Transition to Dynamic Reservoir Operations for Municipal Water Supply

IWRA World Water Congress
May 29, 2017

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Overview

• The New Normal
• System Description
• Operating Rule Assessment
• Implementation
• Conclusions
The New Normal

- Increasing Cost of New Supply
- Growing Competition for Limited Supply
- Increasing Hydrologic Variability
Figure 1. DRO Information

A variety of information is used to meet a utility’s DRO objectives.

- Snowpack
- Antecedent conditions (e.g., first, second, or third year of drought)
- Forecasts—long and short term (hydrology, meteorology, demand, economic, etc.)
- Time of year
- Climatic conditions (e.g., El Niño)
- Inflows
- Demand level
- Water treatment and pumping costs
- Electricity prices/demand
- Water quality conditions
- Environmental conditions
- Fish spawning
- Instream flow requirements
- Groundwater level
- Current reservoir storage
- Water quality conditions
- Water temperature
Suez Water New Jersey

- Serving nearly one million residents from the Hackensack River Basin

- New model needed to deal with operational changes
  - Growing pressure from NY regulators to make greater use of NJ supply
  - Safe yield changes in the main backup supply
Schematic of Hackensack OASIS Model
Reliability Assessment

![New Jersey Storage Chart](chart.jpg)
Limitations of “Static” Rules
Sample Forecasts

[Chart showing sample forecasts with the x-axis representing dates from 1-Nov-12 to 1-May-13 and the y-axis representing NJ Storage (%). The chart includes multiple lines representing different forecasts, with a black line labeled 'Observed' at the bottom.]

- Observed

[Logo of SUEZ and HYDROLOGICS at the bottom right corner of the page.]
Sample Forecasts
Dynamic Rules Based on the Forecasts

**Trigger for Wanaque**

Trigger Not Met  
Trigger Met

- Trigger: 40% probability of reaching 60% Storage in 12 weeks
- If green line crosses horizontal black line on the right of vertical purple line → Turn Wanaque On  
  (27 mgd Winter/48 mgd Summer)  
- If green line crosses horizontal black line on the left of vertical purple line → Keep Wanaque Off
Outcomes

• 20-year old rule curves replaced with forecast-based triggers

• Results
  – Summer: More aggressive action to preserve reliability
  – Winter: Less aggressive action to reduce cost

• NJ regulator embracing forecasts as way of improving regional operations

• 2015 Innovation Award from Suez North America
Implementation

- Suez runs OASIS in operations mode
  - Inputs starting conditions, like inflows and storage
  - Runs forecast and produces recommendation
Conclusions

- Planning and operations are improved through dynamic rules
- Systems models are needed to develop and implement the rules
- Forecast-based rules reduce the uncertainty of drought