

SOLAR CENTURY CONTRIBUTION TO THE STRATEGIC ENERGY REVIEW

STRATEGY FOR A UK SOLAR PHOTOVOLTAICS MARKET

26th September 2001

On 13 February 2001, in the White Paper "Opportunity for All in a World of Change: A White Paper on Enterprise, Skills and Innovation" the Government declared its intention to launch a solar photovoltaic (PV) market-building programme in the UK "in line with" with the major programmes underway in Germany and Japan. The stated aim of this programme is to turn the embryonic UK solar PV industry into an industry able to compete in the front rank of the fast-growing global market. Ministers have made it clear that their aim is not just to create a thriving UK solar services industry, but to establish a PV manufacturing base in the country. Two meetings have been held with large manufacturers (BP, Shell, United Solar) to explore manufacturing options.

A PV market-enablement programme fits well with the government's environmental and social agendas. If this programme is strong enough to generate manufacturing scale-ups large enough to bring the price of PV down appreciably within this decade - and manufacturing economies of scale are substantial in the PV industry - then a "twin track" of PV roofs and optimally electricity-efficient buildings will not only generate an industry in the UK at the cutting edge of a business revolution, but also achieve significant cuts in national greenhouse-gas emissions.

Solar Century (www.solarcentury.co.uk) is the UK's largest solar solutions company. After a year and half of commercial operations, we are currently installing our 63rd solar PV micropower plant, almost all of them on buildings, having used a wide range of technologies in the process. We have six recommendations to the Strategic Energy Review:

1. The UK PV market-building programme cannot succeed in its objective with the resources allocated to date.

In the last 12 months around £16m of grants have been allocated as the first tranche of money for the UK's solar roofs programme, a sum which will begin to be deployed soon. The government intends to add an as-yet unquantified share of £100 million for renewables, beginning April 2002. However, even assuming a one third share for PV in the £100 million, the total will be a small fraction of the support available in our main competitor countries, Germany and Japan, for developing a PV market. It will be insufficient to elevate the pace of solar PV proliferation to levels "in line with" the UK's competitors, insufficient to help much in bringing down the price of PV, and it will not encourage manufacturers to come to the UK.

At a meeting in the DTI on 3 May 2001, the then-Ministers Stephen Byers and Peter Hain enquired of a group of PV manufacturers what the government would need to do to bring PV manufacturing to the UK. BP and Shell responded by saying the government needs to move from sending signals to nucleating real demand. They felt that a 30 MW per year market, or 15,000 roofs per year, would be needed before manufacturing could be justified in the UK.

30 MW per year was achieved in the fourth year of the Japanese programme and the second year of the German one [please see attached chart]. However Solar Century's best estimate, based on the funds the government has announced to date, shows only 10 MW in the UK by Year 3 (2004-5). More resources will surely be needed to hit the threshold for UK-based manufacturing articulated by the manufacturers. Although the services and solutions end of the market (Solar Century's end) is equally important - and in terms of employment numbers more so (there would be around five jobs in services for every one in manufacturing) - manufacturing has a huge significance in terms of industrial competitiveness. In Germany and Japan PV manufacturers are scaling up fast as a result of the government market-enablement programmes, and innovating as they grow.

2. Adding a Solar Obligation within the existing Renewables Obligation would build a UK solar market without requiring government resources.

The Renewables Obligation on electricity suppliers could provide an effective alternative route to meeting the Government's goal of being "in line with" Japan and Germany, but not as it stands. The Obligation (that 10% of supply should be renewable by 2010) is designed for wind and other near-commercial renewable technologies. Solar Century proposes a "PV Standard" within the Obligation. In such a measure, electricity suppliers would be required to obtain from PV a given fraction of the electricity supplied to customers. Such PV standards have already been enacted in some US states. We propose an ambitious but potentially realizable target: 1% of the Renewables Obligation should be from PV, amounting to 0.1% of national supply market, by 2010.

The 10% Renewables Obligation target equates to 34 TWh of electricity p.a. from renewable sources by 2010. If 0.1% of national supply (i.e. 0.34 TWh) were to be obtained from PV, then this translates to about 200,000 domestic PV roofs (assuming 2 kWp capacity per roof, with 800 kWh generated per kWp), or about 400 MW of total capacity, around 50 MW per year over 8 years to 2010. This is well below what Japan and Germany will achieve substantially in advance of 2010 [please see notes accompanying chart], but will be enough to encourage PV manufacturing in the UK, accepting the threshold Shell and BP relayed to ministers.

It might be argued that such a Solar Obligation, even at the miniscule level of 0.1% of national supply eight years from now, would be unfair on electricity suppliers. However, Solar Century's recent experience with utilities is that the more progressive companies are already thinking of large solar projects as a means of accreting green value-added to their brands. Similarly at least one large financial institution is considering a solar mortgage product. A legislative step by government to require a minimal solar PV programme by electricity companies would in this view simply be 'going with the flow'.

3. A proportion of PV should be required by Planning Authorities.

A Solar Obligation should not replace others policies. It is aimed primarily at electricity suppliers. The current subsidy programme, which the DTI hopes will extend to 70,000 roofs by 2010, should be kept in place. To complement and support the Solar Obligation, a proportion of PV should be required in local and regional development plans. In line with Agenda 21, local authorities are looking more carefully at the issue of sustainability, and a shift in planners' attitudes is becoming evident. The Mayor for London recently proposed mandating PV installations on all new large buildings in the capital. The government could do the same nationally.

A related option is to require a small number of houses in new-build estates to have a PV roof. In a country building 200,000 new homes a year, even a tiny requirement would

have a huge market-building effect. The volume builders could not reasonably complain, because the cost of a single / small number of PV roofs in a typical development would be a fraction of one percent. Moreover, evidence is emerging that consumers are prepared to pay more for houses with PV roofs.

4. Enhanced Capital Allowances should be extended to PV.

The IR recently announced a programme of enhanced capital allowances for low carbon technologies. On behalf of the PV Trade Association, Solar Century has submitted a proposal for the inclusion of PV in this scheme which is currently being reviewed by DEFRA. If agreed, this will result in a 100% first year capital allowance for a PV system - essentially a cash discount of up to 16.5% and a one-year cash flow benefit of up to 29%. We would urge the DTI to support this. It is axiomatic that PV is a low-carbon technology, especially when stimulated carbon savings are considered: early Solar Century customers have tended to become electricity-efficiency fanatics.

5. In the post-WTC world, national security provides an important new reason to accelerate uptake of solar PV.

As society revises definitions of security, one overdue investment leaps out. Using a tiny fraction of national defence budgets, the modern renewable energy industry could build a world with much reduced dependence on oil, devoid of nuclear power stations. Such a world would dismantle many security threats. The oil-independent world would be far less prone to the spawning of terrorists in the first place, not to mention the recessions that tend to follow oil price shocks. The nuclear-free world would deprive terrorists of an entire category of uniquely dangerous and therefore attractive targets to attack (fly planes into or steal plutonium from).

How quickly could the renewable energy industry perform this security-building paradigm shift? Given national security-scale budgets, Solar Century's opinion is that we could do it within the decade.

Some will deem this far fetched, but consider that twenty years ago, at the time of the second oil price shock, the Saudi Arabian oil minister, Sheik Yamani, warned his fellow OPEC ministers, "if we force western countries to invest heavily in finding alternative sources of energy, they will. This will take them no more than seven to ten years." That was with the technology of twenty years ago. The world chose not to invest in renewable energy then. Renewable technologies remain dwarfed by oil, gas and coal two decades later, even though we have been warned for most of that period that if we continue burning so much carbon-based fuel we will unleash economically and environmentally ruinous global warming.

The potential for renewables is vast, uncontroversial, yet underappreciated. In the case of solar, for example, even in a cloudy, rainy country like the UK, BP has calculated that modern PV technology applied to all available UK roofs would generate more electricity than the nation currently consumes in a year. A recent PIU study concludes that we could also provide all the UK's current electricity demand with offshore wind farms, using just a small fraction of the areas suitable for them, and easily-available wave power could double current national demand. But we do not need to rely on just one technology; we can mix and match the technologies. Biomass power plants can balance the grid's need for constancy of supply, and hydrogen and fuel cells can provide means of mass storage of energy. Hydrogen, fuel cells, and batteries mean PV will become centrally relevant to transport and oil. Fuel-cell vehicles are under development. Hydrogen fuel can be made from water using solar electricity. Battery cars are available today, capable of 350 miles per charge and sports-car performance.

All this is feasible; it merely requires imagination, leadership, and bold policymaking.

6. The oil companies and large-scale PV manufacturing: time for “windfall” PV manufacturing.

In 1996, a group of solar industry experts chaired by BP Solar conducted a study for the EU on the feasibility and economics of large-scale PV manufacturing.¹ In 1999, KPMG conducted an audit of the study.² Both studies concluded that a 500 MW per year PV-manufacturing plant using crystalline silicon was technically feasible and economically viable. The capital cost of such a plant was calculated at 650 million Euros (approx. £400 million or \$550 million). Its products would be able to generate electricity at or very close to the retail price of polluting electricity.

Manufacturers of thin-film technology profess that they can build plants capable of bringing the price of PV down to levels competitive with retail electricity at smaller volumes and for much lower capital costs. The former head of PV at the US Department of Energy, a top industry expert, has calculated that this goal is achievable with a 100 MW per year triple-junction amorphous silicon thin-film plant for a capital cost of around \$100 million.³

Why do BP or Shell not build such plants? A 500 MW plant using the crystalline technology the companies currently manufacture at low volumes would cost them less than a sixth of a single deep-water drilling rig. Their answer is that the global PV market is too small to justify such volumes. (The global market in 2001 was 260 MW). BP and Shell are not known for such absence of entrepreneurial zest on the oil frontiers. Given the widespread and deep interest that Solar Century's small marketing campaigns have shown across the UK's commercial, residential and industrial sectors, and given the manner in which demand is outstripping supply currently in the global market, the marketing machines of BP and Shell could certainly contribute to nucleation of the necessary demand. Government could synergize here with bulk PV procurement, given that the solar electricity from products made in a “cost-busting” 500 MW plant would be cost-competitive, especially when carbon-trading revenues are factored in.

The huge profits made by oil companies in recent quarters have led to calls for windfall taxes. An alternative option for the government is to require the companies to invest a certain percentage of their profits in large-scale PV manufacturing.

Conclusion

In summary, solar PV is a talisman for a sustainable, survivable, future. It can and should be at the heart of the government's targets for increasing energy efficiency, reducing fuel poverty, reducing carbon emissions, and building energy self-reliance and therefore national, common and global security.

There will be a solar revolution in the years ahead - this is inevitable. Investors increasingly know this and are acting accordingly.⁴ Manufacturers are scaling up

¹ Bruton, T. M. and others, “Multi-megawatt scale-up of thin film solar cell and module manufacturing,” (MUSIC-FM), 1996.

² KPMG Bureau voor Economische Argumentatie, “Solar energy: from perennial promise to competitive alternative,” Project Number 2562, 1999.

³ P. Maycock, Annual review of the global PV market, PV News, 1997.

⁴ Dresdener Kleinwort Wasserstein Research, “Solar PV industry: here comes the sun,” 2001. This report concludes that the PV market will grow fast and recommends investments. Solar Century has a stake in the world's first private-equity-focussed renewable energy investment fund, Bank

everywhere. Solar PV is a disruptive technology poised on the edge of a two-trillion dollar market (global energy supply, including transport). PV manufacturing and deployment are set to become cornerstones of the knowledge economy. Our competitors have spotted this. Our options in the UK are ultimately simple where PV is concerned. We can be a spectator as the solar revolution unfolds, or we can be a player. The proposals in this paper will make us a player. The current suite of policies will not.

The proposals in summary are:

1. Support the 70,000 roofs programme with grant resources on the same scale the Germans and Japanese have made and are making available in their programmes.
2. Instigate a Solar Obligation on electricity suppliers of 1% of their renewable supply, and 0.1 % of total supply, by 2010.
3. Encourage planning authorities to require a proportion of PV in developments and require a proportion of PV in newbuild.
4. Extend capital allowances to PV.
5. Treat solar PV and micropower proliferation as a potentially vital new component in the national security debate, with budgets appropriate to the goals of oil independence and removal of nuclear power stations as terrorist targets.
6. Require the oil majors to spend a proportion of their profits on large-scale, price-busting, PV manufacturing.