



# AQUARIUS Custom Workflow & Modeling Automation

## BC Hydro Improves Efficiency & Management of Water Supply Forecasts

“AQUARIUS has allowed us to efficiently update statistical water supply forecasts on a daily basis. Since BC Hydro is largely a hydropower producer, our water supply forecasts are basically our revenue forecasts. With AQUARIUS we now have a long-term solution that is easy for our team to maintain and support.”

Stephanie Smith, Manager, Hydrology & Technical Services, BC Hydro

**BC**hydro 

FOR GENERATIONS

## About the British Columbia Hydro and Power Authority (BC Hydro)

BC Hydro's corporate purpose is to power British Columbia with clean, reliable electricity for generations. It is a commercial Crown corporation owned by the Province of British Columbia. BC Hydro is one of North America's leading providers of clean, renewable energy, and the largest electric utility in British Columbia, serving approximately 95 percent of the province's population and approximately 1.9 million customers. It is responsible for reliably generating between 43,000 and 56,000 gigawatt hours (GWh) of electricity per year.

## Challenge: Inefficient Long-Term Forecasting System

“Since 95% of our generation is driven by hydropower, it is critical that we have timely and accurate water supply information,” commented Stephanie Smith, Manager of the Hydrology & Technical Services department at BC Hydro. “My team is responsible for measuring and forecasting water supply to support the effective management of BC Hydro's reservoirs. We monitor climate and hydrology conditions in all BC Hydro managed watersheds. Through our partnerships with the BC Government and Federal Government, we co-manage over 160 monitoring stations. We track current conditions, keep records of historical data, and produce water supply forecasts.”

Prior to deploying AQUARIUS, BC Hydro relied on a custom system designed in-house to generate statistical water supply forecasts. This solution, known as Volume Distribution and Calculation (VoDCa), consisted of a suite of Excel-based applications. At the beginning of each month, VoDCa was run manually to build mid-term and long-range inflow forecasts.

Adam Gobena, Statistical Hydrologist with the Hydrology & Technical Services department described the old system: "The VoDCa applications were not integrated. Forecasters had to manually switch between multiple applications to prepare input data and to run models. The VoDCa system also lacked the flexibility to run models for individual projects."



"While our team was able to produce accurate forecasts," shared Stephanie Smith, "the VoDCa system was cumbersome to use and maintain. So the forecasts were only run once a month. Built by one of our hydrologists, VoDCa was not well documented and not readily supportable. We needed a solution that would produce the same accurate forecasts, but that would be easier to maintain and more flexible to meet the evolving needs of our forecasters."

## Solution: AQUARIUS Time-Series

After a formal RFP process, BC Hydro chose AQUARIUS Time-Series. "By selecting a commercial system, we now have a solution that is well supported and easier to maintain in the long run," noted Stephanie Smith. "AQUARIUS is a flexible water accounting platform. We worked with the services team at Aquatic Informatics to set up our workflows and integrate our water supply forecasting models. We can now produce the same accurate mid- and long-term forecasts, daily and automatically. With AQUARIUS, we can spend more time analyzing the results rather than preparing them. That is the best win for us."

To build the new Statistical Water Inflow Forecasting Tool (SWIFT) on AQUARIUS, BC Hydro engaged the Aquatic Informatics Project Management Team, comprised of knowledgeable, seasoned hydrologists and software experts. The integration of AQUARIUS into BC Hydro's existing enterprise architecture was implemented using AQUARIUS' ability to integrate with OGC (Open Geospatial Consortium) web services. SWIFT was delivered on time, on budget, and on specifications.

## AQUARIUS Automates Daily Production of Mid & Long-Term Forecasts

"AQUARIUS is faster and provides more flexibility than our old system. Because AQUARIUS is integrated, it is saving us time. We no longer need to jump from one Excel application to another to prepare the data and run forecasts.

Now the long-term forecasts are updated every day on SWIFT. This is a new feature to help us track changes to forecasts as they are evolving," said Adam Gobena.

"AQUARIUS has also improved the defensibility of our data. VoDCa did not archive forecasts nor track changes made to the data or forecasting models beyond the forecast season. In addition to maintaining a permanent record of all the original data, AQUARIUS automatically builds an auditable data processing, correction, and editing log. Any changes made to the water supply data or forecasting models are tracked and readily available."

## More Frequent Seasonal Forecasts Improve Operations & Water Management

The types of data used to forecast water supply include observed precipitation, snowpack levels, temperatures, reservoir inflows, and seasonal climate indices related to phenomena like El Nino. Changes in water supply forecasts impact real-time BC Hydro operations. When low reservoir inflows are forecasted, BC Hydro minimizes water releases to preserve reservoir levels, optimizing power production potential while protecting environmental flows. When unusually high inflows are forecasted, BC Hydro can safely discharge more water to reduce future threats of floods from heavy precipitation events.

With more frequent forecasts, BC Hydro is able to better balance (1) protecting public safety, (2) optimizing the use of the water resources for power production, and (3) maximizing the economic benefit from generation by taking advantage of opportunities in the electricity market.

"AQUARIUS gives us the added ability to update mid- and long-term water supply forecasts on a daily basis. We can see trending with water supply forecasts going up when long wet periods are coming or down during dry periods. Now it's really easy for us to have that forecast at our fingertips," said Stephanie Smith.

# Results

AQUARIUS has enabled BC Hydro to:

- Produce mid- & long-term water supply forecasts automatically on a daily basis
- Increase modeling speed & system performance
- Automatically track changes to data & models with a rigorous audit log
- Integrate their water supply forecasting tool with their enterprise architecture
- Improve system maintenance & support
- Better manage valuable water resources with more frequent supply forecasts