HydrovSPD

HydrovSPD is a multistage, deterministic version of the New Zealand electricity market dispatch software SPD (Schedule, Price and Dispatch) that is used by Transpower every five minutes to dispatch the New Zealand wholesale electricity market. HydrovSPD is coded in GAMS, and based on vSPD (Vectorized SPD) the GAMS/Cplex copy of SPD that is distributed by the New Zealand Electricity Authority. vSPD is essentially identical to SPD but is publically available. With historical energy and spinning reserve offers (that are publically available) vSPD perfectly replicates historical spot market prices. Thus a simulation in vSPD is effectively an experiment in the real market.

HydrovSPD computes a dispatch in each half hour of a day using vSPD assuming that electricity demand and all energy and reserve offers for the 48 periods in the day are known. With historical offers, HydrovSPD will replicate market outcomes. With appropriate conversion factors for electricity turbines, HydrovSPD will also replicate the water releases from hydroelectric systems (subject to block-dispatch variations).

If, on the other hand, we input *hypothetical* energy and reserve offers, then HydrovSPD will give a hypothetical dispatch and prices for every period of the day. Observe that the water releases computed from this hypothetical dispatch might not be feasible for the constraints imposed by flow down a river chain. Thus hydrovSPD imposes hydrology constraints on all the dispatch variables. One can also impose a constraint on end-of-day reservoir levels (for example to make them match historical levels), or provide a water price surface at the end of the day to incentivize best economic use of the water.

HydrovSPD is a central part of the EMBER project in EPOC (see Philpott and Guan, 2018). This project aims to create perfectly competitive counterfactual water release polices that can be tested against historical outcomes.

HydrovSPD is coded in GAMS/Cplex. It was developed by Ziming Guan at EPOC based on the work in Nick Porter's Master's thesis.

References:

Philpott A.B. and Guan, G. Risk and efficiency in hydro-dominated electricity markets, downloadable from http://www.epoc.org.nz/der2018.html, 2018.

Porter N.R. Intra-day uncertainty and efficiency in electricity markets (Master's Thesis), downloadable from http://www.epoc.org.nz/publications.html, 2015.