

Water-energy joint strategy key to SA's sustainable development

By [Dhesigen Naidoo](#)

20 Dec 2018

South Africa is once again walking the knife edge of an energy security crisis. We, again, appear to be two steps short of continuous rolling blackouts in the most extreme scenarios of demand management. Diversification of the solution box is key to a more comfortable energy future. And in doing so, thinking out of the transformer box is key. One of the earlier energy enterprises in human history is of course water. Firstly, using the kinetic energy in running water to turn water wheels, then moving on to more sophisticated engineering in the form of traditional hydropower from large dams and reservoirs.



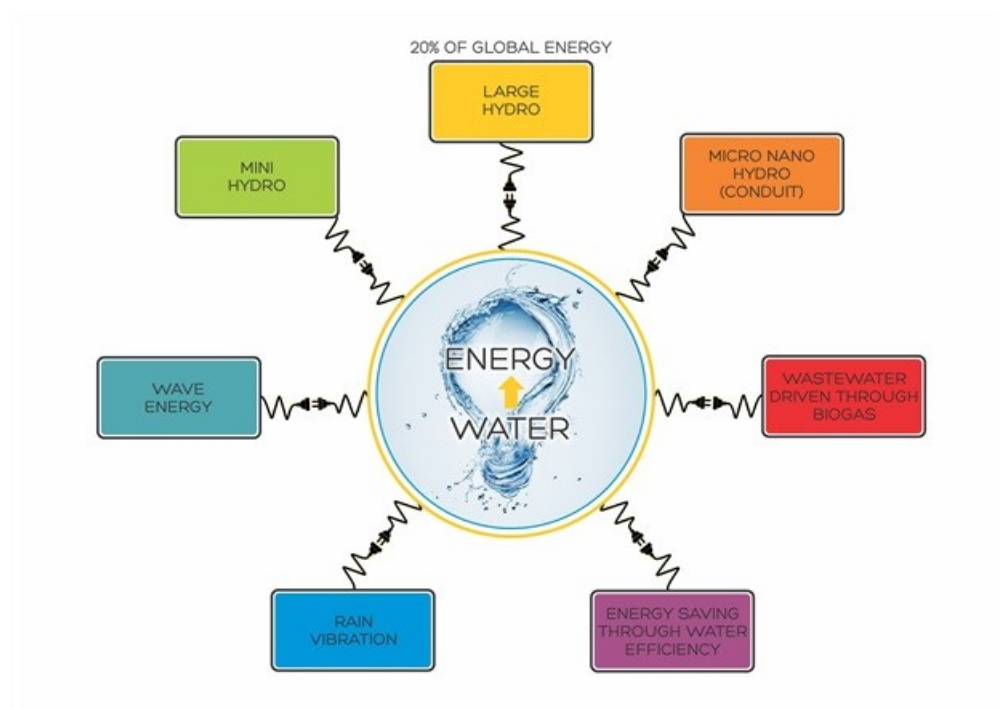
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Refining the older techniques

Research and innovation have expanded the possibilities in the water-energy portfolio exponentially over time. Some of the possibilities are refining the older techniques for the modern age. This includes the upgrade of traditional hydropower with miniaturisation to develop a suite of appropriate energy solutions on or close to site. Better turbine technology and the increasing of our understanding of water flow dynamics now makes it possible to harvest vast amounts of energy from our existing water infrastructure. Installing laminar flow turbines to capture the energy in our large pipelines is the modern day equivalent of the old waterwheels. The Water Research Commission and BloemWater have collaborated on this technology. The net result is an international award-winning solution run on conduit hydropower that now has the BloemWater headquarters getting all of its electricity needs from the micro-hydro unit making it the first off-grid water utility headquarters in the country and continent.

The second option is an extension of this concept to stored energy in the form of the vast amounts of potential energy that 'sits' in every water tower and reservoir in every city and town in the country. As has been demonstrated in WRC-University of Pretoria projects, the installation of a nano-hydropower unit to capture the energy from the water exiting the towers every day. This gives us the possibility of new energy in the gigawatt-hour range if we refit and exploit the many thousands of existing suitable reservoirs and water towers around the country. This combination could organise for not only the marked decrease of electricity demand from an already strained electricity grid. In addition, the water sector has the

real possibility to become a significant energy supplier to the system from these new non-traditional sources.



Water has always been a central pillar in electricity production before being overtaken by the fossil fuel revolution. The aspiration toward a lower carbon future and the massive advances in science and engineering has made possible a new 'hydropower'. Water has several energy generating possibilities from traditional hydropower and wave power generation to the harvesting of 'raindrop energy' through capturing the energy generated by raindrop vibrations.

Wastewater treatment technologies

This is very promising, and this is only the tip of the iceberg. Even more revolutionary are the latest developments in wastewater treatment technologies. This comes in the form of optimising the generation and capture of biogas, primarily in the form of methane as a principal energy source. This channel is extending rapidly with increased innovation in the direction of hydrogen production and the optimisation of microbiological fuel cells or MFCs. We are on a global trajectory that says that wastewater treatment plants of the future will be a significant part of the energy generation fleet. In a country where we clearly need a wastewater treatment plant renewal, we would be amiss if we did not grasp the opportunity to retrofit our existing plants to optimise the energy generation potential while increasing their capacity to better manage the wastewater treatment load. This will be a significant win-win situation.

Combining our efforts in addressing the national challenges on water and energy in a joint strategy is key. The water-energy nexus will determine our future national security, our ability to improve the quality of life of all our peoples, meet our sustainable development goals, as well as our international competitiveness.

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