Middle Fork Project

Operational Interests Overview

February 2010

Interests

Secure the benefits of the Middle Fork Project for the people of Placer County and the State of California

Interests

- Water – Preserve and maintain a reliable water supply for the health, security and economic benefit of Placer County.
- Power – Manage the power and energy benefits of this renewable resource in a reliable manner.
  - Maximize the value of the available hydroelectric power and energy output.
  - Contribute to statewide need for reliable, renewable energy sources.

Interests

- Environment – Be a responsible long-term steward of the watershed resources in partnership with the resource agencies and stakeholders.
  - Balance the values of the community.
  - Protect and enhance the environment within the project watershed.

Interests

- Recreation – Respond to the diverse recreation needs of the public by utilizing the project's inherent capabilities and attributes, recognizing the need for public safety.

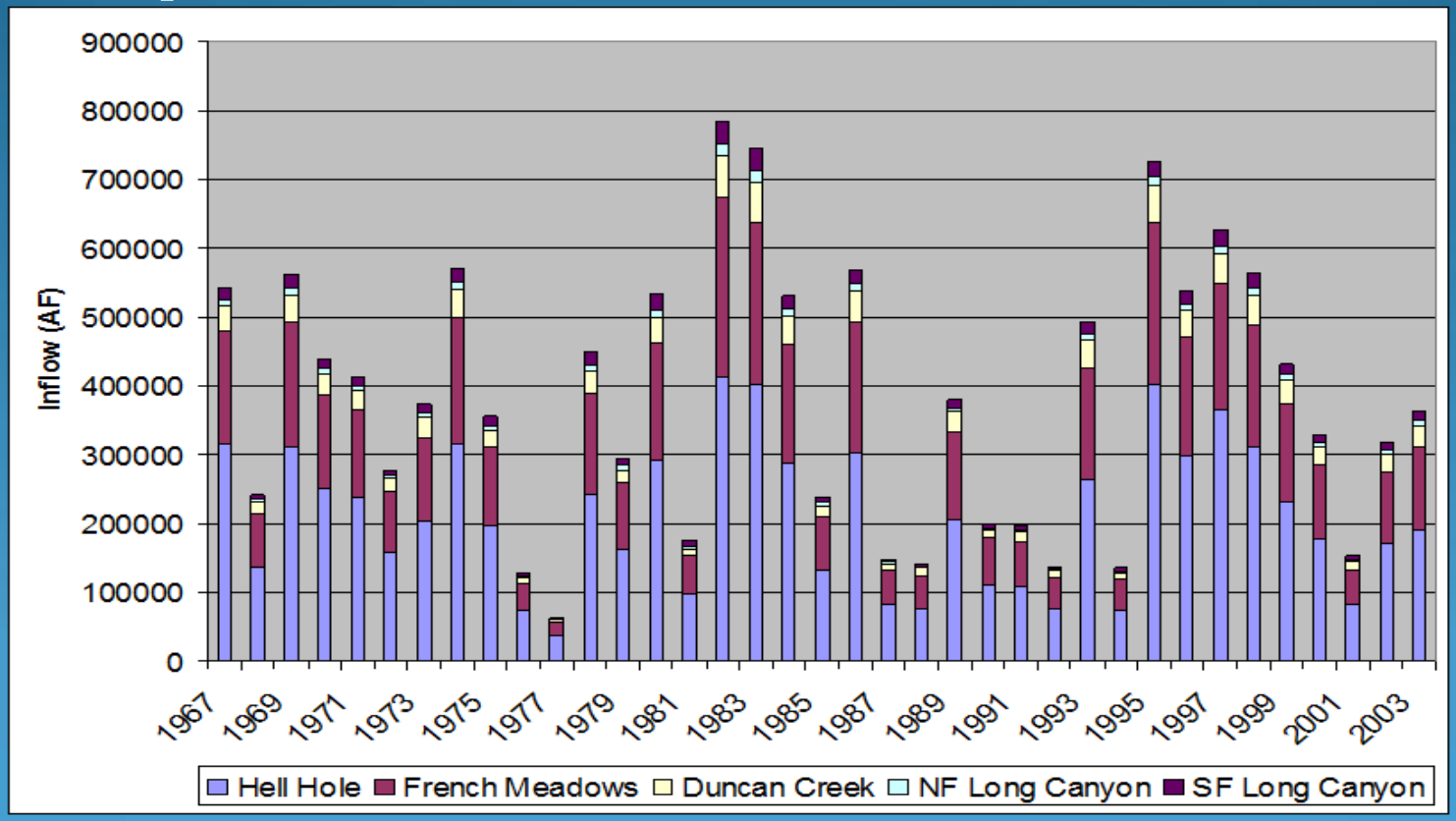
Key Operational Considerations

- Inflow Variability
- Meeting Consumptive Water Demands
- Seasonal Power Demand Variability
- Daily/Hourly Power Demand Variability
- Maintenance

Key Operational Considerations

Inflow Variability

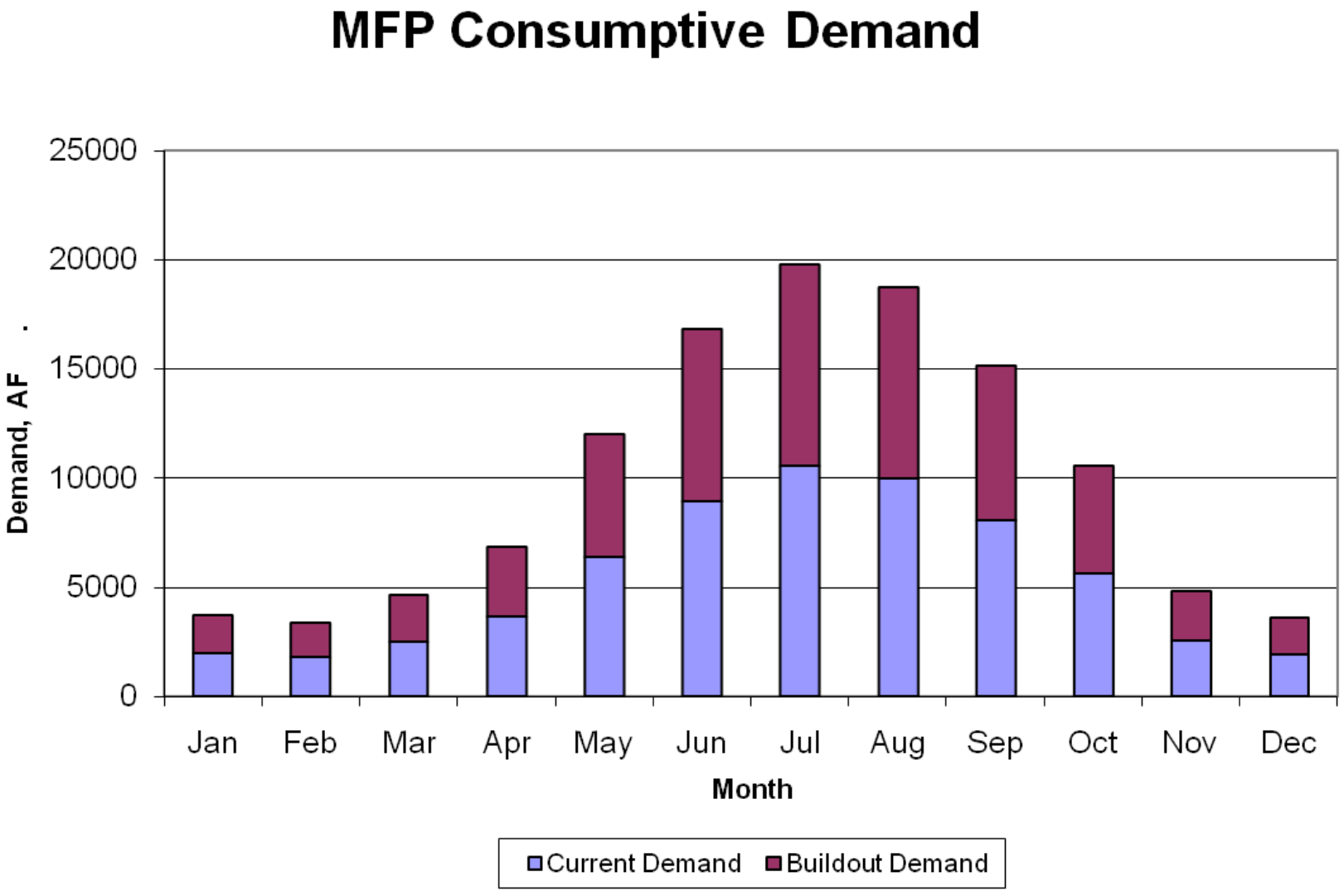
- Inflow is unpredictable
  - Variation year-to-year makes planning a challenge, plan for dry years until proven otherwise



MFP Inflow, 1967 - 2004

Key Operational Considerations

Consumptive Water Demands



Key Operational Considerations

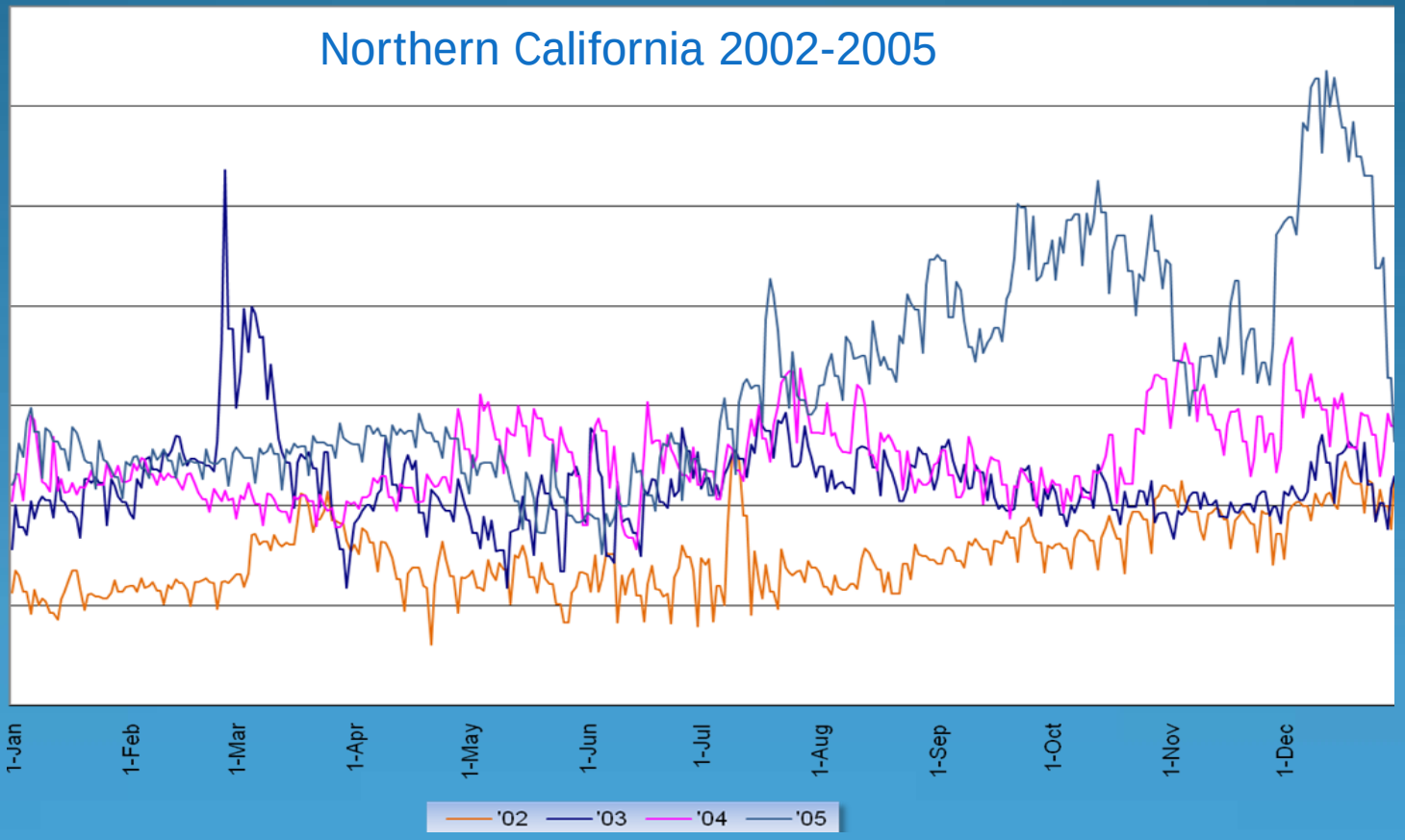
Consumptive Water Demands

- Deliveries to retail customers at Auburn Pump Station
- Deliveries to wholesale customers at Folsom Lake
  - Roseville
  - San Juan
  - Sacramento Suburban
- Additional Dry Year Water Forum releases
- Total:
  - Current demand (2008): 64 TAF
  - Build out demand: 120 TAF + 47 TAF Water Forum

Key Operational Considerations

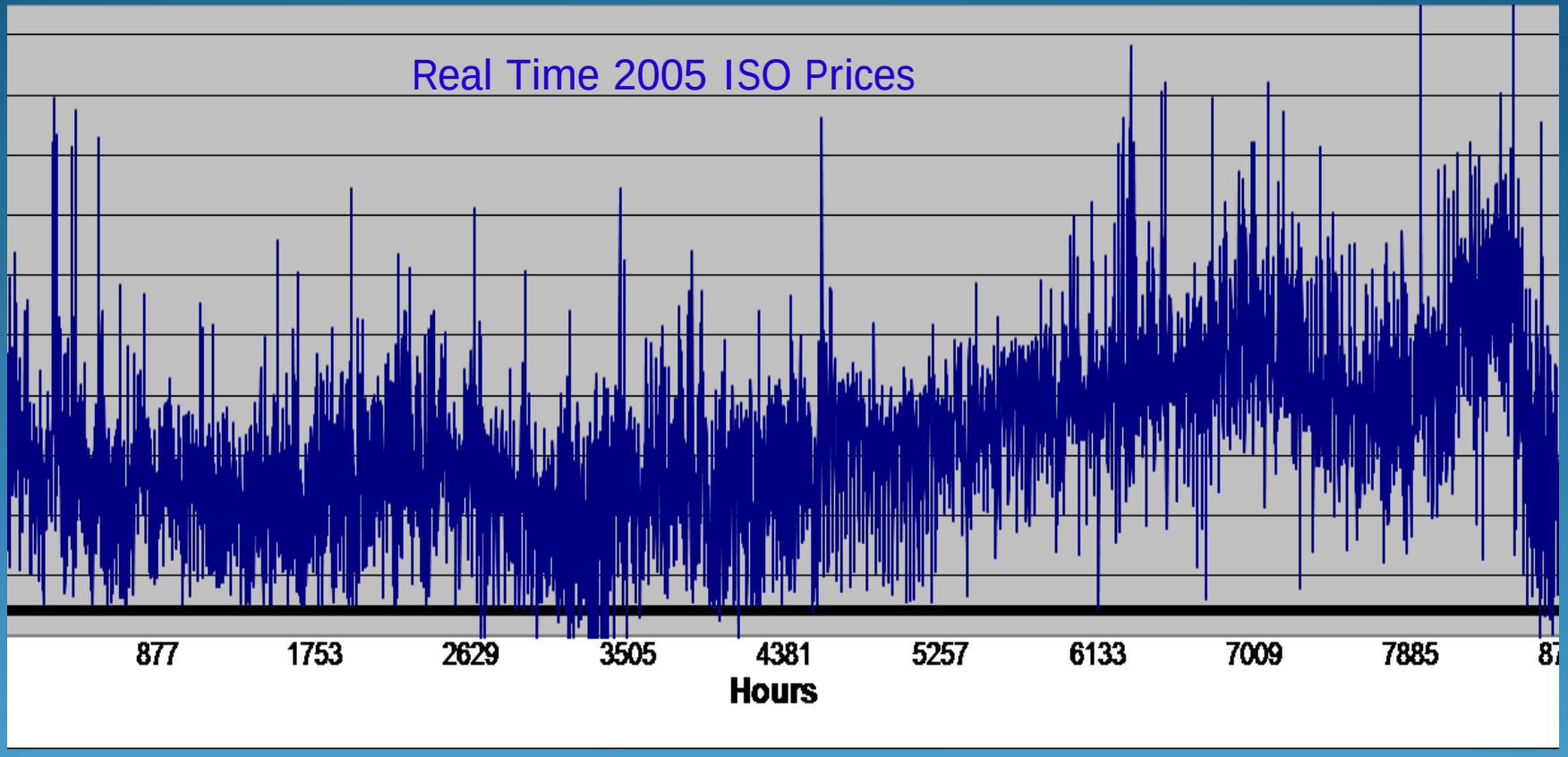
Seasonal Power Value Variability

- Seasonality of the energy market is only semi-predictable
  - Peak seasons vary, peak days vary



Key Operational Considerations

Daily/Hourly Power Value Variability



Key Operational Considerations

Daily/Hourly Power Value Variability

Target Peak Generation Hours

Hour of day	Weekdays Jul - Aug	Weekdays Jun, Sep	Weekdays Nov - Feb	Weekends Jun - Sep	Weekdays Mar - May & Oct	Weekends Oct - May
0	Off Peak	Off Peak	Off Peak	Off Peak	Off Peak	Off Peak
1	Super Off Peak	Super Off Peak	Super Off Peak	Super Off Peak	Super Off Peak	Super Off Peak
2						
3						
4						
5	Off Peak	Off Peak	Off Peak	Off Peak	Off Peak	Off Peak
6						
7						
8	Low Partial Peak	Low Partial Peak	Low Partial Peak	Low Partial Peak	Low Partial Peak	
9						
10	High Partial Peak	High Partial Peak				
11						
12	Peak	Peak	High Partial Peak	High Partial Peak		
13						
14	Crit Peak					
15						
16						
17						
18	Peak	High Partial Peak				
19						
20	High Partial Peak	Low Partial Peak		Low Partial Peak		
21			Low Part Pk			
22	Off Peak	Off Peak	Off Peak	Off Peak	Off Peak	
23						

Hours in 2006	
Critical Peak	176
Peak	434
High Partial Peak	1393
Low Partial Peak	2127
Off Peak	3170
Super Off Peak	1460
Total	8760

Key Operational Considerations

Maintenance

- Routine Maintenance Periods Mandatory
- Operation of Complex Machinery, Remote, Inaccessible & Occasionally Hazardous Locations

Interests Transition into Operations

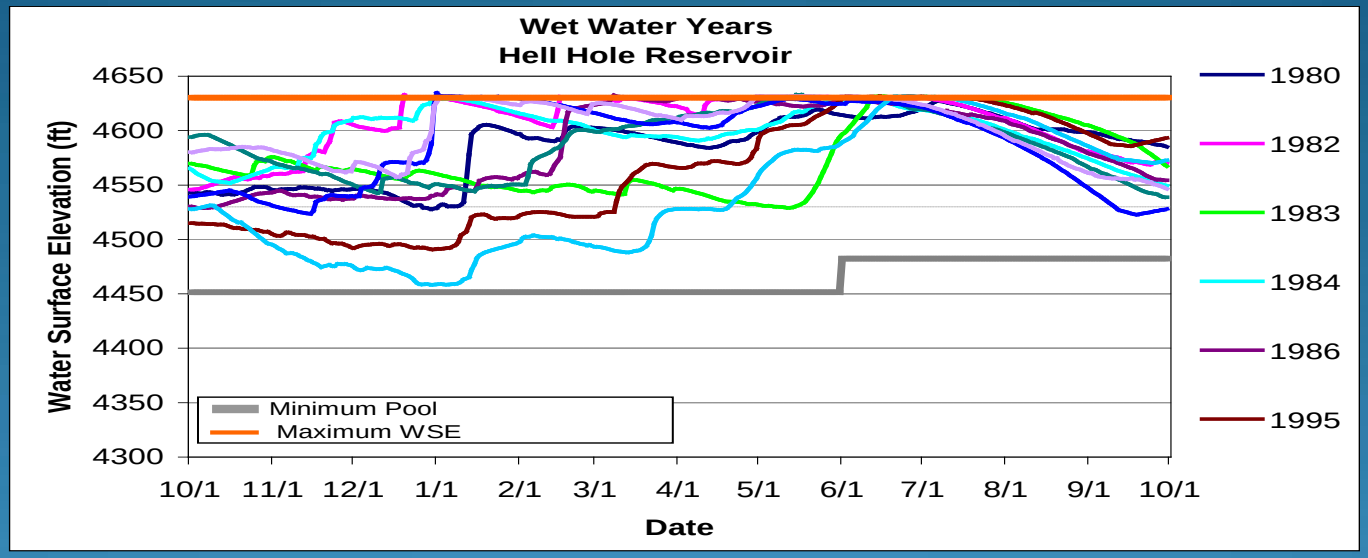
- Operational Characteristics
  - Characteristics of a day/week/season of operations
- Operating Constraints
  - Physical, Regulatory, and other operating constraints
- Model Presentation
- Operational Interests

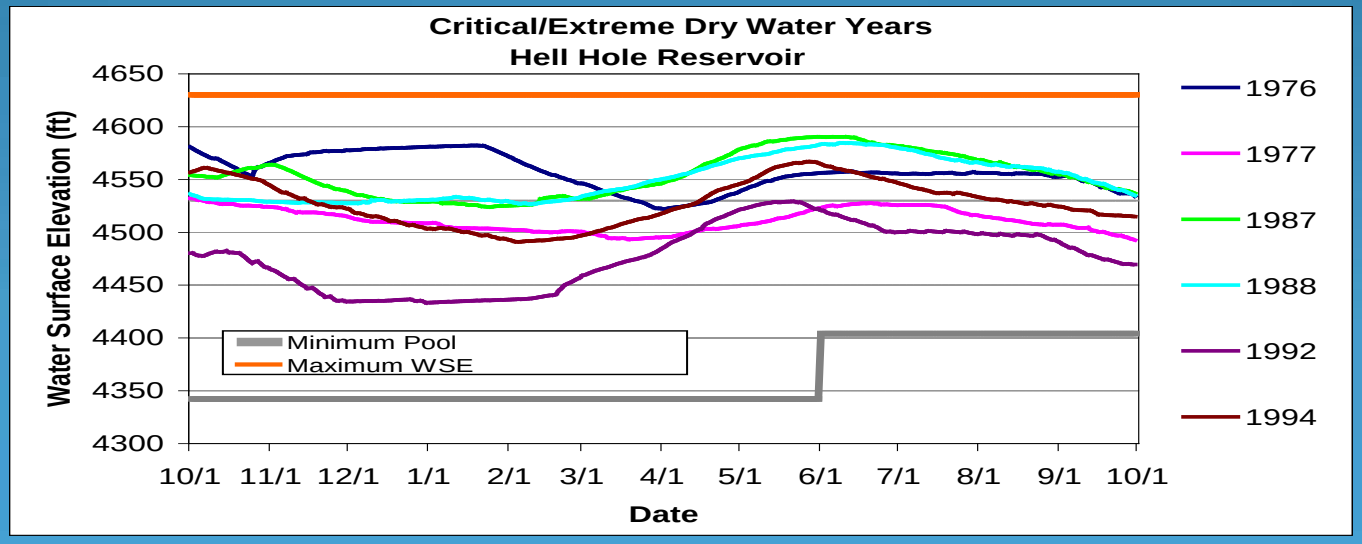
Operational Characteristics

- Reservoir Level Seasonal Variation
  - Fill Cycle (Dec – June) driven primarily by inflow hydrology
    - Reservoirs generally fill in Above Normal and Wet years
    - Reservoir do not fill in Dry and Critically Dry years
  - Drawdown cycle:
    - Driven by consumptive demands in Dry & Critically dry years
    - Driven by seasonal power demands in Below Normal to Wet years

Operational Characteristics

- Reservoir Levels Vary Year-to-Year and Seasonally



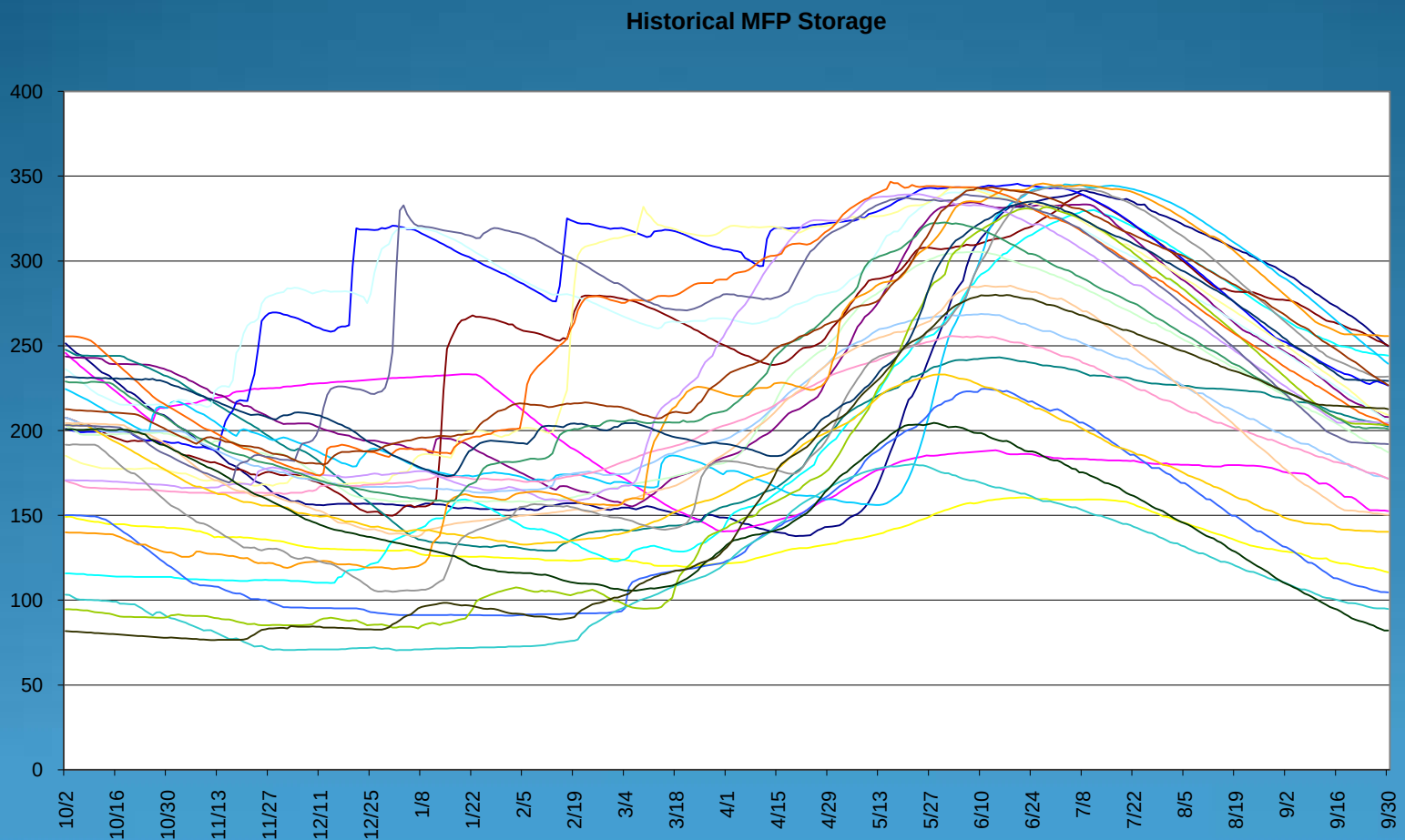


Operational Characteristics

- Reservoir Level Seasonal Variation (con't)
  - Low points (carryover storage) driven by water management considerations
    - Low enough to manage inflow
    - High enough to survive drought
    - Historic average (35 years) = 142 TAF combined
    - Historic variation 70 TAF to 165 + TAF

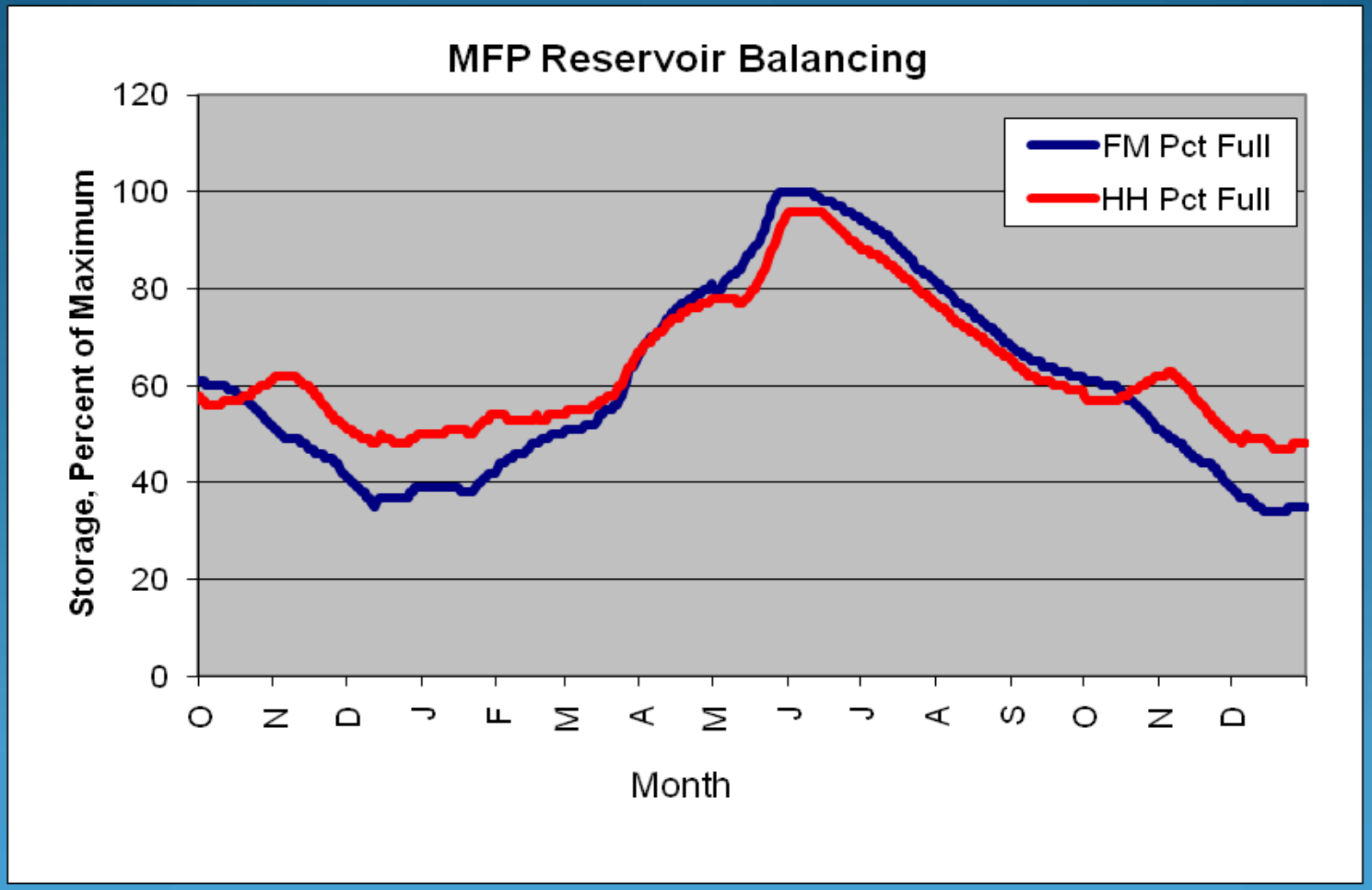
Operational Characteristics

Combined Reservoir Elevation History, 33 years



Operational Characteristics

- Reservoir Level Balancing – French Meadows & Hell Hole



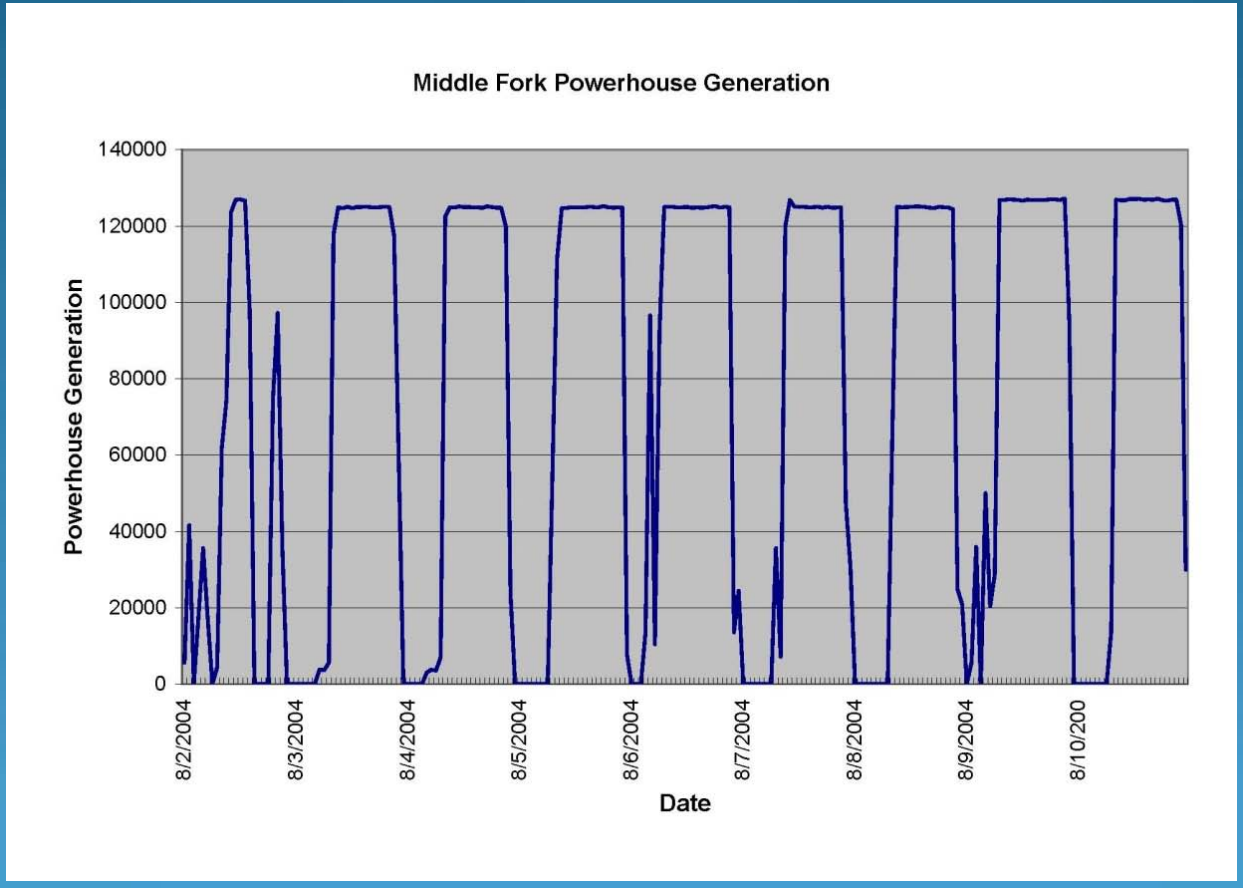
Operational Characteristics

- Flexibility to Undertake Peaking Operations with Large Generators
  - Operate MF & Ralston powerhouses together
  - Operate during valuable hours (peaking)
  - Weekly patterns:
    - Week days usually more valuable than weekends
  - Daily patterns:
    - Generate during hours with greater value

Operational Characteristics
Key Elements for Peaking Operations

- Available water in Hell Hole reservoir
- Middle Fork and Ralston units operate “as one”
  - Long tunnels and small Interbay mandate closely coordinated operations
- Afterbay fluctuates for re-regulation
  - MF & Ralston generate only during peak hours
  - Downstream requirements and minimum flows are 24 hrs/day
  - Afterbay fills during peaking generation operations, empties when generation off-line

Operational Characteristics
Peak Hours Generation Pattern



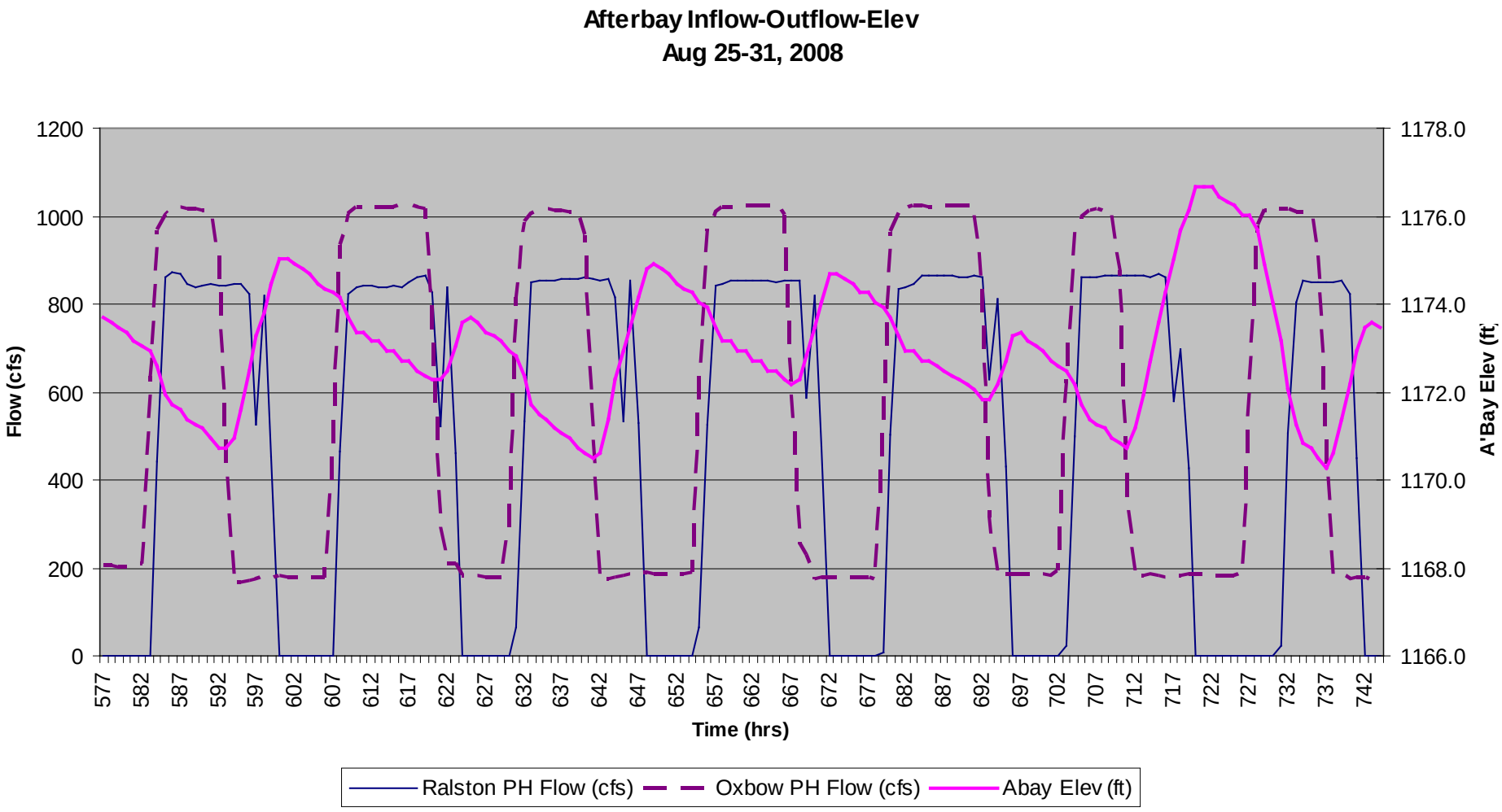
Operating Constraints

- Physical Capacities & Regulatory Requirements
- Total reservoir storage drawdown is limited to protect water supply reliability
- Middle Fork & Ralston Powerhouses must run in tandem due to very limited storage capacity at Interbay
- Afterbay Reservoir operations are constrained by Afterbay volume

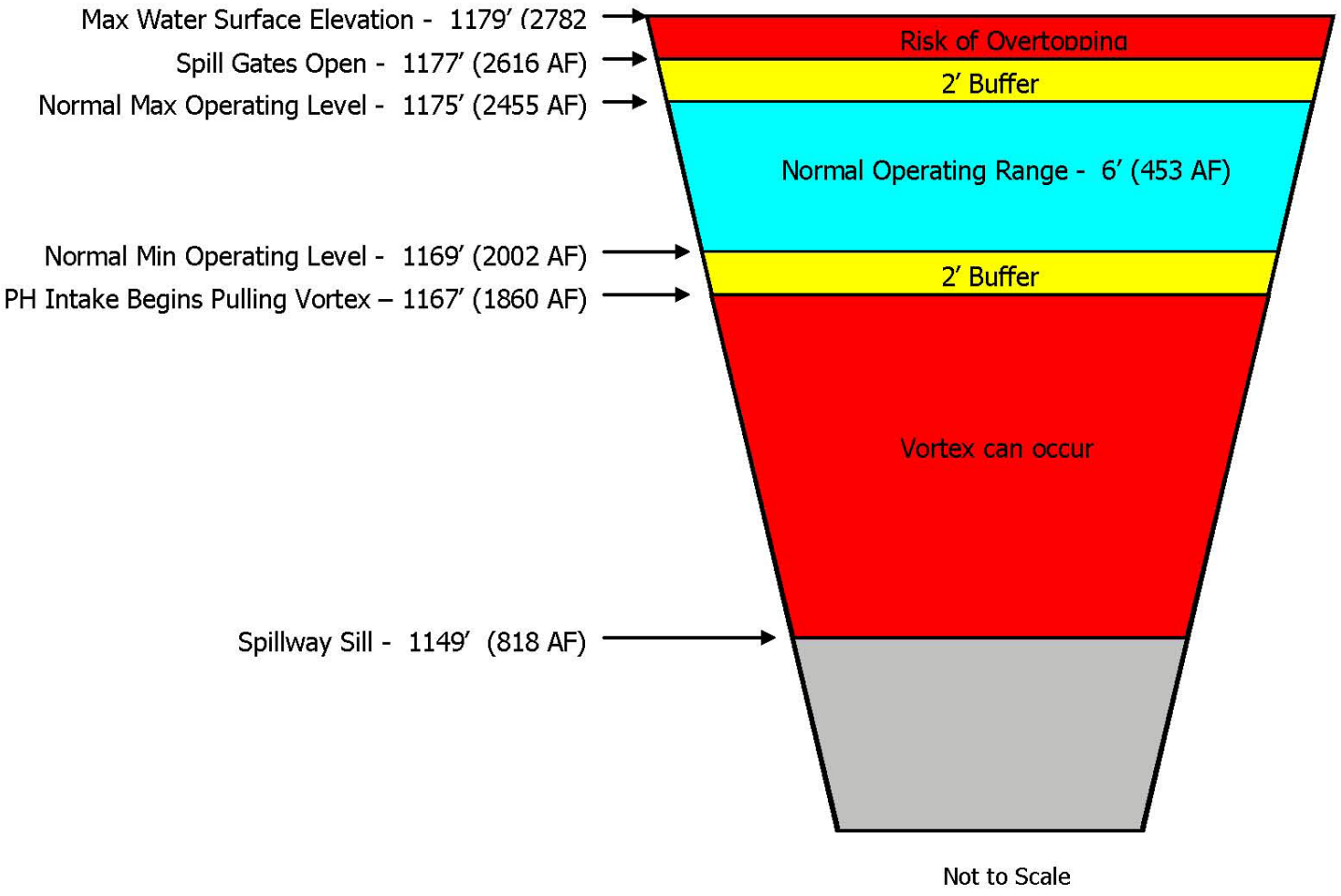
Operating Constraints

- Ralston Afterbay is a valuable operational asset
  - Used for re-regulation, allowing peaking operations with MF & Ralston to be separated from downstream flow requirements
  - Allows continued minimum releases below Afterbay in event of an outage of MF and Ralston

Operating Constraints



Operating Constraints



Model Presentation

Operational Interests

- Large Reservoir Storage Flexibility
  - To meet consumptive demands
  - To meet power requirements
- Middle Fork and Ralston Powerhouse Flexibility
  - Insulation from downstream minimum flow requirements

Operational Interests

- Large Reservoir Storage Flexibility
  - Operate reservoirs to efficiently capture runoff
  - Releases seasonally variable to meet water supply and power demands
    - Plan dispatch operations to focus on Summer (Jul, Aug, Sept) and Fall (Nov, Dec) operations once runoff is certain
    - Retain some flexibility to accommodate hot weather periods, other unforeseen events

Operational Interests

- Middle Fork and Ralston Powerhouse Flexibility
  - Operate MF & Ralston powerhouses together
  - Operate during peak demand hours
  - Weekly patterns:
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Operational Interests

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  - Afterbay fluctuates for re-regulation
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Operational Interests

- Re-Regulation at Afterbay
  - Flexibility to vary daily volume through MF & Ralston (into Afterbay)
    - Minimum instream flow requirements & consumptive demands set basic pattern
      - Current demands 280+ AF/day below Afterbay, Jun - Sept
      - Buildout demand 575 AF/day below Afterbay, Jun - Sept
    - Re-regulate through Afterbay to meet downstream requirements
    - Additional water at discretion of MFP operations

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