Seeking green off-grid solutions

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This year of the Dragon 2012 will be characterised by a range of interesting factors that intimately affect the world of water research and development (R&D). The first relates to the fact that 2012 is the year of Jhb+10 or Rio+20 to examine the sustainable development scorecard since the Rio Earth Summit (UN Conference on Environment and Development) of 1992 and the World Summit on Sustainable Development of 2002. The second is the continued global economic challenge with the recovery from economic crises adopting a much larger timeframe than initially hoped for. In this environment the need to maximise resource benefit on the one hand and extension of services on the other in particular to the rural and the poor, looks like a Herculean challenge. Add to this the need for Green solutions in a cash-strapped environment and this starts to describe the gordian knot we have to slice through.

To help address this, the Water Research Commission (WRC) and its partners have invested in a series of R&D projects for combined energy and water solutions – some of them completely outside the electricity grid and water networks. The idea in each of them is to maximise the possible concomitant water energy solution. The first example examines the possibility of utilising the potential energy stored in water tanks and reservoirs that have become landmarks in every South African city and many of its towns. A micro-hydropower solution has been developed and tested at the Queenswood Reservoir in the Tshwane Metropolitan District. The Queenswood demonstrator when extrapolated for ten reservoirs in Tshwane yields a yearly potential power generation of ten million kWh based on a range of assumptions – a key are being that power is generated for a maximum of six hours a day. If the pool is extended to include the Rand Water pipelines supplying the Tshwane Supply Area, then a further 1.2 million kWh could be generated. The technology has since been installed at the Pierre van Ryneveld reservoir in Tshwane.

A second example is a completely 'off-grid' combined water and energy solution for a livestock subsistence farming community in Okhombe in the Drakensberg area of rural KwaZulu-Natal in the Upper Thukela catchment. It is part of the Okhahlamba Local Municipality. The WRC project demonstrated a water solution through rainwater harvesting, and an energy solution using bio-digestor technology with the biogas feedstock coming from the livestock animals and water sourced from the rainwater harvesting to provide a viable energy from biogas solution. The project demonstrated that the integrated solution provided water and energy to meet both the domestic and agricultural needs in this community.

The final example I want to highlight is a wave energy solution. The southern African coastline has been identified as one of only six wave power rich areas in the world by the US Department of Energy (DoE). The estimate of wave power potential is very high with the US DoE calculating that in the Pacific North West coastline alone wave energy could produce some 40-70 kW per metre of coastline. The WRC project WEROP or Wave Energy Reverse Osmosis Pump is such a wave energy solution. In WEROP wave power is harvested to provide the energy to desalinate sea water in order to provide high quality freshwater for local community use just off Simonstown in Cape Town.

These three examples, all at demonstrator phase are providing models for innovative off-grid, sustainable water and energy combined solutions as part of the broader Green Economy efforts of South Africa.

The Pierre van Ryneveld reservoir where the WRC-funded micro-hydropower solution has been installed.