

Solar Power Incentives in France: Subsidization without 'Planification'?

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Worldwide, energy policy has come to the fore as a driving force in domestic and international politics. Higher prices, coupled with potential environmental damage from the use of traditional fuel sources, have driven governments to search for alternative energy sources while simultaneously attempting to bolster their countries' access to the fossil fuels that will most likely drive economic performance in the short- to mid-term.

In France, a nation that has traditionally been somewhat insulated from the need to purchase fossil fuels due to a strong nuclear power-generation capability (more than 77.9% of electricity production), these recent pressures have given rise to a host of subsidies and policies designed to encourage a shift of energy production from conventional to renewable. One area in which the French have invested heavily is solar. Two firms that stand out in this effort, Redavia and France Panneaux Solaires, have used subsidies to build profitable solar-panel installations on both commercial and residential scales. A third, Saint-Gobain, is focused on technology, innovation, and manufacturing.

French subsidies have facilitated the creation of a nascent market for solar energy and solar energy production capacity, although significantly more work remains to catch up to more advanced countries, including European counterpart Germany, especially in technology R&D. Alternatives for more activity exist, including the possibility of additional French government involvement in the solar energy sector.

Pressures in the Global Energy Market

Demand for energy has never been stronger. Over the past 40 years, consumption of fuel has doubled, rising from just over 4,000 Mtoe (megatons of oil equivalent) in 1971 to over 8,000 Mtoe in 2007. Electricity generation has increased even more dramatically over the same period, ballooning from 6,000 TWh (terawatt hours) to nearly 20,000 TWh, a growth rate of 3.4% per year sustained over 40 years. Recent growth has been driven largely by China and other developing economies: the OECD represents only 48% of total energy production today, compared with 61% in 1973. In contrast, China's share has increased over the same period from 7% to over 16%, an increase in absolute terms of over 400%. With the increasing importance of these new entrants and a full recovery from the recent economic crisis around the corner, growth in fuel and energy consumption will continue for the foreseeable future.

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Within this context of overwhelming demand, it is not surprising that the price of energy is climbing as well, especially given a worldwide reliance on deposits of fossil fuels that are increasingly more expensive to extract. In France, for example, the price paid by industry for 100 kWh (kilowatt hours) of electricity increased from €2.5 (US\$ 3.25) in 1983 to nearly €6.0 (US\$7.8) today. Even more disturbing, the price of 100 kWh of energy produced from gas and heavy fuel has doubled from about €2 (US\$2.6) to €4 (US\$5.2) in the span of less than a decade -- from 2000 to 2008.

In addition to causing a rapid increase in energy prices, the worldwide dependence on fossil fuels has contributed to overproduction of greenhouse gases, including CO₂. While no binding international agreement including the U.S. and China has been signed as yet, European countries -- including France -- have generally agreed to meet targets to reduce the total output of greenhouse gases over the next few decades. Reductions will come from a combination of penalties for greenhouse-gas production in the form of tradable "carbon credits" as well as subsidies designed to shift economies to renewable sources of energy.

On the flip side, the past few years have witnessed a dramatic fall in the price of solar energy, a trend that will continue into the future. As an example, photovoltaic (PV) cells placed on a rooftop in Paris today produce energy at an average cost of €0.31 (US\$0.4) per kWh, down from €0.39 (US\$0.5) in 2007. This is still a long way from the €0.06 (US\$0.08) to €0.11 (US\$0.14) price range that would make solar energy cost-competitive with utility bulk power, but in some markets, such as Los Angeles, solar energy is already cost-competitive with peak rates. Cheaper production of more efficient PV cells will eventually make solar energy cost competitive even in markets in less sunny locations.

The confluence of rising energy prices, the threat of environmental damage, and the increasing competitiveness of an alternate energy source have pushed the French government to offer several layers of subsidies -- primarily in the form of subsidies per kWh produced and income tax credits -- to hasten the development of a competitive market. These subsidies include (1) a requirement that Electricité de France (EDF) buy solar-produced energy at a rate that varies from € 0.31 (US\$0.4) to € 0.58 (US\$0.75) per kWh instead of the market rate of € 0.11 (US\$0.14), (2) income-tax credits for the installation of renewable energy sources, (3) direct subsidies for the installation of solar panels, and (4) 50% income-tax credits on labor wages during the installation of renewable energy materials. These incentives are designed to achieve grid parity, the point at which alternative energy production costs and market energy prices will be equal, artificially. To this end, rates are not uniform: Lower-cost renewable energy producers are compensated at lower rates than higher-cost producers, and companies operating in places with higher solar incidence receive lower subsidies than companies operating in less attractive regions.

The government will reduce these subsidies over time as the cost of solar energy production decreases. In the meantime, a nascent market for solar energy has begun to develop, thanks to the demand stimulus provided by the government and the activities of a number of firms.

Redavia: Solar Development on a Commercial Scale

The primary result of France's solar energy policy is that it has become profitable, after subsidies, to install and operate PV panels in most parts of the country. This, in turn, has led to a proliferation of project-development companies that find and secure land and financing to create new installations. In general, these companies fall into two broad categories: those that deal with large tracts of previously unusable, unused, or lightly used land to create solar installations on a commercial scale and those that deal with small-scale installations of solar panels in urban settings. In both cases, the key is that the companies are profitable thanks to government subsidies. As the government scales these subsidies back over time, companies will need to operate at a lower cost basis or expand their business models.

Redavia, a French company founded in 2010 by Erwin Spolders, finds land and financing to build PV panel installations on a commercial scale. Previously CEO of Q-Cells International France, a solar-panel manufacturer based in Germany, Spolders has a background in the solar industry as well as a strong network of contacts in project finance. He saw a significant opening to take advantage of French subsidies for solar power to develop previously unused or underused land and created Redavia to pursue this opportunity. Under his leadership, Redavia has moved to the forefront of the charge to use government subsidies to create a solar energy market in France.

In many ways, Redavia is typical of other companies building commercial-scale PV installations. The company acts primarily as a broker between landowners, financiers, and panel operators. First, the company identifies a new site -- typically old agricultural land, quarries, or even military bases. Redavia works to sign a lease with the landowner and to obtain all the necessary permissions and authorizations from the government and from EDF to create a PV panel installation. Next, the company identifies sources of financing -- frequently external debt, sometimes Redavia equity -- and negotiates all the necessary contracts with the panel-construction contractor as well as EDF to ensure connection to the electrical grid.

After all the paperwork and agreements are in place, Redavia supervises construction of the PV installation and its connection to the grid, and manages operations for a limited period of time. Finally, the company frequently looks to sell its interest in the project to a third party. Over all, Redavia contributes its expertise in project development in exchange for fees. The company is able to take very little balance-sheet risk, leaving that to banks and other players that have access to cheaper capital.

According to Spolders, the business has been highly successful to date but will require continued innovation to ensure further growth. Redavia is considering several new opportunities to anticipate that movement.

France Panneaux Solaires : A Small-scale Developer

On the other side of the panel-installation landscape sit a number of companies that facilitate residential or smaller-scale installations. Among them is France Panneaux Solaires (FPS), founded in Vannes, Brittany, in 2006. FPS provides all the services necessary to manage solar installations for small customers, frequently on rooftops. These services include studies of need, studies of site appropriateness, physical installation of the panels, management of all administrative and legal paperwork and processes, connection to the EDF grid and operation, provision of insurance, and maintenance. Since its inception, FPS has installed over 3,000 solar panels throughout France.

FPS's success is due largely to government subsidies, as is the success of all companies in its sector. To better understand the importance of subsidies in the residential solar industry, consider a case study of potential cash flows for the *Chambre de Commerce et Industrie de Paris* (CCIP), a large building in the center of Paris. An investment of €24,000 (US\$31,200) would allow the CCIP to cover its roof with solar panels, generating over 2,700 kWh of energy annually. Securing a 20-year contract with EDF at €0.58 (US\$0.75) per kWh would then allow the CCIP to generate over €1,600 (US\$2,080) annually and pay back the investment in 12.83 years. A positive cash flow would then be generated during the remaining

seven years and two months of the contract, earning €12,000 (US\$15,600) in the process. This potentially profitable venture will come to fruition only because of the important subsidies: Over €26,000 (US\$33,800) of revenues -- or 80% of cash flows during the 20-year production period -- would be paid directly or via subsidy by the French government. In the residential sector, too, government subsidies have facilitated the proliferation of solar-panel installations.

Saint-Gobain: Technology R&D

Although France lags behind other countries in alternative energy R&D, government subsidies have created an environment in which a few large multinational French-based companies, such as Saint-Gobain, have been able to expand solar panel research and production early in order to establish market share and develop industry-leading technologies in an otherwise potentially unprofitable segment.

Established in 1665 and with 2009 revenues in excess of €37 billion (US\$48.1 billion), Saint-Gobain is one of the world leaders in construction materials, particularly external glass and cladding. The company recently increased its public status in North America by manufacturing the glass for the eye-catching Skywalk suspended over the Grand Canyon. However, in attempting to enter the PV solar-panel manufacturing industry, the company encountered stiff competition -- most notably from First Solar in the U.S., Suntech in China, and Q-Cells in Germany.

As a latecomer, Saint-Gobain decided in 2006 to enter into a partnership with Shell Solar (a division of oil giant Royal Dutch Shell) to create Avancis, a leading PV research firm that developed the world's first commercial series production of CISPV cells in California in 1998. To capitalize on the French subsidies, Saint-Gobain placed Avancis in its innovative materials division, which employs 60,000 employees worldwide and represents over 65% of Saint-Gobain's annual R&D budget.

In 2010, due in large part to the increasing demand for subsidized PV panels in Europe, Saint-Gobain decided to build a second plant in Torgau, Germany, to produce high-efficiency PV modules. This new Avancis plant will have a production output of 100 MWp per year.

French Solar Power: A Qualified Success

Overall, it is clear that French subsidies have worked. While French electricity consumption increased from 478 TWh in 2006 to 486 TWh in 2009, new PV solar panels installed in the country increased from 8 MW in 2006 to 285 MW in 2009, of which 100 MW of capacity is still awaiting approval to be connected to the grid. In comparison to its neighbors, however, France is lagging. Germany and Spain, which surround France geographically and share similar regulatory environments with France, are commonly accepted as the industry leaders in PV; France is not. This leadership extends from actual PV installations to the perhaps more important field of R&D.

Spanish PV installations have been encouraged since 2007 by means of Royal Decree 661, which established the current subsidy environment. From 2006 to 2008, annual installations of PV panels in the country increased from 88 MW to 2,605 MW, or almost 30-fold in two years. In 2009, the market took a step back. Due to a combination of the credit crisis, cutbacks in guaranteed electricity payments, and a cap system limiting new installations, new panel installations in Spain dropped to only 69 MW. The European Photovoltaic Industry Association (EPIA) forecasts that installations in Spain will bounce back to 600 MW in new capacity in 2010 and will remain at that level until 2014. If political pressure plays a greater role, the total could reach 1,060 MW by 2014.

Germany's performance in the area of solar-panel installation has been even more impressive, a result that should be expected from a country with the most stable subsidy system in Europe. Germany's first law promoting the use of renewable energy dates back to 1991. However, the Renewable Energy Law of 2000 has driven most of the country's success in promoting alternative energy sources. New PV installations in Germany jumped from 843 MW in 2006 to an astounding 3,806 MW in 2009 -- an increase of 315% in just three years. EPIA expects that Germany will install between 5,000 MW and 7,000 MW in new PV panels in 2010.

France has lagged behind Spain and Germany in solar-panel installation in the past, but this may be changing. EPIA estimates that France could reach 660 MW to 1,300 MW of new annually installed capacity by 2014, provided that administrative procedures are softened and support mechanisms

accompanied by political drive are put in place. This scenario would make France one of the major solar energy producers in Europe. But the country appears to have a much more serious issue with R&D. According to Jason Matlof, a partner at Battery Ventures, an American venture-capital firm, "the French are way behind and far from leading the industry. Ten to 15 years ago, they had a few good companies, but no longer." He mentioned only Saint-Gobain as a French company offering much in the way of solar-technology development.

Why has France lagged while Germany and Spain have sped ahead? According to Matlof, the answer is most likely a combination of later and lesser subsidies for PV installations, combined with a lack of commercial incentives to get manufacturers to locate in France. As France considers its next few moves in energy policy, the examples of its closest neighbors will certainly drive the country's decisions.

The Future of Solar Power

As the French example illustrates, subsidies can help build the foundations for a strong solar energy industry. Eventually, this industry will drive down the cost of solar energy until price parity exists with conventional energy, at which point solar can become self-sufficient.

This is the theory. In reality, it is unclear when price parity will be achieved and to whom the value of solar energy will accrue. It could be five years or it could be 20. The winners could be the French, the Germans, or the Chinese. Governments could allow a proliferation of private companies to reap the rewards of new energy sources, or they could place power and profit in the hands of state-run monopolies. Other questions arise: Will solar energy ever be profitable in northern Europe, with its low level of direct sunlight? Will the electricity grid ever be able to handle a less predictable form of energy and will people be able to store sunlight-created energy for the cold winter months? Will entrenched energy interests drive political will away from the transition to renewable energies?

Despite the concerns, there is promise in the interplay of (1) government subsidy and direction and (2) private initiative, as the French experience shows. This is exactly the type of market -- where real innovation in both technology and business process is needed -- in which private companies are most helpful. In the presence of broad direction from the government, companies like Redavia, France Panneaux Solaires, and Saint-Gobain have been able to flourish. They are building the next generation of energy-production capacity, and they are finding ever-more-creative ways to do so. As long as the French government continues its support for the solar energy market, does more to encourage production as well as installation, and refrains from choking the market with undue regulation, the solar market will be a major contributor to electricity production in France.

This article was written by Benjamin Andrew, Mario de Barros, and Seth Kisch, members of the Lauder Class of 2012.

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