

Predictive and intelligent decision support for Avista

Industry

Energy and Utilities

Service

Product Development and Support

Technology/Platform

WPF, WCF, C#, SQL Server

Delivery Model

Hybrid

© Avista's Post Street Substation and Huntington Park. Spokane, Washington

Client Profile and the Initial Situation

About Avista

Our client, Avista is an American energy company involved in the production, transmission, and distribution of energy as well as other energy-related businesses with a particular focus on innovation, sustainability, and clean sources of energy. In 2020, approximately 60 percent of its electricity came from renewable sources.

Avista is a US investor owned, vertically integrated utility providing electricity to 400,000 electric and 370,000 natural gas customers across 30,000 square miles in four north-western states. Its clean energy production ranks it as one of the country's lowest carbon emitters, yet its energy rates are among the lowest in the nation for investor-owned utilities.

Developing a decision support system to help make better power generation, transmission, and market transaction decisions.

Like any other utility company, Avista needed a decision support system to make better decisions about procurement, and best utilization of their resources. Keeping overall system fuel, operations and maintenance costs low were important; but, more important was ensuring a reliable balance of demand and supply, a concept in its industry called "security-constrained economic dispatch." They also needed a predictive solution capable of leveraging past data to enable improved long-term portfolio planning decisions. These requirements had to be met while adhering to all local, state, federal, and tribal regulations.

The forecast and planning rely on data from various sources (external and internal), updating in real-time, to arrive at the right business decisions and operational optimizations. Prior to the Nagarro engagement, they depended on a tedious internal system originally developed as a demonstration project but that rushed into production. This system was developed using quick but brittle architecture that became very hard to maintain and broke easily. It also had very limited user experience, making its broader adoption a challenge.

© Avista's Noxon Rapids Dam. Noxon, Montana



The Solution

Therefore, Avista chose Nagarro as its technology partner to help them conceptualize and build the right technology solution for this challenging task of making sense of almost real-time data from various sources both across the organization and outside.

ADSS – A data enabled decision support application to help better meet the power demand, either by production or procurement.

Nagarro and Avista co-created the Advanced Decision Support System (ADSS) - a powerful, proprietary enterprise-grade application to perform economic optimization of Avista's energy resource portfolio. It is a mixed-integer hydro-thermal^[1] decision support solution based on Avista-patented technologies, taking a leap forward in modeling sophistication and solution accuracy.

ADSS enables business users to make insightful decisions. Leveraging it in forecasting and planning applications takes data inputs from various external & internal systems in real-time and runs Avista's patented algorithms to forecast the future operations for days, weeks or even years. These solutions enable users to make data-driven decisions rather than relying as extensively on intuition.

The current version improves upon its predecessor, particularly through an entirely new, standalone user interface, and a faster and more flexible optimization model. It caters primarily to energy traders and those involved in energy resource planning. ADSS also includes new functionality to support complex simulations for long-term planning and other "what if" scenarios. Users quickly learn how real time data impacts the business. For instance,

- What happens to reservoir elevation when a user wants to change generation levels?
- Setting up generation targets for plants and individual units.
- Balancing all units in the portfolio automatically to meet demand.
- Calculating both the energy and ancillary and reserve products to reliably serve load.
- Handling complex generation relationships such as multi-stage gas generators.

The other complexity ADSS helps solve is the depth of the granularity level. Other similar products currently being used in the industry optimize resources only at the plant level, and that too with daily or, at best, hourly granularity. ADSS pushes these boundaries, optimizing at unit level with granularity down to one minute. When used in a Regional Transmission Organization (RTO) or organized market (e.g., the California Energy Imbalance Market), ADSS goes beyond providing the most economical base schedule. It also uses its proprietary algorithms to develop unit and/or plant energy bids for the entire generation portfolio.

^[1] While focused on the complex aspects of efficiently integrating hydro and thermal assets, the system is used to model all utility resource. This includes, for example, biomass, geothermal, wind, solar, varying storage technologies and distributed generation, to name a few. The technology also manages natural gas fuel supply, storage and delivery.



The Impact to Business

The solution thus developed added the following features to Avista's capabilities:

- **Real time load forecasting** for up to next 15 days.
- **Detailed base schedule operations** for up to the next 7 days with hourly granularity.
- **Dashboards** to collate and display data from all available power generation assets in real time. The dashboard can be personalized per the needs of various business users such as planners or traders with the datasets of their interest.
- **Fair benchmarking** of how efficiently the staff is buying and selling energy in the wholesale marketplaces, and if owned assets are being utilized to its maximum potential.
- **Console for system administration** allowing various business users to view all the power generation elements along with the relevant mappings, validations, and calculations with the current system.

Benefits to Avista

- Improved operations with reduced costs of energy generation and supply.
- Operating guidance for staff of varying experience and aptitude, thereby standardizing operations with best practices.
- Comprehensive analytical and predictive decision-making capability.
- Real time impact of changing system conditions and forecasts.
- Ability to benchmark operations and perform "what-if" scenario analysis.
- Super optimized maintenance planning of resources.
- Economical bids for use in organized markets (e.g., California EIM).
- Optimization results at fine granularities.



Client Testimonials

"Nagarro was an essential partner in this venture. While Avista had a vision of what was needed, and even had a working prototype, its broad use was not possible due to its technology and poor user experience. Nagarro provided a top-notch team to turn our prototype into a powerful user-friendly application capable of being used by nearly any utility anywhere in the world. I recommend Nagarro for your application, without hesitation."

Clint Kalich

*Manager Resource Planning and Analysis
Avista*



"For a forward-thinking Utility company like Avista, my goal is always to drive technology innovation that serves the best interest of our employees, customers, and community while reimagining the future of energy. Nagarro has been an ideal digital engineering partner on this journey. It has been great collaborating with open-minded, intelligent, and passionate people who have always treated our business needs as their own. Nagarro teams are known to never back away from challenges, being persistent and always willing to walk the extra mile, creating progressive solutions to get the job done."

Hossein Nikdel

*Director, Application and System Planning
Avista*

About Nagarro

In a changing and evolving world, challenges are ever more unique and complex. Nagarro helps to transform, adapt, and build new ways into the future through a forward thinking, agile and caring mindset. We excel at digital product engineering and deliver on our promise of thinking breakthroughs. Today, we are 15,000 experts across 28 countries, forming a Nation of Nagarrians, ready to help our customers succeed. www.nagarro.com