Jun 29th, 9:20 AM - 10:15 AM

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Recommended Citation
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SPECIALTY SESSION - EXTENDED ABSTRACT

Keywords: Tennessee River Valley Authority

The Tennessee Valley Authority (TVA) operates a system of 49 dams and reservoirs in the Tennessee River and Cumberland River watersheds of the southeastern United States. TVA operates this system for the purposes of navigation, flood control and power production; management of water supply, water quality and aquatic habitat; and recreation and other public benefits. TVA, created by the U.S. Congress under the TVA Act of 1933, is the largest public power supplier in the U.S. and is fully self-financed with no federal appropriations. The Tennessee River is the only basin in the U.S. that is operated by a single agency, TVA, to achieve basin-wide water management objectives. TVA implements a reservoir operations policy that integrates the entire 110,000-square-kilometer basin through balancing competing demands on the system and overall value to the public. The operating guide, most recently established in the 2004 Reservoir Operations Study, provides seasonal variations in flood storage and guides river management decisions in all hydrologic conditions throughout the year.

Figure 1. Tennessee Valley Authority
TVA operates a system of 30 hydropower projects comprising 29 conventional plants and one pumped storage plant, with a total of 113 hydro units. TVA’s hydropower system has a net dependable capacity of approximately 5,500 MW, and typically generates about 15,000 GWH per year. For real-time plant optimization, WaterView is used to increase plant efficiency, generation and revenue. WaterView receives process data, scheduling inputs and constraints from the automation control system, and optimizes this information to provide necessary inputs for forecasting and system scheduling.

![Figure 2. TVA River Forecasting, Scheduling, and Monitoring](image)

TVA is currently improving its river forecasting and scheduling tools by modernizing and developing new runoff, reservoir routing and hydraulic models, and integrating these models with observed and forecasted time series data into an open data handling platform developed for hydrologic forecasting. This system will provide a central platform for data management, visualization, model integration and reporting.

Discharge rating curves (DRCs) for many of TVA’s dams provide good estimates of discharge for various hydraulic conditions and a range of flows including extreme floods. Historically, this included developing specific spillway discharges from scaled physical models for several TVA dams, and more recently used statistical relationships to develop DRCs for other TVA projects. Results from these analyses have been incorporated into a Spillway Calculator tool utilized by river forecasters to facilitate their modeling efforts and ultimately provide balanced river scheduling decisions.

The Spillway Calculator is a critical component of supporting flood reduction and dam safety by optimizing spillway releases to be effectively scheduled using ensembles of forecasted flows with respect to available storage and spillway capacity. The benefits of appropriate reservoir operations prior to and during floods will likely reduce flood risks and avert loss of life and economic consequences downstream of dams.
Figure 3. TVA Monitoring System Performance