The Future of IPP Is Green

Transforming L.A.’s Last Coal Plant to Help Reach 100% Renewable Energy

By Carol Tucker

As LADWP strives to reach our clean energy goal of 100 percent renewable energy by 2045, a unique opportunity has emerged at an unlikely place: the coal-fired Intermountain Power Project (IPP) in Utah.

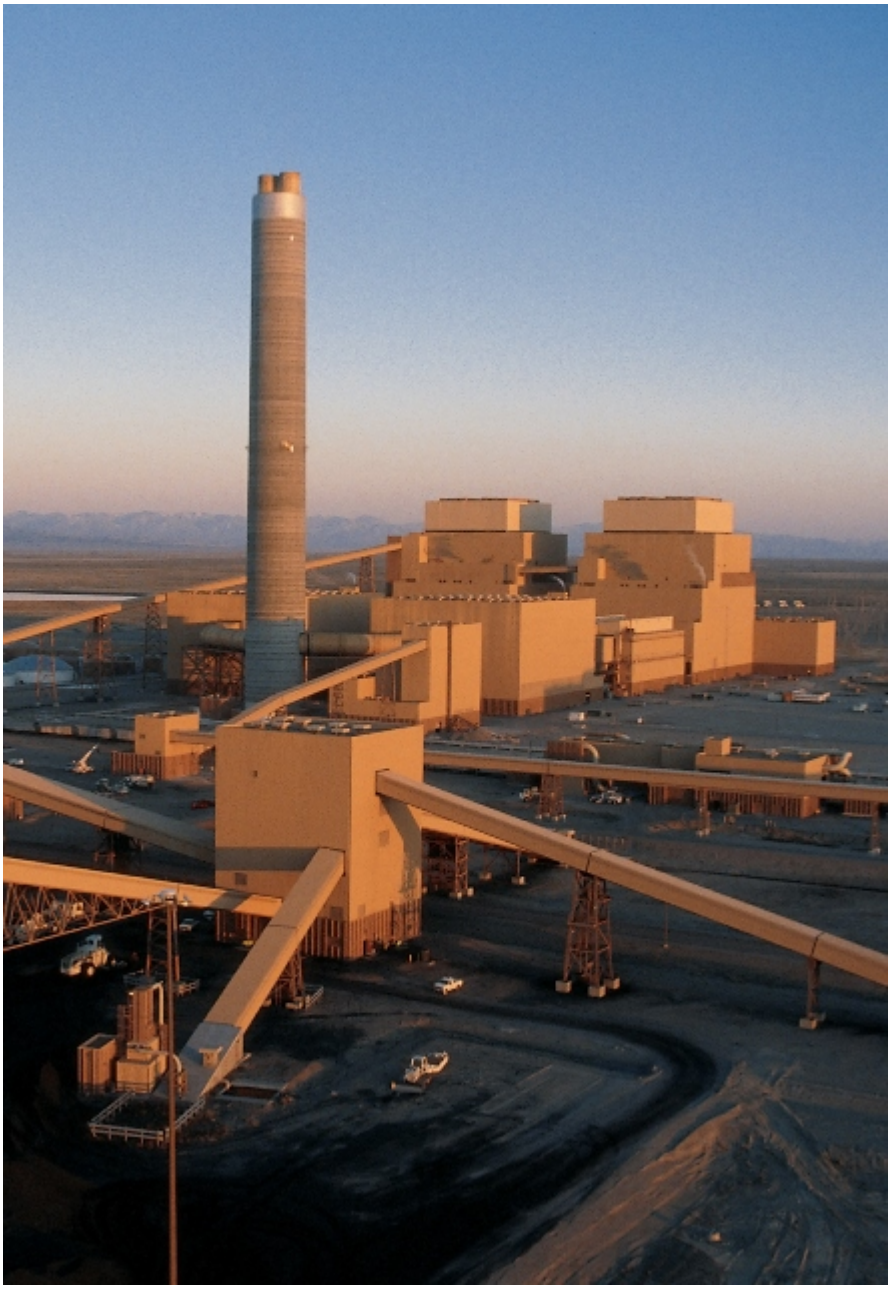
LADWP’s last remaining coal power plant is poised to become the first-ever power plant capable of using clean renewable hydrogen power.

As planned, the new IPP will be capable of burning a fuel blend of 30 percent green hydrogen starting on Day 1 of operation, and up to 100 percent by 2045. It will also have the ability to store renewable hydrogen for months at a time, thanks to a rare geological formation in the Western United States—a giant salt dome located near IPP—that will also be used for compressed air energy storage (CAES) technology.

Martin L. Adams, LADWP General Manager and Chief Engineer, believes that utilizing hydrogen power is essential to achieving 100 percent renewable energy by 2045. “There is no way to get to 100 percent renewable energy that I can see right now without hydrogen in the mix,” said Adams, addressing the role of hydrogen in L.A.’s power future during a December meeting of LADWP’s Board of Water and Power Commissioners.

“The ability to use green hydrogen as an alternative to fossil fuels in existing infrastructure not only ensures reliability, but will also make our clean energy future much more affordable,” Adams said.

“We’re really excited about developing green hydrogen at IPP. We think this is the path forward to allow for very high levels of renewables and deep reduction in carbon emissions,” said Reiko Kerr, Senior Assistant General Manager – Power Engineering, Planning and Technical Services. “The project also brings a level of high diversification of energy storage that will play an important role for maintaining power reliability.”



One of the first concrete steps occurred in March, when the Intermountain Power Agency (IPA), which owns IPP, awarded Mitsubishi Hitachi Power Systems (MHPS) a contract for two advanced-class, combined-cycle natural gas turbines for IPP that will be capable of burning renewable hydrogen.

The turbines will be designed to generate power using a fuel blend of 70 percent gas and 30 percent renewable hydrogen when the plant first opens in mid-2025. Between 2025 and 2045, the turbines capability will be systematically upgraded to allow utilization of 100 percent renewable hydrogen.

The Hydrogen Solution

Each cavern carved into the salt dome would be the size of the Empire State Building.

The green hydrogen and energy storage project at IPP would help solve one of the biggest conundrums facing utilities as they ponder how to serve customer demand 24/7 without fossil fuel power for backup generation. Since the most available and lowest price renewables—wind and solar power—are variable, power operators can’t rely on these renewables to meet customer energy needs during peak, or high demand, periods. Wind turbines and solar panels don’t generate power when the

wind isn’t blowing and the sun goes down or is blocked by clouds.

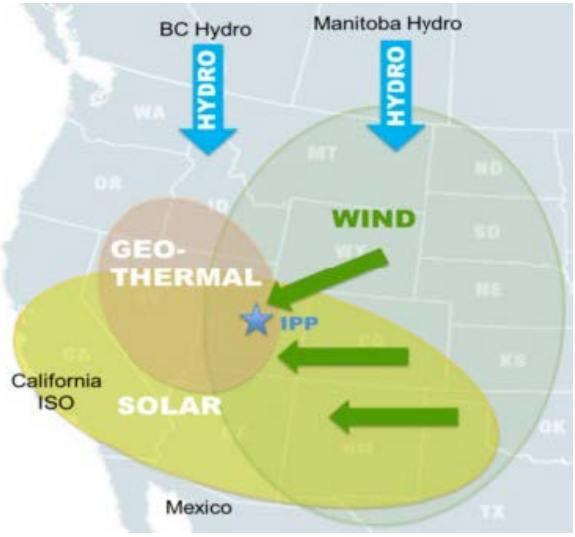
Noting the issue applies to all utilities that will have high penetrations of renewables, Kerr explained: “We have days where the power supply is 85 percent renewables and less than 15 percent from fossil fuel power. But we also have days, such as a hot summer day, where we have 15 percent renewables and the majority is fossil fuel (with some nuclear and hydro power). How do you scale up that 15 percent to 100 percent without building massive amounts of solar and creating an over-generation that you later have to curtail?”

The IPP green hydrogen project would use renewable energy, such as solar or wind power, to produce hydrogen through electrolysis—a process of splitting water molecules to convert water into hydrogen gas as fuel for the IPP generators. Renewable hydrogen would be produced and used to generate energy in real time. But when the renewable power is not needed, it would be stored in the salt dome for future use.

“Hydrogen storage is one of the new IPP’s most unique features. Not only does it alleviate the challenges of hydrogen transportation, it also allows for seasonal shifting of renewable energy, taking the otherwise curtailed energy and storing it as fuel,” said Paul Schultz, Director of LADWP Power External Energy Resources.

The rare salt dome is a two-mile wide solid piece of earth, extending deep into the earth . LADWP power engineers said renewable hydrogen would be stored in caverns, each the size of the Empire State Building, that would be drilled into the salt dome through solution mining—using water to liquefy the salt. The amount of potential energy storage is off the charts—with the capability to build over 100 caverns, each having a capacity of 100,000 megawatt-hours. That amount of power would meet the demand of an estimated 16,667 L.A. households per year. At 100 percent renewable hydrogen, that clean power would offset over 75 million pounds of carbon emissions.

Location, Location, Location



Utah's renewable energy hub

IPP is perfectly situated for the green hydrogen project. Not only is it close to the immense salt dome, part of which is already being used by other companies for natural gas liquid storage, it is also tied to two critical transmission systems.

By rebuilding IPP as low carbon, and ultimately no carbon, power generation, LADWP will maintain the viability of the 500-mile transmission Southern Transmission System (STS) that is needed to push renewable energy from Utah, Nevada and other western states to Southern California.
The transmission line requires a continuous flow of "firm" power generation to work properly. With the advent of green hydrogen storage that requirement could be fulfilled using renewable energy instead of natural gas. The IPP facility also connects to the Northern Transmission System (NTS), an AC transmission system that serves Utah and Nevada from IPP. Additionally, the IPP facility lies at the hub of a confluence of renewable energy resources, already abounding with wind farms and solar arrays, and fertile ground for new projects.

IPP is currently interconnected to 370 MW of wind power. Schultz said there are approximately 2,300 MW of solar interconnection requests in the queue, and another 1,500 MW of wind power interconnections are under discussion. Geothermal energy is also a possibility for future development.

Transition from Coal to Gas to Green Hydrogen

The future of IPP has been in transition for over a decade, as California climate

legislation became more aggressive and the Department began expanding renewable energy and seeking alternatives to replace coal. In 2013, LADWP committed to stop using IPP coal power by 2025—two years earlier than required by California legislation (SB 1368) and led the campaign to gain support of all 35 IPP participants (including Utah and California municipal utilities) to reach agreement on a smaller natural gas generating system that would be in compliance with SB 1368. At that time, the 1,800 MW coal units were to be replaced with a 1,200 MW combined-cycle natural gas generating system.

In 2018, LADWP received approval to scale down the project further—to 840 MW—which meant a 30 percent reduction in carbon emissions. Engineering studies had determined that 840 MW was the minimum generation capacity needed to maintain sufficient voltage for the critical transmission systems to operate reliably.

As plans progressed to replace IPP with the scaled-down natural gas generating system, LADWP power engineers began exploring ways to further reduce carbon emissions from the facility. The idea of using clean-burning hydrogen, produced by renewable energy, pushed its way to the forefront of discussions.

“We knew renewable hydrogen was being produced on a smaller scale. We floated the idea to vendors during discussions about utility-level production were told, ‘yes, we can do it,’ ” recalled Schultz.

As the plant’s operating agent and project manager, LADWP will seek proposals for the engineering and construction contract to build the new IPP. Construction must begin in 2022 in order for the new system to launch operations in 2025. Separately, LADWP will need to issue requests for proposals and award contracts for construction of the hydrogen storage facility as well as the electrolysis technology for producing green hydrogen.

Today, LADWP’s Power System leaders are optimistic about IPP’s future. “We’re looking at a natural gas plant becoming a hydrogen plant, producing carbon-free energy, that also helps keep our grid reliable as we integrate large volumes of intermittent renewable resources,” Kerr said.