

## Sunny Outlook at Home for the Elderly

### Summary

Woking Borough Council has installed a photovoltaic (PV) roof on a residential development for the elderly in Woking. BP Solar was the manufacturer and installer on the project. This is currently the UK's largest domestic PV installation on a single residential building, and the first to use solar PV and combined heat and power (CHP) energy together.

Woking Borough Council and BP

Solar have worked closely together on this and several other projects, where the unique combination of PV and CHP technologies on private wire networks produces complementary summer/winter reverse profiles. Maximum electricity generation is provided by the PV in the summer and by the CHP in the winter, achieving in excess of 100% sustainability in electricity (ie with no input from the grid and able to operate independently in island generation mode).

### Highlights

- ▼ **Area of low environmental impact saving 25,000 kg/year of CO<sub>2</sub> emissions**
- ▼ **No electricity input from the National Grid**
- ▼ **Surplus electricity exported to other Council sites via unique enabling agreement for exempt supply operation**
- ▼ **First local sustainable community energy system using PV with CHP**

**Brockhill residential development for the elderly.**



## Project Background

Woking Borough Council has a vigorous strategy on renewable and sustainable energy on private wire networks. It has taken a lead role in innovative solutions, largely driven by its wholly owned Energy and Environmental Services Company (EESCO), Thameswey Limited and its public/private joint venture Energy Services Company (ESCO), Thameswey Energy Ltd, with its Danish partners, Hedeselskabet Miljo og Energi A/S operating the Brockhill system as well as other green energy projects in Woking.

The aim of the project was to increase green energy generation, reduce CO<sub>2</sub> emissions, tackle fuel poverty and contribute to Woking's local sustainable community energy systems, Energy Efficiency Policy and Climate Change Strategy. The project took one year from conception to completion.

## The Project

Brockhill PV roof was the first of the projects to receive planning permission, but before the application for planning permission was made, planners were educated in sustainable energy and the role of solar PV. Also, articles appeared in the local press and radio paving the way for the planning application.

Some years earlier, energy efficiency, CHP and renewable energy were incorporated in the Woking Borough Local Plan and this was of great advantage to the project.

The aesthetic issues were handled by submitting colour photomontages as well as planning drawings which,



**Installing the PV arrays on the Brockhill elderly residents home.**

together with the education of planning officers, led to a recommendation for approval and no objections from Councillors or members of the public, although there was lengthy debate at the Planning Committee.

Incorporating the above resources in the planning application for the project enabled the whole issue to be widely debated and subsequently supported. This facilitated the planning application and approval process for the PV projects that followed.

Brockhill PV roof is a very visible application of renewable energy in a residential area adjacent to the Goldsworth Park Shopping Centre. Woking Borough Council initially installed 36.5 kWp of PV roof linked to an existing 30 kW<sub>e</sub> CHP plant running on natural gas, with the complementary reverse generation profiles used to provide all-year-round electricity, heating and hot water services.

Phase 2 increased the PV capacity by a further 45 kWp of solar PV roof panels, making a total capacity of 81.5 kWp and a total green generation capacity of 111.5 kW.

Woking is the only local authority generating, distributing and supplying electricity, heat and cooling on private wire district energy networks to public and private residential and non-residential customers.

The Woking system has a number of exempt island generation private wire networks throughout the borough. These are interconnected by the local distribution network operator (DNO) public wires system which, through an enabling agreement for exempt supplier operation, provides its own balancing, stand-by and top-up between its island generation sites, with the aim of not importing from or exporting to the grid. This is to achieve security of supply and independence from the grid.

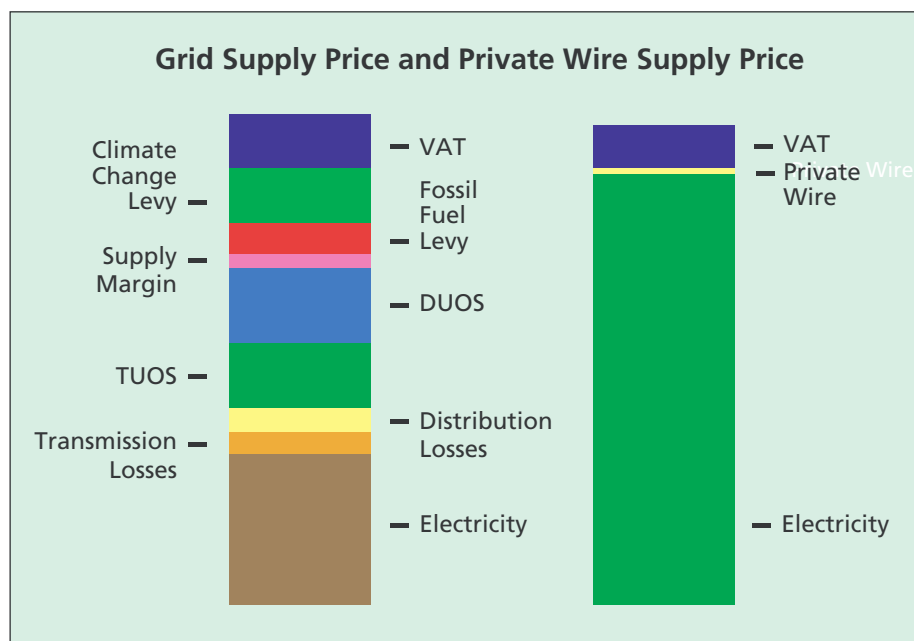
The enabling agreement for exempt supplier operation enables the island generation sites to trade with each other outside of the New Electricity Trading Arrangements (NETA).

The Brockhill integrated PV/CHP project is just one of the projects in the Woking Local Sustainable Community Energy System that is self-sufficient in electricity as well as providing stand-by and top-up electricity to other island generation sites and vice versa.

The private wire approach to PV enables the Council to extract the true value of green energy from PV/CHP by not selling electricity to the grid at a bargain price, but by selling electricity and heat directly to local residents at a much higher price but still lower than the competitive deregulated energy market. This enables the Council to take sheltered housing residents out of fuel poverty as part of its Tackling Fuel Poverty Strategy. This is achieved by displacing the transmission and distribution losses and use of system charges and the NETA imbalance penalty charges risk which, can account for over 80% of the electricity price to residents.

## Performance

- ▼ Maximum electricity demand of the site is 60 kW.
- ▼ Maximum on-site electricity generation is 111.5 kW.
- ▼ Solar PV comprises 36,666 solar cells in 1,018 BP580 high-efficiency monocrystalline silicon pseudo square cell modules.
- ▼ Brockhill is self-sufficient in energy and a net exporter of electricity to other sites.



PV is of particular benefit when integrated with private wire residential CHP since reverse summer/winter electricity profiles are complementary and enables balancing, island generation and security of supply to be achieved via a UPS inverter acting as a black start generator.

## Economics

- ▼ The capital costs of Phases 1 and 2 are GBP 351,083 (where GBP is the UK pound) less GBP 75,000 Seeboard statutory Energy Efficiency Standards of Performance scheme (EESoP) grant towards Phase 1.
- ▼ 25 year warranty on PV roof.
- ▼ Displaced unit energy costs are GBP 0.09-96/kWh for the first 728 kWh/year and GBP 0.06-54/kWh for the remainder.
- ▼ Some of the electricity generation is hypothesized to reduce residents' heating bills by GBP 104/year.

The project was financed partly from the Council's Housing Investment Programme and partly from Thamesway Energy Ltd. The capital investment is recovered from the income generated from the ESCO contract over 25 years.

Implementing PV on private wire networks for residential applications can reduce installation costs by up to 50% since half the cost of PV in individual dwellings can be on the connection and inverter costs.

With private wire networks the developer can connect domestic PV roofs to string inverters, thereby minimising the number of inverters to a technical minimum. Likewise, only one connection to the public wires is needed for a private wire network.

Since the green energy is supplied directly to residential customers (rather than to the grid), a higher value for the energy is obtained to

finance the investment in the green technology while still supplying green electricity, on private wire networks, at a lower price than the grid (brown energy). Residents typically pay between 6% and 7% of a state pension income only (ie ignoring Housing Benefit, Council Tax Benefit, Income Support, etc) for heating, hot water and electricity, compared with the Government's affordable warmth criteria of 10% of all income (ie including other benefits) for heating only.

Project investment and fixed return on investment are designed to make no profit. If profits are made, they have to be reinvested into further green energy projects under Thameswey's Memorandum of Articles and Shareholders Agreement.

## Environment

The combined system which encompasses the PV-generated electricity production, from the 81.5kWp of solar PV roof panels, plus heating & electricity from the CHP plant, equates to savings of 25,000 kg/year of CO2 emissions amounting to reductions of 4,734,000 kg over its lifetime.

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### International Energy Agency

The International Energy Agency (IEA) is an autonomous body established in 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme. Member governments have agreed to share energy information, to co-ordinate their energy policies and to co-operate in the development of rational energy policies. More information about the IEA is available at [www.iea.org](http://www.iea.org)

### CADDET

CADDET was set up in 1988 as an IEA Centre for the Analysis and Dissemination of Demonstrated Energy Technologies. Today, there are two CADDET programmes: one is for energy-efficient technologies and the other for renewable energy technologies. The CADDET Centre co-operates with member countries in the exchange of high-quality information on energy technologies.

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