systems of the Future.
- The European Commission has clearly defined the basic principles of the SET plan to be developed by the European Industrial Initiatives. These basic principles are intended to achieve the following:
- To boost the research and innovation,
- To accelerate the deployment of technology,
- To deliver progress beyond business-as-usual,
- To define and reach clear targets,
- To contribute to the political goals.

Among the six European Industrial Initiatives currently proposed, one is focused on solar energy. This Solar European Industrial Initiative embraces both the Concentrated Solar Power (CSP) and the Photovoltaic energy (PV) sector. The European Commission expects the European Industrial Initiatives to be built upon the European Technology Platforms (ETPs), at least in the preparatory phase. These ETPs have already been established for some renewable sectors, such as wind and PV, but not for solar thermal electric, as it is an emerging industrial sector. Thus, one crucial policy needed is a solar thermal electric European Technology Platform, to be incorporated into the Industrial Initiatives, and hence the SET Plan.

Mediterranean Solar Plan:

On July 13, 2008 the Heads of States for the EU and Mediterranean countries agreed to strengthen the Union for the Mediterranean, a process which began in Barcelona in 1995, and to transform this union into an area of peace, democracy, cooperation, and prosperity. The permanent Secretariat established in Barcelona will be responsible for carrying out proposed feasibility studies and elaborating on six regional projects. One of these regional projects includes the Mediterranean Solar Plan.

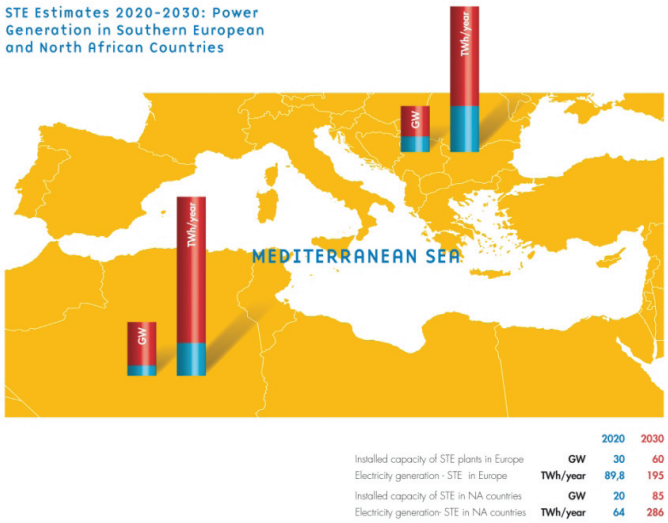
Solar energy is the main energy resource in the Mediterranean region, with one of the biggest potentials in the world. ESTELA's proposal for the Mediterranean Solar Plan could contribute to improving the security of this energy supply, as well as to meet the increasing domestic demand through renewable energy sources and to boost economic development in the Union for the Mediterranean countries. A Mediterranean Solar Plan based mainly on solar thermal electric technologies could generate new income resources and reinforce the grid infrastructure in these countries, as well as create a new regional industrial sector of solar components manufacturing.

The Mediterranean Solar Plan with solar thermal electric technologies could also contribute to the 2020renewable energy targets for EU countries. According to Article 9 (Joint projects between Member States and third-party countries) of the new RES Directive that will enter into force in 2010, EU Member States will be allowed to import energy from third-party countries.

However, the main benefit from the Mediterranean Solar Plan with solar thermal electric technologies will be the creation of a regional market for solar thermal electric, which will allow for a quicker reduction in costs, improved deployment, and reduced water consumption, thus leading to a fully competitive kWh cost for solar thermal electric plants built in 2021 and beyond.

Therefore, ESTELA proposes the creation of a managing body, called E-SECURE, that could set up long-term agreements with countries. Acting mainly as a trader, E-SECURE would buy the electricity from the companies owning the plants and sell it back to local and European markets.

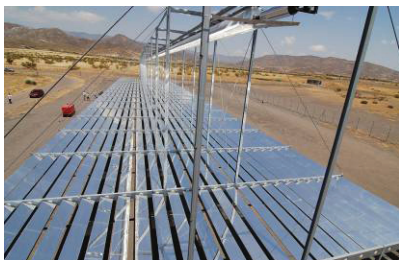
Graph of Solar Potential:



		2020	2030
Installed capacity of STE plants in Europe	GW	30	60
Electricity generation - STE in Europe	TWh/year	89,8	195
Installed capacity of STE in NA countries	GW	20	85
Electricity generation- STE in NA countries	TWh/year	64	286

The picture shows a Parabolic Trough Plant in Puertollano, Spain. This technology is the preferred technology for new plants. Photo courtesy of ESTELA.

A central receiver plant harnesses the power of the sun. This one is called PS 10 and is located in Sevilla, Spain. There are two of these types of plants in operation in Spain, one providing 10MW, the other 20MW. Photo courtesy of ESTELA.



This photo demonstrates Linear Fresnel Technology. Current demonstration projects range up to 6 MW, with larger projects under development that provide up to 150 MW of electricity. Photo courtesy of ESTELA.

This Dish Stirling System is appropriate for both utility-scale projects and stand-alone distributed energy projects. Photo courtesy of ESTELA.

Links to Helpful Documents:

The Solar Thermal Electricity Industry's Proposal for the Mediterranean Solar Plan

The Solar Thermal Electricity Industry Initiative Contributing to the European Commission "Strategic Energy Technology Plan" (SET Plan)

CSP Global Outlook 09 (Greenpeace International, SolarPACES and ESTELA)

All these documents are downloadable at www.estelasolar.eu

European Union Countries, EU-27, represented by ESTIF*

Solar Category	Accelerated Target
Solar Thermal (heating and cooling) Target	0.5% of energy needs from solar thermal by 2020
CO_2 Reduction Equivalent:	69 million metric tons per year (metric tons CO_2-equivalent) until 2020
Jobs Potential from solar thermal target:	470,000 jobs (FTE)
Economic Benefit:	**214 billion EUR (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- **69 million metric tons CO_2-equiv. reduced annually**
- **470,000 new jobs created**

KEY POLICIES:

- **solar building ordinances, financial incentive schemes, awareness campaigns**

Growth of Solar Market in ESTIF: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

Thermal: 27 million square meters in operation as of 2008, equivalent to 18.9 GWth*

Cumulative Capacity needed by 2020 to meet target:

Thermal: 388 million square meters, equivalent to 271.6 GWth*

*(Square meters of collector aperture area.)

Assumptions: For detailed calculations and assumptions, please see the study "Solar Thermal Potential in Europe": http://www.estif.org/index.php?id=546

Policies to Achieve Solar Target(s):

- Solar Building Codes
- Financial Incentive Schemes to promote the use of energy from renewable sources in heating and cooling
- Information and awareness-raising campaigns
- Standards and quality
- Training and certification of installers
- Research support

Further detail on policies:

Experience shows that support policies play a major role in kicking off the national solar thermal market growth, especially if they have long term goals, are well planned and implemented.

A coherent strategy for strong and sustained growth must take into account the local situation. It should be based on clear targets and include a comprehensive set of measures, such as: solar building codes, financial incentive schemes, information and awareness-raising campaigns, policies for standards and quality assurance, training and certification of installers, and research support. Effective support strategies must address not only one but several impediments to growth. This is why the best support strategies consist of a coherent mix of flanking measures, taking into account the local situation.

One of the most important policies for successful deployment of solar thermal technologies are solar building codes, often called solar ordinances.

** European Solar Thermal Industry Federation*

Solar ordinances are regulations requiring that solar energy provides a minimum share of the heating demand. These ordinances usually apply to either new buildings or those undergoing major refurbishment, or sometimes to a building if the heating system is being replaced.

A decade ago, the idea of making the use of solar or renewable energy compulsory sounded radical and politically unrealistic in most regions of the world. However, as 49% of Europe's energy demand is consumed in buildings, solar obligations have now been adopted or are being discussed in a number of countries, regions, and local authorities in Europe and beyond. The European Directive on the Energy Performance of Buildings (EPBD), which came into force in January 2003, requires Member States to set minimum energy performance requirements for buildings, taking also into account the positive contribution of solar thermal and other renewable energy sources. However, member states should further promote the use of renewable in existing buildings undergoing major refurbishment since they represent the major share of the building stock.

Solar obligations are probably the single most powerful tool for promoting the use of renewables in new buildings, and practical experience shows their numerous benefits.

Financial incentive schemes are also important policies. Direct grants have played an important role in the development of Europe's leading solar thermal markets such as Germany, Austria, France, and Greece.Financial Incentive Schemes can come in various forms:

- Direct grants
- Tax reductions
- Loans at reduced rates
- Green heat or energy efficiency certificates

The success of a financial incentive scheme depends mainly on the continuity as well as the design and implementation, including the flanking measures. Only a long term approach gives the right incentive to decisive market actors (installers, designers, architects, construction sector, solar thermal industry) to invest, thus creating the right conditions for a self sustained growth.

Information and awareness-raising campaigns are the third component to successful solar thermal deployment, as knowledge is the key to solar thermal acceptance. In regions where solar thermal is already widely used, awareness is very high. In Cyprus for example, a solar thermal system is to a house what a chimney is to a house in the UK – every child in each country is aware of this.

In Europe, nearly every successful support scheme has included public awareness-raising in its policy mix.

Professionals in the construction sector, including heating, ventilation and air-conditioning (HVAC) installers have also an important role to play in the market: they are the gateway to the final decision makers.

Just as important as information and awareness-raising campaigns are standards and quality. Even after the introduction of European standards, certification standards still differed among EU countries. In order to break down trade barriers and to achieve one European certification scheme for solar thermal products, the Solar Keymark was developed by ESTIF in co-operation with CEN and with the support of the European Commission. It is recognized today by most national solar thermal support schemes in Europe.

The Solar Keymark was developed with the objective of:

- Creating a common certification scheme for collectors and factory made systems in Europe, based on EN 12975 and 12976
- Increasing customers' confidence in solar products by introducing an extra quality test with EN standards on an ongoing basis.
- Accelerating the growth of the European market by breaking down trade barriers resulting from the existence of different requirements to get financial incentives in different countries

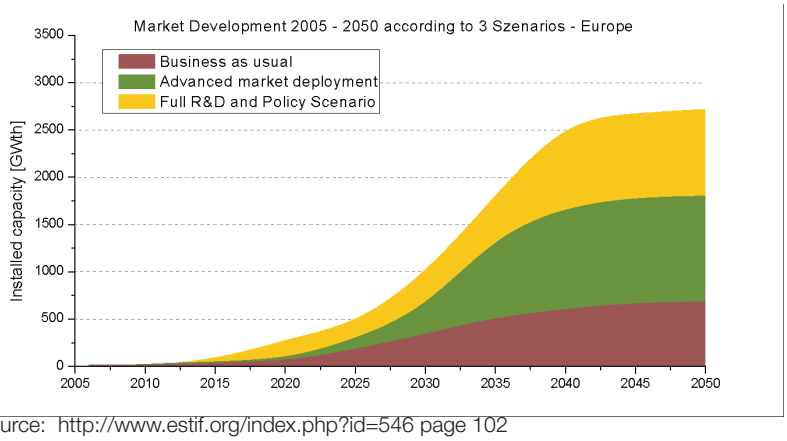
Policies that train and certify installers are also needed. In many countries, public authorities have supported the development and implementation of training courses targeted at professionals. Training helps sustain a high level of quality and plays a vital role in motivating installers to recommend solar thermal systems.

One final policy needed is support for research. Solar thermal energy has the potential to cover 50% of the total low temperature heat demand. To reach this goal, existing technologies must improve and new technologies should be developed for new sectors such as apartment buildings and the industrial sector. Research is needed for new applications like solar combi-systems using compact seasonal storage, higher temperature collectors for industrial applications (up to 250 °C), and solar cooling. The required research infrastructure is an integrated collaboration of research institutes and industry.

Overall, public support policies can be a decisive factor for growth, particularly if they have long term goals and are well planned and implemented. Stable and positive framework conditions must be created over several years to pave the way for investments in production capacities, training, marketing and distribution, and to mobilize resources for research and development.

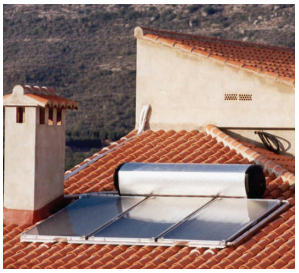
In this regard, the European Directive on the promotion of the use of Renewable Energy Sources (2009/28/EC) closes the legislative gap which had existed in this sector. For the first time, heating and cooling - responsible for nearly half of Europe's energy demand - will be covered by a European Directive promoting renewable energies. Thus the RES Directive creates a positive climate for the long-term development of solar thermal technologies in Europe.

Graph of Solar Potential:



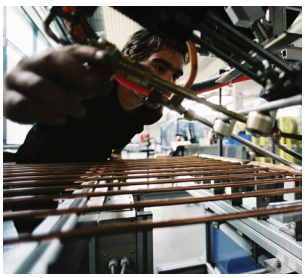
Source: http://www.estif.org/index.php?id=546 page 102

Roof-integrated flat plate collectors are shown. Photo courtesy of Wagner & Co/ESTIF.



A thermo syphon water heating system on a roof provides ample hot water. Photo courtesy of Solahart / ESTIF

A hospital in Rome uses a solar thermal system with evacuated tubes. Photo courtesy of Thermomax/ESTIF.



A worker solders an absorber tube for a solar thermal system. Photo courtesy of GREENoneTEC,

Links to Helpful Documents:

Study "Solar Thermal Potential in Europe": http://www.estif.org/index.php?id=546

Strategic Research Agenda: Solar Heating and Cooling for a Sustainable Energy Future in Europe - a Strategic Research Agenda http://esttp.org/cms/front_content.php?idcat=168

EREC Technology Roadmap 2020 http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf

www.estif.org

Benefits of a Solar Thermal Ordinance

A solar thermal ordinance...

Building the future today
- prepares the building stock to meet the post-oil and -gas era challenge. Buildings constructed today will use energy for decades to come.

Saving energy.......and the environment - an equivalent of approximately 12 million tons of oil or 39 million tons of CO_2 emissions are saved if 50% of Europe's hot water demand is met by solar energy.

Right from the beginning
- integrates solar thermal into buildings at the design stage or when the heating system is changed.

Owners build, tenants save
- lowers energy costs for tenants too. A STO ensures that renewables are also used when the energy bill is paid by the tenant who cannot decide on the building's heating system.

Promoting solar thermal
- a stable market share generates investments throughout the whole supply chain, resulting in economies of scale and greater use of solar energy.

Stimulating the economy - planning and installation form a major part of the solar thermal value chain, creating jobs and boosting the local economy.

Minimal impact on public finances - very little administrative overhead and public funds commitment.

India

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	1-1.5 GW of solar power by 2012; 20 GW by 2020
CO_2 Reduction Equivalent:	42 million tons of CO_2 by 2012

KEY POINTS:

- 20 GW of solar power by 2020
- Solar energy main focus for energy transformation

KEY POLICIES:

- Subsidies, soft loans, low import tariffs

Growth of Solar Market in India: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 112 MW, 97.3% off-grid

Assumptions: For more information on the CO_2 reduction equivalent, please see: http://www.pv-tech.org/news/_a/indias_national_solar_plan_under_debate/ For information on current installed capacity, please see the Global Greens Report.

Policies to Achieve Solar Target(s):

- Subsidies
- Soft loans
- Concessional duty on raw material imports
- Excise duty exemption on certain devices/systems
- 80% accelerated depreciation
- Low import tariffs for many raw materials and components

Further detail on policies:

In 2008, India's Prime Minister announced that solar energy would be the main focus for the energy transformation of the country. The India Renewable Development Agency and the Ministry of Non-Conventional Energy Source are devising programs to have solar energy in more the three million Indian households in the next few years. With the International Energy Agency's predictions of 27GW of solar energy produced in 2020, India's targeted solar production will account for roughly three-quarters of the world's solar production if targets are met.

India plans to invest around $20 billion dollars into solar energy over the next 30 years1. To achieve this large solar energy target of 20 GW, India will likely look to developed countries for technological and financial assistance in order to make the target viable. The Indian government is currently proposing significant financial subsidies to utilities and individuals who install solar infrastructure and mandating that all government buildings install solar systems. The government also plans to include a system for purchasing surplus energy put on the grid from residential solar systems.

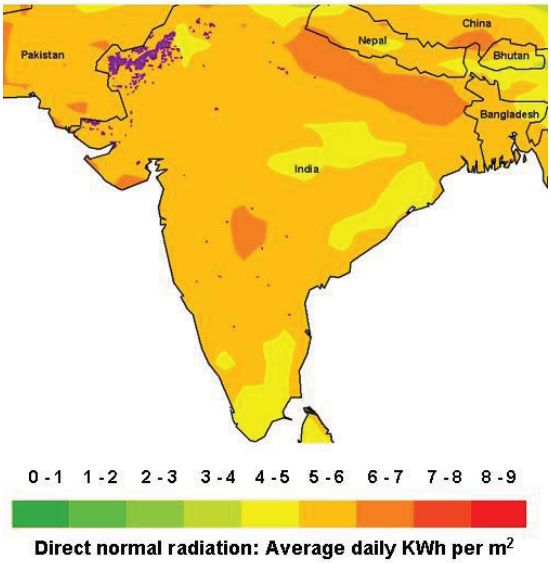
With the majority of India's population lacking access to electricity, investing in the country's grid will require significant funding from both the public and private sector. The Indian government sees solar energy as an excellent energy source to meet the country's rising energy demands and provide electricity to areas lacking access to a national grid.

A woman stands next to a solar panel. Photo courtesy of Greenpeace.

Two men hold up a solar panel. Photo courtesy of Worldwatch.

Graph of Solar Potential:

The dark purple areas are highly suitable for low-cost deployment of solar thermal power



Links to Helpful Documents:
Solar India Online: www.solarindiaonline.com

[1] http://www.businessgreen.com/business-green/news/2253722/india-approves-20bn-solar-plan

New Zealand

Solar Category	Solar Category
Solar Photovoltaic (PV) Target:	5% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	1922 kt CO_2-e per year by 2020
Jobs Potential from PV target:	1370 (FTE) by 2020
Economic Benefit:	**NZD 7.7 billion (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- 5% electricity needs from PV by 2020
- 1922 kt CO_2-e emissions reduced each year by 2020
- 1370 new solar jobs created

KEY POLICIES:

- Cap and trade legislation, net metering, feed-in tariffs

Growth of Solar Market in New Zealand: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 5.5 MWp (estimate, currently no data collection in place)

Cumulative Capacity needed by 2020 to meet target:

PV: 1830 MWp

Assumptions: Solar energy displaces remaining coal and some gas from the current mix to come to 85% renewables by 2020. The costs for installed PV reduce by 5% each year while the amount of installed capacity added doubles each year. Used the MED Energy Outlook 2009 Reference Scenario for expected energy demand.

Policies to Achieve Solar Target(s):

The New Zealand Government currently has no policies in place to help enable or incentivize Solar electric generation. PV Solar is not featured in the New Zealand Energy Outlook 2009 Reference Scenario by the Ministry of Economic Development.

The following policies are suggested to enable deployment of PV and to achieve the Solar PV Target:

- Climate Change Legislation
- National Net Billing Standard and uniform Connection Policy
- Renewable Energy Payments (Feed-in Tariff)
- Solar Investment Tax Credit and Government Loans
- Green Worker Training Programs

Further detail on policies:

There are several key policies that should be put in place to help deploy solar energy in New Zealand. Cap and trade legislation would incentivize low carbon technologies and maximize deployment of solar. PV Solar provides a direct measurable and auditable means for carbon offsets, and legislation governing carbon trading should allow participants to make use of these offsets from PV Solar generation.

Net billing allows consumers and businesses to generate electricity at their homes or business, e.g. with PV modules on their roof (also referred to as “distributed generation”). This electricity can be used to offset electricity purchased from the grid. Currently, no government programs mandating net billing contracts are in place. SEANZ supports the immediate introduction of a national uniform standard for net billing at full retail electricity rates and a national uniform standard for a grid connection procedure for distributed generation.

In overseas markets, Feed-in Tariffs or Renewable Energy Payments (REP) have proven to be the single most effective policy for rapid deployment of PV solar. Net metering should be followed by a REP market scheme as soon as possible to achieve the set PV targets. An effective New Zealand REP market scheme requires four main components in legislation:

- Electricity providers are obliged to buy PV generated electricity at a government set rate above market prices
- Electricity providers are permitted to spread the cost for the REP over their total electricity sales
- The REP must be applied to the total electricity generated from the renewable source
- The Scheme must be such so it provides long term certainty to investors

Solar Investment Tax Credits should be made available to home and business owners that invest in generation capacity. Government loans at below market rates will allow a larger portion of the population to make investment in generation capacity and benefit from Net Metering or REP schemes.

To achieve the PV Solar target, Green Worker training programs will be required to ensure a competent work force and sufficient number of installers. Funds must be made available for industry training and accreditation and training options must be provided for persons wanting to make a career in the PV industry. A portion of the funds currently set aside for job creation should be labeled for Green Worker training programs.

A PV Solar array provides Motuora Island with electric power. Photo courtesy of SEANZ.

The Auckland Airport has a grid-connected PV Solar system. Photo courtesy of SEANZ.

A grid-connected PV Solar array on the roof of a rural property is shown here. Photo courtesy of SEANZ.

Links to Helpful Documents:
New Zealand Energy Quarterly: www.med.govt.nz/energy/nzeq/

New Zealand’s Energy Outlook 2009 Reference Scenario: www.med.govt.nz/energyoutlook
http://www.seanz.org.nz/

New Zealand

Solar Category	Accelerated Target
Solar Thermal (heating and cooling) Target	50% of new housing has solar water heating (SWH) by 2020. The target to reduce electricity by displacement is 280 GWh pa.
CO_2 Reduction Equivalent:	175,000metric tons CO_2-equivalent
Jobs Potential from solar thermal target:	2400 FTE

Growth of Solar/Themal Market in New Zealand: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

Thermal: 130,000 m2 of collector aperture area

Cumulative Capacity needed by 2020 to meet target:

Thermal: 400,000 m2 of collector aperture area

KEY POINTS:

- **175,000 metric tons CO_2-equivalent emissions avoided**
- **2,400 new solar jobs created**

KEY POLICIES:

- **Support for individual businesses, worker training, interest free loan schemes**

Policies to Achieve Solar Target(s):

- Generic industry promotion
- Assistance to individual SWH business
- Industry standards
- Supply and installation training
- Demonstration and reference projects
- Interest free loan schemes linked to municipality property taxes
- System energy performance calculation
- Listing of Complying SWH Systems by heat capacity and energy performance
- Scheme for Accreditation for Supply and Installation of SWH Systems

Further detail on policies:

- Government policy has been to provide assistance to solar industry participants to grow their business, provide quality products and specify and install to best practices.
- Monitoring of actual performance and reporting publicly on results
- Auditing to ensure industry best practice is being achieved.
- Demonstration projects encourage others.
- Accreditation of solar specialists to emphasis their experience and training compared to general plumbers.

A solar thermal system on the roof provides hot water for this family. Photo courtesy of Solar Industries Association, NZ.

Links to Helpful Documents:
www.solarindustries.org.nz

Sunbelt Countries*

represented by EPIA

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	8.6% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	400 million (metric tons CO_2-equivalent)
Economic Benefit:	**Low 397 billion EUR/High 655 billion EUR (Cash investment between now and 2020 in order to meet goal)**

Growth of PV Market in Sunbelt Countries: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 245 megawatts

Cumulative Capacity needed by 2020 to meet target:

PV: 580,000 megawatts

Policies to Achieve Solar Target(s):

- Keep informed and updated on PV dynamics in terms of cost/performance development and market potential
- Integrate PV in energy plan and mix taking all PV benefits into account
- Set-up sustainable support schemes and de-bottleneck administrative procedures
- Plan grid investments and upgrades (smart-grid, storage capabilities)
- Develop partnerships with private sector, utilities, and research community and business organizations
- Develop trainings and education programs to supply the required skill force

KEY POINTS:

- 400 million metric tons of CO_2-equivalent emissions avoided
- 8.6% of electricity needs from PV by 2020
- 8.2 million jobs created

KEY POLICIES:

- integration of PV into energy plans, investment support, education and training programs

Assumptions: Total PV electricity produced and consumed in 2020 based on EPIA, ASIF and ARE report, commissioned to A.T. Kearney, on the potential for Sunbelt Countries. CO_2 avoidance based on: the share of PV in the electricity consumption by 2020 in the region, the average CO_2 emissions by kWh in those regions given a projected energy mix in 2020 and the average CO_2 emissions embedded in PV systems. The energy mix in the Sunbelt countries is based on 2006 numbers for the following countries (Representing in 2006 92% of the electricity production in those countries (5931 TWh /6430 TWh)): China, India, Brazil, Iran, Saudi Arabia, Thailand, Indonesia, Egypt, Venezuela, Argentina, Malaysia, South Africa and Mexico.

The average energy mix was computed in those countries for 2006 and balanced with regard to the electricity production.

Please contact EPIA or ARE for more information.

Links to Helpful Documents:
Please see www.edia.org for more details.

** Cambodia, Senegal, Nepal, Tanzania, Angola, Botswana, Ethiopia, Namibia, Cameroon, Sudan, Republic of Yemen, Kenya, Jamaica, Guatemala, Ghana, Costa Rica, Sri Lanka, Zambia, Lebanon, Mozambique, Ecuador, Jordan, Tunisia, Dominican Republic, Qatar, Nigeria, Morocco, Libya, Bangladesh, Peru, Syrian Arab Republic, Algeria, Colombia, Kuwait, Philippines, Vietnam, Chile, United Arab Emirates, Pakistan, Venezuela, Malaysia, Egypt, Argentina, Indonesia, Thailand, Iran, Saudi Arabia, Mexico, South Africa, Brazil, India, China, Chad, Somalia, Mali, Uganda, Madagascar, Afghanistan, Ivory Coast, Myanmar, Democratic Republic of Congo, Cuba, Iraq*

SWISSOLAR Switzerland

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	12% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	3.8 million (metric tons CO_2-equivalent)
Jobs Potential from PV target:	20,000 (FTE)*
Solar Thermal (heating and cooling) Target	1.4% of energy needs from solar thermal by 2020
CO_2 Reduction Equivalent:	1 million (metric tons CO_2-equivalent)
Jobs Potential from solar thermal target:	3,000 (FTE)*
Economic Benefit:	**$37 billion (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- **4.8 million metric tons of CO_2-equivalent emissions avoided**
- **23,000 new solar jobs created**

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in Switzerland: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 44 megawatts

Thermal: 600,000*

Cumulative Capacity needed by 2020 to meet target:

Thermal: 7.7 million*

*(Square meters of collector aperture area.)

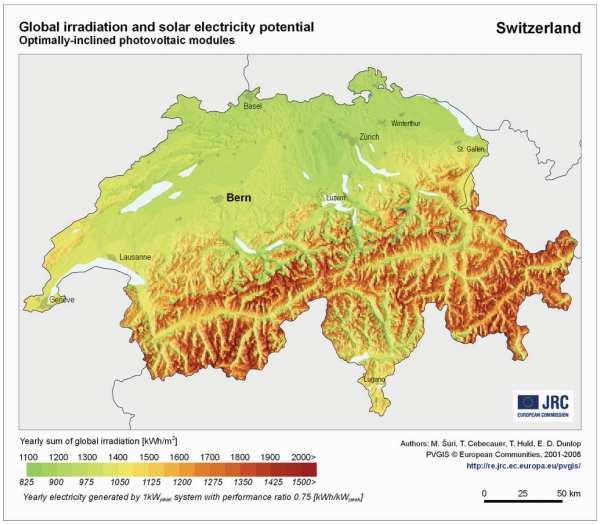
Assumptions: Total end energy usage: 250 TWh
Only warm water and space heating usage: 101.5 TWh
7.7 Mio. m2 collectors à 450 kWh annual yield: 3.5 TWh
replace 346'500'000 l oil
X 2.6: 900'900'000 kg CO_2

A solar hot water system is installed on a multifamily house in Zurich. Photo courtesy of Cobra.

The façade of this house in St.Moritz displays a PV system. Photo courtesy of Swissolar.

A multifamily "plus-energy"-house in Bennau has a PV installation on the roof and thermal collectors on the facade. Photo courtesy of Swissolar.

Graph of Solar Potential:



Links to Helpful Documents:
Swiss Solar Systems: http://www.3-s.ch/
www.swissolar.ch

United States of America

Solar Category	Accelerated Target
Solar Photovoltaic (PV) Target:	10% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	380 metric tons CO_2-equivalent per year by 2020
Jobs Potential from PV target:	676,000 direct and indirect jobs (FTE)[1]
Solar Thermal (heating and cooling) Target	3% of energy needs from solar thermal by 2020
CO_2 Reduction Equivalent:	114 metric tons CO_2-equivalent per year by 2020
Jobs Potential from solar thermal target:	139,000 direct and indirect jobs (FTE)
Concentrating Solar Power (CSP) Target	2% of load displaced by CSP by 2020
CO_2 Reduction Equivalent:	76 metric tons CO_2-equivalent per year by 2020
Jobs Potential from CSP target:	67,000 direct and indirect jobs (FTE)
Economic Benefit:	**$1,100 billion gross investment (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- 570 million metric tons CO_2-equivalent emissions avoided
- 882,000 new solar jobs created

KEY POLICIES:

- Comprehensive global warming legislation, RPS, transmission, net metering, ITC, MTC

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in USA: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 1,500 megawatts

Thermal: 1 million square meters*

CSP: 424 megawatts

Cumulative Capacity needed by 2020 to meet target:

PV: 350,000 megawatts

Thermal: 70 million square meters*

CSP: 50,000 megawatts

Assumptions: Electricity demand is assumed to follow the projection from the Energy Information Administration's (EIA) 2009 Annual Energy Outlook (AEO) updated reference case. Solar thermal technologies (water heating, space heating and space cooling) are assumed to displace electricity demand otherwise used for those services.

Energy from solar sources displaces natural gas and coal only. The fraction of coal displaced increases as solar penetration increases. For every 1% of solar penetration the fraction of coal displaced increases 5% as shown in the reference case in "The solar photovoltaics wedge: pathways for growth and potential carbon mitigation in the US".

This scenario depicts rapid scale-up and wide geographic distribution of solar energy capacity. Wide distribution enhances grid stability and reduces (but does not eliminate) the need for new transmission capacity.

Policies to Achieve Solar Target(s):

- Global Warming Legislation
- Federal renewable energy standard/ renewable portfolio standard
- Strong transmission policy
- Strong interconnection policy
- Net Metering Standards
- Solar Investment tax credit
- Manufacturing tax credit
- Loan guarantee program
- Federal Treasury Grant Program
- Green Worker Training Programs
- State Incentive programs

Further detail on policies:

As part of a comprehensive energy bill, Congress should enact cap and trade legislation, a federal renewable energy standard, strong transmission and interconnection policy, net metering standards, and green worker training programs. These policies and programs are crucial in achieving the above listed solar targets and CO_2 reductions for all solar technologies.

Cap and trade legislation should reduce carbon emissions while maximizing deployment of solar through all sectors of the economy. Each aspect of such legislation (auction revenues, allowance set-asides, new entrants or output-based standards) should contain solar-specific provisions to recognize solar energy's public benefits and facilitate massive and immediate deployment of solar generating assets.

A federal renewable energy standard would require retail electricity providers to supply a minimum percentage of their electricity from renewable sources, such as solar, wind, and geothermal. The federal standard would defer to more aggressive state mandates. All solar thermal technologies (e.g., hot water, space heating and cooling) would qualify.

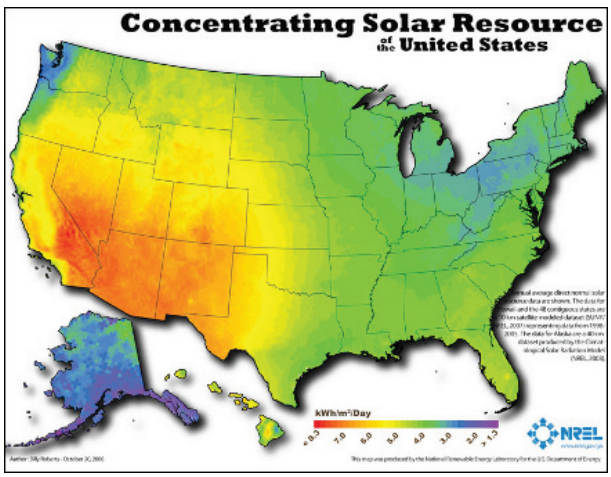
Access to high-voltage transmission lines is key for the development of concentrating solar power (CSP) projects, as transmission lines are what move the power from where the electricity is generated to where it is consumed. However, much of the existing transmission infrastructure in the Southwest United States is full to capacity. Congress should pass comprehensive legislation on this issue and promote Federal Energy Regulatory Commission (FERC) policies that result in rapid construction of new transmission lines necessary to deliver renewable energy to customers, incorporating superconducting and smart-grid technology.

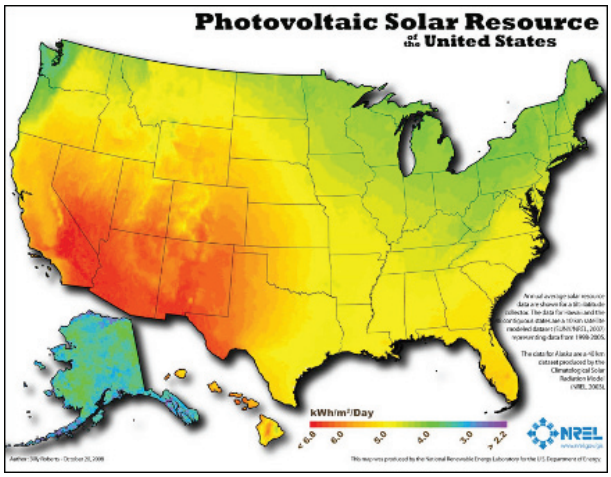
Net metering programs allow consumers to generate electricity at their homes and businesses, for example from solar panels on their roof. This electricity can be used to offset electricity purchased from the grid. Nearly forty states plus the District of Columbia have net metering programs in place, though the size and scope of these programs vary widely. SEIA supports a single national standard for net metering at full retail rates, as well as uniform federal standards for interconnection.

Green worker training programs are also needed to expand the US domestic solar energy industry. In the 2007 energy bill, Congress authorized $125 million for "green workforce training." Congress should pass an appropriation for the full authorization amount.

In addition, continued support for the investment tax credit and manufacturing tax credit, along with the loan guarantee program and treasury grant program, are required to achieve the solar targets set for the United States. The continuation of strong state incentives and solar programs are also necessary to achieve this accelerated deployment of solar energy.
These policy items can all be found in the Solar Bill of Rights, www.solarbillofrights.org

Graph of Solar Potential:





Solar PV panels collect the sunlight and produce electricity on a home in the U.S. Photo courtesy of Velux.

Workers install PV panels on a rooftop. Photo courtesy of DOE/NREL.

This photo features a field of panels in the desert. Photo courtesy of SEIA.

A worker mounts a solar water heating system to a roof. This photo showcases evacuated tube technology. Photo courtesy of SEIA.

Links to Helpful Documents:
www.seia.org/cs/2008_year_in_review_requester_information
http://www.seia.org/galleries/pdf/2008_Year_in_Review-small.pdf
www.seia.org
www.solarbillofrights.org

On October 8, 2009, SEIA released the results of a poll that showed that a vast majority of Americans, across all political parties, overwhelmingly support development and funding of solar energy, and their support for solar has remained consistent over the last year. These and other findings were reported in the 2009 SCHOTT Solar Barometer, a nationally representative survey conducted by independent polling firm Kelton Research. The survey found that 92 percent of Americans think it is important for the U.S. to develop and use solar energy. Furthermore, close to eight in 10 (77%) Americans feel that the development of solar power, and other renewable energy sources, should be a major priority of the federal government, including the financial support needed. The poll also showed that if they had to choose one energy source to financially support if they were President, 43 percent of Americans would opt for solar over other sources such as wind (17%), natural gas (12%) and nuclear (10%)

France

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	1% of electricity needs from PV by 2020
Jobs Potential from PV target:	60,000 (FTE)
Solar Thermal (heating and cooling) Target	from 0.3 to 0.6% of energy needs from solar thermal by 2020
Jobs Potential from solar thermal target:	38,000 (FTE)

KEY POINTS:

- 1% of electricity needs from PV by 2020
- Potential 21,200,000 m² of solar thermal collector aperture area by 2020

KEY POLICIES:

- national environmental laws, feed-in tariff

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in France: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 400 megawatts (expected total end of 2009)

Thermal: 1,880,000* (total end of 2008)

Cumulative Capacity needed by 2020 to meet target:

PV: 5,400 megawatts

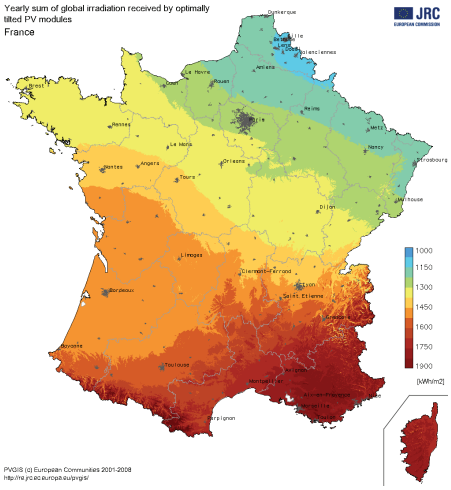
Thermal: 14,000,000* (or 927 ktoe, target by Grenelle de l'environnement)

*(Square meters of collector aperture area.)

Policies to Achieve Solar Target(s):

- Policies to Achieve Solar Target(s):
- Laws from “Grenelle de l’environnement”
- FIT for PV production
- Tax credit for individuals
- “Fonds chaleur”: this is a subsidy scheme for collective heating installations based on renewable energy

Graph of Solar Potential:



BIPV installation is shown. Photo courtesy of Enerplan.

A large solar thermal installation is shown on the roof in France. Photo courtsy of Enerplan.

In 2008, Enerplan published a study on the PV market which found that the potential cumulated capacity for PV on building roofs could be 13.4 GWc by 2020.

The potential for solar thermal, with the same assumptions on building roofs as PV, could result in a total of approximately 21,200,000 m² solar thermal collector aperture area by 2020.

Links to Helpful Documents:
www.enerplan.asso.fr

Report of “Grenelle de l’environnement”:
http://www.legrenelle-environnement.gouv.fr/grenelle-environnement/IMG/pdf/rapport_final_comop_10.pdf

Germany

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	7% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	30 Million (metric tons CO_2-equivalent)
Jobs Potential from PV target:	100,000 (FTE*)
Solar Thermal (heating and cooling) Target	4.5% (in buildings) of energy needs from solar thermal by 2020
CO_2 Reduction Equivalent:	16 Million (metric tons CO_2-equivalent)
Jobs Potential from solar thermal target:	50,000 (FTE*)

KEY POINTS:

- **46 million metric tons of CO_2 avoided from solar target**
- **150,000 new jobs created**

KEY POLICIES:

- **feed-in tariff, renewable energy standard, solar building obligations**

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in Germany: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 8,000 megawatts

Thermal: 13 million*

Cumulative Capacity needed by 2020 to meet target:

PV: 39,500 megawatts

Thermal: 60 million*

*(Square meters of collector aperture area.)

Assumptions:
Electricity Sector: Reduction of overall electricity need of 0.35% per year, oil price $200 per barrel, and price increase for natural gas, coal and uranium

Heat: Reduction of 17% in the overall heat demand, price decrease for solar thermal systems of 66% compared to the year 1990.

Policies to Achieve Solar Target(s):

- RES Priority Principle, priority and free access to grids (for electricity & heating)
- Smart grid policies
- Investment security for solar investments (PV: FIT legislation, ST: Market Incentive Program)
- Solar building obligations
- High energy standards for new and refurbished buildings
- Maintenance of special financial incentives for solar thermal technologies.
- Incentives for the exchange & phase out of conventional, highly inefficient heating systems (e.g. strict emission standards)

Further detail on policies:

Germany has seen one of the strongest increases in the use of electricity from renewable energy sources in the world. Thanks to the innovative Renewable Energy Sources Act (FIT) the share of renewable electricity in Germany has increased from 4.8 to 15.1 percent between 2000 and 2008, of which close to 1% was made up by solar PV in 2009. The solar heating sector has grown continuously as well due to favorable support programs. Such policies are crucial in achieving the above listed solar targets and CO_2 reductions in the future and must be maintained and continuously improved.

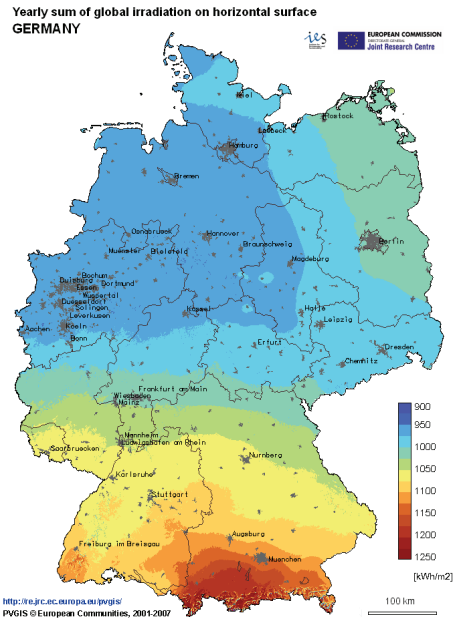
Since renewables will play an important role in mitigating climate change and reaching ambitious climate targets, the integration of large quantities of RES electricity into the public grid needs to be insured. Policies establishing regulations to leverage smart grid developments by ensuring priority connection and transmission of RES electricity need to be established and improved. Innovative concepts supporting auto-consumption, storage and balancing grid loads with intelligent networks and incentive schemes will play an important role. Also, free access to grid systems is crucial for solar thermal heating, which should be connected to district heating systems.

The heating sector has a vast potential for reducing CO_2 emissions by using alternative solutions to provide domestic hot water, space heating and cooling, and air-conditioning. Since most of the potential in these areas is still untapped, appropriate policies and financial incentives are the fastest way to introduce and invest into clean technologies such as solar thermal. Incentives aim at providing a level playing field in a sector where conventional energy sources are highly subsidized. Supporting renewables, however, aims at kick-starting the development of these sources in order to achieve competitiveness with other energy sources. Therefore, the market incentive program, which has led to a good development of solar thermal in Germany, must be maintained and strengthened.

In the building sector, low energy buildings can easily meet a large percentage of energy needs with renewables energies, particularly solar. Therefore it is crucial that energy efficiency standards are high in order to make solar the most efficient way of heating and cooling and energy production. Solar building obligations, which are already in place for newly created buildings, should also apply to the existing building stock in case of major renovations or when the need to exchange a heating system arises. Such policies need to be enacted by all the different states in Germany.

When replacing a conventional heating system, most home owners only install solar thermal systems. Therefore an increase in emission standards might create incentives to replace many of the very old, inefficient heating systems currently used in many houses throughout Germany.

Graph of Solar Potential:



Source: http://www.estif.org/index.php?id=546 page 102

Image: BSW-Solar/ Suntechnics

Links to Helpful Documents:

BSW-Solar: http://www.solarwirtschaft.de/

PV-Market Germany: http://en.solarwirtschaft.de/home/photovoltaic-market/german-market.html

ST-Market Germany: http://en.solarwirtschaft.de/home/solar-thermal-market/german-market.html?L=0

Renewable Energies in Germany: http://www.bee-ev.de/Publikationen/Publikationen.php

European Union New Member States

Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia*

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	12% of electricity needs from PV by 2020, as part of EU-27
Jobs Potential from PV target:	200,000 direct and indirect jobs

KEY POINTS:

- **200,000 new solar jobs created**
- **12% of electricity needs from PV by 2020, as part of EU-27**

KEY POLICIES:

- **RES Directive, feed-in tariffs, tax incentives**

Growth of Solar Market in EU New Member States: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 62,699 kW

Assumptions:

Please see the report "The Status of PV 2008 in the European Union New Member States" for more information. http://www.pv-nms.net/pvnms/web/files/NMS2008.pdf

Policies to Achieve Solar Target(s):

- Renewable Energy Sources (RES) Directive
- Strong feed-in tariff system
- Stable solar policy
- Tax incentives
- Quota system
- Preferential loans
- Net Metering Standards
- Federal Treasury Grant Program
- Green loans for small investments

Further detail on policies:

The new Renewable Energy Directive replacing the existing measures was adopted in December 2008. It is the next highly important step towards a low carbon economy. The new RES Directive seems to be a historical piece of legislation as it pushes further RES power development to an unprecedented scale. Under provisions of the Directive each member state has a legally binding obligation to increase its share of renewables by 5.5% from 2005 levels, with the remaining increase calculated on the basis of gross domestic product (GDP) per capita. EU's total renewables share is to rise from 8.5% of the bloc's energy mix today to 20%. By June 2010 each Member State must submit a National Renewable Action Plan (NRAP) detailing plans (indicative trajectory) to meet its 2020 targets. This Renewable Energy Directive and the National Renewable Action Plans are important for encouraging investment and deployment of PV.

Moreover, the EU requires that all member states adopt a minimum level for the use of energy from renewable sources in buildings. Thus, integrating PV in buildings will be important for meeting these levels. New construction project shall include state guidelines for installations of renewable technologies.

The European Commission, in cooperation with stakeholder representatives, undertook measures oriented at development of renewable energy sources. The Seventh Framework Program for Research and Technological Development provides the main instrument for the funding of research, which is crucial to further PV development in the EU.

In November 2007, the European Commission also put forward a

**With a special alternative for Croatia and Turkey.*

European Strategic Energy Technology Plan (SET-plan), designed to improve and speed up the energy research and innovation in Europe. Maintaining the status quo is perceived as inadequate with regard to the challenges of climate change and energy supply. The European Commission emphasized the need for technology breakthroughs in RTD, a prerequisite for lowering clean energy prices and low-carbon-energy industry development.

One of key points of SET plan is to earmark more funds for the renewables industry, especially in terms of RTD innovations. One of the new priority initiatives is the Solar Europe Initiative, oriented at large-scale demonstrations of commercial PV and concentrated solar power (CSP). Solar Europe Initiative also aims to reinforce European energy research capacities, to link broad programs such as the European PV Technology Platform and ETAP, and to increase human and financial resources.

On November 26, 2008, the EU adopted the European Economic Recovery Plan. Unfortunately, this plan does not acknowledge the role of RES as one of the key solutions to overcoming the global recession. In this plan, only clean transportation and energy efficiency have been considered the European priorities for the upcoming months. Nevertheless, overall PV market condition should not deteriorate. A lowering of module prices may actually lead to a moderate push for market demand. The general trend forecasted for upcoming years shows an expansion of the PV sector.

Links to Helpful Documents:
http://www.pv-nms.net/pvnms/web/files/NMS2008.pdf

The outdoor test facility at Warsaw University of Technology. Photo courtesy of Polish Center for PV.

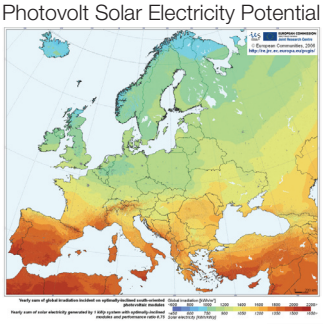
The first large PV installation for Bulgaria, located in Zornitza. Photo courtesy of www.pv-nms.net.

Rooftop solar panels are shown here in Malta. Photo courtesy of www.pv-nms.net.

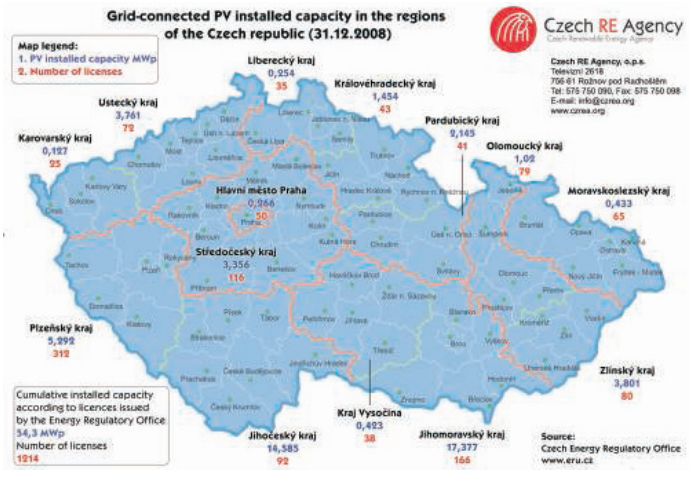
Croatia and Turkey are included in these calculations and the "Status of PV 2008" in the EU New Members State report recognizing the high potential for future development and further integration.

Graph of Solar Potential:

Photovolt Solar Electricity Potential in European Countries



Source: European Commission Joint Research Center



Source: Czech Renewable Energy Agency

Poland

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	1% of electricity needs from PV by 2020 (Polish Society for Photovoltaic's target)
CO_2 Reduction Equivalent:	1.4 million metric tons (metric tons CO_2-equivalent)

KEY POINTS:

- 1.4 million metric tons CO_2-e reduced
- 1% electricity needs from PV by 2020

KEY POLICIES:

- Green certificates for PV, RPS with solar carve-out, investment support

Growth of Solar Market in Poland: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 1 megawatt

Cumulative Capacity needed by 2020 to meet target:

PV: 1000 megawatts

Assumptions: 830 g of CO_2 for every 1 kWh of electricity produced in Poland.

Policies to Achieve Solar Target(s):

- Financial incentives: green certificates for PV
- Renewable portfolio standards: PV carve-out
- Investment support
- Policies to support job creation

Further detail on policies:

Poland currently has several normative acts that stress the need of further renewable energy source utilization and development. A Renewable Energy Development Strategy was passed in 2001, and in 2005 the Polish Energy Policy was passed, outlining measures for renewable energy till 2025. In 2006 the Ministry of Economy issued the Program for Electric Power Engineering. All of these acts promote renewable energy sources, including PV. Moreover, the Energy Law Act, in force since 1997, regulates the entire energy sector, providing the opportunity for further promotion of renewable energies. However, energy policy proposals out to 2030 are currently being discussed; in November 2009 the Polish government forecasted a mere 32MW of PV in Poland by 2030.

To date, financial incentives have helped to deploy renewables in Poland, and such schemes should be strengthened to promote the deployment of more energy from PV technologies. The primary financial incentive is a system of Green Certificates. In compliance with directive 2001/77/EC, these green certificates, or tradable titles, are allocated to producers of renewable energy for each MWh of energy generated. The market price is set around 250 PLN/MWh, plus an additional 150 PLN/MWh as of March 2009. Unfortunately, there are no multiplying values or special certificates for PV. With the green certificate system, the utilities are required to buy electricity and heat from sources using renewable energy. However, selling this electricity and heat to the utilities is very difficult, and the process can be quite long, as payment is required for even the smallest system. Currently the Agency for Energy Regulation only registered about 10 kW of energy from renewables using this process. This process should be simplified to allow for more deployment of solar energy, and the overall incentives strengthened.

Another policy needed deals with renewable portfolio standards. Power plants, utilities, and grid operators must prove the origin of renewable energy sources for any electricity sold. The renewable portfolio standard required a 7% share of renewables in 2008, increasing to 10.4% in 2010. However, there is no specific provision for PV; a specific percentage of this share should be carved out for generation from PV for optimal deployment. Also, instead of purchasing a green certificate to

fulfill this portfolio, it is possible to simply pay a replacement fee. Clearly this is not desirable, but despite this the renewable portfolio standards are considered an important step toward developing renewable energy technologies in Poland.

Additional government support schemes for foreign and domestic investors include initial investment support (material and non-material assets), which encourages job creation. Investment is encouraged in regions where the GDP rate is lower than the average GDP for all EU countries. This initial investment support consists of tax exemptions or government grants.

As for taxes, there are two credits applicable to PV: an investment tax credit, and a real estate tax credit. Both are granted by local authorities. Other financial support for investors is granted by the Ministry of Economics on a case by case basis and individual negotiations (central grant). It is also possible to apply for financial support from EU funds, but only through an intermediary national institution. To date, Poland has been very efficient in receiving support from EU funds. Nonetheless, this financial support from the Polish government and the EU should continue.

Government support for job creation has been allocated a minimum of 10 million EUR, and should create at least 250 jobs. This investment and the jobs created must be maintained for 5 years (3 years in case of SME). Policies that support the job creation from renewables, particularly PV, should be strengthened and continued.

Investors may benefit from the Cohesion Fund and the European Regional Development Fund through operational programs co-financed by EU Structural Funds. However, the program on Infrastructure and Environment, for the years 2007-2013, does not include generation of energy from PV electric power sources. For other renewables, the minimum investment cost is 20 million PLN, with funds subsidized for up to 70% of the total investment cost (40 million PLN). The overall budget for renewables within this program amounts to 91 million EUR.

The Environment Protection Bank (BOS), in cooperation with the National Property Bank (BGK), currently offer a 5-year soft loan (usually at half the commercial rate), covering up to 25% of the investment cost on energy efficiency upgrades including renewable energies.

In 2008, 2,700 loans (total amount was more than 580 million PLN) were granted during the first 6 months of the year, but none of these upgrades included PV. To meet the PV deployment target set for Poland, these loans must encourage homeowners and building owners to install PV systems.

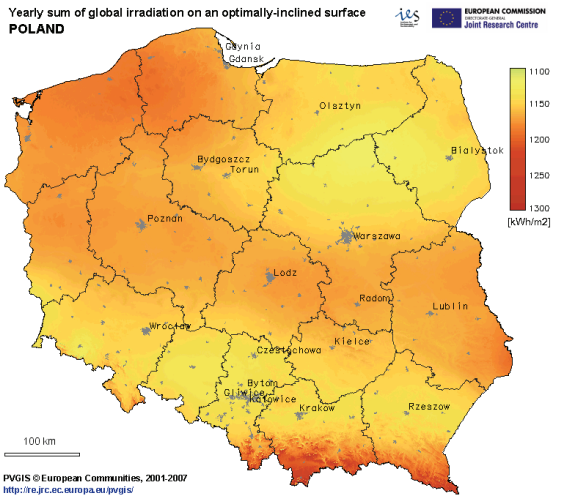
The Environment Protection Bank and the National Fund for Environmental Protection and Water Management (NFOSiGW) also give credits for projects addressing one of the priority programs of the Fund; unfortunately PV is not mentioned as one of the prioritized electric power generation sources. The Environment Protection Bank and the Provincial Fund for Environmental Protection and Water Management act locally, and support regional investments with preferred loans. There are also some preferred loans from commercial banks such as Sygma Banque, which offers a special “green loan” for small renewable investments (including PV).

The Polish Center for PV is able to perform detailed research on cells, modules and systems thanks to high-tech measurement equipment. Since 2007, the Center for PV uses outdoor and indoor testing facilities to evaluate PV technologies under simulated and accelerated indoor and outdoor conditions. This allows for a tighter cooperation between industry and RTD representatives in unifying standards and codes of PV devices. A similar outdoor test center that can evaluate different PV modules in Nordic conditions is located in Estonia.

A 53.5 kWp system at the Warsaw University of Technology is installed on the façade. Photo courtesy of Center for Photovoltaics.

The PV system at Warsaw University of Technology as viewed from the roof. Photo courtesy of Center for Photovoltaics.

Graph of Solar Potential:



Links to Helpful Documents:

www.pv.pl

PROTERMO SOLAR

Spain

Solar Category	Baseline Target
Concentrating Solar Power (CSP) Target	10% of electricity needs from solar thermal by 2020
CO_2 Reduction Equivalent:	60 millions (metric tons CO_2-equivalent)
Jobs Potential from CSP target:	4,000,000 (FTE)*
Economic Benefit:	**80,000 M€ (Cash investment between now and 2020 in order to meet goal)**

KEY POINTS:

- 60 million metric tons CO_2-equivalent emissions avoided
- 4 million new solar jobs created

KEY POLICIES:

- feed-in tariff

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in Spain: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

CSP: 330 megawatts

Cumulative Capacity needed by 2020 to meet target:

CSP: 20,000 megawatts

Assumptions: This figure is not yet adopted. It will be subject to the new Renewable Energy Plan 2010 - 2012

Policies to Achieve Solar Target(s):

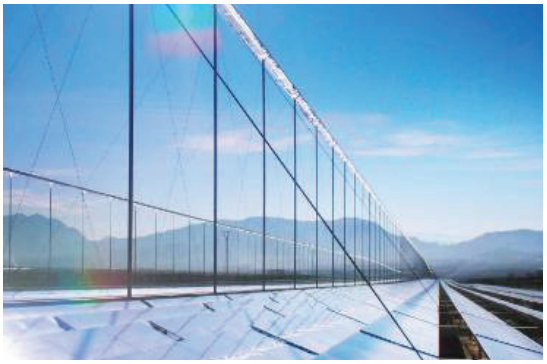
- Feed-in Tariff
- R&D Support

Further detail on policies:

As proven in many markets and nations around the world, the best policy to support solar deployment is the feed in tariff system. Other policies on R&D support can work to complement this system.

The SOLNOVA 1 project generates 50MW. These projects are located in the province of Seville, Spain. Photo courtesy of Protermo Solar.

The ANDASOL 1 and 2 each generate 50 MW with 7.5 hours of storage (using molten salt), located in the province of Granada, Spain. Photo courtesy of Protermo Solar.



The Puerto Errado 1 is a Fresnel system with dry cooling that can generate 1.4MW. It is located in the province of Murcia, Spain. Photo courtesy of Protermo Solar.

The Villarrobledo is a 1 MW Dish-Stirling plant in partial operation already in the province of Albacete, Spain. Photo courtesy of Protermo Solar.

Spain is currently the leading country in CSP with around 2,000 MW under construction.

Links to Helpful Documents:
http://www.protermosolar.com/

Spain

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	6% of electricity needs from PV by 2020
CO_2 Reduction Equivalent:	80-92 millions of metric tons CO_2-equivalent
Jobs Potential from PV target:	Over 55,000 (FTE)
Economic Benefit:	**Net profit between 3,800 – 5,800 million EUR (0.18%-0.28% Spanish GDP)**

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

KEY POINTS:

- 92 million metric tons CO_2 equivalent emissions avoided
- 55,000+ new solar jobs created

KEY POLICIES:

- Revised renewables legislation, feed-in tariff

Growth of PV Market in Spain: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 3,500 MW

Cumulative Capacity needed by 2020 to meet target:

PV: 17,000 – 20,000 MW

Assumptions: each million euro invested in new power directly creates 7.2 full time jobs. Each million euro invested in O&M directly creates 14 full time jobs. Each million euro of final demand directly creates directly 7.1 full time jobs.

Policies to Achieve Solar Target(s):

- Renewable revision legislation
- Regulations changes to approach the self electricity generate for consumers
- Stability market
- Grid Parity model
- Feed in Compensation
- Feed in tariff after reaching Grid Parity
- The elimination of administrative barriers to small infrastructures

Further detail on policies:

Over the past few years, Spain has demonstrated the possibility for a strong solar market. There are many companies that exhibit international leadership, and some of them are now implementing large solar projects overseas.

Spain has a regulatory framework based on a retribution Feed in Tariff (Royal Decree 1578/2008), which guarantees legal and economic stability. Moreover, Spain has developed a modern photovoltaic industry in the last several years that is competitive and technologically advanced.

Before the regulation changes in 2008 (Royal Decree 1578/08), PV exceeded expectations with a 385% increase from 2007 levels. However, 2009 has seen a significant drop in installations as companies adapt to new support schemes within the global economy.

This aggressive deployment in 2008 has created a provisional period for solar development to head towards grid parity in Spain. To be competitive, the photovoltaic industry needs to reach grid parity as soon as possible, and increase levels of installed MW. ASIF believes that this goal is

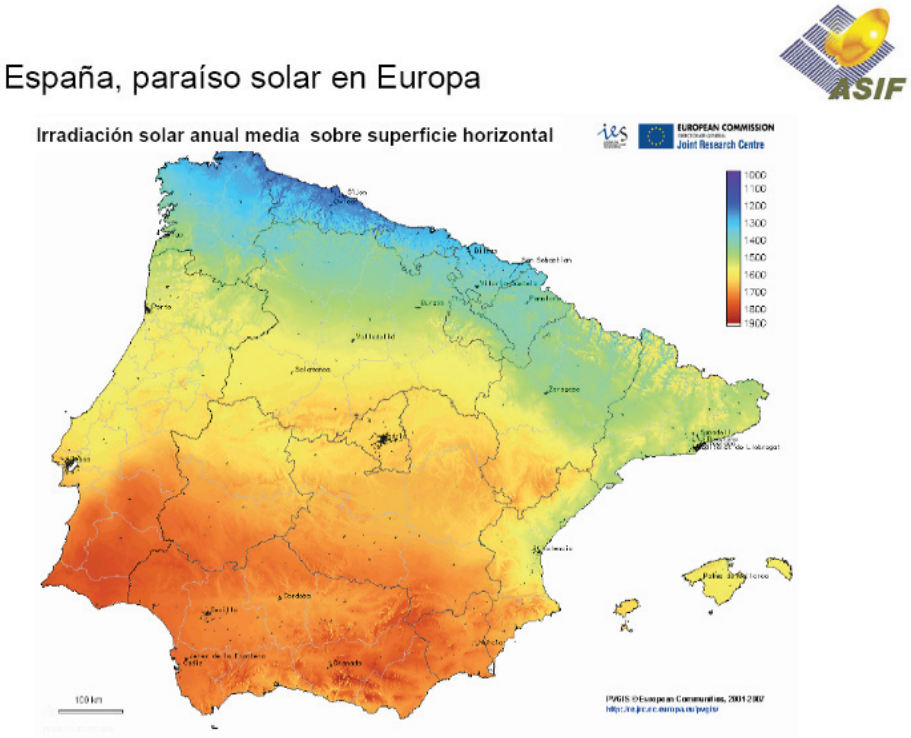
impossible without the commitment from the government; the cut prices make profits more attainable without subsidies. A recent study by ASIF and the international consultant company KPMG demonstrates how to maintain profits, preparing the market for a future where electricity can be fully generated for consumers connecting to the grid.

However, one of the necessary challenges to address to reach the solar target in Spain is the bureaucracy surrounding roof installations. This sort of infrastructure involves a large amount of red tape, regardless of size. In addition, private homeowners have difficulty receiving financial backing due to the economic situation and the banks' level of support.

Links to Helpful Documents:

www.asif.org

Graph of Solar Potential:



PV panels serve as the roof for this structure. Photo courtesy of ASIF.

Sweden

Solar Category	Baseline Target
Solar Photovoltaic (PV) Target:	4 TWh (2.7% of electricity needs) from PV by 2020
CO_2 Reduction Equivalent:	1,000,000 – 4,000,000 (metric tons CO_2-equivalent)
Jobs Potential from PV target:	5000 (FTE)
Solar Thermal (heating and cooling) Target	230 ktoe from solar thermal by 2030
CO_2 Reduction Equivalent:	1,000,000 (metric tons CO_2-equivalent)

KEY POINTS:

- 5 million metric tons of CO_2 emissions avoided from solar targets
- 5000+ new solar jobs created

KEY POLICIES:

- feed-in tariffs, market support for solar thermal

[1] One FTE equals roughly 1960 hours of labor (less in some countries).

Growth of Solar Market in Sweden: Capacity Growth to Reach 2020 Target

Current Installed Capacity:

PV: 8 megawatts

Thermal: 275,000*

Cumulative Capacity needed by 2020 to meet target:

PV: 5000 megawatts

Thermal: 6,000,000*

Assumptions: Solar/PV installed capacity is doubled year to year from 2012 until 2020 using technology specific certificates or equally powerful deployment mechanism (e.g. FiT), Solar/Th installed capacity grows with 50% CAGR for five years until 2015, then slows to 20% CAGR from 2015 – 2020 using strengthened market deployment mechanism.

*(Square meters of collector aperture area.)

Policies to Achieve Solar Target(s):

Technology Specific Certificates tailored to reach price-parity with FiT. For example, in Germany, a Feed-in-Tariff with compensation of at least € 0.35/kWh.

Further detail on policies:

Solar Thermal: Starting on January 1, 2009, the Swedish government introduced an investment support scheme that applied to solar heating for all applicants, from private individuals to companies.

The investment support corresponds to SKR 2.50 per kWh the solar panels produce per year, calculated in terms of heat exchange, for which a calculation method is specified. The investment subsidy is limited up to a maximum of SEK 7,500 per apartment building, and a maximum of 3 million SEK per project. Funding for this investment is disbursed through provincial governments.

In order to qualify, solar thermal collectors must be installed by a

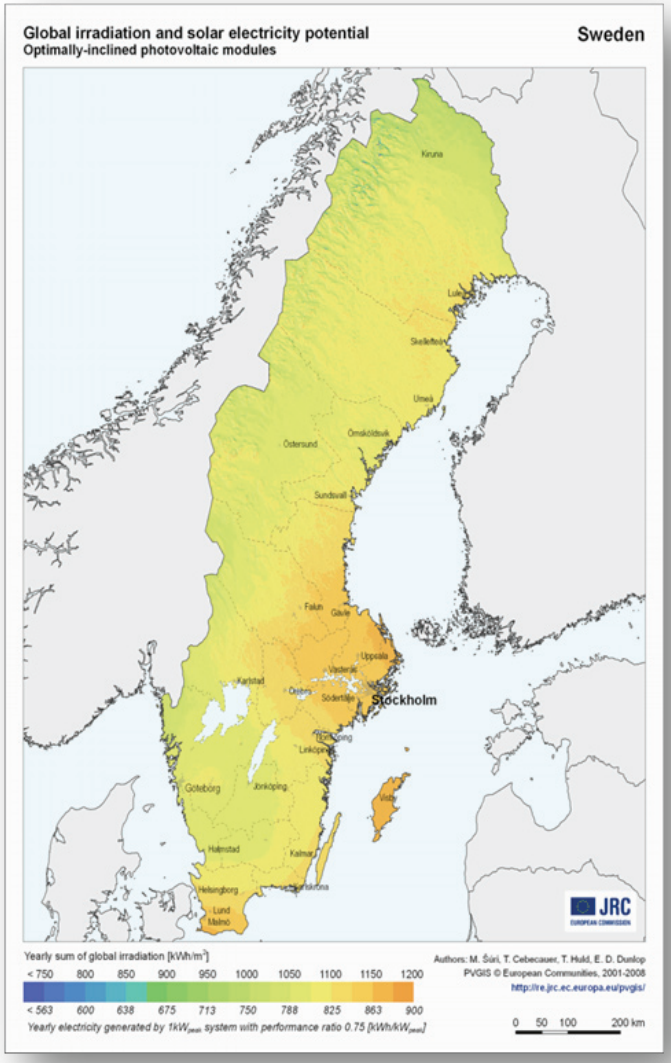
professional and meet certain quality standards. The program will be monitored for evaluation purposes, and subsidy recipients can be required to submit data for monitoring and evaluation.

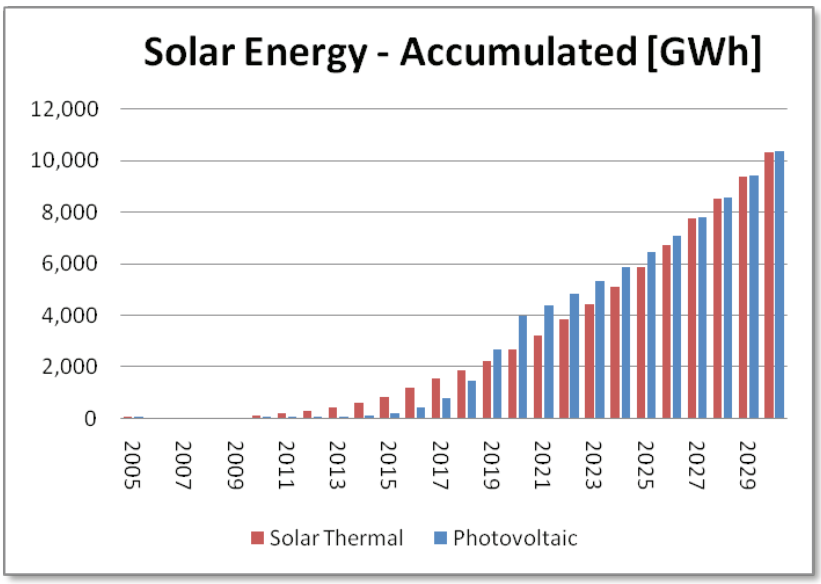
The market support for solar thermal applications must be strengthened, particularly for larger scale applications, in order to reach the target of 230 ktoe by 2020.

Solar Photovoltaic: A new financial support for the installation of solar cells was introduced on July 1, 2009. County administrative boards received more than 100 applications for approximately 100 million SEK in funding - twice as much as allocated for the entire year of 2009. As a reaction, the Swedish government increased funding for 2009 by an additional 50 million SEK in September. Current expectations are that funding will increase by 50 million SEK in 2010 and 60 million SEK in 2011. Support is provided for all types of grid-connected photovoltaic systems, including installations that were initiated before July 1, 2009, yet completed by December 31, 2011. The investment aid covers up to 60% of investment cost, except for large companies that will receive funding to cover up to 55% of costs.

The current system of electricity certificates, introduced in May 2003, handicaps solar photovoltaic power applications in comparison to other sources and technologies, as it incentivizes centralized power generation at the lowest cost/kWh. The system neither accelerates distributed power generation nor solar photovoltaic technology deployment. Solar PV policies must be amended as a matter of urgency in Sweden, for launch no later than 2012.

Graph of Solar Potential:





Source: Svensk Solenergi

Swedish BIPV Reference Projects

The Ecology Building–University of Lund (109 kWp)

In autumn 2007, Switchpower installed the National Property Board of Sweden's Higher Education Facilities, at the University of Lund. This is one of Sweden's largest and in terms of building integration, one of Sweden's most spectacular solar installations for Akademiska Hus. The plant consists of four different types of subsystems, one on the roof, one for sun-screening and two facade solutions. The system was awarded System of the Year at Energitinget in 2008.

Bua Church, Varberg (13kWp)

Switchpower installed the first solar power plant on a church roof in Sweden during the winter of 2008. All modules use black frames and black tedlar back-sheet, as the system was designed to blend in aesthetically with the roof. The Swedish Church is actively trying to reduce its energy consumption in buildings. During the renovation of Bua church, it was proposed that church install solar power to reduce environmental impact. It was possible to install the solar panels directly on the church roof, as Bua church was built after 1940 and does therefore not fall under cultural heritage protection.

City Theater in Stockholm (32 kWp)

Switchpower installed a 32 kWp photovoltaic power system on behalf of the City of Stockholm's Facility Management Body during the summer of 2007. The system was installed on a tin roof and consisted of multi-crystalline modules produced by Gällivare PhotoVoltaic and inverters delivered by Fronius.

Schools in Stockholm (36 kWp)

SISAB, the City of Stockholm's School Property Board, installed ten PV systems during the spring of 2007 in cooperation with Switchpower. The systems are located on the roofs of eight prep-schools and two primary schools in a Stockholm suburb where mono-crystalline modules supplied by Gällivare PhotoVoltaic, and inverters delivered by Fronius were installed. All modules have black frames and black tedlar back-sheets, even the mounting system is coated black.

Ullevi Stadium – Gothenburg (86 kWp)

During the winter of 2006/2007, Switchpower installed what was then the largest photovoltaic power system in Scandinavia for Got Event AB at Ullevi Football Stadium. The system consists of 86.4 kWp mono-crystalline PV modules supplied by Gällivare PhotoVoltaic. Note that all modules in the system contain black tedlar and that module dummies in the form of black glass were used for areas in which standard rectangular photovoltaic modules do not fit due to the arched shape of the roof.

Links to Helpful Documents:
Solar Energy Association of Sweden (SEAS):
http://www.svensksolenergi.se/inenglish.html

Solar Groups in this Report

Asociación de la Industria Fotovoltaica

ASIF is a private non-profit organisation that was founded on 17 April 1998. Its main objective is to empower, and develop the photovoltaic industry, providing expertise and experience to the Spanish market and authorities at state, regional and local level. ASIF's activities aim to provide the Photovoltaic industry with the necessary leadership to achieve significant solar energy production in Spain.

http://www.asif.org - Spain

Australian PV Association

The Australian PV Association (APVA) encourages participation of Australian organisations in PV industry development, policy analysis, standards and accreditation, advocacy and collaborative research and development projects concerning photovoltaic solar electricity. APVA provides:

- Up to date information on PV developments in Australia and around the world (research, product development, policy, marketing strategies) as well as issues arising
- A network of PV industry, government and researchers which undertake local and international PV projects, with associated shared knowledge and understanding
- Australian input to PV guidelines and standards development
- Management of Australian participation in the IEA-PVPS

http://www.apva.org.au - Australia

Bundesverband Solarwirtschaft e.V.

With about 700 member companies, Bundesverband Solarwirtschaft e.V. is the interest group of the German solar energy industry. Forming a strong community of companies, BSW-Solar acts as an informant and intermediary between business and the political and public sectors. Its objective is to establish solar energy as a permanent pillar of a global energy industry.

http://www.solarwirtschaft.de - Germany

Canadian Solar Industries Association

CanSIA works to strengthen the Canadian solar industry, increase the professionalism of companies, foster domestic and international markets, and promote the use of renewable energies.

http://www.cansia.ca - Canada

Enerplan

Since 1983, Enerplan, the French trade association of solar energy, works for the promotion and development of solar energy and the representation of the French solar energy sector. Enerplan members include manufacturers, OEMs, engineering firms, installers, architects, and energy providers as active members.

http://www.enerplan.asso.fr - France

European PhotoVoltaic Industry Association

With over 200 members active along the whole value chain, the European Photovoltaic Industry Association (EPIA) is the world's largest industry association devoted to the solar photovoltaic electricity market.

http://www.epia.org - Belgium

European Solar Thermal Electricity Association

ESTELA is the industry European Solar Thermal Electricity Association that was created in 2007 and started operating in Brussels in March 2008.
ESTELA currently has 52 members. One of these members, the national Spanish association PROTERMOSOLAR has 80 members itself. Thus, ESTELA represents -directly and indirectly- more than 130 companies, in fact most of the European companies that have activities in the solar thermal electricity sector.

http://www.estelasolar.eu - Belgium

European Solar Thermal Industry Federation

ESTIF is the voice of the solar thermal industry, actively promoting the utilisation of solar thermal heating and cooling technologies in Europe. It now has over 100 members representing the whole solar thermal value chain from collector manufacturers to component suppliers, research institutes, service providers, national solar thermal and renewables associations.

http://www.estif.org - Belgium

Solar Energy Society of India

The Solar Energy Society of India was established in 1976, and having its Secretariat in New Delhi, is the Indian Section of the International Solar Energy Society (ISES). Its interests cover all aspects of renewable energy, including characteristics, effects and methods of use, and it provides a common ground to all those concerned with the nature and utilisation of this renewable non-polluting resource.

http://www.sesi.in - India

Japan Photovoltaic Energy Association

Established in 1987, Japan Photovoltaic Energy Association (JPEA) has been consistently committed to promoting the dissemination of photovoltaic energy and its industrial development. JPEA consists of 95 members including most of the PV manufactures in Japan.

http://www.jpea.gr.jp - Japan

Protermo Solar

Protermosolar is the Association of the Spanish Solar Thermal Electricity Industry. It has 90 members including all the relevant companies in this field –promoters, component manufactures, engineering and construction companies, advisors and research centre.

http://www.protermosolar.com - Spain

Polish Society for Photovoltaics

Polish Society for Photovoltaics promotes the widespread use of solar electricity as realistic, reliable, and economic energy source to encourage the integration of PV energy into Poland's research, economy, and everyday life. PV Poland serves as a focal point to conduct and stimulate research and demonstration activities; educates; organises expert meetings, workshops, symposia, and conferences; disseminates information and address environmental issues.

http://www.pv.pl - Poland

Shanghai New Energy Industry Association

Shanghai New Energy Industry Association (SNEIA) pushes forward the technologic al and economic information exchanges inside the association, improves the relationship between its members and the government, society and organisations at home and abroad, prompts the technological advancement of new energy and the publicity work as well as providing trade, technology and information services for Chinese and overseas new energy enterprises.

http://www.sneia.org – P.R. China

Solar Energy Industries Association

Established in 1974, the Solar Energy Industries Association is the national trade association of U.S. solar energy industry. As the voice of the industry, SEIA works with its 1,000 member companies to make solar a mainstream and significant energy source by expanding markets, removing market barriers, strengthening the industry and educating the public on the benefits of solar energy.

http://www.seia.org - USA

New Zealand Solar Industries Association

Established in 1996 to promote and coordinate the development of the solar water heating industry in New Zealand. The Association provides a central focus point for liaison with Government agencies, the dissemination of information amongst the industry, and the long term positioning of solar water heating in New Zealand's energy system

http://www.solarindustries.org.nz - New Zealand

Sustainable Electricity Association of New Zealand

This industry association represents the interests of all stakeholders on the smaller scale of the renewable / distributed generation (SSR/DG) industry. New Zealand's energy supply can be supported by photovoltaic (PV) solar, small scale hydro and small wind technologies. Its objective is to increase the uptake of small scale renewable power generation.

http://www.seanz.org.nz - New Zealand

Swedish Solar Energy Association

National industry association with a member base of more than 60 professional organizations representing Swedish research and industrial interests in solar energy. The association pursues its objective of actively ensuring that solar energy - direct transformation from solar radiation to heat and/or electricity - play an important role in a sustainable Swedish energy system and that Swedish companies be recognized for their technological and innovative leadership in Europe.

http://www.svensksolenergi.se - Sweden

Swiss Association for Solar Energy

Swissolar is the solar energy trade association of Switzerland. It is active both in the photovoltaic and solar thermal sector. The 200 members are manufacturers, installers and planners. Activities include information, quality assurance, education and lobbying.

http://www.swissolar.ch – Switzerland

Chinese Renewable Energy Industry Association (CREIA)

Since its establishment, Chinese Renewable Energy Industry Association (CREIA) has been serving as a window bringing together national and international project developers and investors; a bridge between regulatory authorities and the industry; and a network for enterprises, drawing together renewable energy experts on research and development, production and sales, professionals and entrepreneurs to accelerate the development of Chinese renewable energy. As an industrial association, CREIA has succeeded in attracting over 100 corporate members and about 160 individual members covering all the subsectors of renewable energy in China.

http://www.creia.net - China

EPIA

SEIA Solar Energy Industries Association®