

Photovoltaic Energy Production

the planning, design, installation and commissioning of PV arrays on South West Water operational sites

by Robert Prentice BSc CENG MICE & James Pearce BEng (Hons) MEng CENG MICE

The drive for sustainability underpins every aspect of South West Water's long-term environmental, social and economic strategy, and along with its parent company Pennon Group, is committed to being and becoming more sustainable in their business operations. South West Water has 1,800 energised sites across the region with 80,000 operational assets. In its business operations, the company consumes 260GWh energy per annum which generates 130,000 tCO_{2e} annual carbon emissions and leads to a £20m annual electricity bill. To put this into context, this annual electrical consumption is equivalent to the burning of 300,000 barrels of oil. This paper provides an overview of South West Water's solar energy initiative, which to date has seen solar power generation arrays installed on 31 operational sites.



Lostwithiel STW: 50 kW PV Installation - Courtesy of MITIE Energy Ltd

South West Water

South West Water is the provider of water and sewerage services for Devon, Cornwall and parts of Dorset and Somerset.

- 1.67m resident population.
- 15,146km of water mains.
- 14,710km of sewers.
- 39 water treatment works.
- 645 waste water treatment works.

Pennon Group is a net exporter of energy, with South West Water's sister company Viridor currently generating 820GWh a year of renewable power from landfill gas, energy from waste and anaerobic digestion facilities.

South West Water is committed to increasing its use of energy from renewable sources, the goal being to ensure that 30GWh of the energy used per year is generated from renewable sources by 2015. Ultimately, South West Water aims to source 50% of its energy from renewables by 2050. (Source: South West Water's Corporate Sustainability Report 2012.)

Preparation

This project started in August 2011 with a deadline for completed installations of 31 March 2012, which was fixed to coincide with what

was believed to be the next change in Feed-in Tariff (FIT). To provide an incentive to companies and individuals to invest in renewable power the Department of Environment and Climate Change (DECC) introduced the Feed-in Tariff Scheme which provided a benefit for purchasers of solar arrays made up of three elements:

1. **Feed-in Tariff.** This is payable for every unit of electricity that is produced and at the start of this project (for arrays with installed capacity of less than 50kW-peak) was 32.9p/kWh produced.
2. **Energy exported.** Where energy was not used on site an additional 3.1p/kWh for power fed into the grid.
3. **Energy import avoided.** Producing power on site means that South West Water avoids paying up to 10p/kWh for purchase of electricity.

There was a clear financial advantage to South West Water to install these systems on sites where all of the electricity would be used on site, avoiding energy purchase.

Financial payback model

Whilst South West Water was willing to fund these works, it needed to ensure that they provided a market level return on investment. This meant that as well as the site-specific issues that needed to be overcome, a reasonable payback period needed to

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be demonstrated once all costs had been taken into consideration. In order to ensure this, a financial payback model was put in place which considered capital costs and operational expenditure costs against predicted income.

In order to protect the investment, the installation contractor was made responsible for providing the income figures and the contract would be written to ensure that those income calculations were accurate or that damages for underperformance would be payable.

As part of the procurement exercise to select the contractors, South West Water provided a list of 47 potential sites which had been compiled as a desk-top exercise. Given the deadline, they immediately engaged with their designers and MEICA partners to physically survey the sites and investigate any blockers such as land gradient, shading, flood risk and planning restrictions, so that they were in a position to begin delivery and not waste time on unviable sites.

From the procurement exercise and using existing partners, a delivery team was assembled:

- MITIE Energy Ltd – Specialist photovoltaic design and installation.
- May Gurney Ltd – Civils, electrical and process support.
- Hyder Consulting Ltd – Project management, structural design and CDM coordinator role.

Delivery

From the initial surveys it was found that 17 sites were not suitable, 21 required further investigation and 9 sites were considered to be appropriate to proceed with. The list was shared with MITIE so that detailed costings (both installation and estimated income calculations) could be obtained for the 9 definite sites to allow installation to commence.

Some of the issues that needed to be addressed on each site were:

- **South-facing elevations.** The primary requirement was clearly to identify an area of land or roof of the required area preferably inside 'operational land' (which had benefit in terms of planning requirements).
- **Use all power produced.** South West Water needed to ensure energy usage was balanced with on-site demand. Accordingly, sites with a consistent baseload in excess of 50kW for all periods of the day were considered.
- **Structural considerations.** Every roof installation required structural calculations to prove that the loading would not require any additional structural strengthening. This applied to building roofs and reservoir roofs (which were eventually discounted due to ongoing maintenance requirements).
- **Ground conditions.** Trial pits were required to confirm ground conditions – some of the sites on the moors had rock at ground level.
- **Future development.** Some operational sites which were identified could not proceed as South West Water needed to hold the land for potential future expansion of treatment processes.
- **Existing infrastructure.** It was necessary to ensure that the electrical Distribution Network Operator (DNO) would allow the new installation to connect without any costly upgrade to the local electrical system.
- **Ecological impact.**
- **Security.** Consideration needed to be given to not only protecting the solar panels but also not to encourage intruders onto secure sites.
- **Future maintenance.** We needed to be clear of the regime for future maintenance and what access would be required and provided for this.
- **Compliance with planning requirements.**



Honiton STW: 50 kW PV Installation - Courtesy of South West Water

All of these considerations were kept on a master tracker to ensure that comments or reasons for going ahead with a scheme or otherwise were recorded.

In order to procure the works, a new engineering contract engineering and construction contract Option A was raised between South West Water and MITIE. The main contract was an 'umbrella' contract with no value, with the individual sites being procured using purchase orders that referenced the overarching contract.

Phase 1

On 31 October 2011, as preparations were still being made for the delivery of the first batch of projects, DECC announced that the FIT would be reduced from 32.9p/kWh to 15.2p/kWh as of 12 December 2011.

This announcement appeared to be flawed under the terms of the statutory process defined in legislation, not least as the required consultation period ended after the proposed FIT reduction date. This announcement came less than a week after SWW had agreed a £4.6m budget to progress the project.

Fast tracking

Given that South West Water was in the early stages of negotiation with the installation contractor and had a limited number of sites approved, serious thought was given to halting the scheme at that stage as there was less than 6 weeks until the new deadline. Ensuring that appropriate governance and safeguards were in place added to the time pressures, but these were achieved through mature and straight-talking dialogue.

All parties discussed this new deadline and MITIE accepted the financial implications for them if this new FIT rate was missed. As such, MITIE and South West Water signed up to the delivery of 6 (No.) 50kW installations by the 12 December 2011 deadline.

Not only was the installation period curtailed, the announcement also put pressure on the supply chain as all available stock was being purchased by installers so they could complete their installations by the new deadline. MITIE took the commercial decision to secure the required materials ahead of contractual terms and conditions being agreed – had they not done so, the project could not have been completed.

Hyder surveyed all the sites and worked with MITIE to understand programme so that designs were available when required, May Gurney provided ground and electrical works to meet the now three-week deadline in the most proactive manner so as not to cause delays to the programme.

MITIE completed the 6 (No.) 50kW installations and commissioned and registered the systems for the FIT on 9 December 2011 meeting the contract requirements for completion.

Meeting this deadline was a real achievement and testament to true collaborative working by all parties involved, the contractors, designers, South West Water Engineering, which provided technical and commercial support, and South West Water operational staff, who provided us with access onto sites, pulling together to make this happen.

Whilst the initial installations were being completed, an appeal was lodged by Friends of the Earth and two installers to challenge the legality of the Government's proposed FIT reduction. This appeal was heard at the Court of Appeal on 21 December 2011 and the appeal was allowed – although the Government immediately announced that it would appeal this decision to the Supreme Court.

Given the uncertainty in the market as a result of the ongoing legal arguments, the cost of the major procurement items had begun to drop due to low demand. Due to this cost reduction and also the



Countess Wear STW: 50 kW PV Installation - Courtesy of South West Water



Buckland STW: 50 kW PV Installation - Courtesy of MITIE Energy Ltd

belief within the team that ultimately the Government would lose the appeals process, South West Water gave approval to continue with further installations.

Phase 2

To reduce uncertainty in the market the Government announced that the FIT rate would be reduced on 2 March 2012, if it lost its final appeal, and this became the new deadline for the phase 2 installations. The team signed up to a further 10 (No.) 50kW installations and 1 (No) 100kW installation by 2 March 2012.

South West Water negotiated a 20% reduction in installation costs as a result of the uncertainty over the FIT. Accordingly, South West Water agreed to fund a further 5 (No.) 50kW installations and 2 (No.) 100kW installations with a 31 March 2012 deadline. MITIE, with support from Hyder and May Gurney, mobilised ten teams to ensure that these dates were met.

Phase 3

The team are currently concluding a further 7 installations and have been given permission to install the largest array we have yet done on SWW Headquarters building at Peninsula House, Exeter.

Summary

To date the three phases of PV have installed the following on SWW Operational Sites:

- 2 (No.) sub 50kW installations.
- 24 (No.) 50kW installations.
- 3 (No.) 100kW installations.
- 1 (No.) 150kW installation.

This investment totals approximately £3.7 million and has to date generated 2.1 million kWh of electricity. Available data for the first 12 months of generation has shown that despite the poor summer of 2012, the forecast generation targets were exceeded.

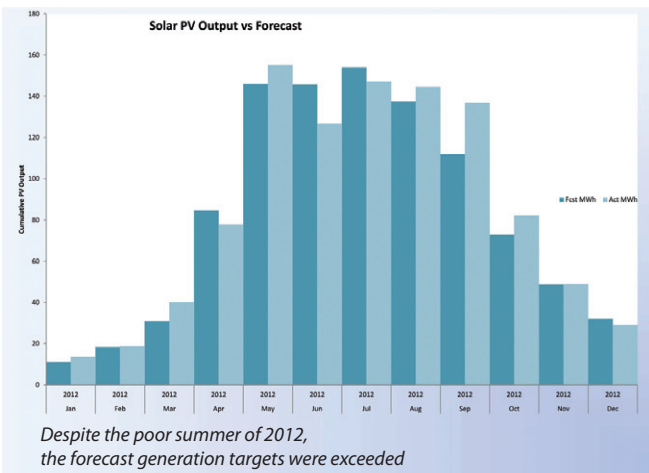
This proved a real challenge for the team especially during a period of uncertainty and shifting deadlines relating predominantly to changes and interpretation of generation policy.

This success is testament to the tenacious, agile and hard working team members who were involved in the life cycle of this project and demonstrates what can be achieved when like minded people work collaboratively and all pull together to achieve a common goal. It was a real privilege and a pleasure to be involved with such an outstanding achievement.

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Kilbury STW: 50 kW PV Installation - Courtesy of MITIE Energy Ltd



Despite the poor summer of 2012, the forecast generation targets were exceeded



Brokenbury STW: 100 kW PV Installation - Courtesy of MITIE Energy Ltd