Building Better Models Through Collaboration:

Lessons from Alabama Power Company's RiverWare Development

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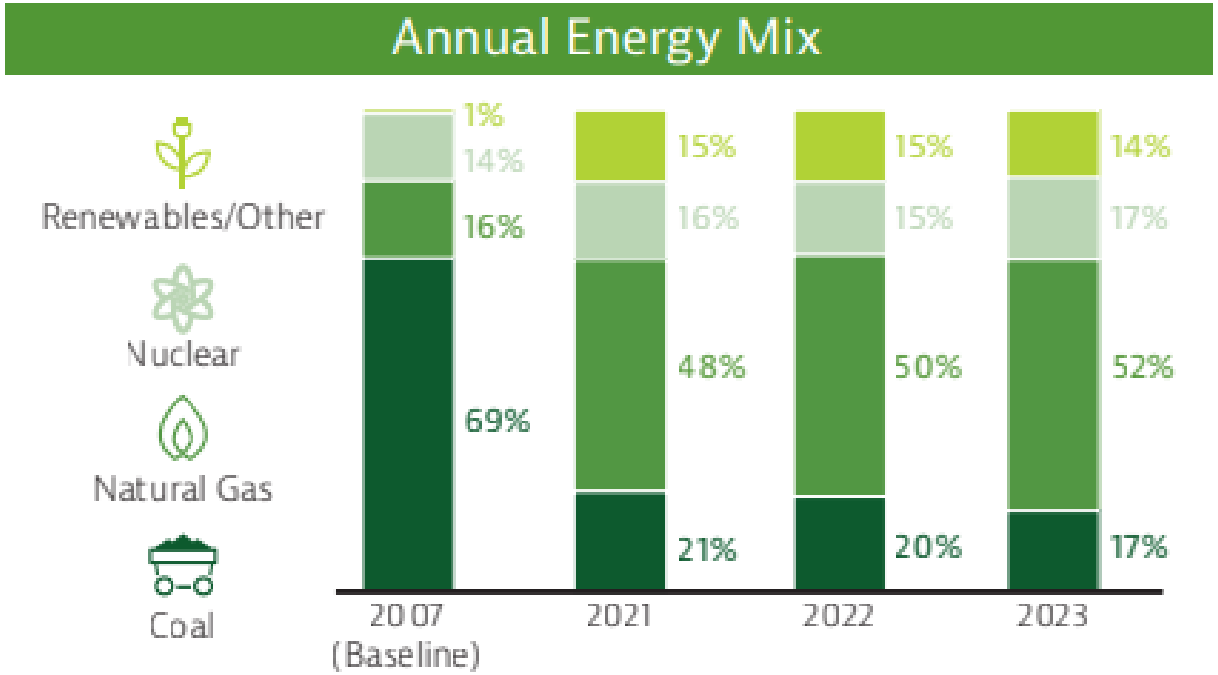
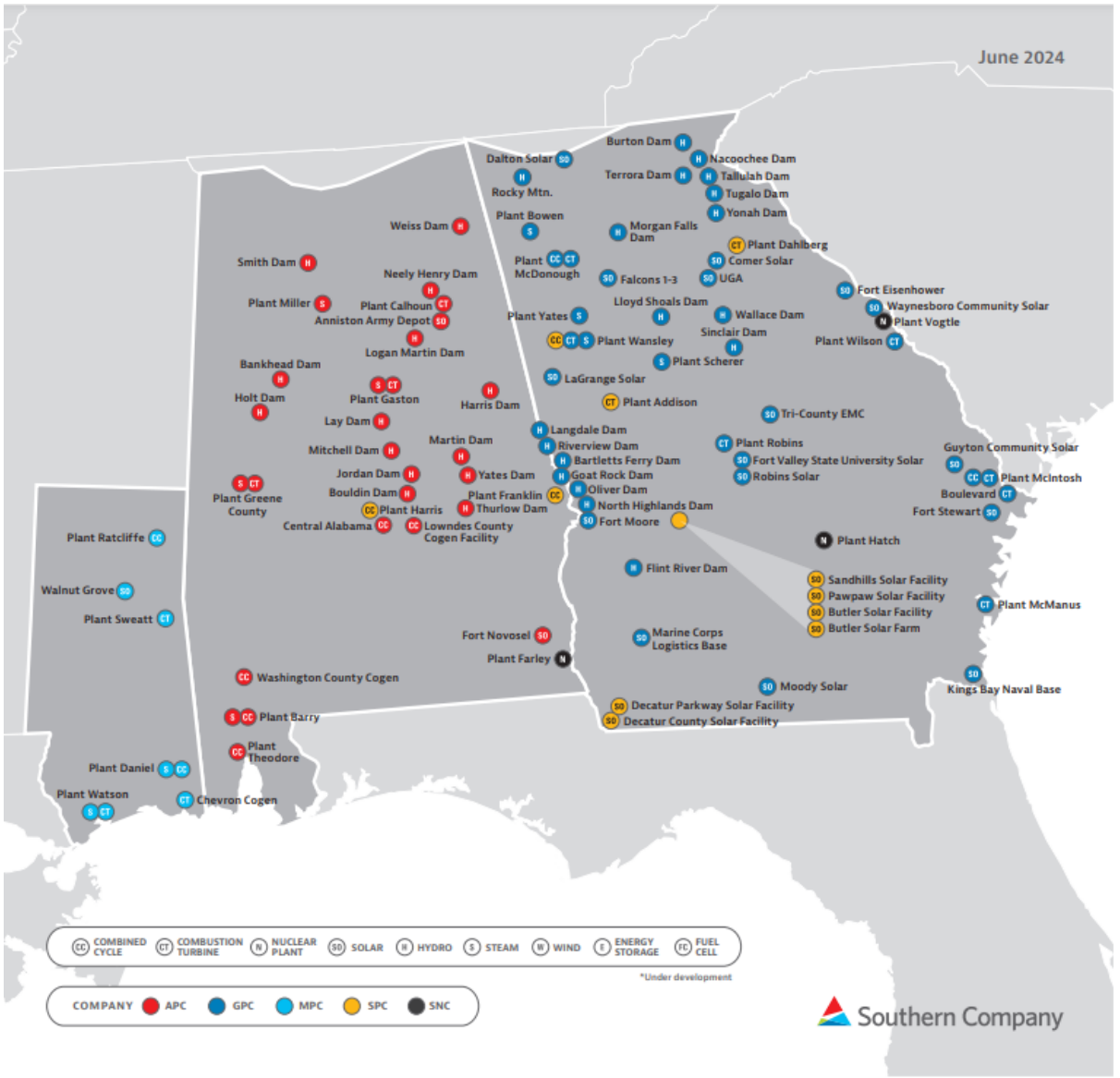
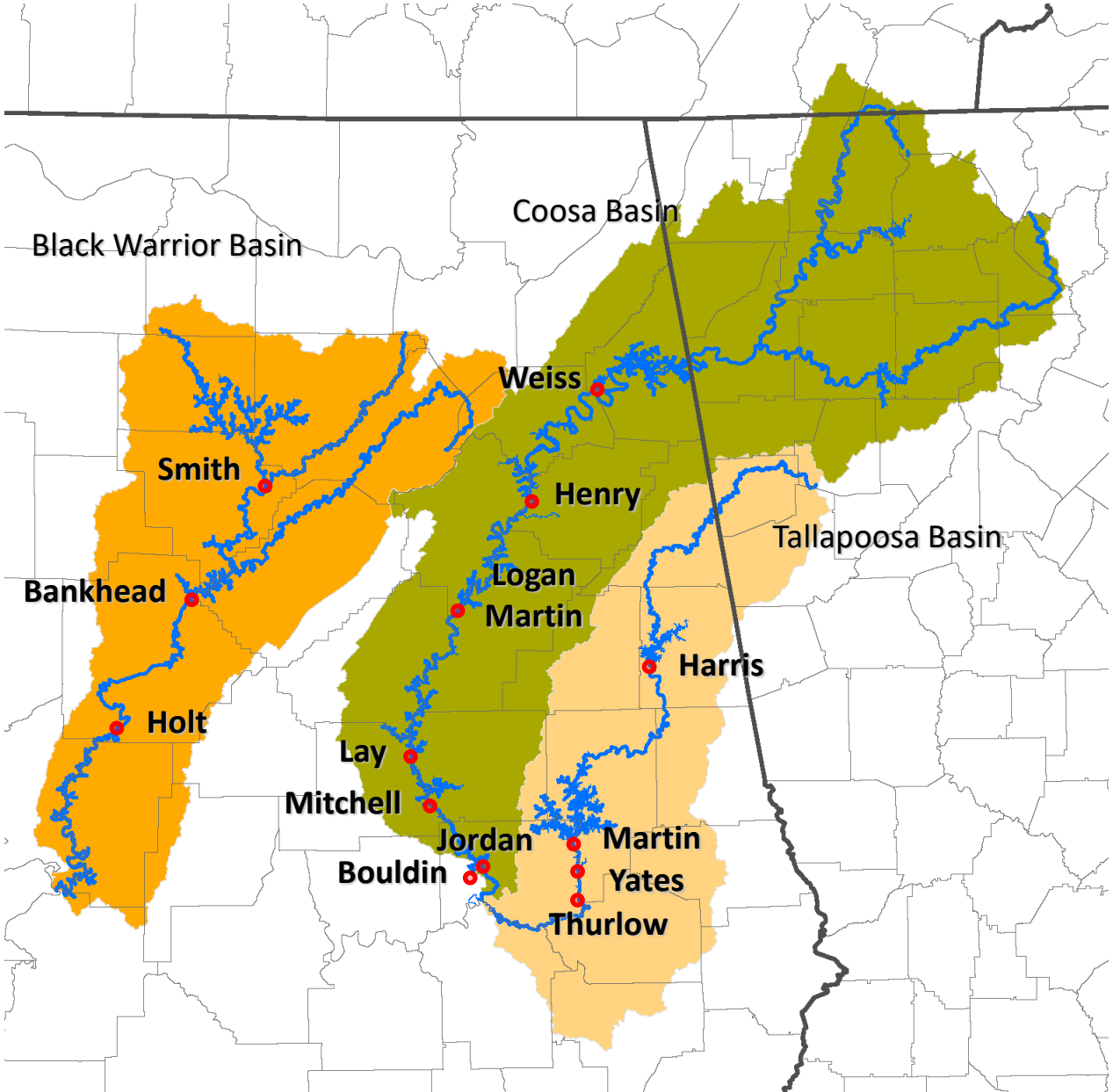
Southern Company





Hydroelectric Generation



- Alabama Power
  - 14 Powerhouses
  - 41 Units
  - ~ 1700 megawatts of capacity
  - 11 Reservoirs
  - ~157,000 acres of pool area
  - ~3,500 miles of shoreline
  - Located in the Black Warrior, Coosa and Tallapoosa Basins

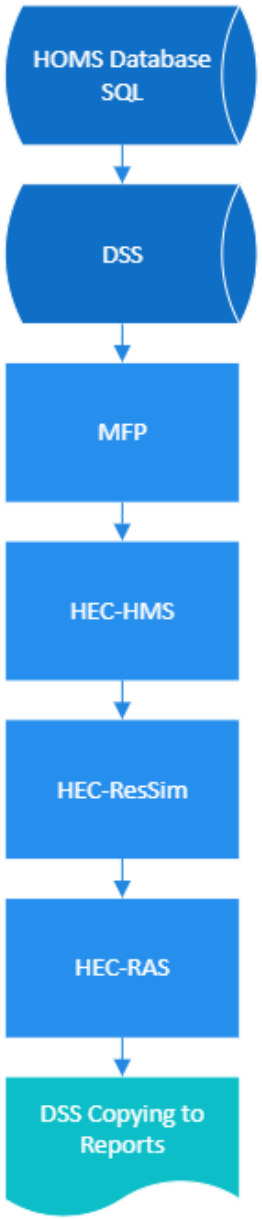
Reservoir Management

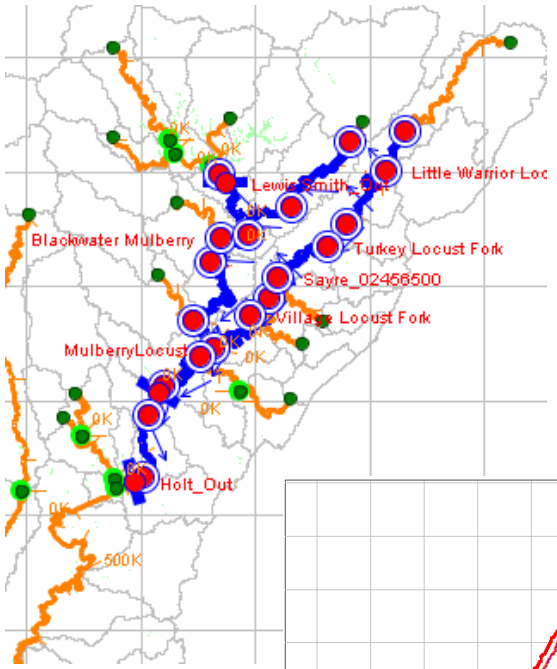
- Reservoir Management
  - 3 operators, 2 forecasters
  - On-call rotations
  - Daily schedule and flood control
  - Maintain gaging network

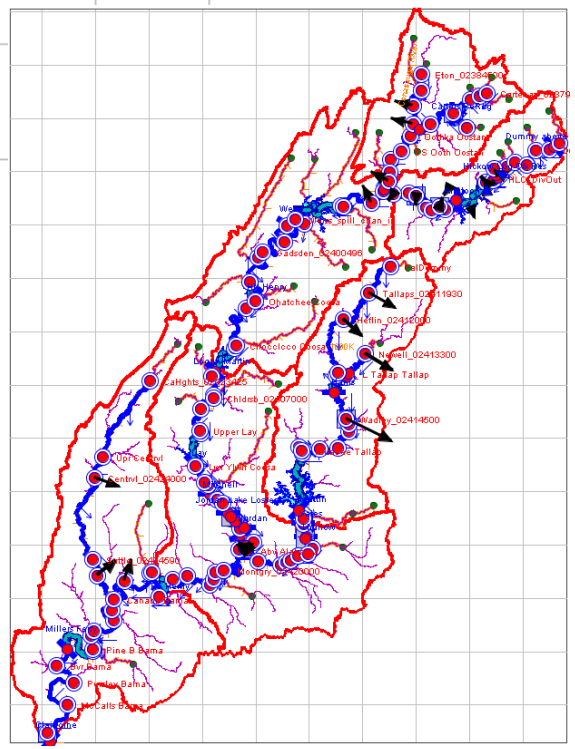
- Operational Guidelines
  - Maintain full lakes
  - Hydropower generation
  - Dissolved oxygen levels and environmental flows
  - Flood and drought management

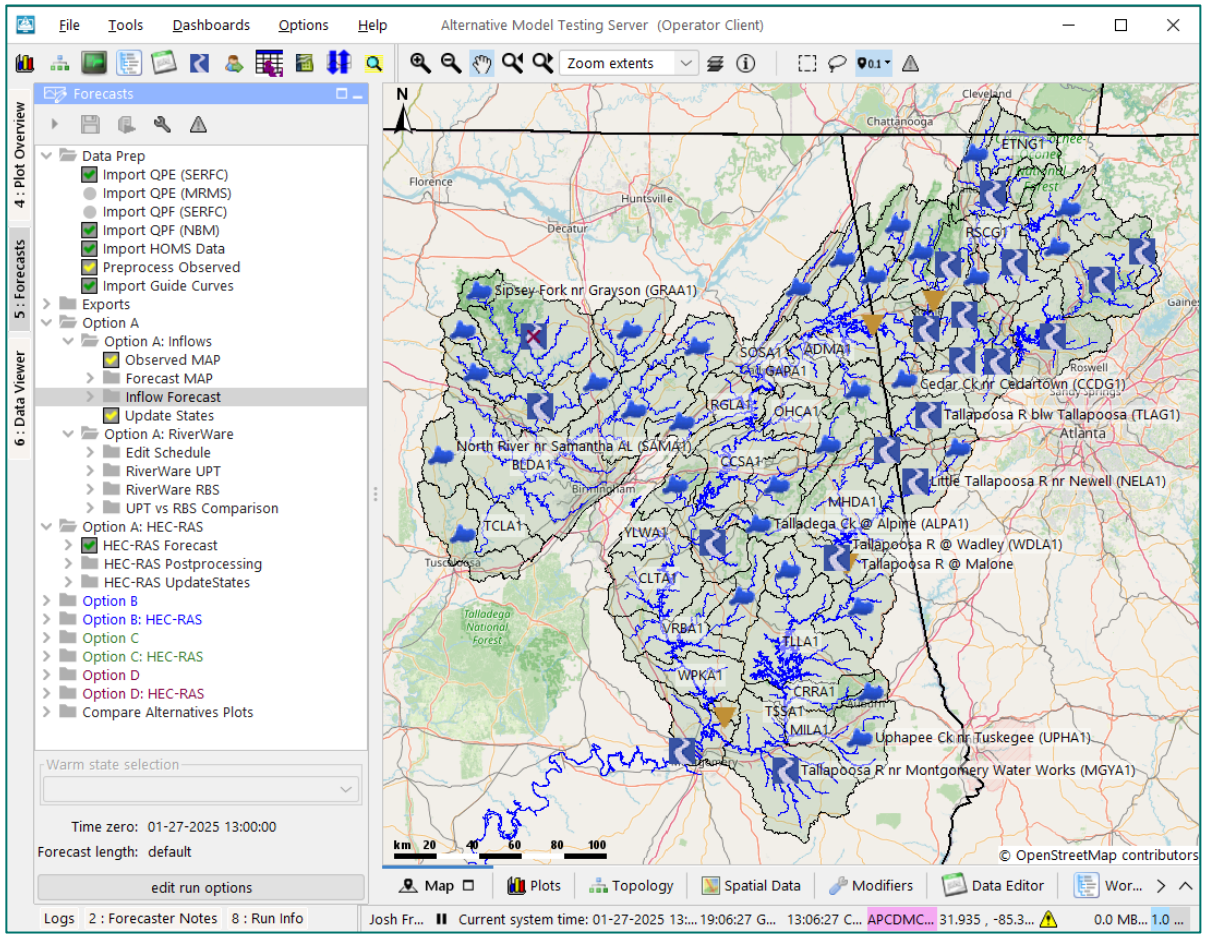
Martin Dam

Deltares-FEWS Forecast System





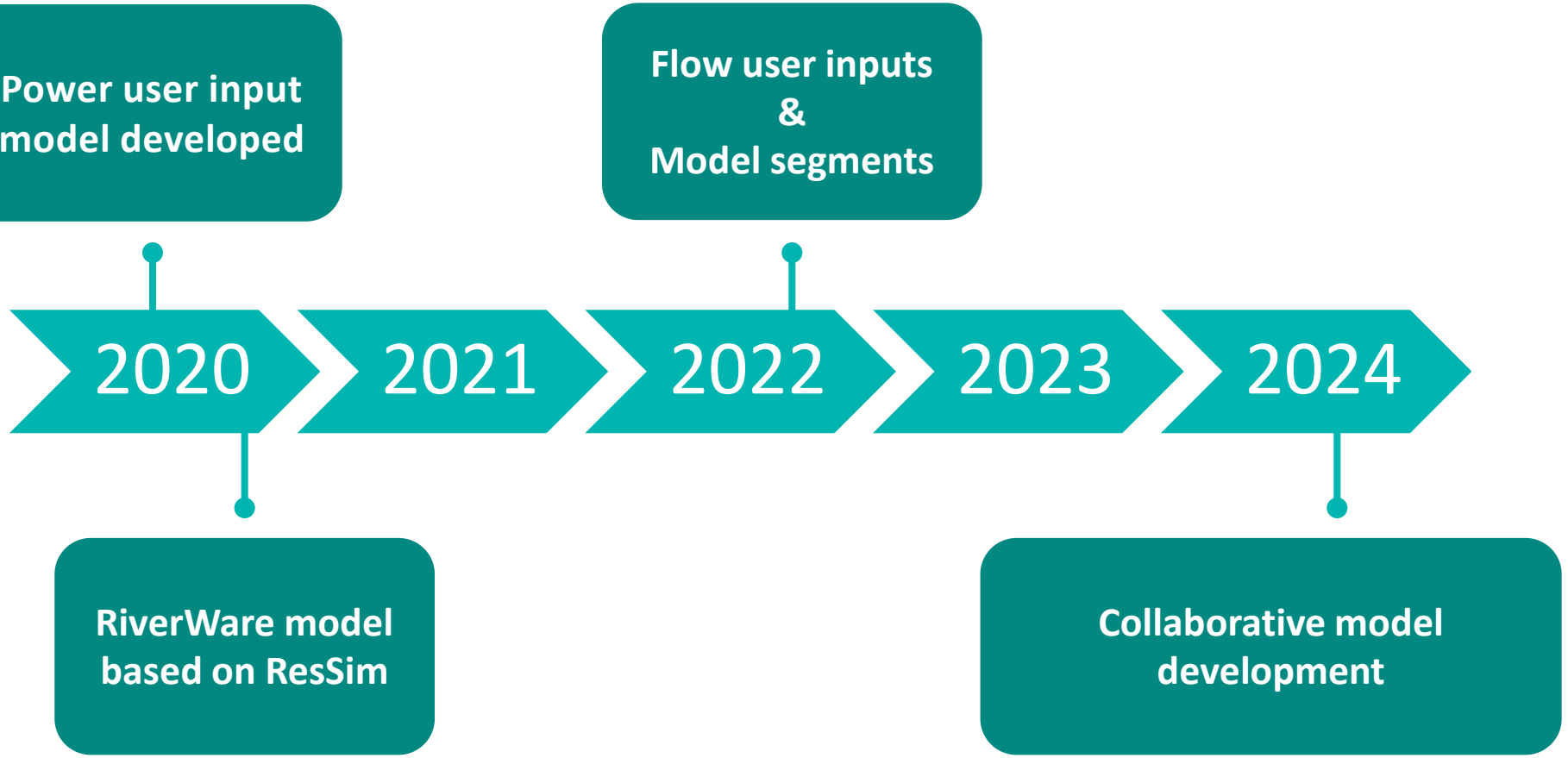




A Brief History of RiverWare Development

Simulation Model Development
(Unit Power Table Method)

Rulebased Model Development
(Rulebased Model)

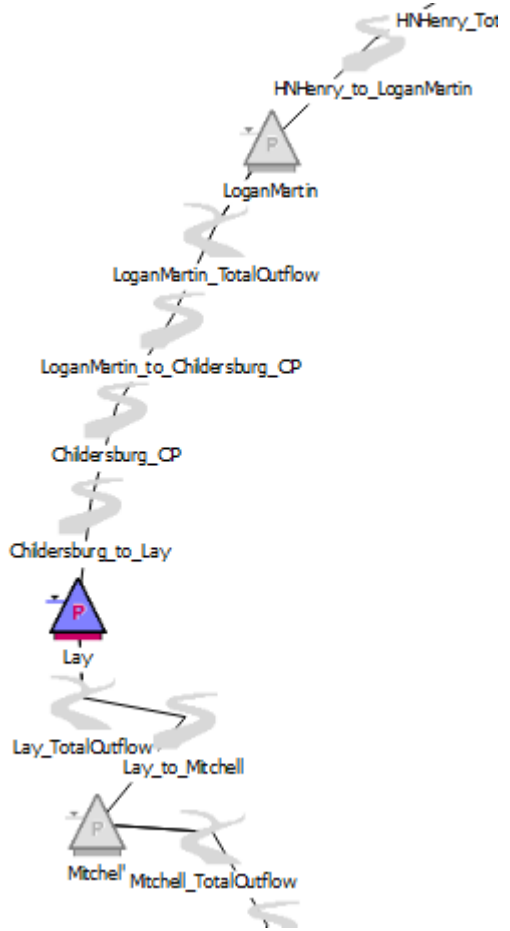


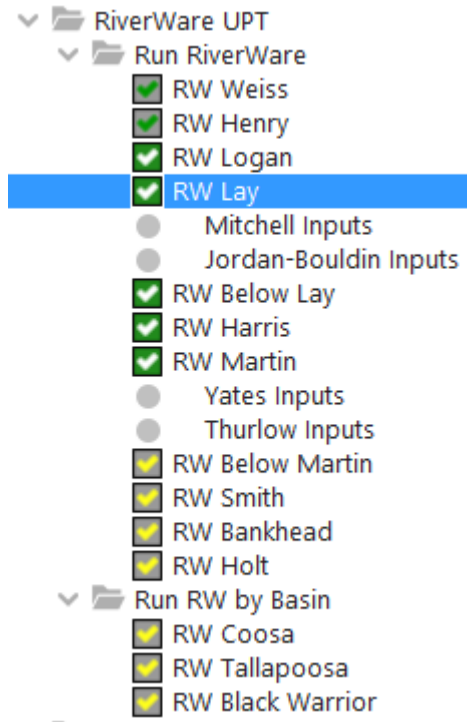
Lesson #1

It’s best to prioritize reliability.

Simulation Segments

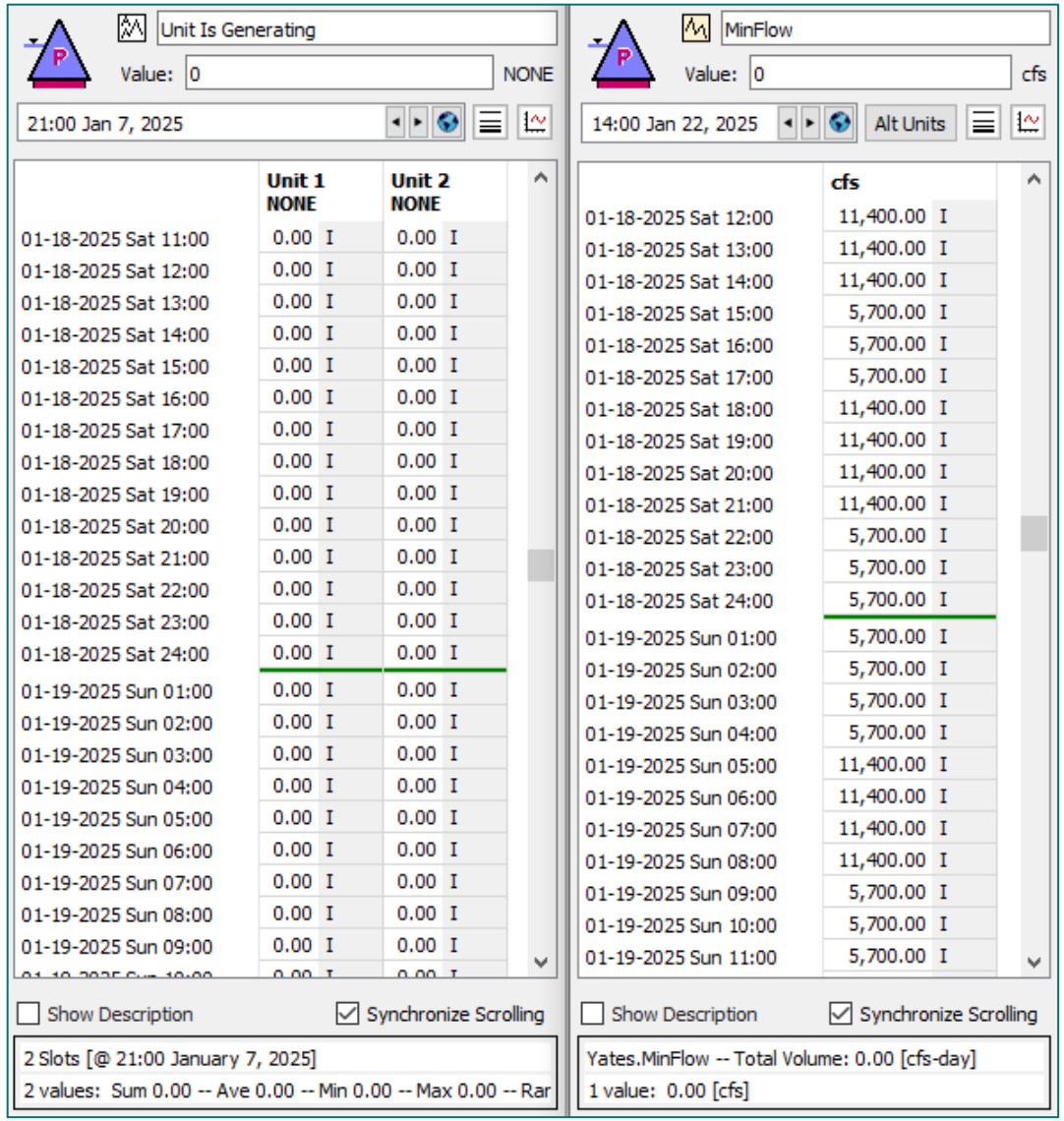
- River basins segmented into individual plants or small groups of plants
  - Mirrored previous methods
  - Decreased number of simulation failures
  - Eased debugging
- All flow routing handled outside of RiverWare
  - Enable routing to match the inflow model
  - Variable Lag/k vs. Modified Puls
- RiverWare scripts and DMIs used to enable/disable objects





Change in Simulation Philosophy

- From Unit MWs to Unit Flows
- Underlying curves are deficient
  - No internal program for continuous testing of power curves
  - Power curves require updates for dissolved oxygen operations and unit upgrades
  - Tailwater curves can be unreliable for projects in backwater
- MinFlow slot hacked to be used for flow inputs

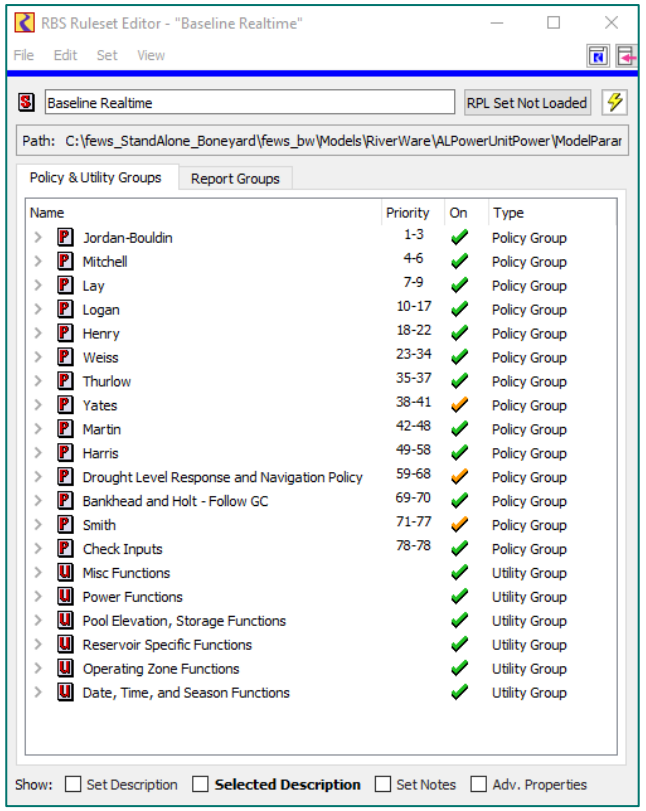


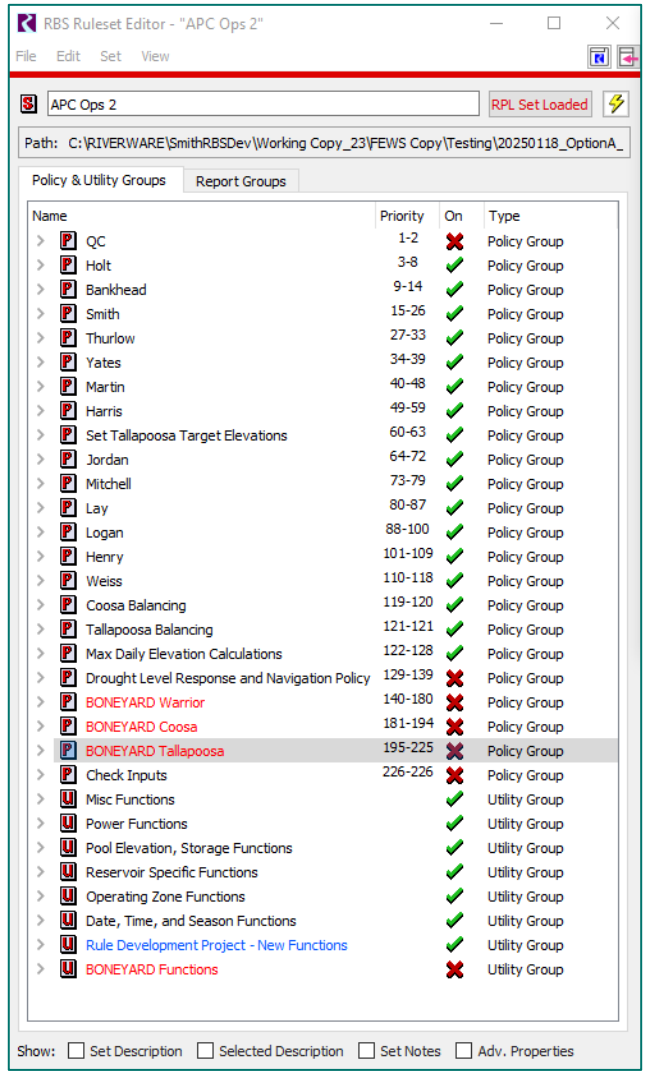
Lesson #2

It’s important to learn from each other.

Collaborative Learning

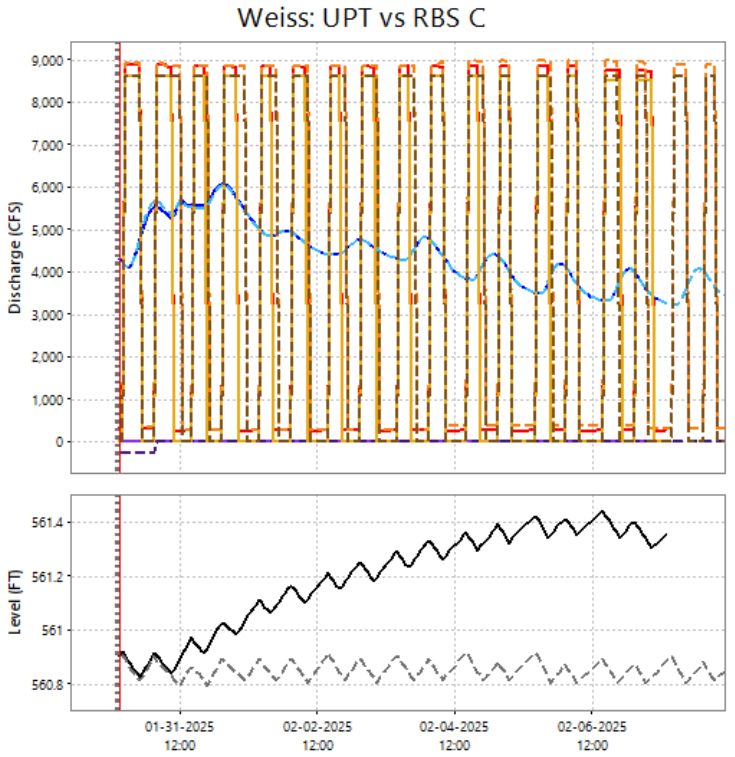
- From APCO
  - Daily operational thought process
  - Expected end product definition
  - Model Development Priorities
  - Individual rules interpretation
  - Rule logic blueprinting
- From RTI
  - RiverWare model building philosophy
  - NWS model calibration and setup
  - FEWS configurations and versions
  - FEWS data and server requirements
  - Model and FEWS troubleshooting

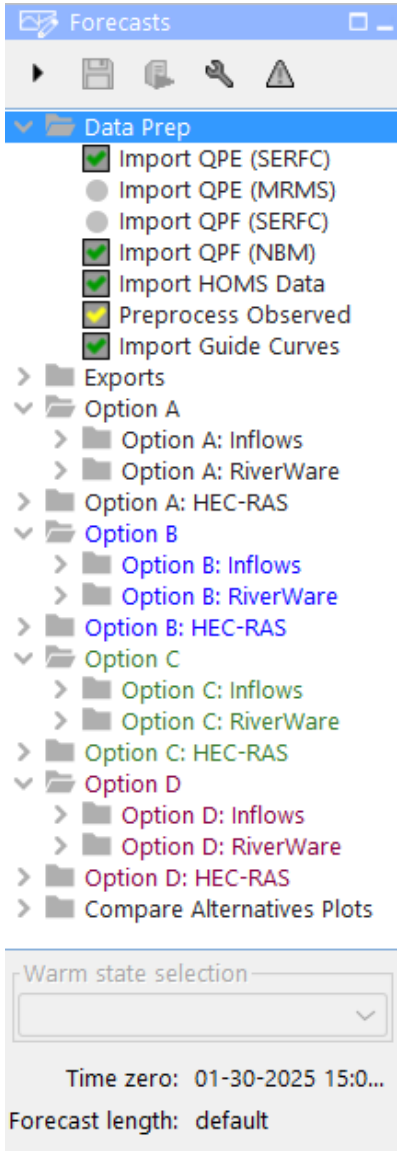




Resetting the Vision

- Include tight standards
  - Close to Rule Curve
  - Changing daily targets
- Real life scheduling
  - Unit flows/outages
  - Summer/Winter peaks
  - Spread generation
  - Reflect local uniqueness
- Flood Control Changes
  - Gate configuration/scheduling
  - Smooth transitions between normal and flood operations
- Balancing
  - Bridge the gap between normal and drought operations





Questions?