Optimizing TVA’s Hydro System Using RiverWare

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TVA Region Covers 40,000 sq Miles

- Watershed
- Power Service Area
Reservoir Operations Study (ROS) Reviewed Operation of TVA Reservoirs

- Initiated in October 2001
- Implemented in June 2004
- Comprehensive review of how TVA operates the 49 dams and reservoirs in the Tennessee River system
- Purpose: to determine if changes in TVA’s reservoir operating policy would produce greater overall public value
Integrated Operation of the River System Provides Overall Value

- Year round commercial navigation
- Reduced risk of flooding
- Affordable and reliable electricity
- Improved water supply
- Improved water quality
- Recreation opportunities
What Changed on the Tributaries?

- Drawdown is limited from June 1 through Labor Day on 10 major tributaries

- Winter operating zone raised on 11 tributaries

- Expanded and more dependable scheduled releases for tailwater recreation will be provided at 5 reservoirs
Tributary Guide Curves Were Changed

SOUTH HOLSTON RESERVOIR

- 80% Probability Bound
- Balancing Guide
- Flood Guide
- Base Case Median
- Preferred Alternative Median
- Top of Gates
What Changed on the Tennessee River?

• Spring fill operations on upper main river occurs in two stages

• Summer operating zones extended on 5 reservoirs

• Winter pool elevation raised on 1 reservoir
Main River Guide Curves Were Changed

**CHICKAMAUGA OPERATING GUIDE**

- **TOP OF GATES:** EL 685.44
- **Max EL 687.13 at 1900 5-07-03**

- **TOP OF NORMAL OPERATING ZONE**
- **BASE CASE TYPICAL ELEVATION**
- **MOSQUITO FLUCTUATIONS**
- **PREFERRED ALTERNATIVE TYPICAL ELEVATION**
- **BOTTOM OF NORMAL OPERATING ZONE**

**ELEVATION, FT**

**X-Axis:** JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC
How was Hydro Optimization Impacted by ROS?

- Higher winter pool levels on tributaries means possibly more spilling – less discretionary generation

- Restricted flows in summer means less flexibility – less discretionary generation
RiverWare Optimization Model was Modified with New Constraints

• Constraints were added to:
  – Balance tributary reservoirs relative to one another within their operating ranges
  – Meet weekly system flow requirements during summer

• Simplified objective function does not consider future value of water during summer
Water Allocation is Optimized Over Short Term

- Current Day
- Observed Values (3 - 14 Days)
- RiverWare Hourly Preschedule (2 Days)
- RiverWare 6-Hourly Forecast (14 Days)
- Future Value of Water (14 - 120 Days)
- Not Used During Summer
Over 900 Constraints Help Determine Operation of Reservoir System