



CASE STUDY | TransAlta

Hydro Resources and Power Generation Optimization

ABOUT KISTERS

KISTERS is a global software solutions and technology firm dedicated to effective long-term management of water resources. Our environmental experts help clients achieve organizational goals through the deployment of powerful and flexible software.

Technologies:

BelVis - ResOpt*
WISKI Platform*
WISKI Launch Pad*
KiDAT application
KiDSM application
WISKI BIBER*
WISKI SKED
WISKI MAP*
WISKI iReD*

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TransAlta: Optimization of their Hydro Power Operations

TransAlta, with more than 100 years of experience, is the largest power generator in Alberta, Canada. At the end of 2010, TransAlta became the first company to own and operate more than 1,000 MW of installed wind capacity in Canada - almost 30% of the country's total. Beginning as a small, local power company in 1909, TransAlta has transformed over the last century to become an experienced and well respected power generator and wholesale marketer of electricity. TransAlta has approximately \$3 billion in annual revenue, more than \$9 billion in assets, with power plants in Canada, the United States and Australia.

The Challenge

TransAlta's goal of generating safe, reliable and affordable power to millions is made possible by their commitment to operational efficiency through the use of resources optimization modeling techniques that considered:

- 1) Environmental constraints,
- 2) Market pricing, and
- 3) Energy demand.

Three hydro power systems managed by TransAlta in Alberta are considered unique generating systems that required consideration of operational limits. Turbines, dams, gate characteristics and outage hours were included in the optimization process.

Key Challenges included:

- Collection and analysis of water and generation data from several heterogeneous sources,
- Implementation of an optimization model that considered numerous operational and environmental constraints,
- Ability to provide day-ahead generation schedules for 25 turbines (774 MW max. capacity) located in Alberta, Canada.





The Solution

On a daily basis, operations and trading groups enter outage hours and market prices into BelVis - ResOpt. Water data (inflow forecast, and elevations of rivers, dams and canals) was automatically imported into the WISKI Platform where it seamlessly transferred to the optimization extension - ResOpt*. ResOpt ran automatically every morning at 1:00 am so users could analyze results each morning to confirm the next days schedule before noon. BelVis - ResOpt provide the following output:

- Turbine generation schedules,
- Indepth understanding of water usage through the entire hydro system,
- Reservoir elevation values,
- Revenue/turbine calculations.

Results were reported and dispatched for the next day.

Results

The application was setup to automatically provide day-ahead operational schedules to optimize for maximum benefit over time. Prior to using BelVis - ResOpt, plant engineers manually calculated the optimal results with the use of simple spreadsheets. This process was not only time consuming but did not guarantee the best possible solutions. Switching to BelVis - ResOpt, users were able to focus their attention at a global level while the software ran various analysis scenarios and automatically provided the optimum daily operational scenarios.

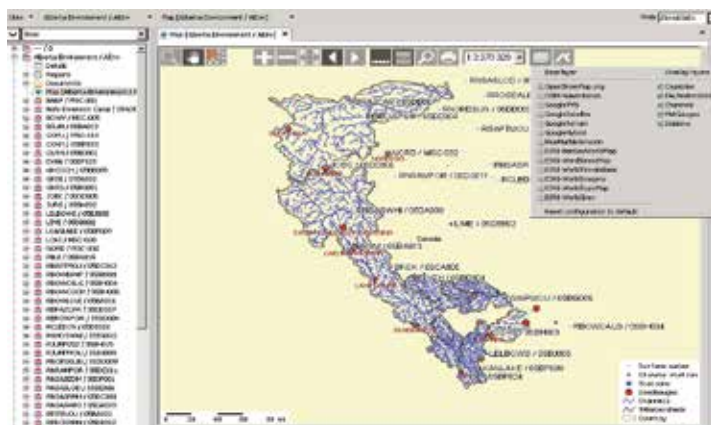


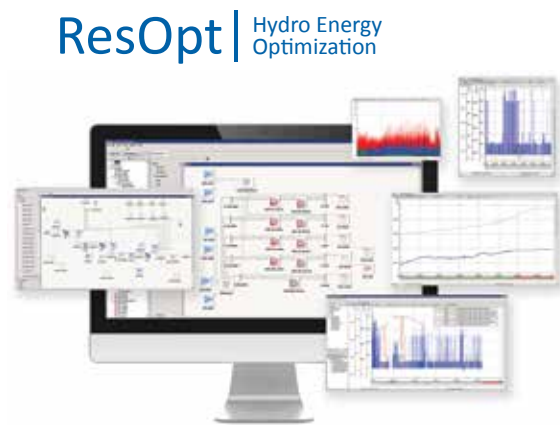
Figure 1: WISKI Map with rivers, water station and weather station locations

TECHNOLOGY DEPLOYED

The combination of **BelVis - ResOpt** and the **WISKI Platform** offered TransAlta a robust, reliable and truly integrated solution that addressed their energy challenges. BelVis - ResOpt solved complex optimization problems using Mixed Integer Linear Programming while the WISKI Platform maintained high quality model input data through manual or automatic validation, analysis and exporting on critical operational data.

Additional software benefits include:

- High-level overview of complex data and decision workflows,
- Fast analysis of numerous scenarios,
- Improved communication between functional groups (hydrology-trading depts.),
- Consideration of multiple data variables (i.e. weather, calendar and macroeconomic data),
- Wide range of forecast and analysis algorithms from the most basic to the most advanced,
- Flexible time series models customized for specific needs and by meter typology,
- Hierarchical instance model by market roles.



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