

Shuttered Mine Streamlines Development, Slashes Costs of Pumped-hydro Storage in Australia

William Steel June 28, 2016 Renewable Energy World

In the eastern Australian state of Queensland, developers plans to transform a disused gold mine into a 450-MW pumped-hydro storage facility at a fraction of the cost typically associated with pumped-hydro projects.

Renewable Energy World spoke with Simon Kidston — executive director of the project developer, Genex Power — to learn more about the project and its significance for renewable development in Australia. “We see this as a trailblazer project — there’s great opportunity here for supporting the emergence of renewable energy,” Kidston said. “The broad strategy is to develop a very low-cost pumped-hydro storage project utilizing infrastructure left behind by the mining industry. Together with an adjacent solar PV park, we’ll be dispatching cost-effective power, whilst enhancing grid stability.” Genex is well underway in its planning — much of which,

including permitting, has been streamlined due to a combination of the site’s previous industrial use and the strong community and governmental support the project has garnered.

Construction of the Kidston hydro facility is anticipated to begin in the second half of next year, with first generation planned for 2019. The plan also entails phased construction of a 150-MW (>140-GWh per year) solar PV park adjacent to the storage facility. “Construction of phase one — 50 MW — will begin [4Q16]; another 100 MW will be developed alongside the hydro project,” Kidston said.

Conditions in Australia are ripe for such a large-scale storage solution.

“There are several things we’ve observed motivating the development,” Kidston said. “In Australia, as the share of renewables increases greatly, we’ll see more instability in

electricity prices because of the intermittency of wind and solar power. We've seen this in other markets, and want to counter it here in Queensland through large-scale storage."

A second factor, he said, is that the majority — about 74 percent — of Queensland's peaker plant supply is gas powered.

"Whilst the global cost of gas has collapsed recently, the domestic price in Australia has in fact tripled due to LNG exports," Kidston said. "Our project will be substantially cheaper than gas peakers, and thereby create enormous opportunity to displace the gas-powered peaking market."

In addition, the Kidston development holds even greater appeal as the site could hardly be better suited for repurposing into a pumped-hydro storage facility. Decommissioned in 2001, and since flooded and rehabilitated, the site already comprises two large reservoirs of 52 and 54 hectares. Considering their dimensions and proximity to one another, the reservoirs are pitched to provide basis for a highly efficient pumped-hydro plant with a capacity of 450 MW and daily generation of 2,225

MWh.

"We're still finalizing the design," Kidston said, "but we're looking at a head — or height differential — of around 300 m. By utilizing some smart design techniques though, we've gained some extra height. That means gains in water pressure, and better efficiency — we estimate efficiency up to around 80 percent."

Additional to the reservoirs, remnants of the mine's history constitute considerable useful infrastructure, including a water pipeline, an airstrip, and a 132-kV transmission line and substation. Altogether these circumstances are cutting capital costs — contributing to expected expenditure of between a quarter and a fifth the typical costs of pumped-hydro storage.

"We expect costs of about AUS \$1 million (US \$750,000) per MW; massively less than a green field operation."

While the existing transmission line "perfectly accommodates" the 50-MW phase one solar PV build, Kidston explained that "the combined capacity of the hydro project and expansion of the solar park to 150 MW will require a new 275-kV transmission line. That work will commence next

year and is planned for completion in 2019.”

The project also has been aided through support of the Australian government, which, as Kidston explains, has been quick to recognize the development’s benefits: “We’ve been blessed by a huge amount of government support at two levels. At state level, the Queensland government has described this a project of state significance; what that means is a fast-tracking of approvals down from the typical 12 months to around three.” Kidston said the hydro project also received federal support and funding.

“They recognize the need for large-scale storage to support the expansion of renewables — it’s the one thing we’re lacking in Australia,” he said, adding that the Australian Renewable Energy Agency is providing ongoing support.

The Kidston location holds ingredients to success for the solar park. The site is highly amenable to PV development and exceptionally well irradiated; although final costs aren’t yet confirmed, the park is pitched to provide one of the lowest costs

per MWh in the country. Kidston added, “we’re on schedule; before September we’ll announce final design elements, capital and operating costs [for both the solar and hydro projects].” Once completed, the Kidston facility will be the third largest pumped storage scheme in Australia, but Kidston is confident this is only the beginning. Asked about the potential for repurposing more of Australia’s abandoned mines, he said: “Absolutely. I think they’ll be other groups that look to follow in our footsteps.”

“There are thousands of closed mines in Australia,” he said. “Of course, not every mine site is suited to hydro generation. Rock strength is important and abundance of fresh water is another important limiting factor. But certainly some of them present opportunities for the future. We’ve already identified another suitable site we’ll seek to develop after Kidston.”