

Operational decision support for water systems

Conventional decision-making processes often revolve around established guidelines, sometimes supported with computer simulations or black box optimisation models. RTC-Tools helps decision-makers find operational strategies that maximise financial profits and minimise expenditure. In the first step, decision-makers state and prioritise their operational objectives. Using a computer model of the water system, RTC-Tools then computes the best possible schedules in terms of those priorities for controlling pumps and turbines, sluices and weirs. The computed schedules are presented to the decision-maker in a graphical user interface such as DelftFEWS.

Version 2.0 of RTC-Tools was released as open source software in October 2016. This followed more than a year of intense development by a growing team. RTC-Tools 2.0 focuses on the transparent treatment of the competing goals and objectives that are typical of water systems. It also introduces a generic modelling framework, opening the door to decision support for interdisciplinary systems such as hydropower-transmission grid interaction. RTC-Tools 2.0 puts operator confidence first: the mathematical framework underpinning the software was designed from the ground up for accurate and predictable decision support.

RTC-Tools has been used as the engine for a series of Quick Scan Tools that allow policymakers to rapidly evaluate different water allocation strategies. One of these was a prototype developed for Rijkswaterstaat (part of the Dutch Ministry of Infrastructure & Environment) to support the Landelijke Coördinatiecommissie Waterverdeling (national coordination committee for water allocation) in its operational decision-making processes. The



Control room of the Rivierenland water authority, a participant in the JIP Slim Malen (source: Rivierenland water authority)

second Quick Scan Tool application was developed to support the bottleneck analysis (knelpunten analyse 2.0) of the Freshwater Delta Programme. Furthermore, given the need to replace the legacy surface water models Distribution Model and MOZART in the National Hydrological Instrument, Deltares has proposed that RTCTools should be used for this purpose. Rijkswaterstaat and the water authorities have agreed and a project has been launched to complete this replacement by April 2018.

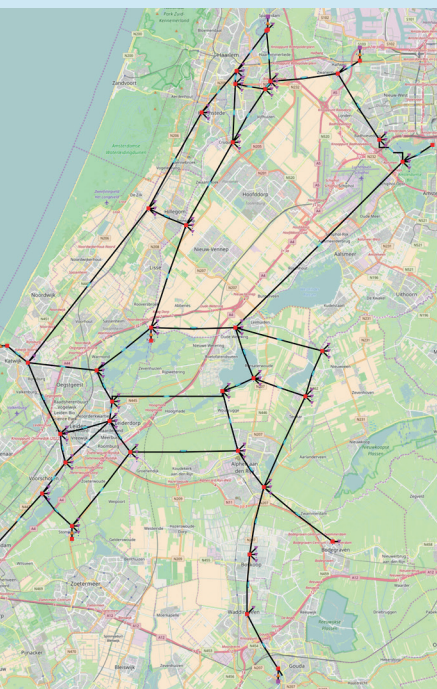
The new RTCTools is now being used in a variety of projects. Deltares is, in the context of the projects JIP Slim Malen (a joint industry project on smart polder drainage) and Rekenen aan Slim Water Management in de praktijk (computational smart water management in practice), working with a wide range of water authorities and energy suppliers. We are also collaborating with consultancy firms to develop control models for water systems and save pumping costs by means of smart scheduling that takes into account precipitation forecasts, surge and tidal forecasts, storage capacity at hand, and variations in the energy spot price. In this way, water authorities will contribute to the clearing of the energy market and therefore support the growing share of intermittent renewables such as wind and solar. RWsOS-IWP, which is used daily by Rijkswaterstaat for the day-to-day operation of many of its structures, will also use the new RTC-Tools to advise on short-term operations in the (North Sea/Amsterdam-RhineCanal).



Hydropower optimisation for the Três Marias dam in Brazil (source: Universo Cemig, Dec. 2015)

Further reading:

<https://www.deltares.nl/en/software/rtc-tools/>



RTC-Tools hydraulic model of the Rijnland water authority