

# Hydropower and the pioneers of independent power production

NuPlanet is the developer of the Bethlehem Hydro Project, South Africa's first independent hydropower plant to be connected to the grid in 24 years. This award winning project has positioned the company as a benchmark independent power producer in the renewable energy sector and the undisputed market leader in small hydro power.

**“W**e run NuPlanet as a business,” says PG Needham talking to *MechTech* from the company's Menlo Park premises in Pretoria. “We develop and run all our plants based on their viability as businesses.”

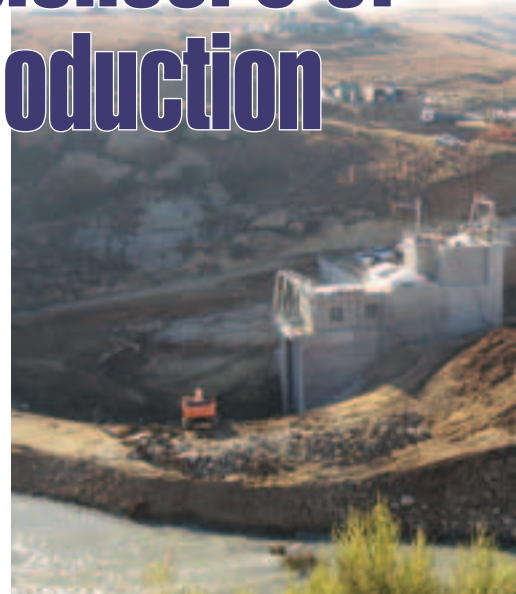
NuPlanet is a dedicated hydropower developer: “While we supply renewable energy, we don't get involved in energy efficiency businesses. At this point we don't get involved with energy efficiency and we have not yet done any solar or wind projects. Our interests lie solely in hydropower and we are presently positioned very well in this market,” Needham explains. “We estimate South Africa's small hydro resources to be in the region of 200 MW, and until these projects are fully exploited and the market closes up, we intend to remain focused on the core strengths we have developed.”

The 200 MW estimation is based on identified pipeline feasibility studies totaling some 120 MW of generating capacity and Needham suggests that a further 80 MW of, as yet unidentified, opportunities are likely to arise. “Some

studies suggest that 5 000 MW is available, but these are desktop assessments based on the total river flows and generic height variances across the whole of South Africa. Unfortunately, there are geographical limitations to hydro use, hence the lower number,” he adds.

NuPlanet sets out to exploit identified hydro resources with small hydro projects in the 2,0 to 50 MW range. “We first identify possibilities, when someone contacts us, through our own geographical studies or when a new opportunity arises,” Needham explains. “From there we do an in-house assessment. This we call a prefeasibility study to determine if it is worth putting our own money into the project – because we develop everything on our own risk. Based on the prefeasibility report, if, by our calculations, the project is feasible, we would move to develop the project further.”

That involves getting all of the required permits and licenses: water use and electricity generation licenses; land ownership; servitude rights; and EIAs for both the power station itself and for the power distribution lines. “We would develop some conceptual or low-



*The Sol Plaatje hydropower station is located on the right bank of the Sol Plaatje Dam. A new intake was constructed within the non-overspill flank and the power station was located immediately downstream of the intake.*

level designs and do some geotechnical investigations. Then, if we can get all of these in place, we package this up, add the financial models and a business plan, and take it to a bank. At the end of the day, securing finance is all about bankability,” he suggests.

“If we have all the documents, permissions and engineering designs to legitimately build a power station, then we would get the money, appoint contractors, turbine and generator suppliers and start with the construction and the integration of the various engineering disciplines. We use the full EPCM process, we manage the whole process and we stay involved through every facet.”

Not only does NuPlanet invest upfront, the company aims to remain one of the owning partners for the full operating life of its projects. “We do take an initial developer's fee, but we like to keep a majority share in our projects, along with a BEE partner and other investors. That way we have an operational interest in the wellbeing of the plant and, through Revolution Energy, we take full responsibility for maintenance and operational efficiency,” Needham tells *MechTech*.

Pioneering this approach – without the benefit of a REFIT tariff – NuPlanet successfully commissioned two hydro-



*Bethlehem Hydro's Sol Plaatje power station.*



power plant's on the Ash River for the Bethlehem Hydro Project, the 3,0 MW Sol Plaatje Power Station in 2009 and the 4,0 MW Merino Power Station in 2010. The generated power is sold to the Dihlabeng local municipality, and Eskom. "This is a time-of-use tariff, so there are three different tariffs during the day and two different sets of seasonal tariffs," he adds. "But this project has taught us a lot and we are now in a position to manage and operate much more efficiently."

The Ash River, says Needham, is an ideal hydro resource because it is not a naturally-fed river. "This water is being delivered from the Lesotho Highlands project, so it has a continuous and constant flow release. In winter, when we are selling at the higher Eskom tariffs, the river flow is in fact, higher," he explains.

Plans are therefore at an advanced stage for two more cascading projects on the Ash: "We signed a mandate with a commercial bank for two 4,1 MW plants, one at Botterkloof and a second at Boston. For the Bethlehem project, only the DBSA was interested, but now the commercial banks are also keen to get involved," he adds. "We will be using new turbine technology for these projects and a right-of-first-refusal agreement is in place for the supply of the complete water-to-wire package, which includes everything from the Eskom overhead connection all the way back to the turbine in the river," he explains.

But neither of these projects will be

bankable without REFIT – or a privately agreed tariff level that is close to the original R0,98/kWh proposed in the 2009 REFIT draft. "We are hoping to be selling to the single buyer under Nersa's REFIT programme. The tariff for hydropower was revised down to 68 cents during the latest review, but after Nersa hearings, in which the whole sector participated, we are confident that the soon-to-be published final tariffs will accommodate our business," Needham predicts. "At 98 cents, we can make returns on our investments and we can also develop some of the projects that were previously not feasible," he adds.

The REFIT tariff for hydropower is not as strongly linked to the generating technology as most other renewable energy options. "For solar or wind, for example, it is the cost of the technology that governs the total cost and the total returns that are possible. But because hydro has such a large site-based civil construction element, it is much more difficult to calculate a general tariff for all projects. Every installation is unique and the civil construction work component will usually account for 70% of total project costs."

Needham is optimistic about REFIT: "As soon as the programme is launched, a lot of private investors will be willing to develop projects. Our energy mix will improve and a lot of energy problems, particularly those in remote areas, will be solved," he says. "Generally projects like ours are symbiotic with Eskom. Our plants operate far away from Eskom power stations, so it is no longer necessary to send megawatts of power down hundreds of kilometers of transmission cables, with all of the associated transmission losses, to places like Bethlehem."

Even without REFIT, though, NuPlanet remains determined to make a success of small hydropower technology in South Africa. "It will take more time and more hard work, but we are confident that we can find private buyers. If we consider Eskom's proposed price increases over the next six years, the Megaflex tariff is likely to overtake the hydro REFIT tariff in any case," Needham points out.

Looking beyond South Africa's borders, the company has also secured the rights for a 5,0 MW installation on the wall of the Mtirikwi Dam near Masvingo in Zimbabwe. "We are in the prefeasibility stage, have secured a generation

license from the ZETDC and we are currently looking for private buyers, sugar cane farmers, for example. The civils for this project are straightforward because it is already on the dam. We will have to build our own 30 km transmission line, though," he adds. Called Great Zimbabwe Hydro, the project is being developed in partnership with a Zimbabwe counterpart, MOL Power,

"The whole of Africa has electricity shortage issues and no country, including South Africa, has a surplus. So we are confident that the hydro market across Africa will grow. The existing hydropower projects were all built many years back and the current difficulties are much more about poor maintenance and age than a reflection on the technology itself. All rivers are seasonal to some extent, and some projects might need backup for a few months a year, but for most of the time, hydro is an excellent solution for Africa," Needham says.

"We are ahead of the pack in terms of expertise and we back our projects by taking on the full development risk, a substantial share of the ownership and operating responsibility for the complete project lifecycle."

"Through the REFIT programme, we hope to play a significant role in South Africa's renewable energy sector by installing small hydropower stations at as many viable sites as possible. Following which, we will look north of our borders for opportunities on the larger scale," he concludes. □



*The Kaplan-type turbine used for the Sol Plaatje and Merino installations.*