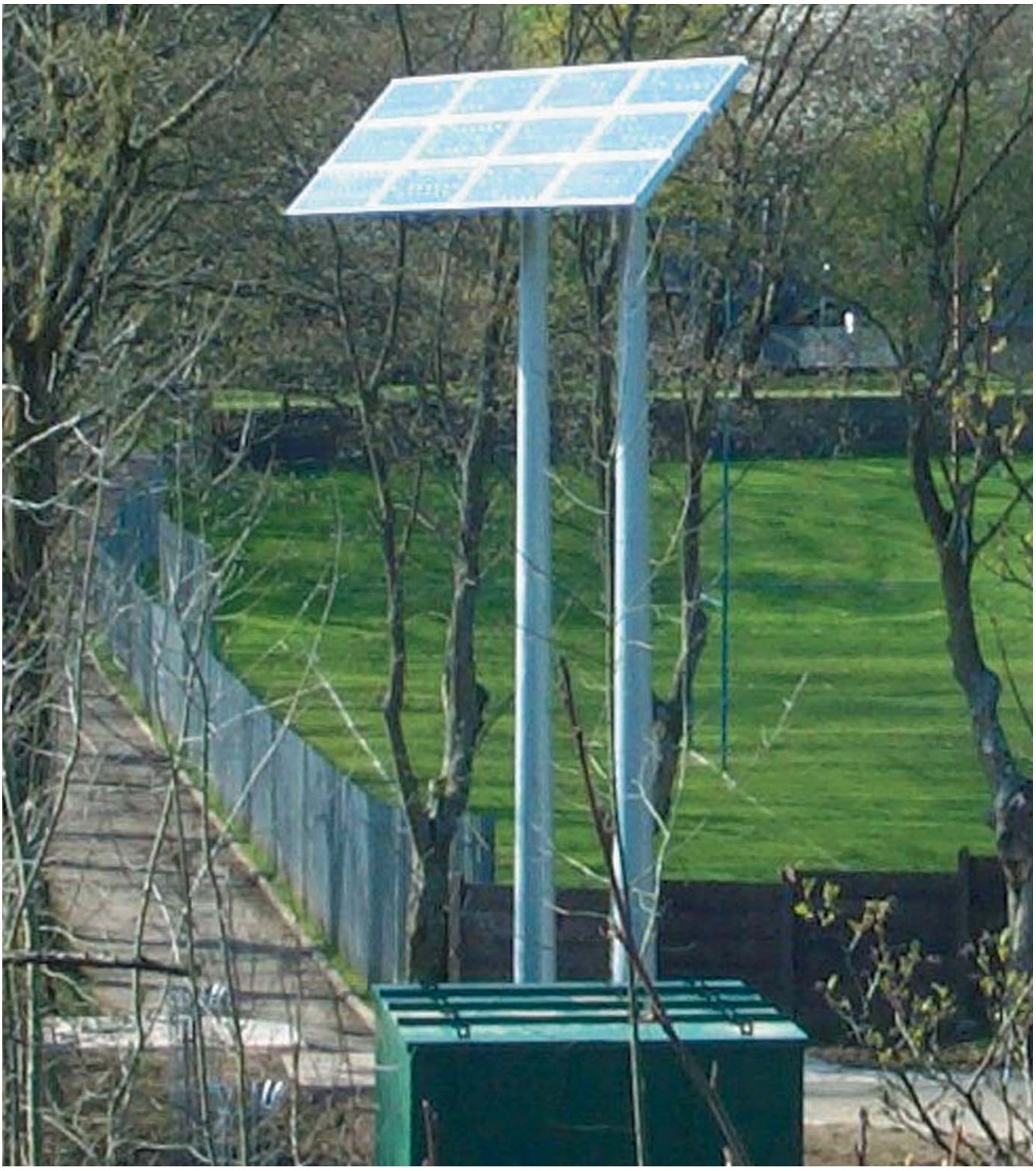
First Solar Powered Combined Sewer Overflow

UK 'first' claim for Gelligaled Park, South Wales

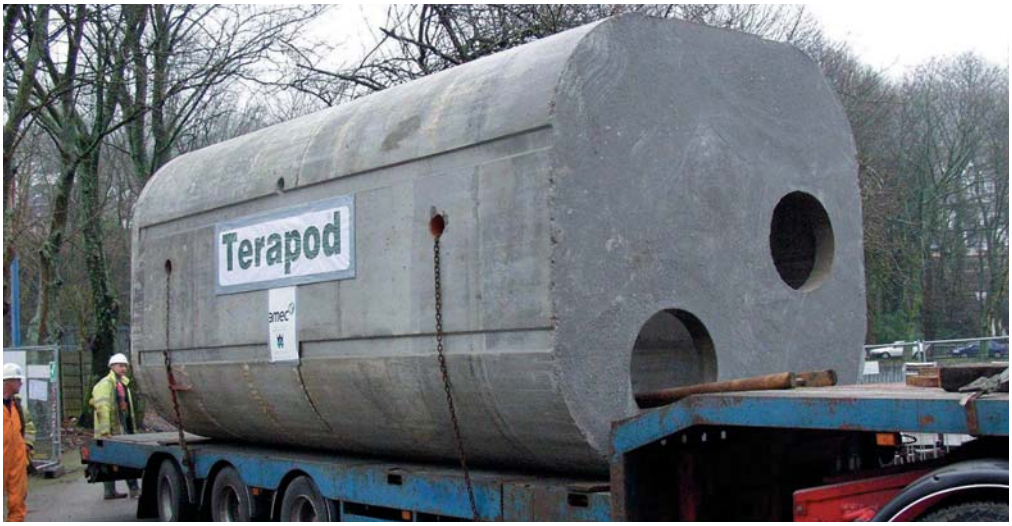
by

Bob Hughes

A new Combined Sewer Overflow, (CSO), at Gelligaled in Ystrad Rhondda, South Wales, has incorporated several unique technological features which separates it from traditionally constructed CSOs One of these features will be the use of solar power to drive and control the installed plant and equipment. This is thought to be the first time that solar power has been used in a CSO in the UK.



Solar panel in the park provides electricity for CSO courtesy: Welsh Water



The 'Terapod'
An alternative method for constructing the concrete CSO chamber. It was pre-cast off site and delivered 'on the back of a lorry'. Reducing 'curing' time, hire of ground support systems, disruption to roads network and the community.

The new CSO was constructed as part of Dwr Cymru Welsh Water's capital investment programme 2000-2005 in which around 60 per cent of the £1.2 billion programme is being delivered by the Welsh Water Capital Alliance, a strategic partnering team, made up mainly of specialist engineering and construction companies.

The use of environmentally friendly solutions in CSO design is actively pursued by the *Capital Alliance* and designers are encouraged to use, wherever possible, non-powered or self powered screens before electrically driven screens. There are a number of self cleaning CSO screens powered through the innovative use of integral waterwheels and siphon systems already being used. However, these type of screens are limited by the spill frequency and as such this results in electrically powered screens being required on many of the CSOs.

The costs associated with obtaining mains supplies to CSOs can vary widely. CSO locations are often restricted to the immediate vicinity of existing sewers, in locations where no nearby electricity supplies are present and land issues in obtaining Wayleaves also become problematic.

The *Capital Alliance's* South East Team sought and drove alternative power source solutions in an industry where very little, if any, research had been previously undertaken.

In 2002, *Amec Group Limited* and *Hyder Consulting* commissioned *ACDC Automated Systems* and solar energy company *Energy Equipment Testing Services, ETS* from Taff Wells, to undertake a feasibility study into this area. The study concluded that Solar Energy supply was feasible. Gelligaled Park, in Ystrad, Rhondda was selected to trial this innovative solution, due to many factors including extent of electricity supply, security against vandalism etc.

The solar panels comprise an array of photovoltaic (PV) cells, which generate an electric current during daylight hours, irrespective of direct sunlight being present or not. This generated current is used to charge a battery bank. The battery bank then stores the electrical energy which is used to drive the screen during spill events.

Because of the limitation in the size of the panels needed to run the CSO in peak flow conditions, dual energy sources of solar panels and a diesel generator were incorporated. Under this arrangement, solar panel area of 7.6m^2 could be used in conjunction with a small generator set, which would cut in to power the screen and charge the batteries should the battery charge fall excessively during storm conditions. This arrangement means that two thirds of the power required will come from the solar panels over a 12 months period of typical rainfall.

Mobile phone technology has been developed for the scheme whereby faults/spills etc., are reported via a telemetry unit within the kiosk. The idea is to replace the standard telephone line that is required with a mobile phone unit. The performance of the CSO will be monitored in the short and long terms and it is anticipated that valuable feedback will be obtained, which will benefit future schemes and further development. Maintenance of the plant is minimal because the batteries are maintenance free with a 10 year life span, and the solar panels are self cleaning.

An alternative method for construction of the concrete CSO chamber was also trialed at this asset. The chamber itself was precast off site utilising a design which maintained the structural integrity of the chamber in the final position, but was also light enough to transport to the site. This system would eliminate the need for formwork and concrete placement thus reduced confined space working on site. It also reduced the time taken to construct the CSO, by utilising the off site construction it eliminated curing periods on site, reduced the hire of ground support systems and reduced disruption to the community and roads network. Utilising an innovative design for the shape, which also incorporated thinner walls, combined with a specially designed high strength concrete mix, made this possible. **The chamber was then fitted out in situ with the mechanical and electrical equipment.**

Collaborative working with the supply chain partners has again proven invaluable and their contributions have enabled further improvements to be identified, which can be incorporated into future schemes. ■

The team comprised: *Dwr Cymru Welsh Water - Client; AMEC Group Ltd - Construction Services - overall design project management & construction; Hyder Consulting Ltd - Design Consultant; Tomlinson Engineering - Pre-cast CSO Chamber; ACDC Automated Systems - Electrical Design, Project Management, Supply & Installation; Energy Equipment Testing Services Ltd - Solar Array Design and Supply; Copa Ltd - Screen supply & installation; SJ Controls; Wessex Water Enterprises - operating contractor; ChandlerKBS & EC Harris - Cost Consultants; Rhondda Cynon Taff Council - Planning.*

***Note on the author:** Bob Hughes is Liaison Manager with Welsh Water Capital Alliance's South East Team, Dwr Cymru Welsh Water's strategic partnering team delivering the majority of its Capital Investment Programme.*