

Case Study: SunCities Solar Villages



PROJECT SUMMARY

This case study provides an overview of an initiative to create several 'solar villages' in the Kirklees district in the north of England, through a European project SunCities. SunCities started in 2000 and completed in 2005. The project aimed to install 3.05MW (megawatts) of solar electricity on 2,000 homes in Germany, the Netherlands and Kirklees in the UK. In Kirklees this includes a total of 350 kWp solar photovoltaic (PV) systems and 63 solar thermal systems. Around 518 households were involved across Kirklees, including elderly tenants and families with young children. They now benefit from free solar electricity and make significant savings on their fuel bills. The energy performance of the homes was also improved; EcoHomes ratings of very good and excellent were awarded by the BRE for the new build homes.

Solar panels have been installed on to 268 council owned homes, two 40-bed residential care homes, four 8-bed care homes and luxury apartments at Titanic Mill. Upon completion in 2005 Kirklees had installed 4.9% of the total solar electricity installed in the UK through

SunCities. This made SunCities the largest domestic solar project in the UK. SunCities attracted funding of up to £1.8 million to Kirklees and attracted nationwide attention through winning, in 2006, an Ashden Award for Sustainable Energy, a British Renewable Energy Association Award and Green Apple Award.

HOW WAS IT STARTED?

SunCities was started in 2000 with a successful submission for EU Funding from the EU 5th Framework Programme.

PROJECT AIMS

- Reduce tenants' fuel bills.
- Contribute to reaching district renewable energy targets – currently 10% by 2010.
- Increase capacity to deliver large scale renewables initiatives on domestic properties in Kirklees.
- Reduce climate change emissions.
- Support Decent Homes energy efficiency improvements on the existing houses.
- Contribute to achieving an Ecohomes 'Excellent' status for the Primrose Hill new build homes.

- Reduce the cost of PV for the large-scale application of solar PV.
- Demonstrate that PV can be installed in an appealing way.
- To disseminate the results and to reduce risks associated with PV to increase the uptake by the housing industry.

FUNDING

| Fund | Solar PV | Solar thermal |
|--|------------------|----------------|
| EU SunCities | 283,211 | |
| UK DTi Major PV Programme | 970,193 | |
| UK DTi ClearSkies Programme | | 57,000 |
| Kirklees Council Renewable Energy Fund | 351,160 | 17,000 |
| Kirklees Neighbourhood Housing | 110,000 | |
| Yorkshire Housing Limited | 75,000 | 41,500 |
| Kirklees Community Association | 30,700 | |
| Lowry Renaissance | 100,879 | |
| Single Regeneration Budget | | 25,000 |
| TOTAL | 1,820,264 | 140,500 |

WHO HAS BEEN INVOLVED?

- **Netherlands:** Heerhugowaard Municipality
- **Germany:** MeteoControl consultancy
- **UK:** Kirklees Council & ESD Ltd (energy consultancy)

Partners in Kirklees:

- Kirklees Council Environment Unit
- Kirklees Community Association
- Kirklees Neighbourhood Housing
- Yorkshire Housing Group
- Lowry Renaissance Ltd

ABOUT THE TECHNOLOGY

Solar photovoltaic (PV)

Solar electricity (photovoltaic) systems capture the energy from the sun's radiation and convert it into

electricity. They will work in any weather, as long as there is daylight. Each solar photovoltaic (PV) array is connected via an inverter (d.c. to a.c. converter) to the electricity supply of the house, so that the power generated is used when there is demand, or exported to the grid if the supply exceeds demand.

The solar PV arrays on the SunCities homes were rated between 1 kWp and 1.3 kWp. Each project was tendered separately, so there is a mixture of mono- and poly-crystalline PV and several different PV manufacturers, including Astropower, NAPS and BP Solar. All the inverters were made by Fronius.



Fernside solar village: 100 solar PV panels

Solar hot water (thermal)

Solar thermal systems capture the energy from the sun's radiation and use it to heat water. The hot water can then be used immediately or stored in a cylinder for later use.

OUTCOMES & BENEFITS

Solar PV and solar thermal

A total of 351kWp solar PV was installed, this represented 4.9% of the total domestic solar PV installed in the UK in 2005. Solar thermal systems were also installed on 63 properties.

| Project | kWp | No. homes / rooms | Integration |
|--------------------------------------|-------|-------------------|-----------------|
| Sackville Street: social housing | 40 | 31 | Retrofit |
| Titanic Mill: luxury apartments, spa | 48.45 | 130 | Roof integrated |

| | | | |
|---------------------------------|---------------|------------|--|
| Fernside Avenue: social housing | 108 | 100 | Retrofit |
| Primrose Hill: social housing | 58 | 58 | Retrofit, also includes solar thermal systems |
| | 31 | 31 | Roof integrated, also includes solar thermal systems |
| | 24 | 48 | Roof integrated, apartments |
| Primrose Hill: Solar Thermal | 63 systems | 63 | Retrofit and roof integrated |
| Care Homes | 20 | 80 | Roof integrated |
| Sheltered housing | 20 | 40 | Roof integrated |
| TOTAL | 349.45 | 518 | |

Cost reduction

The overall cost of the programme was £1.8 million, or about £5,200 per kWp installed. Costs were brought down during the lifetime of the project (see table), by local organisations taking over project management, bulk procurement and learning from earlier projects.

householder. The energy is not stored therefore the full potential is only realised if all the energy generated is consumed or if the excess electricity is sold back to the grid. Monitoring at Sackville Street showed that export of electricity to the grid could be up to 40%. There is an opportunity here for householders to gain income through the sale of this electricity.



Solar PV panels installed at Primrose Hill

| PROJECT NAME | Year installed | PROJECT COST £/kWp |
|--------------------------|----------------|--------------------|
| Pre-SunCities | 1999 | £7,330-£16,920 |
| Sackville Street | 2003 | £6,563 |
| P Hill KNH | 2005 | £4,706 |
| P Hill YHG Houses | 2006 | £5,493 |
| P Hill YHG Circus | 2006 | £4,280 |
| Titanic Mill | 2005 | £4,902 |
| Fernside | 2005 | £4,275 |
| Care homes (each) | 2006 | £7,965 |
| Sheltered housing (each) | 2006 | £7,965 |

Energy generation

The SunCities programme is estimated to generate around 260 MWh of electricity per year, and save around 110 tonnes of CO₂. This translates to a potential saving of around £85 (at current prices, 11p/kWhr) per year for each

A number of the systems were monitored for their performance over a 2 year period. Over 80% of those monitored performed to 80% or higher against the predicted performance for the sites of 780kWhrs / kWp installed per annum. Several systems achieved a performance above the prediction. It was identified that the properties with low performance may have been switched off, either unwittingly by the tenant or because the electricity supply had been suspended in void properties, a small number (around 5%) reported system faults. These faults have been, or are in the process of being, rectified by the installers.

Raised community awareness

The enthusiasm of the tenant representatives was instrumental in the project running smoothly. They informed

local residents about the scheme and were a focal point for enquiries and feedback. Tenants have taken part in energy information workshops, talked to the media and provided feedback on PV system performance. This project has raised awareness of sustainable energy and the need to tackle issues of climate change and security of energy supply. Some tenants have become keenly interested and have even competed to see who has generated the most energy! However a follow-up survey among residents of the first retrofit estate found fairly poor understanding of energy issues, particularly among residents who were not living there when the PV was first installed. This was addressed during maintenance visits and by the provision of plain English user guides in all new tenant packs.

Energy efficiency measures

The Kirklees Neighbourhood Housing homes have undergone Decent Homes works, including loft and cavity wall insulation which improved the homes' energy efficiency. Eco Homes ratings of very good and excellent were awarded by the BRE for the new build homes at Primrose Hill, developed and managed by Yorkshire Housing.

Local jobs and skills

The solar installation companies were from outside the area, but they recruited local staff to assist with installation. One local boiler fitter has now diversified into installing both PV and solar water heating systems. The housing associations involved in this project are now able to replicate the SunCities project on other parts of their housing stock. Kirklees has provided assistance to other housing associations in the development of new PV and sustainable energy projects.



New Build Homes at Primrose Hill

Partnerships

Partnerships have been forged with European and UK local authorities, housing associations, Kirklees Neighbourhood Housing (the Council's own arms-length housing department), external consultants, private developers and NGOs such as EnergyWatch, Green Alliance and the Micropower Council.



Residents at Fernside Solar Village

Visual impact

A key benefit of the programme was to demonstrate how well PV can be integrated in both existing and new buildings. By concentrating the installations on a small number of housing estates, SunCities has provided a good visual impression of how the widespread use of PV would appear. This is a common sight in Germany and the Netherlands, but only just starting in the UK.

Sharing Best Practice

Kirklees Council set up a mentoring programme to assist other housing providers in the Yorkshire region to deliver sustainable energy projects. *Sustainable Energy Getting Started* was delivered in 2007 and funded by the Ashden Awards and Government Office for Yorks and Humber. The project culminated in 2 days of site visits and workshops for over 100 delegates, more in-depth mentoring assistance to 5 organisations and the production of web based materials.



New build flats at Primrose Hill

LESSONS LEARNED

- Photovoltaics are one of the easiest renewable energy technologies to integrate in towns and cities, because they can be installed on roofs and building facades with minimal intrusion, they have a high level of acceptance by the general public and now have Permitted Development Rights therefore do not require planning permission in most cases.
- The technology performs well and requires little or no maintenance.
- Buying and installing in bulk (e.g. Fernside solar village 100 solar PV systems) can greatly reduce project costs.
- Currently the financial benefit of PV is in the units of electricity displaced. Electricity generated which is not consumed can be sold back to the grid

but generators are not guaranteed a price equivalent to that which they pay for electricity. Also it is difficult for householders to access the government's financial incentive for generating renewable electricity (ROCs – Renewable Obligation Certificates). Kirklees Council is one of many organisations lobbying at a national level for the introduction of Feed-In Tariffs (which would guarantee a fair price for exported renewable electricity) and for ROCs to be more accessible to small generators. Recent government announcements indicate feed-in tariffs will be introduced through the Climate Change Bill currently going through parliament.

MEASURING SUCCESS

- **Environmental:** the solar photovoltaic installations will save around 115 tonnes of carbon dioxide every year; the solar thermal systems an additional 24 tonnes each year.
- **Economic:** the project attracted around £1.8m investment to Kirklees and householders benefit immediately from savings on their fuel bills.
- **Social:** the solar villages have revitalised the areas and attracted nation-wide attention including a visit to Primrose Hill from HRH Duke of Edinburgh and recognition by the Ashden Awards.

PLANS FOR THE FUTURE

Training

Training in solar thermal installations has been set up with internal partners within the Council and Calderdale College. The potential for solar PV training is also being assessed.

RE-Charge

The RE-Charge scheme was launched in August 2008 and offers interest free loans of up to £10k to homeowners to install renewable energy on their property.



CONTACT DETAILS

For further information please contact:

Kirklees Council
Environment Unit
23 Estate Buildings
Railway Street
Huddersfield HD1 1JY
Tel 01484 223568
Fax 01484 223576
email: environment.unit@kirklees.gov.uk

Please also see the SunCities website
www.suncities.nl

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