

Hydro Leader

VOLUME 5 ISSUE 6

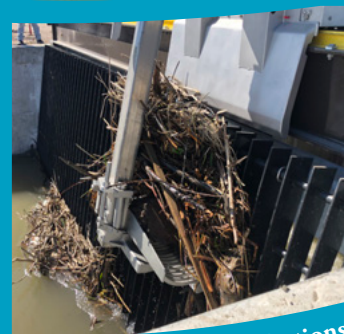
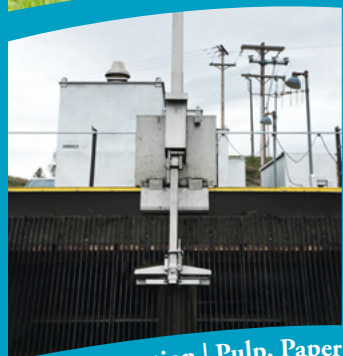
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Janice Goodenough of HYDROGRID: Bringing a Digital Revolution to Hydropower

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Janice Goodenough, CEO, HYDROGRID.
Photo courtesy of HYDROGRID.

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The Importance of Digitalization for Hydropower

By Kris Polly

To a great extent, the physical side of hydropower infrastructure is already highly optimized. However, digitalization offers significant opportunities to improve operations, power trading and dispatch, and revenue. To push this process forward, Austria-based HYDROGRID has created a real-time data hub called Insight with modules for data capture and communications, inflow planning, automated generation and energy bidding planning, maintenance planning, and more. In our cover story, we speak with CEO Janice Goodenough about the company's offerings and the promise of digitalization.

Further pursuing the topic of digitalization, we speak with Quentin Ploussard, an energy systems engineer at Argonne National Laboratory who is developing modeling tools to help hydropower operators better manage reservoir operations, power generation, the timing of water releases, modernization options, and more.

Next, we learn about two federal programs that can be sources of funding for hydropower. Phil Kangas, the director of outreach and business development at the U.S. Department of Energy's Loan Programs Office (LPO), joins us to speak about the debt financing the LPO offers for high-impact, large-scale energy infrastructure projects. We go into detail on the programs available for hydropower as well as how the LPO helps applicants put together successful applications. Then, we

speak with Aaron Snyder of the U.S. Army Corps of Engineers' Corps Water Infrastructure Financing Program, which provides low-cost, long-term federal loans for dam safety projects.

Last, we bring you a fascinating story of two linked careers in the hydropower field. Charles Alsberg cofounded North American Hydro nearly 50 years ago and, since then, has founded at least two other companies and amassed immense domestic and international experience in the hydropower sphere. His son, Rory, put in time at North American Hydro before transitioning to the specialty marine construction company J.F. Brennan. We speak to both father and son about their careers and accomplishments in hydro.

Considering how much digital technology has shaped each of our lives, it's no surprise that digital will be a game-changer for hydro, too. The process is already afoot, and companies such as HYDROGRID aim to harness the powers of this technology to optimize hydropower facilities for the future. [H](#)

Kris Polly is the editor-in-chief of Hydro Leader magazine and the president and CEO of Water Strategies LLC, a government relations firm he began in February 2009 for the purpose of representing and guiding water, power, and agricultural entities in their dealings with Congress, the Bureau of Reclamation, and other federal government agencies. He may be contacted at kris.polly@waterstrategies.com.

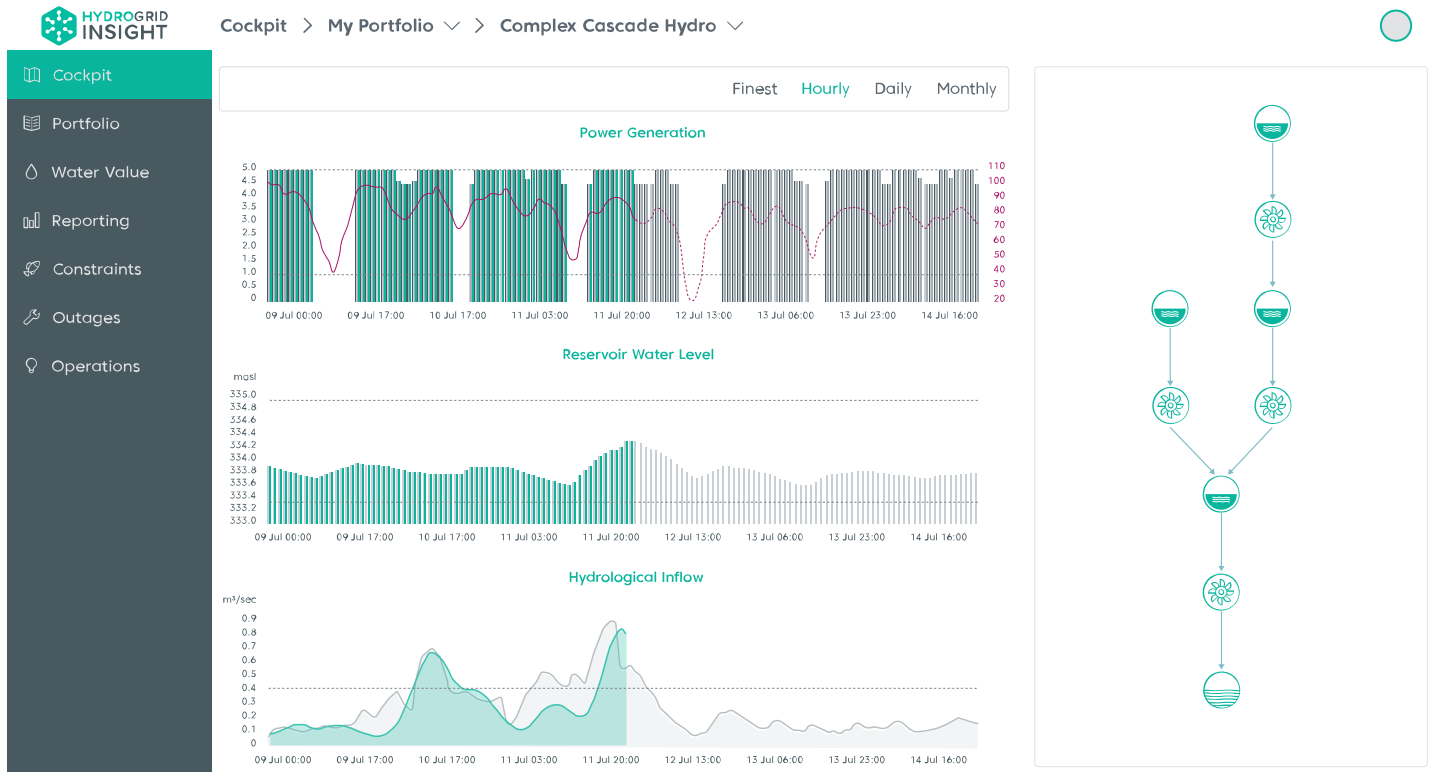
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Janice Goodenough of HYDROGRID: Bringing a Digital Revolution to Hydropower



A cockpit view of HYDROGRID Insight, featuring live data, price and inflow forecasts, and production planning.

Much of the physical technology of hydropower hasn't changed in 100 years. But there are big changes afoot in another aspect of the industry: digitalization. With the liberalization of power markets and the massive buildout of solar and wind generation, hydropower operators have seen rapid growth both in the difficulty of their work and in the opportunities open to them. Digitalization can help in both areas. Eight years ago, Janice Goodenough started HYDROGRID to offer hydro operators of all sizes an all-in-one software solution for the optimal water management and operation of their plants. Among other services, HYDROGRID Insight delivers solutions for inflow forecasting, power trading, and the management of daily operations that are used by hydro operators in 11 countries. In this interview, she shares with Hydro Leader readers her forecast for the future of an industry in flux, including why she thinks digitalization is a requirement to remain competitive in the changing power market landscape.

Hydro Leader: Please tell us about your background and how you came to be in your current position.

Janice Goodenough: I studied applied mathematics at the Vienna University of Technology and the University of Nice Sophia Antipolis in France. Though many of my colleagues followed the typical path from applied

mathematics into investment banking, finance, and insurance, I always felt that I wanted to work on something tangible—something connected to the physical world. During my studies, a visitor from one of Austria's largest hydropower producers gave a seminar on the unsolved mathematical challenges in hydropower, specifically in hydropower optimization. That piqued my interest. After my studies, I started working for Verbund, Austria's largest hydropower producer. After 4 years, I became the leader of the quantitative analysis team, which is in charge of power trading. We handled everything related to the optimal trading of power-generating assets, hedging strategies, and the valuation of structured power products. Liberalization meant that the European market was going through a lot of transitions at that time.

After having seen the financial part of power generation, I was still interested in the physical part of it, so I moved to the physical power plant dispatch, where large pumped storage in the Alps is dispatched 24 hours a day. I saw that the process of optimally commercializing power generation was handled by multiple departments using several different software solutions. I thought, "This works for a billion-dollar company, but it wouldn't work so well for a midsized utility." Even for a large company, it's not really suited to where the power markets are going, because they are becoming more

volatile and short term focused. Almost 10 years ago, I could already see that this trend would increase.

It was clear that there was a need for a solution that covered the entire process of digitalizing hydropower in one easy solution. I did some searching and found that there was nothing out there. That's when I decided to create HYDROGRID Insight. We have been in live operation in hydropower plants since 2017 and are now active in 11 countries across multiple continents.

Hydro Leader: Please introduce HYDROGRID and your HYDROGRID Insight solution.

Janice Goodenough: HYDROGRID Insight is an integrated water management and production planning platform that offers a full digitalization solution for the optimal operation of hydropower plants. We cover everything from inflow forecasting to short-, medium- and long-term dispatch planning, the automated handling of environmental and regulatory requirements, and maintenance planning. It's an all-in-one, fully digitalized platform that works in real time and provides hydropower operators seamless and efficient digital data flows across the entire company. If an operator wishes, it optimally provides a production plan that will increase the revenue gained from selling energy in their power markets or via power purchase agreements. It also increases the technical efficiency of the assets by reducing spill and using the turbines at their point of optimal efficiency, increasing power generation by up to 10 percent. Additionally, by selling power in the market at the best prices, hydro operators can increase their revenue per megawatt-hour by an average of about 15 percent—though for some users, the increase over manual operation has been up to 50 percent. It is an easy-to-use solution that works for power producers across all sizes, from 1 megawatt up to more than 1 gigawatt of generation capacity.

Hydro Leader: Please tell us more about HYDROGRID's technology solutions.

Janice Goodenough: Within our HYDROGRID Insight solution suite, there are different modules, and each operator can pick and choose the parts they need to support and digitalize their operations. Some may need only an inflow forecast; some may need only water management and production planning; some may need maintenance planning. Operators can integrate those modules into their existing information technology (IT) infrastructure. It's important to us that our product plays nicely with whatever IT landscape exists. We offer automated application programming interfaces (APIs) for data flows. The advantage of using multiple modules together is that they're all already optimized to play together, and the data from one module is automatically used in the others.

Hydro Leader: Who are your typical customers, and where are they located?

Janice Goodenough: Most users of HYDROGRID are utilities across a wide size range. Our smallest client operates a single hydro plant in Norway with a capacity less than 1 megawatt. In the larger size range, Scottish and Southern Energy, the second-largest hydropower producer in the UK, has its entire fleet contracted with HYDROGRID Insight. We also have lots of medium-sized customers that operate 10 or 20 hydropower assets of varying sizes—for example, the largest medium hydro producer in Norway, Småkraft AS, is a HYDROGRID client. In Switzerland and Finland, we work with regional utilities. Tata Power in India is one client outside Europe.

Hydro Leader: Would you explain how the technology works and where the data come from?

Janice Goodenough: HYDROGRID Insight is a real-time system, meaning that data are continuously coming in—both sensor data from the power plants themselves and data from outside, such as weather data and energy power market data from power exchanges. We collect all this under our digitalization hub. Based on these data, machine learning comes up with an optimal inflow forecast. The forecasts are tuned to each individual power plant, based on the local weather conditions. A price forecast is integrated for power plants that are in a liberalized power market. To forecast for the power plants that are flexible, we also offer optimal trading and dispatch instructions. You can imagine Insight as a real-time data hub with the data continuously flowing in via automated interfaces and automatically flowing from the power exchange back to the power plant.

I like to compare it to the navigation system of a car. HYDROGRID Insight is like the intelligent copilot that helps the owner of the car get where they want to be and follow the road rules. The owner of the car can, however, decide whether or not to implement the suggested path, and the system will adapt in real time and recalculate the recommended way forward. This is the equivalent of HYDROGRID Insight supporting the operator in complying with all their concession requirements related to water management, flood management, and so on.

The system is bundled into different modules so that each hydro operator can pick and choose what they need. There is the basic digitalization and data platform, which allows data capture from the power plant, ensures smooth communication among stakeholders within the company, functions as a central hub for all operational data related to a hydropower plant, serves as the single source of truth, and contains the historical reporting about what has been going on in the power plant. Then, there is the inflow planning module, which allows users to see what is happening at the power plant and to predict hydrological inflows in real time, allowing operators to safely plan the levels of the water in the reservoir and ensure that they stay in line with operational and environmental requirements. If desired,

Insight can create an automated generation plan and automatically provide the recommended energy bidding plan to the trading team so it can sell the power in the optimal way at the power exchange. There is also maintenance planning, which helps you conduct your maintenance at the optimal time to minimize revenue loss. Different parts of the product are used by different people within the organization, but those modules automatically talk to each other.

Hydro Leader: What are some of the challenges that hydro operators face in balancing things such as power production and environmental flow requirements, and how can HYDROGRID Insight help them?

Janice Goodenough: Hydropower operators face several challenges, and those have increased in recent years. Quite a lot of environmental compliance requirements are placed on hydropower operators—rightly so, because water is a multipurpose resource. It's not just used for power generation; the same lakes are often also used for irrigation, fish farming, or flood and drought prevention. Additional restrictions are designed to minimize effects on aquatic life and fish habitat. Hydropower operators have a huge responsibility toward the communities around them. For this reason, those operators have several concession requirements, and the absolute highest requirement is to follow those commitments. In most cases, revenue generation comes second to those commitments to the local community.

On the power market side, things have been moving quickly in the last 5–10 years. With the increased buildup of wind and solar, power markets have become much more volatile and are moving toward shorter-term trading. Ten years ago, you could plan in January how you were going to run your hydro plant for the whole year, and you'd be relatively accurate. That is no longer the case. Inflow levels, and how to best use the water coming in, can change drastically not just from one day to the next but within hours. You have to be sure you can keep to your environmental and compliance requirements, even amid rapid changes in the power markets.

Operators are having to manage all those things and react quickly. A hydropower plant doesn't go to bed at 6:00 p.m.; it runs 24 hours a day, 7 days a week. That's what HYDROGRID Insight supports. Our machine learning algorithms predict inflow, take price forecasting into account, alert the end users to potential issues, and help them solve issues before they become problems. We help hydro operators sleep soundly at night, knowing that their plants are well taken care of and that the communities they serve are protected.

Hydro Leader: How does the increased use of pumped hydro storage and hybrid hydro systems play into what you are doing with HYDROGRID Insight?



The Warmatsgund hydroelectric plant in Oberstdorf, Germany, uses HYDROGRID Insight.

Janice Goodenough: It's clear that the goal is to move toward a zero-carbon economy. That means that there is going to be a need for increased energy generation from renewables, but in order for that to work without bringing down the grid, there will also be a need for enough generation capacity at each point in time. People often confuse the two. It's easy to satisfy the energy demands of a country in terms of megawatt-hours per year from fully renewable sources. Germany, for instance, has many days on which the amount of generation from wind could cover demand. The issue is that these new renewables are variable, because we can't choose when the wind blows and when the sun shines. So the challenge that we're going to be facing over the next 20 years is not so much about creating enough

PHOTO COURTESY OF HYDROGRID

renewable energy but about making that energy available to the grid when consumers need it.

The gap between the energy we generate and delivering it when it is needed is spanned by storage capacity, and hydropower has the big advantage of a large storage capacity. Hydropower can react quickly, and it's a proven technology that can cycle energy with a 70 percent efficiency rate, which is comparatively high. The only downside of hydropower is that you can't build it everywhere. That is where batteries, such as standard lithium-ion or incoming sodium-ion batteries, come in—they can be placed in a decentralized location. That said, batteries have a shorter storage capacity than pumped storage hydro—hours of energy storage versus days, weeks, or months. We're going to need these technologies to work synergistically, and hybrid hydro is an exciting development in that scheme. It makes a lot of sense to combine hydropower plants with battery technology to get the best of both worlds—perhaps using the battery for short-term storage and using the hydro reservoir for longer-term storage, or using the battery to turn an inflexible hydropower plant into a flexible one.

HYDROGRID Insight can also help the flexibility that is available in hydropower plants to be used for energy storage. When we look at the numbers, a renewable energy transition is impossible without hydropower, since we need both capacity (megawatts) and energy (megawatt-hours) that can be called upon at any time and for variable durations. In energy terms, the current storage potential of hydropower is about 8,500 gigawatt-hours. By the year 2030, hydropower storage capacity will grow to about 12,000 gigawatt-hours, based on numbers from the International Energy Agency. By comparison, the currently projected battery buildout is around 1,800 gigawatt-hours by the year 2030. That means that even well past the next decade, the largest share of storage capacity will continue to come from hydropower. Even more importantly, based on our rough estimations, the unused potential in hydropower storage amounts to up to 4,000 gigawatt-hours. That does not mean that we should not build the batteries, because we absolutely need those as well, but at the same time, hydropower storage capacity is a gemstone that is lying by the side of the road, largely overlooked by policymakers.

Hydro Leader: Why is it important for hydro operators to digitalize their operations, and what are the challenges in doing so?

Janice Goodenough: Digitalization is so important now because the world has changed around hydropower operators. Hydropower technology itself has been around for more than 100 years. It's a fantastic technology that is already optimized to a very high degree. Turbines and generators themselves are more than 90 percent efficient. There's very little optimization potential left in terms of the technical aspects of hydropower plants. But there

is huge optimization potential in power trading, inflow forecasting, and managing daily operations. What that means is that digitalizing the process is one of the only key competitive advantages that hydropower producers have left. With the changes in the power markets, this is becoming more and more important. Some 4 or 5 years ago, there was a 10–15 percent difference in revenue between nonoptimized and optimized generation and trading. That's already huge, because that goes directly to the bottom line. But over the last 2–3 years, after the Ukraine crisis and the corresponding increase in power market volatility, that number has gone up to 50 percent for some operators. I believe that U.S. markets will go through a similar pattern over the next 2–10 years, which means that for most hydropower operators, digitalization will be a requirement to remain competitive in this new landscape.

Hydro Leader: What would the full digitalization of a hydro utility using HYDROGRID Insight look like?

Janice Goodenough: It may be best to start with what does *not* need to happen. There is no need to install any new equipment or sensors. Most hydropower plants that are not 100 years old already have the necessary sensors. There is no need for any physical change to the power plant or the installation of any new equipment. We offer a standardized interface API that allows the hydropower plant to submit the sensor data in a fully automated and secure way. We support the operator with the setup by providing ready-made code snippets that can be used to create this connection. This can take less than a day to do, though it depends on the IT landscape that exists.

Then, there are the technical data of the power plant, such as the efficiency curve, which need to be initially configured in the system. Our software tool guides the user to the data that need to be submitted. Depending on how the data are distributed across the organization, whether they are already available, and the age of the power plant, it could take 1 day or a couple of weeks to collect the necessary technical data. Then, our team of experts calibrates the necessary models, such as inflow forecast modeling, and chooses the relevant weather data locations. It is typically possible to go live within a period of about 3 months. During most of that time, the operator just submits the data to us, and then they wait a couple of weeks while we do the rest.

How daily operations change depends on what systems were in use before. With HYDROGRID Insight, most of the information that may have been on Excel spreadsheets or in internally developed software is collected in one tool. Access can be granted to different users at different levels of the organization. Then, each user logs in and sees and interacts with the screens that are relevant for their role. The data are automatically transferred, captured, and documented for compliance purposes.

Hydro Leader: What results do customers see from HYDROGRID Insight?

Janice Goodenough: I would say there are four main benefits or effects. The first is that through technical optimization—by using water more efficiently, avoiding spills, and operating turbines at their optimal efficiency points—the operator can increase power generation by up to 10 percent using the same amount of water. This is where our positive climate impact comes from: We support hydro operators in creating more clean energy with the same amount of water.

The second benefit is financial optimization. By optimally forecasting and trading their energy in the power markets, operators can increase the revenue per produced megawatt-hour by up to 50 percent, depending on the volatility in the market. In other words, they can generate power when it matters the most for the system.

The third benefit is that the company can work more efficiently. When operational processes are digitalized and automated, people don't have to get up at 3:00 a.m. to adjust the opening of a hydrological gate because it started raining. This is something that operators are happy about.

The fourth benefit is that the tool helps with environmental compliance by alerting the user about potential risks. Operational and environmental requirements can be configured within HYDROGRID Insight, which will then suggest an optimal generation plan that ensures compliance with those requirements or alerts the user when there is a risk of noncompliance, allowing the user to make the final decision on what to do. The final decision is always made by the end user, but the tool supports them by giving them a much better visualization of what is happening; identifying the risk factors; and identifying their potential short- and long-term effects, both on power generation and on budgeting. It allows the user to see the future clearly and make the appropriate decisions.

Hydro Leader: What can you tell us about your cybersecurity measures?

Janice Goodenough: Our software is cybersecurity certified across several categories. It aligns, for instance, with the Cyber Essential Certification, and undergoes periodic audits to maintain this accreditation. Further information about our certifications is available on our website.

The data that we collect are not sensitive, because they are backward looking. Much of the data we collect become public knowledge after the fact, anyway. The second part that's important to mention is that the system is set up in such a way that the end user always has the final decision. From an IT security point of view, all the communication is outward going. There is no communication dialing into the power plant. The end user in the power plant—the operator—always has the final say on operational decisions. The tool is merely there to support them.

Hydro Leader: What are your plans to expand your business?


Janice Goodenough: Our goal is to be the hydropower digitalization solution that hydro operators around the globe trust and, most importantly, love to use. Our ambition is that the person using the software should feel that they're achieving their commercial and operational goals more easily than before. We are already established in Europe, and North and South America are our key growth areas over the next couple of years. We started operating on both continents this year. There is also a lot of potential in Southeast Asia. We'll probably pursue that starting in 2026, following the trend of power market liberalization. We see that wherever power markets are liberalized and wherever wind and solar are built out, the need for digitalization increases significantly for hydropower operators, so we follow that trend geographically.

Hydro Leader: If an entity wants to see whether HYDROGRID Insight is right for them, what steps should it take?

Janice Goodenough: You can reach out to us via our website. The first step would be to book a 30-minute demo so that we can demonstrate the tool live. You can try it out for yourself to see if the tool is right for you.

We would also be happy to meet in person. For example, we have exhibited for the last couple of years at CEATI International's hydropower conference, and we will be back next year. We are a member of the National Hydro Association and are present at the Clean Currents conference. We also organize regular road shows through the United States and Canada.

Hydro Leader: What is your vision for the future?

Janice Goodenough: I think the need for a transition to renewable energy is now clearer than it ever has been. I believe that hydropower is one of the key pieces to this puzzle—a successful renewable energy transition can't happen without hydropower. I'm excited about the future of smart, digital hydro and the role that HYDROGRID Insight will play in this future. This is something that drives me and the entire HYDROGRID team: that each day we are working on something that will help us get where we want to be and to keep this planet our home for many more generations to come. 



Janice Goodenough is the CEO of HYDROGRID. She can be contacted at optimize@hydrogrid.ai or via LinkedIn. For more on HYDROGRID, visit hydrogrid.ai.

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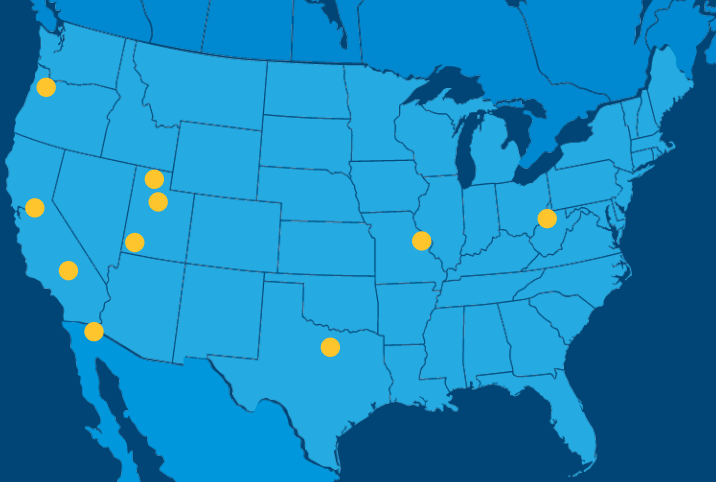
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Quentin Ploussard of Argonne National Laboratory: Modeling the Future of Hydropower in the West



Quentin Ploussard shares information at the Argonne Open House, a STEM outreach event at which his team showcased a pumped storage hydro plant model.

Quentin Ploussard is an energy systems engineer at Argonne National Laboratory (ANL) in Lemont, Illinois, where he develops computer models that help unravel and inform the complex tradeoffs in hydro dam operations among environmental flows, water supply, and electric power generation. Dr. Ploussard tells us about several of these undertakings, including models to help the Colorado River Storage Project (CRSP) schedule its water releases and power generation and to assess options for the modernization of the San Luis Reservoir.

Hydro Leader: Please tell us about your background and how you came to be in your current position.

Quentin Ploussard: I was born in a small town in the south of France—picture a lavender field. I was always a curious kid and quickly became interested in math and science. In 2010, I got into an electrical engineering school in Paris, where I got my master's in electrical engineering and industrial economics. In 2014, I was awarded a PhD scholarship by the European Commission. In my thesis research, I worked on finding ways to reduce the mathematical complexity of modeling the power grid. In 2019, I was offered a postdoctoral appointment at ANL, where I currently work. Most of my work deals with designing, implementing, and solving mathematical models for hydropower projects.

Hydro Leader: Please tell us more about ANL and its work.

Quentin Ploussard: ANL was the first lab national lab in the United States and is the largest in the Midwest. The lab was

born at the end of World War II from the Manhattan Project. The original goal was to create the world's first self-sustaining nuclear reactions. Today, the lab's research work has expanded to environment; climate; and energy, including hydropower energy.

Hydro Leader: What options does ANL offer waterpower resource managers to harness the water cycle in new project development or existing project upgrades?

Quentin Ploussard: Harnessing the cheap and carbon-free energy generated by hydropower is essential to powering our homes with minimal effects on the environment and the climate. ANL's role is to help find the most efficient way to convert water into energy, because this is a difficult task. For example, say you have a dam with a giant reservoir. You don't want to release all this water at once and empty your reservoir—that would create a problem. You also don't want to use it in a way that exceeds the turbine's nominal capacity and ends up breaking the turbine. Ideally, you want to release the water when the price of electricity is high to improve the economic value of the hydropower that you produce.

Hydro Leader: Would you describe the tools you use to model reservoirs, grid resiliency, and market pricing?

Quentin Ploussard: Many of the modeling tools developed by ANL's hydro team are scheduling tools that help operators identify the best timing and amount for their water releases. They help identify how much water they should release and also how much should flow through their turbine and how

much through your bypass. We simultaneously model not only the volume of water contained in the reservoir, but also the elevation in both the forebay and afterbay, the amount of power generation, and the resulting revenue stream that the operator can get based on forecasted market prices.

Hydro Leader: Please describe your work with the Western Area Power Administration (WAPA) and CRSP. Would you tell us about the scheduling tool you developed for their turbine releases, nonturbine releases, and power generation?

Quentin Ploussard: ANL and the WAPA CRSP office have a long working relationship. We developed several modeling tools for it, including the most current one, the GTMaxSL model. GTMax stands for *generation and transmission maximization*. The original GTMax model was developed by ANL several years ago as a versatile hydropower, grid, and market tool. The GTMaxSL model—*SL* stands for *superlight*—is a simplified version of the GTMax model that is tailored to the specific needs of the WAPA CRSP office.

GTMaxSL identifies the best hourly scheduling of CRSP's water releases and power generation. We're proud to say it's a tool used daily by the WAPA CRSP office. The office uses it not only for its day-ahead schedule but also for its long-term backward and forward analyses. Whenever it wants to identify the financial effect of a change in rules, such as an environmental policy, it uses our tool. The tool is constantly evolving to address the CRSP office's ever-changing needs.

I am currently working on a new Python-based version nicknamed CRiSP-Py (*CRSP* stands for the Colorado River Storage Project, and *Py* stands for *Python*) that is 100 times faster. This new version was needed to conduct an analysis

that will model several million operational scenarios and generate billions of data points.

Hydro Leader: What sorts of releases are WAPA and CRSP experimenting with? What initial conclusions have you reached about their effects?

Quentin Ploussard: The hydropower plants that the CRSP office markets electricity for are owned by the Bureau of Reclamation. Reclamation conducts experimental releases at its hydropower plants essentially for environmental purposes. A variety of environmental release experiments are being conducted at Glen Canyon Dam. For example, there are high-flow experiments that release enough water to move sediment and rebuild some eroded sand bars at the afterbay downstream. There are also bug-flow experiments that aim to flatten the water release during the weekend to help some insects living near the Colorado River lay their eggs and reproduce. More recently, we conducted an important analysis for the CRSP office of a smallmouth bass experiment Reclamation is planning to conduct. The goal of this experiment might be a bit surprising, because instead of helping fish reproduce, the aim is the opposite. Some nonnative fish species have started to reproduce in the Colorado River, and Reclamation is trying to disrupt them from spawning. The smallmouth bass is a predatory, nonnative warmwater fish species present in the Colorado River, and changing conditions, including recent droughts, have made the water warmer and created ideal spawning conditions. The goal of the smallmouth bass experiment is to implement water flows that will significantly cool the water and prevent nonnative species from spawning. This is an important study that will have significant environmental and economic effects.



A high-flow experiment at Glen Canyon Dam in 2018, designed to rebuild sandbars.

WAPA, because it markets electricity, is more interested in the economic side of hydropower and the economic and financial effects of these environmental releases. Even though in comparison to other energy sources, hydropower is environmentally friendly, there is still a tradeoff between economics and the environment. The goal of the analyses ANL is conducting for WAPA's CRSP office is to estimate and monitor the economic and financial costs associated with these experimental releases. Though the experimental releases are good for the environment, they are not necessarily good for hydropower economics.

Hydro Leader: What can you tell us about the importance of Glen Canyon Dam and other Colorado River hydroelectric projects for the grid?

Quentin Ploussard: Glen Canyon Dam is one of the largest hydropower plants in the United States and one of the largest sources of carbon-free electricity in the West. Glen Canyon Dam represents 80 percent of CRSP's hydropower capacity. In total, the WAPA CRSP office sells enough energy to power 1.2 million homes.

Hydro Leader: Please tell us about your work assessing retrofit options at the San Luis Reservoir. What role does ANL's modeling play there?

Quentin Ploussard: The San Luis Reservoir is an interesting project. To give a bit of context, there are three main types of hydropower plants. The first is run-of-river: Energy is produced as water flows through the plants, and there is limited control over the amount of water flowing by. The next category is dam hydropower plants. In these plants, giant concrete dams contain and store water, and you can decide when to release the water and produce energy. The third type, pumped storage hydro, has even more flexibility. Instead of just deciding when to release water for power demands, these plants can pump water back into their upper reservoirs using electricity from the grid.

Pumped storage hydro plants basically act like giant water batteries. Like the lithium-ion batteries in your cell phone or in electric cars, they can take energy from the grid and release it at a convenient time. However, because they are much larger in scale, storing several gigawatt-hours of energy rather than several watt-hours or kilowatt-hours, pumped storage hydropower plants are more economically efficient than lithium-ion batteries. Elevated water contains gravitational energy that can be converted into electricity. There are fewer than 50 existing pumped hydro projects in the United States, compared to thousands of dammed hydropower plants.

The San Luis Reservoir is one of these pumped storage plants, and the reservoir is at least 60 years old. Turbine and pump technology has evolved a lot since it was built, so WAPA's Sierra Nevada Region asked ANL to work on estimating the economic benefits of some retrofitting

options. We are currently working on modeling the options for modernizing the plant. We mathematically model and simulate each potential scenario to show how the modernized San Luis Reservoir would pump water for energy storage and produce electricity for the western grid. From that, we will be able to calculate benefits and identify a viable cost-benefit analysis for all these different options. This project is one of the many pumped storage hydro valuation projects that ANL is involved in. You can read more about these projects at <https://pshvt.egs.anl.gov/>.


Hydro Leader: What other trends do you see in hydropower in the West?

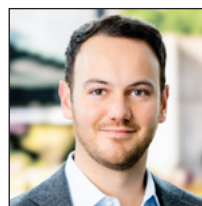
Quentin Ploussard: Because of climate change, we are seeing more and more droughts. Hydropower generation essentially relies on the availability of water. With higher temperatures and more drought, it becomes more and more challenging to use water to reliably produce carbon-free electricity.

Another challenge is the tradeoff between the environment and the economics of hydropower. We strive for an efficient and optimal balance between numerous water uses, including the production of hydropower. These reservoirs must not only produce hydropower but provide potable water and irrigation water as well.

Historically, hydropower was among the least prioritized uses of water. Because of the challenges of the drought and environmental constraints, there needs to be better coordination among users. We must make significant progress in closing the modeling gap between managing water supply and producing carbon-free electricity for the western grid.

Hydro Leader: What is your vision for the future?

Quentin Ploussard: Hydropower produces large amounts of cheap and carbon-free electricity, but it is less well known that hydropower plays a critical role in maintaining grid stability. You cannot control when wind and solar power come onto the grid. You get wind power whenever the wind is blowing, and you get solar power whenever the sun is shining. Hydropower, and especially dams and pumped storage, contribute flexibility and can integrate other renewable energy sources into the generation mix by stabilizing the grid. My view for the future is an increasingly decarbonized grid in which hydropower plays a larger and larger role in integrating more renewable energy into the grid. 



Quentin Ploussard is an energy systems engineer at Argonne National Laboratory. He can be reached at qploussard@anl.gov.

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Phil Kangas: The U.S. Department of Energy's Loan Programs Office Offers Significant Opportunities for Hydropower



Under the Title 17 Clean Energy Financing Program, the LPO can consider all types of hydropower projects, including turbines for pumped storage hydropower and run-of-river applications.

In this interview, Hydro Leader speaks with Phil Kangas, the director of outreach and business development (OBD) for the Loan Programs Office (LPO) of the U.S. Department of Energy (DOE). The LPO, he tells us, has billions of dollars to lend to the right innovative clean energy projects, including hydro projects. We dig into the eligibility criteria, application process, and more.

Hydro Leader: Please tell us about your background and how you came to be in your current position.

Phil Kangas: I came into this role as a recovering management consultant. I had spent about 25 years consulting for public- and private-sector energy, science, and national security clients, focusing mostly on financial management, process improvement, and performance results. I now lead the OBD team for the LPO. I couldn't be happier to have this opportunity, as the LPO is focused on the wide-scale deployment of technologies that directly address climate change. Our OBD team, which is made up of about 50 professionals, works with the private sector to invest hundreds of billions of dollars into clean energy, including first-of-a-kind and large-scale infrastructure projects.

Hydro Leader: Please tell us about the LPO and its scope of work.

Phil Kangas: The LPO provides attractive debt financing for high-impact, large-scale energy infrastructure projects. We finance projects that commercial banks often cannot. We offer due diligence and risk assessment services that help companies achieve more successful outcomes.

The LPO has issued tens of billions of dollars in strategic debt financing to transform the energy and transportation sectors in ways that benefit all Americans



The LPO understands the important role of the hydropower community in the transition toward a clean energy future and is interested in follow-up conversations with readers of *Hydro Leader*.

and strengthen our economic competitiveness. Our loans have launched the utility-scale solar and wind industries, expanded the domestic manufacturing of electric vehicles (EVs), and revived the nuclear energy industry in the United States.

We administer programs designed to get clean energy innovators and financiers over the bridge to bankability. The Title 17 Clean Energy Financing Program includes four project categories. Two categories support the deployment of innovative energy or supply chain projects. The third category finances projects sponsored by a state agency or granting authority, and the fourth finances Energy Infrastructure Reinvestment projects under title 1706, a separate authority within the program designed to retool, repower, repurpose, replace, or upgrade existing energy infrastructure in a way that yields an emissions reduction benefit.

Additionally, we manage the Advanced Technology Vehicles Manufacturing program, which provides loans to support the manufacture of eligible vehicles and qualifying components; the Tribal Energy Financing Program, which allows us to make investments with tribal borrowers; and the Carbon Dioxide Transportation Infrastructure Finance and Innovation Act program, which finances large-capacity common-carrier carbon dioxide transport projects.

With that full portfolio of programs in hand, our team is out in the marketplace, making connections and educating potential company applicants, hopefully finding and funding those partnerships.

Hydro Leader: How has the portfolio been affected by the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA)?

Phil Kangas: President Biden's BIL and IRA have both significantly increased our office's ability to finance energy and infrastructure projects. The IRA increased loan authority for the LPO by billions of dollars, expanded eligibility for state-level-supported projects, and created the Energy Infrastructure Reinvestment Program. We're also working with the private sector to support the administration's efforts to deploy clean energy safely and responsibly.

Through the president's Justice40 Initiative (J40), 40 percent of the benefits from certain federal investments, including those of the LPO, are required to flow to disadvantaged communities, such as those disproportionately burdened by pollution. To support J40, we now require a community benefits plan. We're asking companies to work hand-in-hand with local labor, community stakeholders, and tribes to build from the bottom up and the middle out, so to speak, to make sure that these billions of dollars are benefiting all Americans and creating high-paying and lasting jobs.

Over the last few years of this administration, the results have been impressive. Across the nation, companies announced more than 500 planned investments with at least 450 new and expanded clean energy manufacturing facilities, totaling over \$160 billion of public-private investments in markets such as solar power, EV assembly, EV components, chargers, offshore wind, batteries, and manufacturing.

Hydro Leader: What do you see as the greatest opportunities for clean energy advancement?

Phil Kangas: Our financing is designed to be catalytic. For example, LPO financing helped launch the EV sector and enabled the commercialization of solar and wind power generation. Now, millions of Americans work in clean energy jobs in these industries. The climate benefits and market opportunities of EVs and renewable energies are enormous.

Over the life cycle of this program, LPO investments resulted in close to 50,000 permanent jobs, according to the latest study, and avoided the emission of 47 million tons of carbon.

Hydro Leader: Please tell us about your efforts to promote hydropower development.

Phil Kangas: We see hydropower as having great potential. My OBD team has been reaching out to sector leaders. We've been working with industry groups such as the National Hydropower Association and participating in events such as the Water Power Week and Clean Currents conferences.

Elsewhere in DOE, the Water Power Technologies Office has done a lot of work in this sector. Although the LPO has restrictions on providing loans to projects that already receive federal funds, such as grants, we do collaborate with our sister offices with subject-matter expertise across DOE and directly

with parts of the industry. The last thing I'd say is that our team has been involved in discussions with hydro developers about how they can fit our funding portfolio requirements.

Hydro Leader: What programs are available now for hydropower?

Phil Kangas: Under title 17, we can look at all types of hydropower. Our formal guidance for technology innovation falls under two of those authorities. For the United States, there are a lot of options, including turbines for pumped storage hydropower and run-of-river applications.

We look for innovative deployments or new improvements in traditional technology to fund. For example, let's say there is an innovative new technology to make turbines more fish safe than traditional Kaplan turbines are, or perhaps a portfolio of multiple projects for developing new turbines in a more standardized approach across multiple waterways. If fewer than three projects have been installed for a particular technology in the last 5 years, we generally consider that project to be innovative and therefore potentially eligible.

Through the Energy Infrastructure Reinvestment Program, we're able to provide loans for upgrades or replacements to existing energy infrastructure if they have the additional benefit of reducing greenhouse gas emissions. That could include the upgrade or expansion of an existing hydropower dam.

We don't have, by statute, a minimum loan size, but because of our process and associated due diligence costs, we generally look for loans of at least \$100 million to maximize the results per dollar. We can consider funding a group of projects tied together by a unified business plan. That may be a likely model in cases in which hydropower fits all the criteria, but a single project or a group of projects comes up as too small.

My team likes to engage early with projects, including before they submit a formal application. We have robust standards for project readiness that we front-load to ensure a smooth ride through the program. Without going into too many details about our phased approach, we look at eligibility and then feasibility during part 1. We expect to see major project milestones completed before application, including site selection, technology selection, and the establishment of secure offtake agreements, as well as a reasonable prospect of loan repayment. We expect to see project permitting well underway before an application for loans. FERC permitting should have started, and major milestone dates for those reviews should be on the calendar; National Environmental Policy Act requirements should be being considered; and any needed water rights should be secured or in negotiation. Our OBD specialists talk to the applicants about each of these items.

Hydro Leader: How do you help your applicants achieve successful funding?

Phil Kangas: We operate with an open program for applications. There's no set solicitation period with only a limited time window for funding and a firm deadline. Rather, we encourage applicants to approach our division for a preapplication conference to go over the requirements as well as opportunities within DOE, even in divisions other than the LPO.

After we confirm eligibility but before we issue a loan, we conduct a rigorous due diligence analysis comparable to best practices in the private sector. That includes eligibility determinations and technical, market, financial, credit, legal, and regulatory reviews. It's not necessarily a quick process, but remember, we're issuing loans of hundreds of millions, if not billions, of dollars. We want to make sure we're moving forward cautiously and making good investments for the department and for the U.S. taxpayer. We have a full-time due diligence professional staff on site here with qualified engineers and financial and legal experts, and we engage third-party advisors. We ensure that the project is evaluated to properly identify and manage any risks that may come up and ensure that there is a reasonable prospect that the loan will be repaid, satisfying the intent of the authorizing legislation.

Sometimes it will take months, if not a year, to move through the loan application process. That time is required to make sure that our team has an opportunity to review all the required documents, and often these take time for the applicant to put together. We work in collaboration with those applicants—that's really our role. We will work with applicants as their advocate and advisor to make sure that they have a good experience in moving through those checks.

Hydro Leader: Are there any recent notable announcements from LPO?

Phil Kangas: We've had some exciting announcements just recently. In March, we announced our first conditional commitment under the Energy Infrastructure Reinvestment Program for the Holtec Palisades project, in which we have committed up to about \$1.5 billion to restore a nuclear generating station in Michigan and resume its service. That's a major investment in restarting the nuclear industry in the United States.

Earlier in March, we announced our first Tribal Energy Financing Program conditional commitment. That is a big first for us. This will provide a partial loan guarantee of up to \$72.8 million for a solar-plus-long-duration-energy-storage microgrid on tribal lands of the Viejas Band of the Kumeyaay Indians near Alpine, California, to support some of its high-load facilities.

We'll continue to make announcements throughout the year. In fact, our monthly application activity report, approved through the end of April, shows that we've got well over 200 applications submitted to our lending authority, representing requests for federal support of almost \$300 billion across at least a dozen distinct cleantech markets.

While we haven't yet announced a hydropower project, we're continuing to work with applicants. We are seeing a lot of interest in this program and, quite frankly, we are eager to have follow-up conversations with readers of your magazine. We understand how important a role the hydropower community plays in the transition toward a clean energy future.

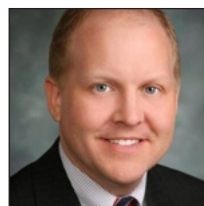
Hydro Leader: Is there anything you would like to add?

Phil Kangas: We're really excited about an upcoming conference on December 4–5 in Washington, DC, that we have sponsored. The Deploy24 conference is our annual event at which we bring together over 1,000 investors, companies, stakeholders, and other key decisionmakers to explore opportunities to collaborate with the LPO, to work with DOE, and to get clean energy projects done.

Hydro Leader: What is the LPO's vision for clean energy in the future?

Phil Kangas: You'll hear the secretary of energy and our leadership often say that effectively addressing climate change requires private-sector leadership plus government enablement. This administration's goals for climate change require \$10 trillion of investment through 2050. Most of this capital will need to come from the private sector. Those numbers can't come from the government alone. We're here to enable and assist private-sector leadership, but the ventures must become self-sustaining in the market.

The LPO plays a critical role in advancing emerging technologies, including clean hydrogen and virtual power plants that aggregate distributed energy sources. Hydropower, too, is continuing to evolve to meet today's energy and electricity requirements. However, most of the investment, to the tune of \$100 billion in each of the more than 20 critical technology areas, must come from our colleagues in the private sector. Our job is to unlock investment through strategic financing, placing the right bets and enabling leadership in those innovations to bring them to market feasibility. We're promoting better coordination with the private sector so that we can determine how each of the twenty technologies can cross the bridge to bankability to achieve full commercial acceptance. With programs like those of the LPO, we can get there so much faster, working together to advance the clean energy future. H

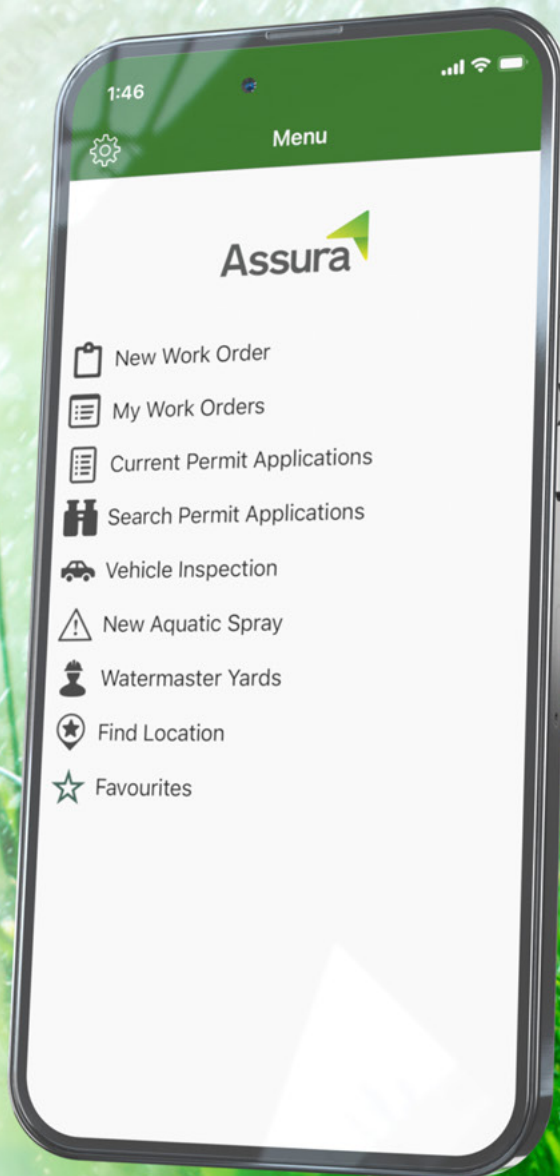


Phil Kangas is the director of outreach and business development for the Loan Programs Office of the U.S. Department of Energy. He can be reached at philip.kangas@hq.doe.gov.



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Federal Credit for Dam Safety Repairs: The Corps Water Infrastructure Financing Program



Aaron Snyder addresses stakeholders during a notice of funding availability signing event at Anderson Dam in Morgan Hill, California, in June 2023.

The U.S. Army Corps of Engineers' Corps Water Infrastructure Financing Program (CWIFP) provides low-cost, long-term federal loans for dam safety projects. The loans are designated for major repairs to large nonfederally owned, operated, and maintained dams. In this interview, the program's director, Aaron Snyder, talks with Hydro Leader about the program's benefits, which include long repayment periods and customized repayment schedules.

Hydro Leader: Please tell us about your background and how you came to be in your current position.

Aaron Snyder: I am an economist with a master's degree in public policy. I have been with the Army Corps for 21 years. I started in our project management and planning offices, overseeing the implementation of large civil works projects. That got me focused on alternative delivery, which included public-private partnerships, and then alternative financing. I became the director of the CWIFP in February 2023.

Hydro Leader: Please introduce the CWIFP.

Aaron Snyder: The CWIFP is authorized by the Water Infrastructure Financing and Innovation Act of 2014. The law authorized the Army Corps and the U.S. Environmental Protection Agency (EPA) to administer credit programs for eligible water projects. The EPA is focused on water and wastewater projects, and the Army Corps was given a mandate to focus on flood risk, ecosystem, and navigation projects as well as ecosystem restoration. We got our first appropriation from the program in 2020. That appropriation

limited our work to dam safety projects, so we're currently focusing just on that.

Hydro Leader: How has the program been affected by the Bipartisan Infrastructure Law?

Aaron Snyder: In 2021, we received \$75 million from the Bipartisan Infrastructure Law, \$64 million of which was for credit subsidy. The cool part about federal loan programs is that the federal government pays for anticipated defaults and recoveries, which are expected to make up 1–2 percent of the face value of the loans. That means that \$64 million can go a lot further—it can turn into something like \$5 billion. We have a lot of capital available to lend out, and as a federal lending program, we intend for those loans to be paid back. So the program is relatively low risk and costs federal taxpayers little.

Hydro Leader: As you mentioned, the current focus of the program is dam safety. What types of projects are eligible, and what does the funding look like?

Aaron Snyder: The program is intended to address safety issues, such as the deterioration of concrete or foundations, seepage, and instability issues. It also funds seismic retrofits, spillway modifications, and gate replacements. A federal loan program cannot lend to a federal dam, so this program funds projects at nonfederally owned, operated, and maintained dams. To be eligible, they have to be listed in the National Inventory of Dams (NID), so they are generally larger dams. The project cost must exceed \$20 million, but applicants can bundle multiple projects together to reach that amount.

These federal loans are long term and flexible, and they complement the types of financing that you can find in private loans. Our loans fund up to 49 percent of the total project cost, or up to 80 percent for projects that serve economically disadvantaged communities. To receive this loan, the project has to have an investment-grade rating from one of the rating agencies. We need assurance that it has a pledged stream of revenue to use for repayment and will be able to repay the loan.

Hydro Leader: What do you see as the greatest benefits of the program for hydropower?

Aaron Snyder: Dams and hydro facilities go hand in hand. Some facilities may only be able to produce a limited amount of hydropower because of a dam safety or spillway capacity issue. Dam safety also affects the overall safety and functioning of hydro facilities. By ensuring that your dam is safe and reliable, you also improve the safety and reliability of your hydropower facilities and enable them to function optimally.

Hydro Leader: What does the application process entail, and how do you work with applicants to ensure successful outcomes?

Aaron Snyder: Anyone who has applied for a home mortgage would find the application process similar. It is a two-step process. In the preliminary application phase, you enter information on the online application portal. We look at high-level eligibility criteria such as whether the dam is in the NID; whether it is nonfederally owned, operated, and maintained; whether the fixes are for dam safety purposes; and whether the loan can be paid back. If those criteria are met, you are invited to submit a full application, which is like all the extra documentation you need to submit for a home mortgage after you make an offer on a house. At that stage, we begin to get all the financial pro formas, get the official risk ratings on the debt, and make sure the loan is properly underwritten before we ultimately negotiate the terms of the agreement. Both the preliminary and full applications are online, so we can carry over the information to minimize the amount of work needed.

Hydro Leader: Please tell us about the loan terms and repayment process.

Aaron Snyder: Repayment is based on the terms of the loan agreement. Interest rates will be very close to the current rate of a 30-year treasury bond. The interest rate is locked when the loan closes. One of the benefits of the program is that unlike a home mortgage, in which you pay the same amount every month for 15 or 30 years, our loan program is flexible. During the construction period, we can function almost like a line of credit. When you need the money, we give you the money to help you with construction. You don't get charged interest on those disbursements until you receive

them. Once construction is complete and you've received your final disbursements, you'll pay interest on that amount. You can also go into a 5-year deferment period, after which you have to enter into a 30-year repayment period. That can be skewed in various ways. For example, if the owner has other debt that needs to be paid off first, we can, for example, lower the payments for the first 5 years. We can flex the amortization over the life of the loan to meet the needs of the borrower. Your rate payers or taxpayers can have either a constant repayment stream or a slight increase over time so there are no shocks from year to year.


Hydro Leader: Are there any success stories that you would like to highlight?

Aaron Snyder: We are currently early in our process and have not closed our initial loans yet. However, the EPA has closed over 100 loans and provided a significant amount of financing. We have tried to learn from the EPA so we can be as efficient as possible.

Hydro Leader: Is there anything you'd like to add?

Aaron Snyder: We encourage anyone who is interested in our program to reach out to us before applying. Our team is happy to meet with them to talk about the financing and the terms and conditions of the program and learn about their projects. We can answer questions such as, "Can we fund the access road to the dam? Does that fall under dam safety?" (Answer: Typically, yes, if it is needed for the safe function of the dam.) We are happy to help.

Hydro Leader: What is your vision for the future of your program's work with the hydro industry?

Aaron Snyder: Our vision is to be a trusted partner. We want to be there to provide financing to ensure that dams are safe and reliable for the public. If you turn on the news one morning and see that a dam has failed, that a spillway has had challenges, or even that a dam has been deemed unsafe, the owner cannot store water behind it until the infrastructure has been repaired. Our goal is to make sure that dams can provide the benefits that they were originally intended to provide, and one of those benefits is hydropower. If we can help make dams safe, that in turn will ensure that we can continue to rely on hydropower. 



Aaron Snyder is the director of the Corps Water Infrastructure Financing Program. He can be contacted at cwifp@usace.army.mil.

Looking for Half-Century Leaders

50

**Do you know anyone who's been in the hydro industry for 50 years or more?
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our Half-Century Leaders feature.**

To recommend a professional for inclusion in our magazine,
please e-mail Managing Editor Josh Dill at joshua.dill@waterstrategies.com.

Scholarship Opportunity for Women Pursuing Undergraduate Degrees in Water Studies

Formally launched in 2019, the Women in Water Scholarship Fund is designed to encourage young women to consider the pursuit of fulfilling careers tied to the management and conservation of water.

Each year the program awards a scholarship to a woman who is pursuing an undergraduate degree in preparation for a career in any element of water resources, including water law, communications, community and government relations, or engineering.

For the 2024-2025 academic year, the Women In Water Scholarship Fund will be awarding one scholarship with a value of \$7,500 which will be evenly split between the academic year's two semesters. The application period for this scholarship is April 1 - July 1, 2024. Applications received after July 1, 2024, will not be eligible for consideration.



**For more information, go to
www.fundingwomeninwater.com.**

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Two Generations of Industry Expertise With Charles and Rory Alsberg



The J.F. Brennan Company works on the restoration of Scanlon Dam in Scanlon, Minnesota.

Hydro is a family business for Charles and Rory Alsberg, both of whom have decades of experience working on hydropower projects across the United States and around the world. After cofounding North American Hydro, Charles has had an impressive career in many areas of the industry and is now the founder and chairman of American Energy Services, based in Oshkosh, Wisconsin. Rory started his career shadowing his dad as a child, then forged his own path in business and is now the senior business development manager of dam construction at the J.F. Brennan Company, based in La Crosse, Wisconsin. In this interview, Hydro Leader dives into the expertise of both father and son, who have started and supported numerous businesses and organizations and have been championing industry development for decades.

Hydro Leader: Please tell us about your background and how you came to be in your current positions.

Charles Alsberg: In the late 1970s, I briefly served as a distribution transmission engineer for a Wisconsin public utility. Required fieldwork gave me the opportunity to visit millponds, which I had previously seen on old engineering drawings. I started to ask questions about my discoveries, and I was taught by the old-timers at the business that millponds were intended to power a sawmill, a flour mill, a

grinding mill, or to produce hydroelectricity. Coming from northeastern Montana, I imagined all hydroelectric projects to be much larger, like Hoover Dam and Grand Coulee. I was unaware that such small hydro plants existed. Through more of this fieldwork, I found several abandoned hydro plants. Typically, the dam was there, but the condition of the powerhouses varied. I grew interested in getting these hydro projects back up and running, so I began working with a strong technical partner and coworker, Bill Harris, and we started a company called North American Hydro.

Hydro Leader: Please tell us about how you bought your first projects and grew North American Hydro.

Charles Alsberg: One of these abandoned hydro facilities, the White River Project, was located near where we resided and had only been shut down for 3 years because of technical issues. Bill and I discovered that it had been owned since 1924 by the family of a schoolteacher. We ended up purchasing it on a land contract, since funds were tight for both of us, and my income was needed to raise a family. Having been with the Wisconsin public utility I mentioned for less than a year, we kept our boss up to date on our intentions to get this facility back up and running as a hobby. To our surprise,

upper management told us that this was an unacceptable competitive dealing and that we must unwind the deal or be fired. We decided that weekend to go ahead and pursue our passion to restore the project, and we both resigned. Bill and I ended up incorporating North American Hydro Inc., and the White River Project was our first project. We were both engineers and liked to be hands on in the powerhouse. We rehabilitated that plant and sold power, believe it or not, for one penny per kilowatt-hour to our previous employer.

Subsequently, we found and rehabilitated more decommissioned hydro facilities. After 8 years in the business, it became apparent that it would be easier to buy operating assets than to redevelop abandoned ones, so we went on an acquisition binge and purchased numerous small hydro plants from public utilities, paper companies, and municipalities. We typically bought projects that were operating but were in less-than-pristine condition. We also continued to redevelop other projects, but most of the time, we were refurbishing our acquisitions. This period of major growth allowed us to hire a larger, more dedicated staff. Major success can be attributed to our positive banking relationship; the people who financed us believed in the idea and loved the cash flow. This growth resulted in a portfolio of 44 plants. In 2012, with the turmoil in the banking business, to continue to grow the business it seemed necessary to bring in outside capital from sources other than traditional bank loans, but my partner disagreed. As we are all aware, partners do not always agree, and it was time for me to exit and maximize value. I ended up selling my entire share of the assets, while my partner kept some. Thus, after 34 great years, we went our separate ways.

Through our rehabilitation work, it became apparent that we could not find the components needed to repair these vintage plants at a reasonable cost. We used older turbine-generator technology in these abandoned powerhouses and made all the balance-of-plant switchgears, controls, governors, excitation equipment, automation equipment, and other essential electrical equipment in house. I saw an opportunity to grow this balance-of-plant engineering controls business, so I hired a couple folks from a competitor and opened up a shop in Wausau, Wisconsin. The business grew rapidly, and we completed projects around the world in places such as Canada, Latin America, the Philippines, and Turkey.

I eventually found another company in Washington, Phoenix Controls, with whose owners I became close friends. With the help of some great partners, we merged the two companies into an even better business. This expansion generated strong interest from larger companies, and in 2010, we sold that company to Alstom Power, one of the largest global power companies at the time. Alstom was a pleasure to work with, especially Debbie Mursch, who spearheaded the deal.

With the history of successfully building and selling two companies, my son Rory and I started a company called Americas Energy Services, where I still work today. It is

a company based more on project development, with the objective of providing high-level advisory work and trying to put financial folks together with other developers to create successful projects. I have found a lot of good financial resources throughout my career to fund hydroelectric projects and other energy projects.

Hydro Leader: Rory, what was it like growing up in the industry? How did your upbringing lead you to where you are today?

Rory Alsberg: When I say I was in hydro plants in diapers, it is true. When I was 1 year old, my dad purchased his first hydro project, and we lived next door to it. Growing up, I spent a lot of late nights trying to get things working with Dad, and I remember high-water events, heavy rain nights, and opening spillway gates at all hours of the day. I have always enjoyed being around water and hydropower. Early on, my dad's company was small, so I knew everybody on a first-name basis, and I have great memories of visiting the office. In high school, I worked for North American Hydro for two summer breaks in the summer crew program. I spent my time cleaning newly acquired hydro plants, painting, clearing brush, hauling junk, and mowing. We also helped operators, so I was able to travel around the Midwest and see different hydro plants and towns. I learned a lot about the hydro industry and renewable energy.

After high school, I decided I did not want to work for my dad's company, which seemed like taking the easy way out. I realize now that I should have just stuck with it, because I would be that much more advanced in the industry. Instead, I moved to the Milwaukee area and lived there for 7 years, working as a toolmaker in the tool-and-die world. I came back in 2003 and started at North American Hydro full time, managing day-to-day operations for some of the hydro plants. I have been in the industry ever since. Once I started to learn more about different industry groups and organizations, I started going to trade shows. When walking through a trade show by myself, people would say, "Oh, you must be Chuck's son." He was that well known in the industry. Even now that I have 21 years in the industry, people still ask me how my dad is doing when I'm at conferences and industry meetings. The hydro industry has a family feel, with a lot of the same faces that I have been working with for a long time. It has always been interesting trying to follow in the big footsteps my dad laid down in his career. No one else, in my opinion, can follow what he has done.

Hydro Leader: Please tell us about the J.F. Brennan Company.

Rory Alsberg: While I was working at North American Hydro, we hired the J.F. Brennan Company Inc., known as Brennan, to do work at some hydro projects and dams we owned. I always had a good experience working with the people at Brennan. They were nice people and did high-quality work. For a couple of years, at various industry



Charles Alsberg during the early days of North American Hydro.

meetings and trade shows, my superior now, Mark Binsfeld, would ask me how things were going and what I thought about coming to work for Brennan. He wanted a market lead for Brennan's dam and hydro work and thought I would be a good fit. I ended up accepting the position over 4 years ago and have been at Brennan ever since.

Brennan is a specialty marine construction company based in La Crosse, Wisconsin, that does all types of marine services. It is a fourth-generation, family-owned company. Dams and hydro are a small part of what we do, but we have grown so much over the last 4 years that we have offices on the East Coast, the West Coast, throughout the Midwest, and down to Kentucky. Lately, I have been involved with the growth on the East and West Coasts and have made a lot of trips to get in front of new hydroelectric clientele to find more work in those areas. We also do a lot of environmental remediation and cleanups. We remove contaminated soils from the bottom of lakes and rivers. I work mostly on the marine construction side. Whether you need work done above, around, or below water, we have barges, cranes, and over 100 divers on staff to do underwater inspections and construction.

Hydro Leader: Chuck, please elaborate on your work in the industry with various groups and organizations.

Charles Alsberg: When you run a small, growing company, you may overlook involvement in industry groups simply because you feel you do not have the time or resources. Fortunately, however, I came to realize early in my career that public outreach is critical. You should support your industry groups and get to know the people in them, even if you do not think you have the time. The first one I joined was a group called RENEW Wisconsin, a big advocate for renewables. When I joined, renewables did not include hydro, so my objective was to get hydro included

in the renewable standards of the State of Wisconsin and the Midwest more broadly. I was on RENEW's board of directors for 10 years, and I accomplished my goal: Hydro is recognized as a renewable and has thus gained significant public support. My involvement on this board allowed our company to gain not only valuable public awareness but better power contract rates.

Then, I helped found the Hydro Users Group (HUG), which aimed to get all hydro owners on the same page. Back in those days, that was a significant challenge, as public utilities and private companies, which even included large paper companies, all had different objectives and were concerned about sharing information. We finally found some common concerns and interests that were more important than the potential conflicts related to sharing ideas and materials. The first such battle was with a regulatory group that was trying to impose dam restrictions and restraints that were unacceptable and unaffordable. By coming together, we stopped this damaging legislation.

Realizing the benefits of this organization, we expanded beyond Wisconsin into the Midwest. That is when HUG got its real start and changed its name to the Midwest Hydro User Group (MHUG). MHUG kept getting more and more active and gaining more and more members, mostly thanks to a group called the Wisconsin Valley Improvement Company, which managed a series of dams that controlled the Wisconsin River. Its management, and in particular one of its staff, Sam Morgan, really got the ship at MHUG sailing. The organization is now significantly larger and more active than we ever expected. I was one of the advocates for getting MHUG involved with the National Hydropower Association (NHA) despite significant concerns with costs; MHUG now covers both regional and national interests and any concerns about joint participation in meetings, conferences, and committees have disappeared. Many members of MHUG eventually joined NHA and have seen the benefits of that involvement.

Through these and other organizations, committees, and boards, North American Hydro started to build beneficial relationships, mostly on the asset ownership side. We were introduced to new opportunities but also met numerous owners and engineering and consulting companies. These relationships also increased sales in the engineering controls business. Through this interaction, I also gained more respect for the power and authority of the state and federal agencies that oversee our assets, which were encouraged to attend regional meetings. I could see the need for our company to stay ahead of the curve on regulation, but as always, there were concerns about the time and expenses associated with this involvement. It became apparent, however, that it was necessary to collaborate and meet companies and people with similar issues.

Moving to the national level, I served on the NHA advisory board for 5 years. Eventually, NHA talked me into running for a full board position. I was fortunate enough to

be nominated for a few terms and was eventually persuaded to run for president. After a successful nomination, I became the president of NHA for one term. I was unusual in being from a private company; typically, presidents were from public companies or utilities. I was careful and thoughtful about how to promote small hydro among some major players. I believe everyone gained respect for small hydro as we all found common interests on many levels. The relationships I formed with the “big guys” allowed me to better understand their issues and our common objectives.

Throughout the years, I did some nonprofit work, served in a couple of board of director positions, and did advocate work for numerous organizations, but I always stayed focused on renewables and helping businesses grow.

Rory Alsberg: I am currently the president of MHUG. I have been active in the group throughout my career. We have around 140 member companies right now. MHUG’s growth from its establishment to where it is today is impressive.

Brennan has always been a big advocate for community groups. We support dozens of organizations within the industry. We attend more than 50 trade shows and meetings throughout the different markets we are in. The two most relevant organizations for us in the hydroelectric industry are NHA and MHUG, but there are many others. It is important to go to meetings, get to know people, network, see presentations, even learn of mistakes and troubles in the industry, and then relay what you learn back to your team. As Dad said, a group of voices is stronger than one voice. At Brennan, we have industry meetings and conferences that focus just on U.S. Army Corps of Engineers work. Army Corps meetings attract different individuals from those who attend the hydroelectric ones. They are another opportunity to learn from and network with the professionals in that industry. We are also members of the Associated General Contractors of America, through which we aim to improve regulations.

Hydro Leader: What are the biggest needs in the hydropower market today?

Charles Alsberg: The two biggest hurdles that I have seen in my career are probably power rates and regulation. My main focus was always to enable more hydro development by finding ways to reduce the development burden, especially during the regulatory process, and to figure out how to create power contracts with potential incentives for creating more affordable projects. Everybody likes to study hydroelectric projects—the technical and engineering aspects are very interesting—but unless you have a buyer for the power, it is all for naught. You must have a price that is going to assure that you can get to the finish line through feasibility, licensing, and various other costs. A lot of people have failed by spending too much time on the technical side and not enough on the financial side. When asked to review



Charles Alsberg (left) and his business partner Bill Harris (right) during the early days of North American Hydro.

or look for good development opportunities, we always start on the revenue side. I have been doing recent development in British Columbia and in the Caribbean, where power rates are high enough to make hydro successful. If you find high power rates, you can find the projects.

NHA has been doing a great job of trying to make the regulatory hurdles more surmountable, pursuing legislative agendas to promote this great resource, and creating a strong technical group. Among the big issues are always the licensing and relicensing processes, especially for small hydro. Obviously, some smaller projects can have as much impact as larger projects, or even more, but forcing everyone to go over the same hurdles can make smaller projects simply unviable. We should have good environmental standards, but we should also be able to function on a more reasonable basis and find ways to compromise up front. In the old days, we would literally send a pallet of paperwork with required copies for relicensing a small hydro project.

During numerous trips to Washington, DC, for NHA, I started visiting numerous members of Congress to see what could be done. The licensing process was a massive undertaking. Some owners would attempt to stay under the radar of federal and state regulation, knowing that the process would be the end of their project. That is not the correct business plan. Owners should be good citizens and even better environmental stewards, but they also need to make money and to spend it on the structures, not paperwork and



Brennan works to repair the St. Anthony Falls Spillway in Minneapolis, Minnesota.

studies that many times are unneeded. If they do not make money, they will not be able to pursue projects or will end up with poor structures. I always tried to keep it simple: If you do not have the generation to pay the costs, somebody else is going to be stuck with the dam. We had good technical and operational people, but we spent 20–30 percent of our money on regulatory work, and that was frustrating. I would rather have spent it on dam safety issues.

Finally, hydro needs some financial incentives in terms of long-term power purchase agreements with a reasonable rate of return. I believe hydro is better than the other renewables, but it does not get the credit it deserves. It is more reliable than wind and solar. It is the oldest and most reliable and viable of any of the renewables. However, hydro projects are not getting done because they just cannot get a power purchase agreement that reflects the true value of the resource. It boils down to financial math.

Hydro Leader: Charles, would you like to highlight any other success stories from your career?

Charles Alsberg: When I look back, there are a lot of failures and a lot of success stories. One that sticks out in my mind,

probably because it was early in my career, is redeveloping an old, abandoned project in Minnesota called the Byllesby Dam. It was North American Hydro's fifth or sixth project, and at that time in our career, it was way out of our league. We had one competitor, and we worked hard to beat them out and were successful in gaining a long-term lease. I felt confident that we could raise the money to complete the work, which was significant, and I was able to do so with a major insurance company, Prudential. Bill Harris, my partner at the time, did a great job keeping the cost down and solving numerous technical issues we uncovered as we rehabilitated the old equipment. We also hired an awesome project manager who kept the project on schedule and the budget right on the numbers. We got the project up and running, and what a proud day commissioning was. Our revenue forecast was \$550,000 per year, and as luck would have it, our first 2 years of production were during the worst drought years in Minnesota's history. Our first year's revenue was \$99,000, and the second year's was \$150,000. We simply could not make debt payments, which resulted in a trip to Prudential's corporate headquarters. Imagine trying to explain to 10 or so financial folks why your project is generating 75 percent less revenue than forecast. The problem was all water related, so

I put together a hydrology presentation for the board room titled “No Fuel, No Energy.” I will never forget giving that presentation by myself to a room full of financial and legal personnel. Fortunately, they were convinced that the issue was due not to our technical approach but to Mother Nature. They called me back and said, “We believe you, and we will give you an extension, but on your next trip here, we will own you.” The following 2 years were among the best water years in the history of Minnesota, and our production went through the roof. The project got back on track, and we ended up paying back the money early. That project sticks out in my memory because when you are a young engineer and you start dealing with financial people of that caliber, you must get up to speed very quickly. It gave me a lot of respect for the financial liabilities that you incur doing capital-intensive projects.

Hydro Leader: In what ways have you both been recognized for your contributions to the industry?

Charles Alsberg: I have been recognized by groups such as MHUG and RENEW Wisconsin, but the most important milestone in my career was NHA’s 2011 Henwood Award, which I received on the national level. NHA only gives it out once a year. I always thank the folks at NHA for that honor, in particular Linda Ciocci, who convinced me to become active in NHA in the early years and supported me during my time at this great organization. If you are not a member, join and get active—it protects your future.

Rory Alsberg: Talking with the people in the hydro world and being a resource to the industry is a great thing. Being a known and respected resource for the industry is something I consider special. People will call me and ask for help, and it might not even have anything to do with the services that Brennan provides. When I can help connect people, they’ll often ask me “Who *don’t* you know in the hydro industry?” That is the recognition I enjoy.

Hydro Leader: Is there anything you would like to add?

Rory Alsberg: Getting the next generation involved in hydro is very important to me. As we have mentioned, MHUG is a 100 percent volunteer organization, and one of our goals is to host more educational events, as there are a lot of people who do not know a lot about dams and their benefits. Organizations such as NHA, the Hydropower Foundation, and the Northwest Hydroelectric Association have started young professional groups and host career days and events at universities, all with the goal of making younger generations aware of hydropower, the careers that are available, and how much fun it is.

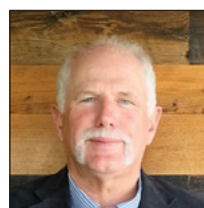
Charles Alsberg: I continue to support hydroelectric projects. For example, I am on the board of directors for a company called Lemke Industrial that makes dam hoists

and other related equipment for the hydro industry. That keeps me in touch with the industry. As a sideline, I am extensively involved in several real estate developments in the Las Vegas area, where I reside during the winter months. I also serve on a couple of boards. I am also starting to dedicate more time to social issues and recently began to serve on the board for We Are Many—United Against Hate, working with high schools and colleges to help young adults heal divides among communities and people. I also recently formed the Alsberg Foundation to give to some of the best charitable organizations.

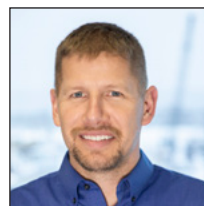
Hydro Leader: What is your vision for the future?

Charles Alsberg: The vision that I started with was to make sure that the hydroelectric industry was looked at as a renewable in the energy sector. Now, my vision is that it will once again become the dominant, most reliable, most valued, and most respected renewable energy source in the world. That will require an increase in the hydroelectric footprint in the United States.

Rory Alsberg: Increasing hydro generation in the United States is a huge part of my vision. Another part is getting hydro the recognition it deserves and needs as a renewable energy source. There must be greater emphasis put on increasing energy rates, thus providing a better return on investment and increasing interest in long-term investments such as adding generation, putting in powerhouses, and upgrading older equipment. When owners are getting paid so little with their current power purchase agreements, it is hard for them to invest. One big thing that we are seeing a push for right now is early contractor involvement. It is a good fit for Brennan, so I enjoy it. Getting involved early in the project eliminates the need to make drastic changes after the standard design and bid process. Getting contractors and engineers involved early and having a team approach, especially in large, complex projects, is changing the industry for the better. **H**



Charles Alsberg is the founder and chairman at Americas Energy Services. He can be contacted at calsberg@americasenergyservices.com.



Rory Alsberg is the senior business development manager of dam construction at J.F. Brennan Company. He can be reached at ralsberg@jfbrennan.com or (920) 376-7023.

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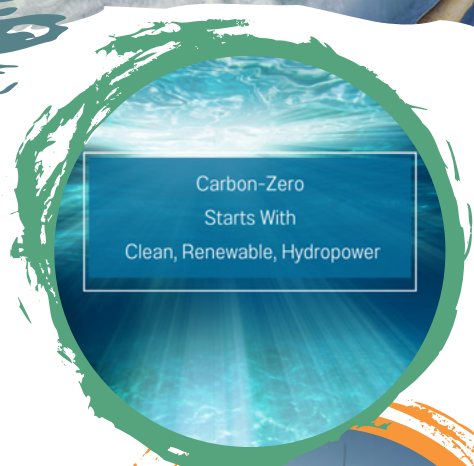
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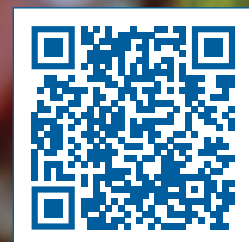
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Hydro Leader

Upcoming Events

June 25–26 Tristate Tour and Meeting (Idaho, Oregon, Washington), Burley, ID

July 10–11 North Dakota Water Resource Districts Association and North Dakota Water Education Foundation, Joint Summer Water Meeting, Minot, ND

July 15–18 Hydrovision International, Denver, CO

July 23–25 National Water Resources Association, Western Water Seminar, Kennewick, WA

July 25 Water Day at the North Dakota State Fair, Minot, ND

August 5–7 National Conference of State Legislatures, Legislative Summit, Louisville, KY

August 19–22 Colorado Water Congress, Summer Conference, Colorado Springs, CO

August 27–28 National Hydropower Association, Alaska Regional Meeting, Juneau, AK

September 8–11 American Public Power Association, Business and Financial Conference, Cleveland, OH

September 9–11 National Rural Water Association, WaterPro Conference, Savannah, GA

September 11–12 Nevada Water Resources Association, Fall Symposium, Reno, NV

September 17–18 P3 Electrified Summit, San Diego, CA

September 18–19 Northwest Hydroelectric Association, Fall Regional Workshop, Boise, ID

September 20 Agribusiness and Water Council of Arizona, Annual Meeting and Water Conference, Phoenix, AZ

September 24–26 American Water Works Association, WaterSmart Innovations, Las Vegas, NV

October 1–3 Coalition of Rio Grande Water Users, Conference, Santa Fe, NM

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