# Powell Operational Rules Outline for Midterm Probabilistic Model

Revisions:

* Rev. 1, 23 July 2010 *Cameron Bracken*

## Data

### Data Object

PowellData

* Equalization Elevevation Table
* Tear Limits

### Other Data

TBD

### Required User Data Input

TBD

## Rules

In order of priority

### 1. Set Lower Elevation Balancing Release

*Execution Constraint*: Tier is Lower Balancing

*Description*: Ensure release is between 7 and 9.5 MAF.

See Question 5.

*Slots Set*: Powell.Outflow

### 2. Set Mid-Elevation Release

*Execution Constraint*: Tier is Mid Release

*Description*: If the Mead Jan1 projected elevation is greater than or equal to 1025 ft then release 7.48 MAF/yr, otherwise release 8.23 MAF/yr.

IF Mead.Elevation[Jan 1] >= 1025

Powell.Outflow = 7.48 MAF/yr

ELSE

Powell.Outflow = 8.23 MAF/yr

*Slots Set*: Powell.Outflow

### 3. Set Upper Balancing Release

*Execution Constraint*: Tier is Upper Balancing

*Description*: If the Mead Jan1 elevation is less than 1075 ft. then release to equalize Mead and Powell storage by the end of the water year. Ensure that the release is between 7 and 9 MAF. If this release is greater than 8.23 then check that Oct, Nov, Dec volume is greater than 2 MAF.

the Mead Jan1 elevation is greater than or equal to 1075 ft then release 8.23. In april readjustment is allowed, though this rule will not need to check because the Teir will have already been reset to equalization if necessary. If the Mead end of water year elevation projected on April 1 is less than or equal to 1075 ft. and the Powell end of water year projected elevation is greater than or equal to 3575 ft. then release to equalize Mead and Powell storage by the end of the water year. Ensure that the release is between 8.23 and 9 MAF.

See Question 1, 4, 6.

IF Mead.Elevation[Jan 1] >= 1075

Powell.Outflow = 8.23 MAF/yr

IF (Month is April or later) and (Mead.ProjectedElevation[Jan 1] >= 1075) and (Powell.ProjectedElevation[Jan 1] >= 3575)

EnsureReleaseLimits(EqualizationRelease(),8.23,9)

*Slots Set*: Powell.Outflow

### 4. Set Equalization Release

*Execution Constraint*: Tier is Equilization

*Description*: Release steady to meet the Equalization level at end of water year or such that Powell and Mead storage are equal by the end of the water year. Release above this amount if necessary to avoid spills. If this release causes Mead elevation to be less than 1105 ft then increase release until the first of the following is met:

1. Powell Storage equals Mead storage at the end of the water year
2. Mead elevation is 1105 ft. at the end of the water year
3. Powell Elevation at the end of the water year is 20 feet below the equalization level.

See Question 2.

Powell.Outflow = Min( Max/Min( ReleaseToMeetEqTarget(), EqualizationRelease()), MaxOutflowGivenInflow())

*Slots Set*: Powell.Outflow

### 5. Reset Upper Teir to Equalization

*Execution Constraint*: April and Currently in Upper Balancing Teir

*Description*: If the current teir is upper and the projected Powell elevation on April 1 is greater than equalization level then change to Equalization teir.

*Slots Set*: Powell.Outflow

### 6. Set Release Teir

*Execution Constraint*: August

*Description*: Sets the Powell Release Teir for the next water year. First determine the Jan1 elevation then look up teir from .

Jan1Elevation = SumFlowsToVolume(August to December Inflow) - Aug and Sep outflow from current tier – Fixed Oct to Dec Release.

**Table 1**: Powell Release Teirs

|  |  |
| --- | --- |
| **Projected Powell Jan1 Elevation** | **Teir** |
| >= Eq. Level for WY | Equilzation |
| < Eq. Level and >= 3575 ft. | Upper Elevation Balancing |
| < 3575 ft. and >= 3525 | Mid-Elevation Balancing |
| < 3525 ft. | Lower Elevation Balancing |

*Slots Set*: Powell.Outflow

## Functions

### EqualizationRelease()

Release to equalize powell and mead storage at the end of the WY

(Powell.Storage – Mead.Storage+LossesBetween-GainsBetween)/MonthsUntilEndWY

### EnsureReleaseLimits(Release, ul, ll)

Ensure that a numer is between ul and ll, if not set it to the respective limit.

### ProjectPowellElevation()

TBD

### ProjectMeadElevation()

TBD

### Questions

1. How to deal with “projected” Mead elevation/storage (calcualate or input)? If calculated, should mead and demands below be modeled explicitly from the beginning (i.e. start with the expanded 24 month study)?
2. In Equalization, if both targets allow for > 8.23, is releaseing more or less preferred?
3. Confirm OND release, Does an 8.23 year mean steady releases every month?
4. Discuss/Explain OND release especially Upper Elevataion Balancing Equalization > 8.23?
5. How is total release for WY projected in Lower Balacing Tier?
6. How to deal with projected Powell elevation/storage? Discuss how this is done in CRSS currently.