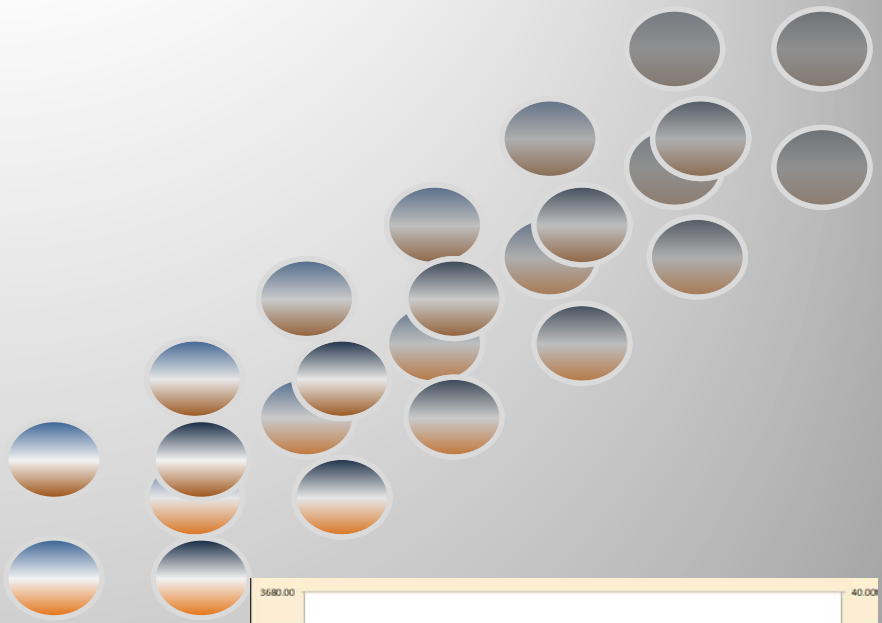
Using Batch Mode to Run RiverWare Models For the use of Logic Testing and Model Change Verification



2015 RiverWare User Group Meeting
February 3rd, 2015
Boulder, CO

Tony Powell
Precision Water Resources Engineering
www.precisionwre.com

Collaboration

Lahontan Area Office

Federal Water Master Office – Reno, NV

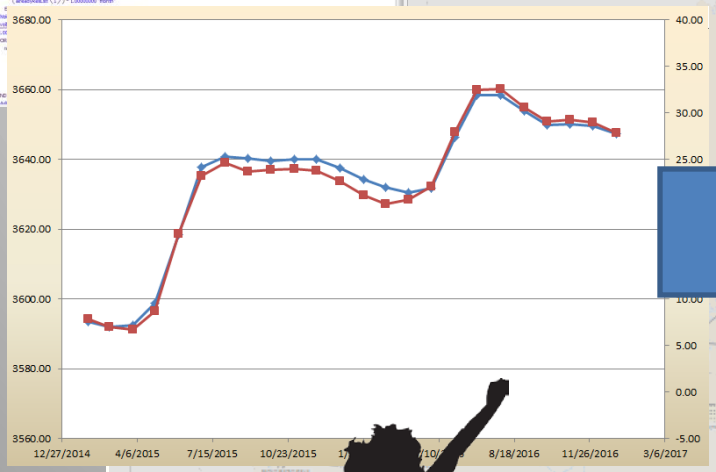
Overview

1. Introduction to Batch Mode
2. Reasons for Model Testing
3. Introduce the space in which models can be tested
4. Example of logic testing:
   - Colorado River Basin Mid-Term Probabilistic Operations Model
   - TROA Model – Start Storages and Hydrology
   - TROA Model – Backward Looking Accounting

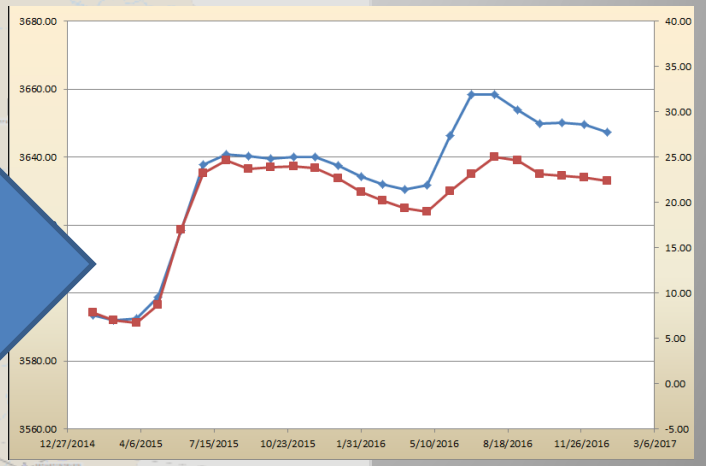
RiverWare in Batch Mode

- No open RiverWare Interface
- RiverWare model runs in “Background Mode”
- Use a RiverWare Command Language (RCL) script file to make runs instead of RW Interface
- RCL scripts are invoked through Command Prompt
- The use environment variables allow for easy distribution between shared networks and stakeholders

Reasons for Model Testing: changing conditions

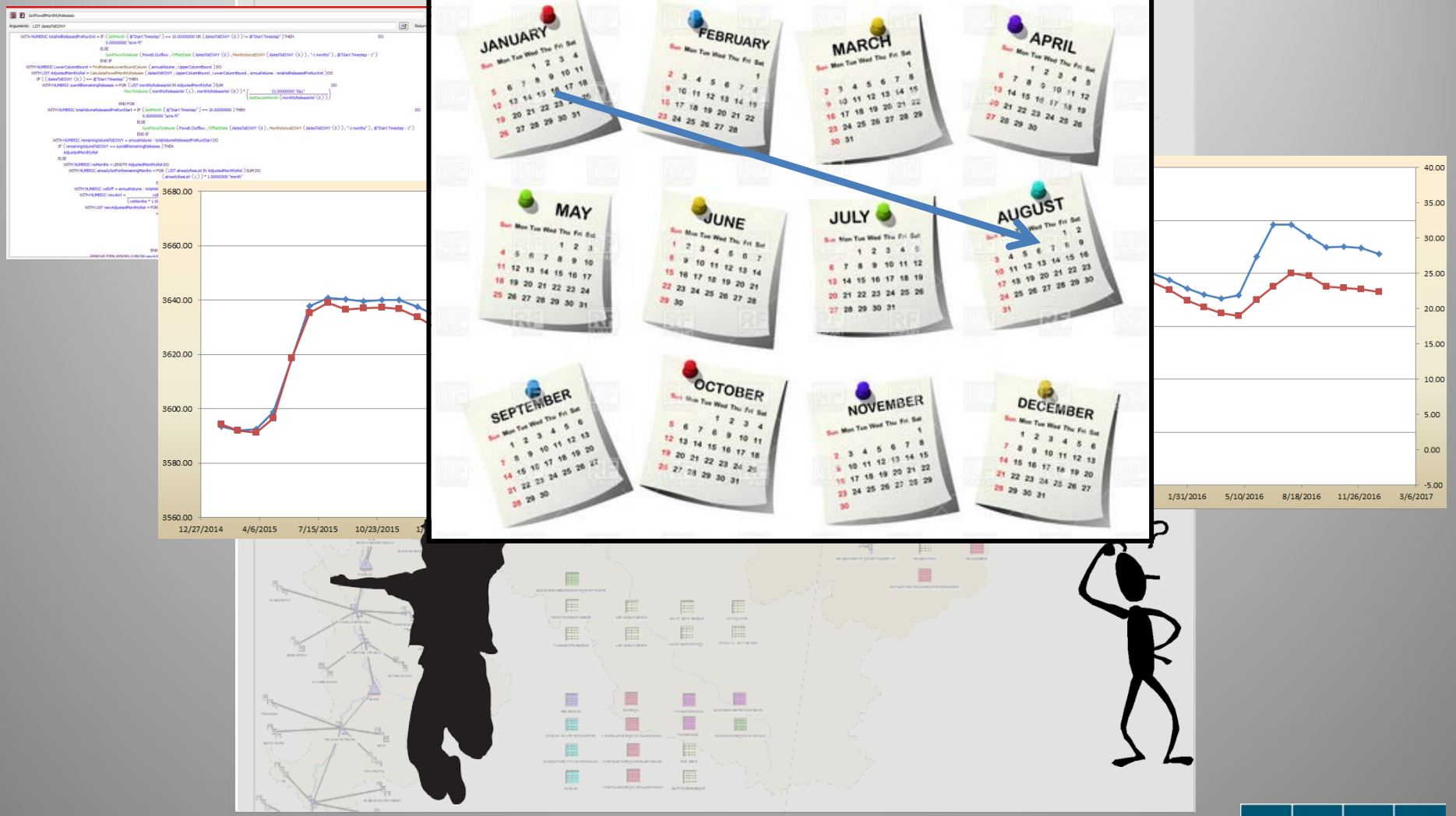


Change In condition

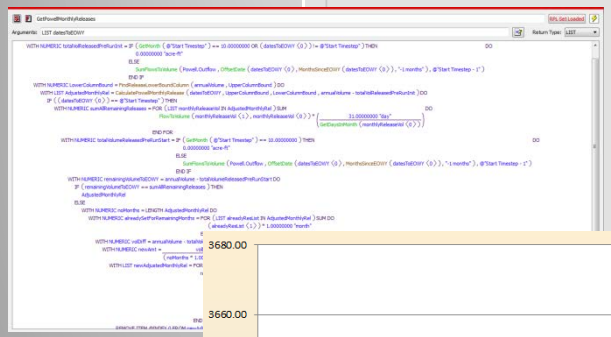


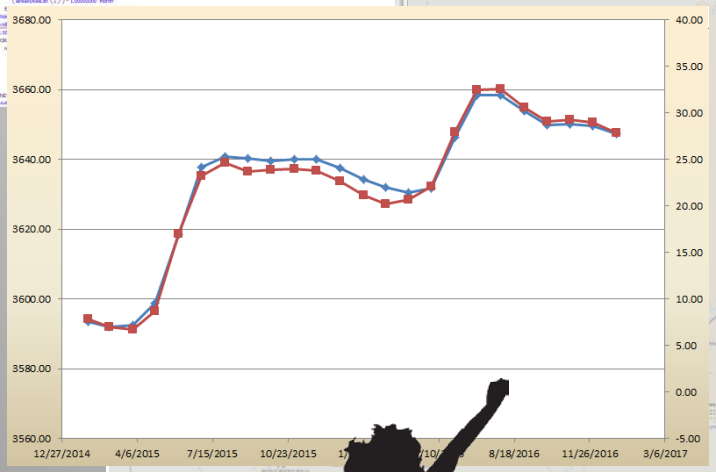
Awesome Logic-> Huhh?

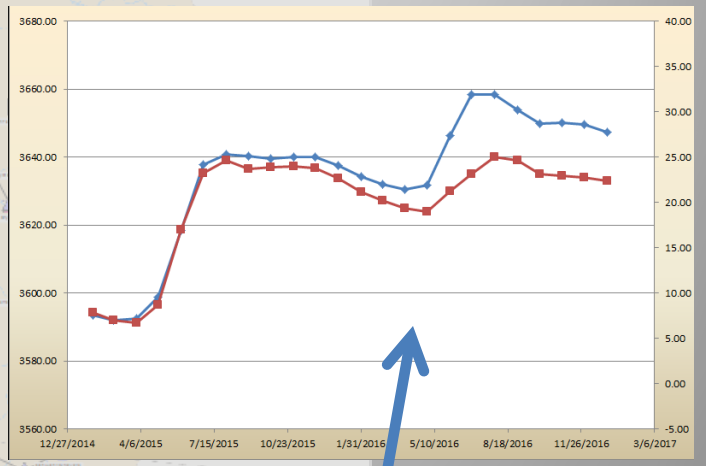
Reasons for Model Testing: using a model throughout the year

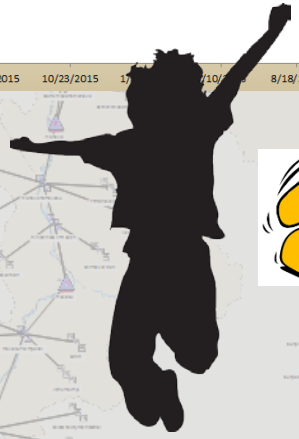


Reasons for Model Testing: Use By Stakeholders





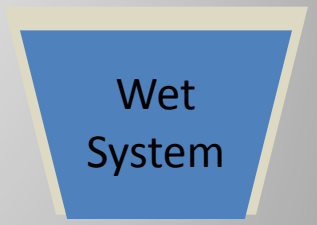


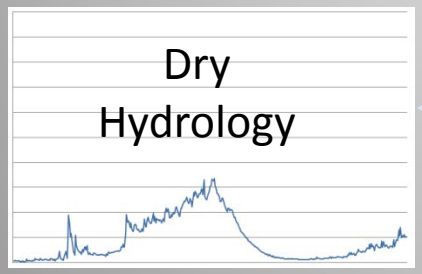


Stakeholder Testing

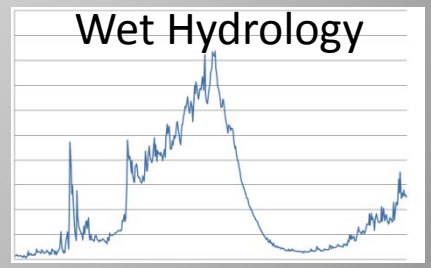
Test Logic Based on Varying Model Conditions

Initial Storages





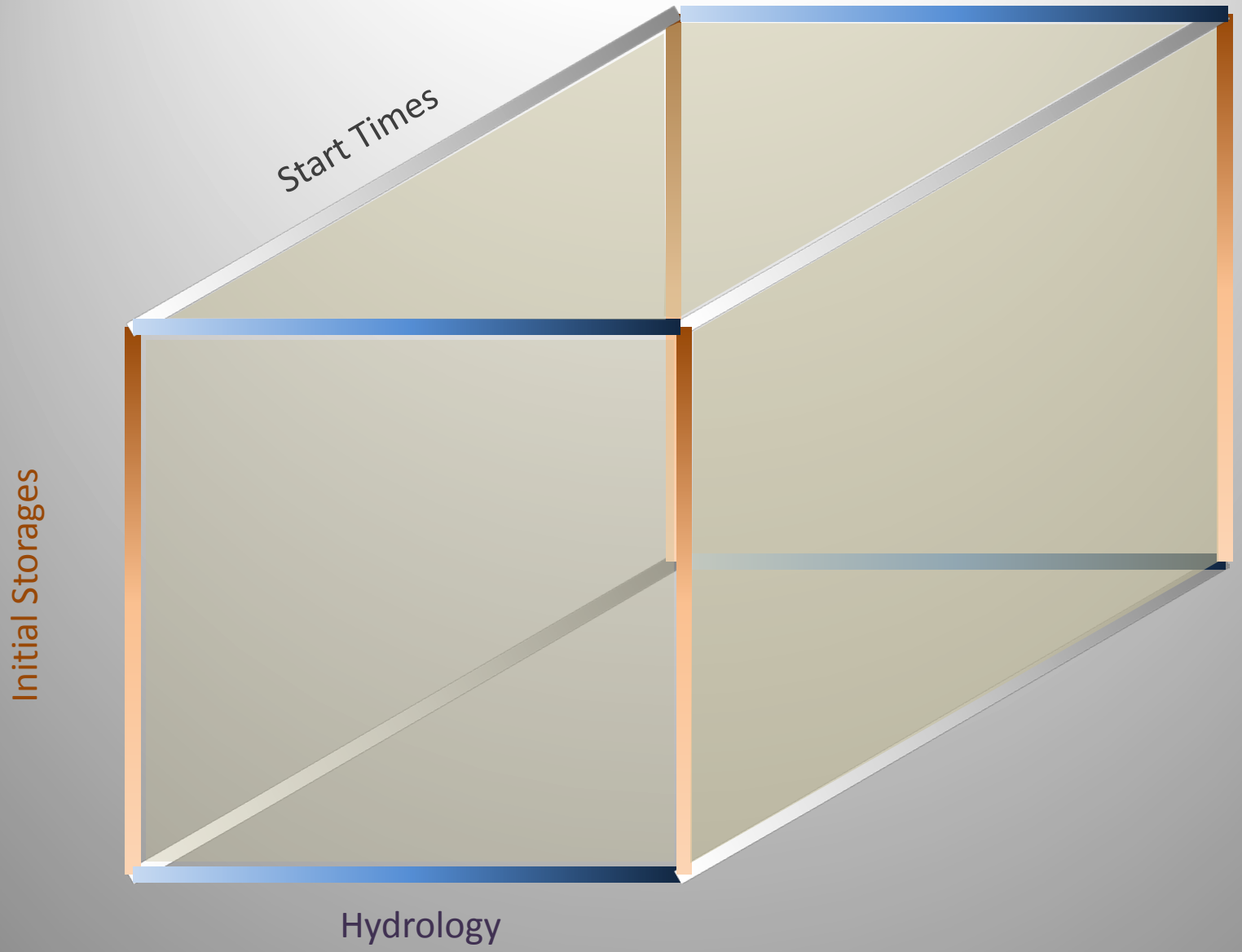
Hydrology

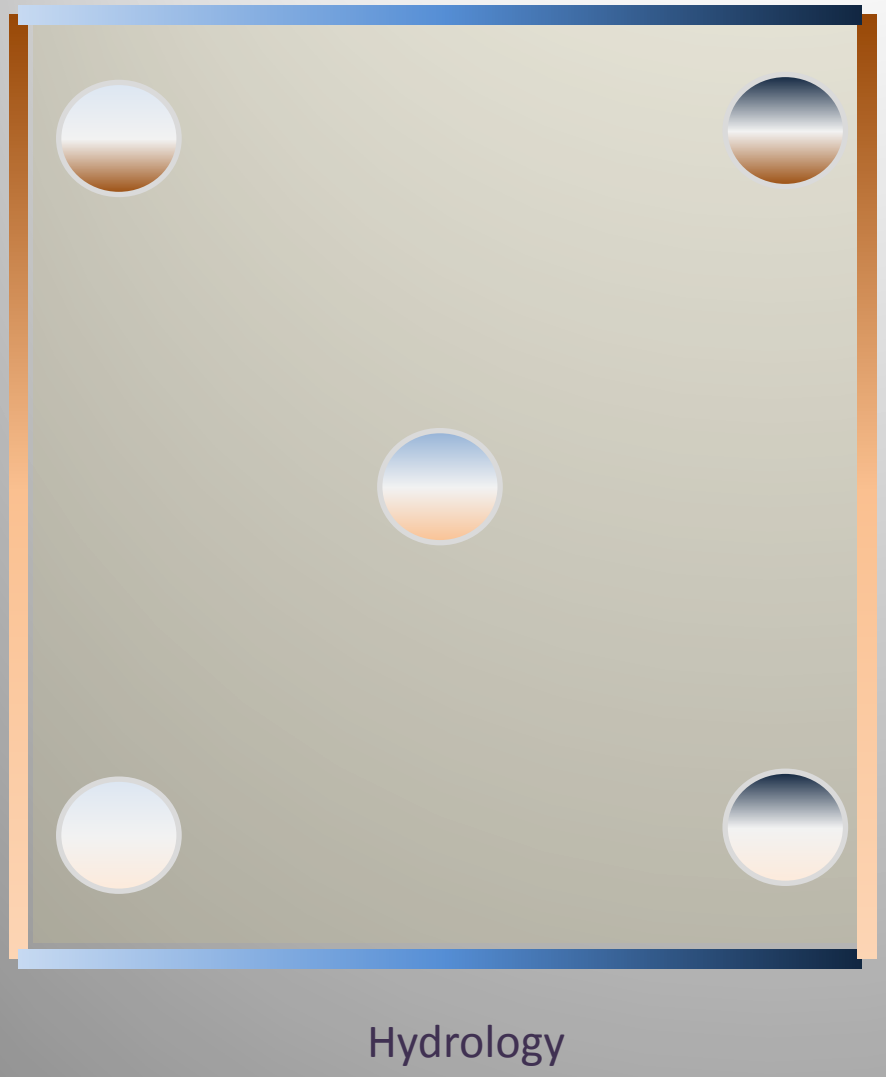


Different Start Times

Run Start: January, 2015
Run Duration: 60 Months

Run Start: August, 2015
Run Duration: 64 Months


Start Times
Initial Storages
Hydrology



Same Start Time for All Runs (5 Runs)

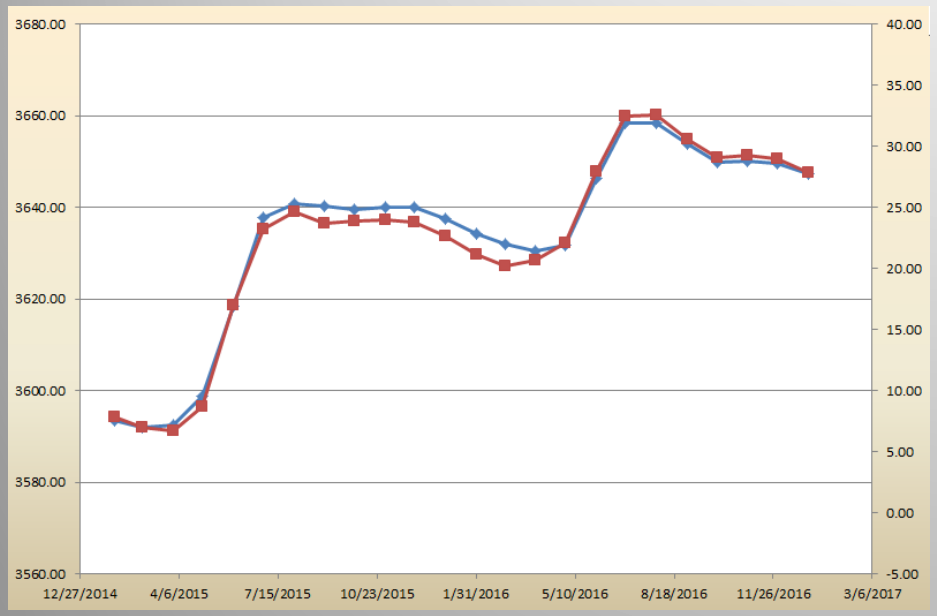
Dry Initial Storage with Dry Hydrology

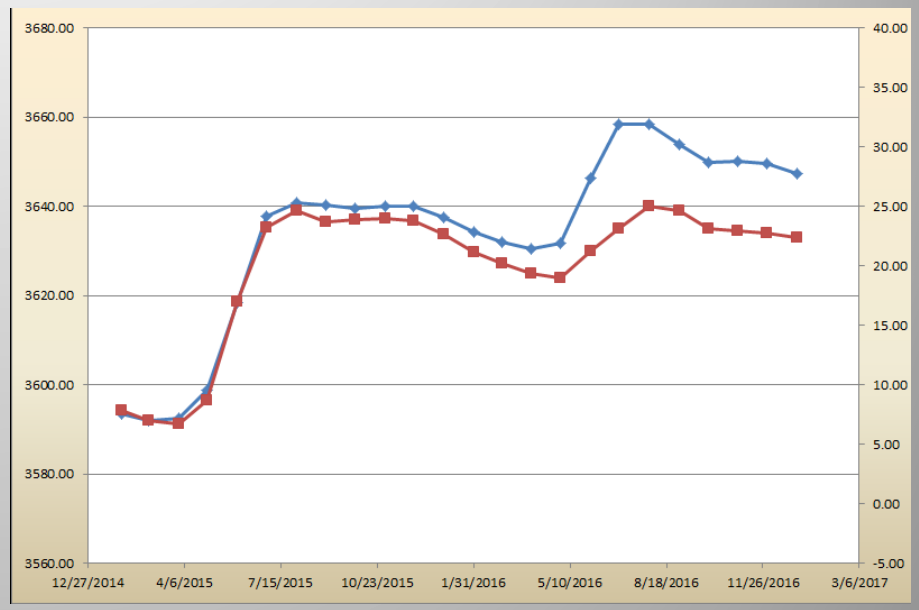
Dry Initial Storage with Wet Hydrology

Wet Initial Storage with Dry Hydrology

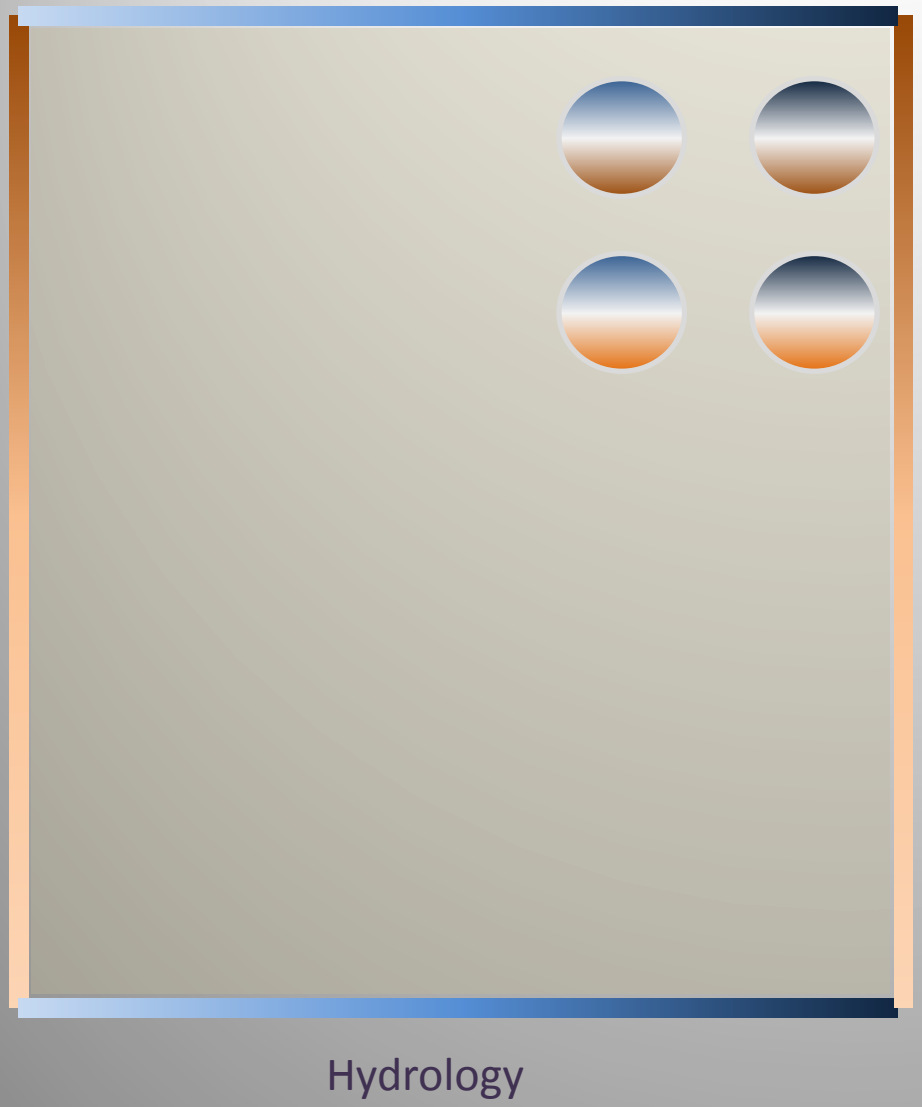
Wet Initial Storage with Wet Hydrology

Average Initial Storage with Average Hydrology



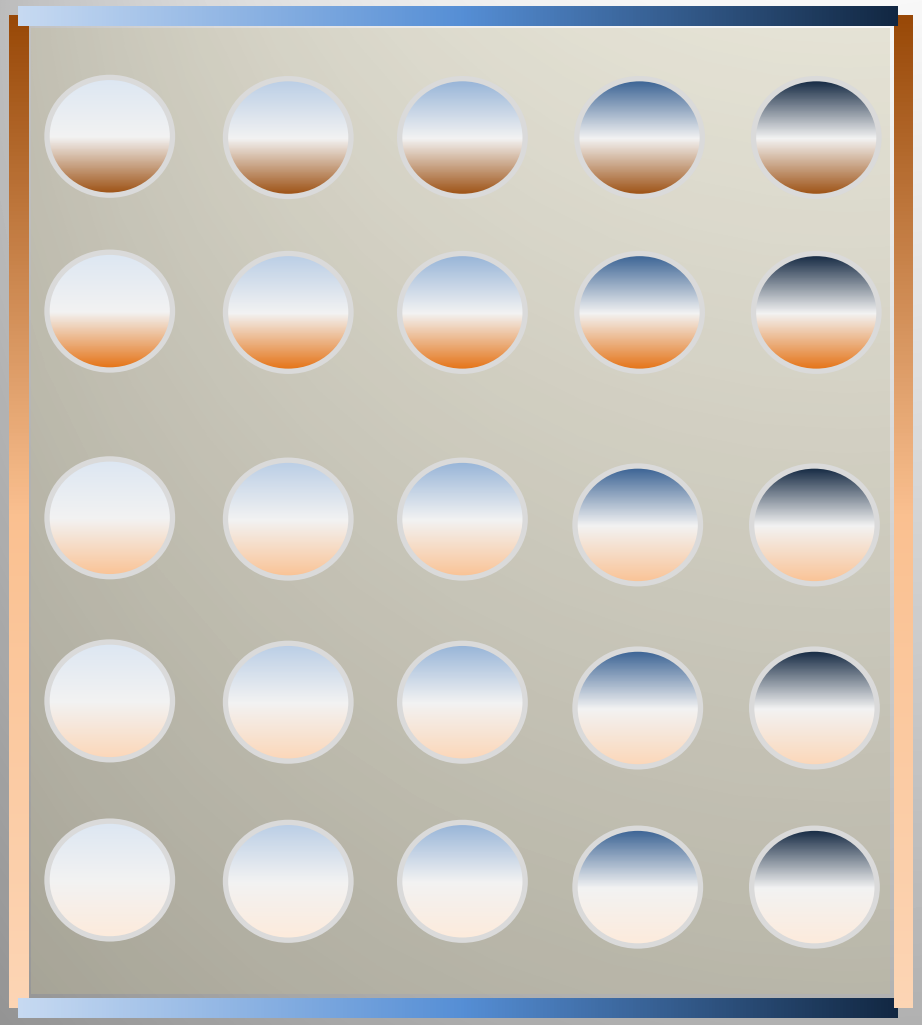


Change In condition

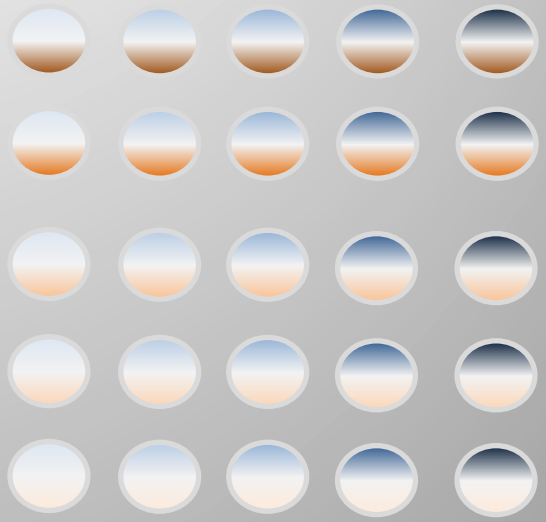


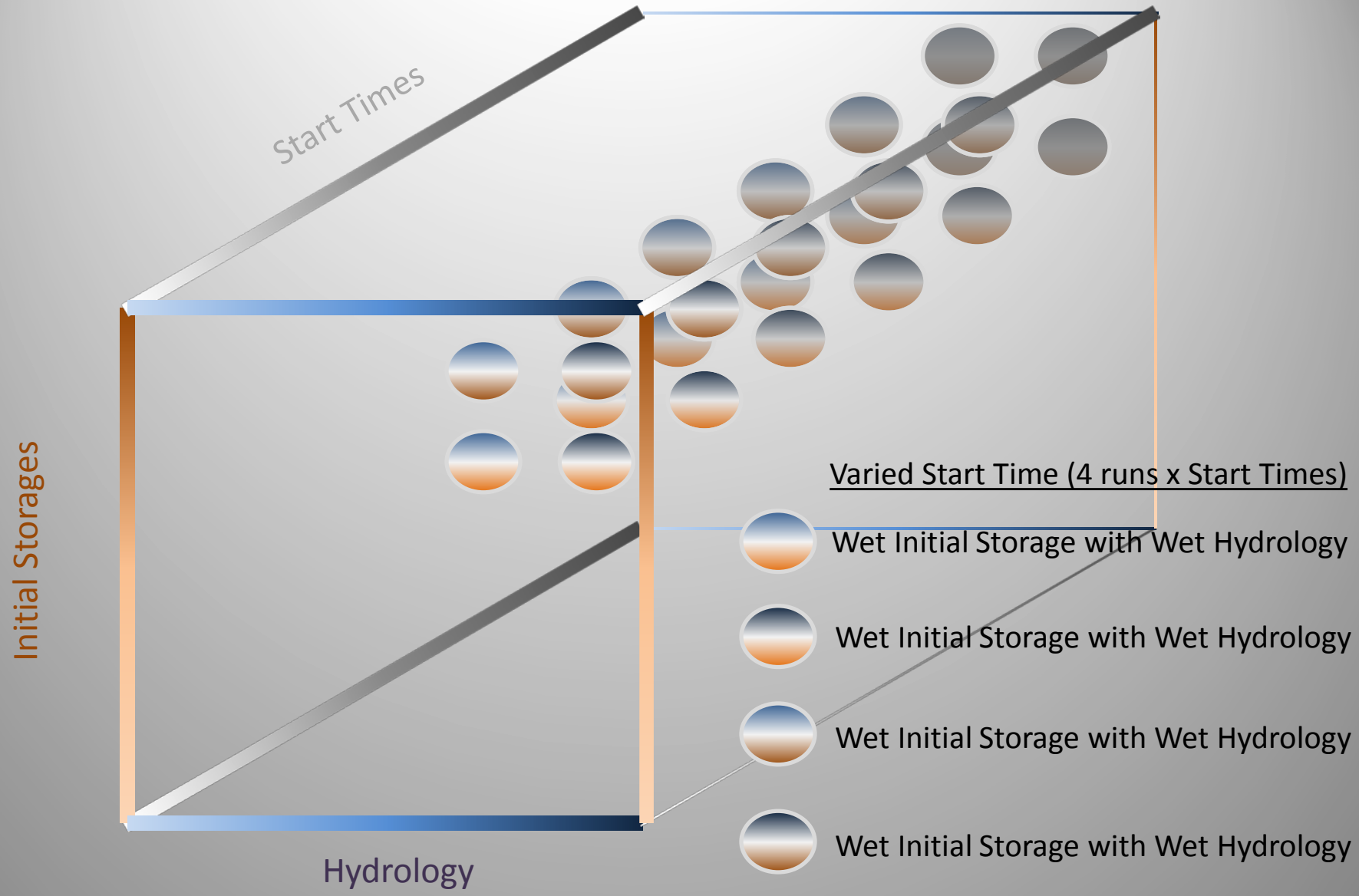
Runs in the Correct Space (4 Runs)

- Wet Initial Storage with Wet Hydrology
- Wet Initial Storage with Wet Hydrology
- Wet Initial Storage with Wet Hydrology
- Wet Initial Storage with Wet Hydrology



Complete coverage (25 Runs)




Start Times
Initial Storages
Hydrology
Varied Start Time (4 runs x Start Times)
Wet Initial Storage with Wet Hydrology
Wet Initial Storage with Wet Hydrology
Wet Initial Storage with Wet Hydrology
Wet Initial Storage with Wet Hydrology

Script Outline

Set Initialization states for model runs (1 to n)
Set Hydrologic condition states for model runs (1 to m)
Set Time Range model will run (1 to t)
Save the Script

For each initialization state (n)
For each hydrologic condition (m)
For each time range (t)

- Open the base Model (Current Official Model)
- Set Parameters (start time step, Ops Start Date, DMI Output parameters)
- Run Input DMI's (Change initial storage and change the hydrologic condition)
- Run the Model
- Run Output DMI's (Direct Connect Excel DMI's to preconfigured Spreadsheets)
- Save the Model with Run Specific File Name

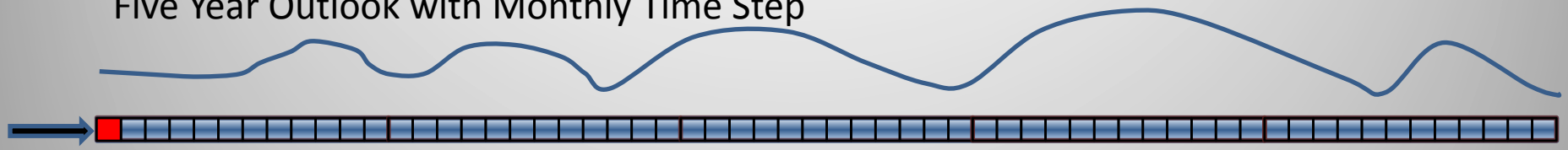
Next time range
Next hydrologic condition
Next initialization state

Within MTOM

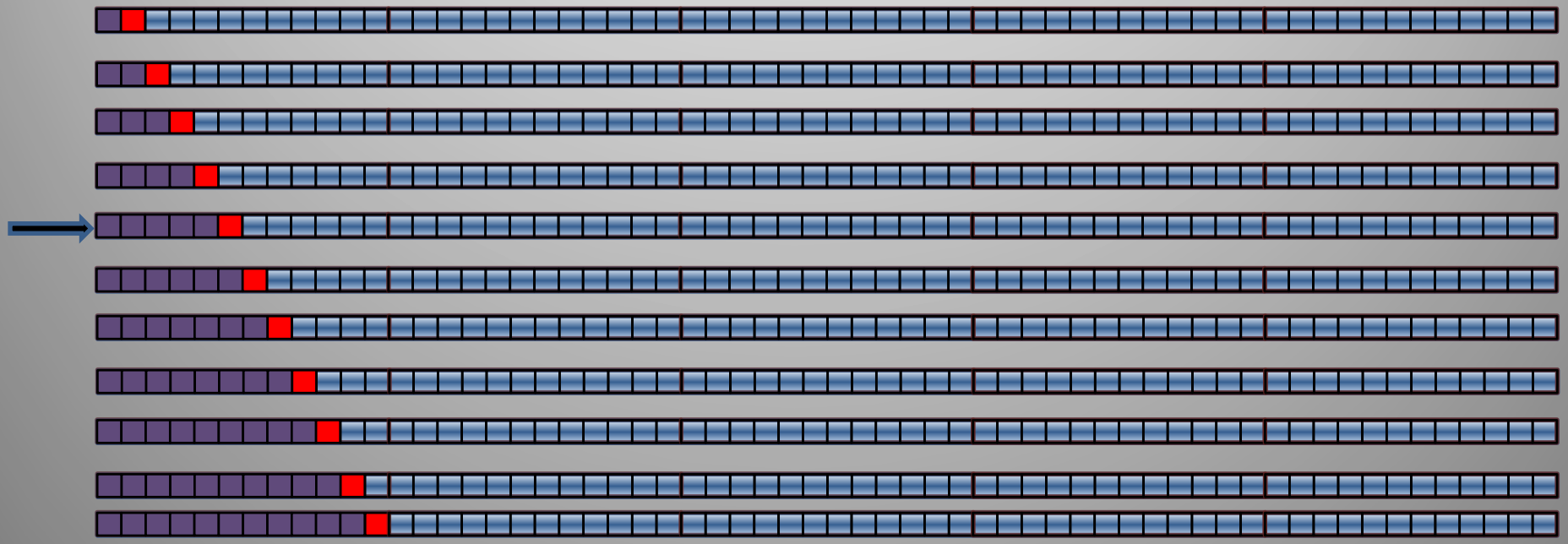
Script Settings for Batch Mode

Initialization states for model runs (1)
Set Hydrologic condition states for model runs (1)
Set Time Range model will run (1 to 12)

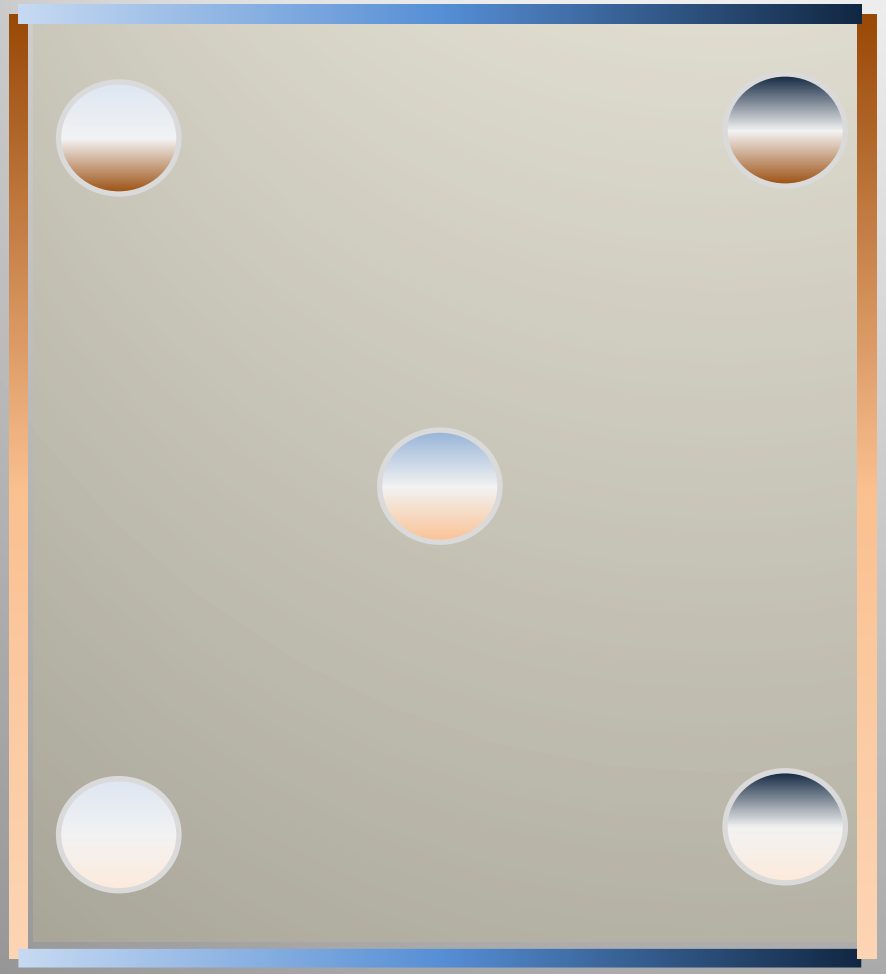
Five Year Outlook with Monthly Time Step



Change the start time step and run duration for each run (x 12 start time steps)



TROA – Across Initial Storages and Hydrology

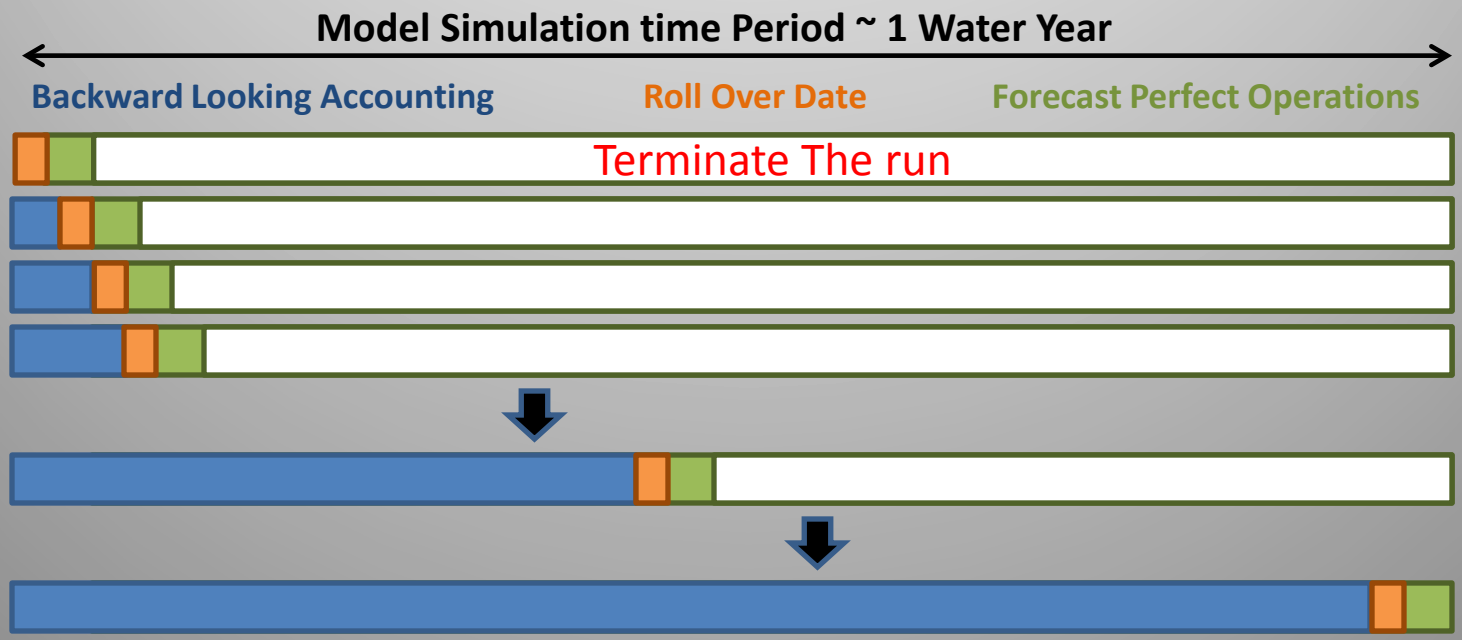


Script Settings for Batch Mode

Initialization states for model runs (1 to 2)
Set Hydrologic condition states (1 to 2)
Set Time Range model will run (1)

TROA – Backward Looking Accounting

- TROA is a new operating agreement but currently the system is operated on an old operating agreement, how do we test the backward looking accounting algorithm?
- Simulate the "Real World Process" for an entire year – perfect ops, export data, import data, run the model, repeat (x 365)
- When reconcile does not occur, is it a common occurrence and can be fixed, or rare enough that the logic should not handle it?



Summary of testing logic with Batch Mode

- Need an efficient way to test logic so that it is robust enough for all conditions and scenarios for which the logic can be used.
- Allows us to exit the “Fix the model now and revisit later” paradigm.
- Allows us to give models to stakeholders with confidence that they will have a harder time “breaking” the models.
- This process allows us to test over the conditions that we find logic needs to be tested on, but could easily be adapted to test against many others.

Next Steps

- rcl to internal Scripts.
- More test dimensions
- More studies
- TROA Implementation!

Questions?