

Pump Storage at Grand Coulee Dam



Grand Coulee Dam

- Dam Built 1942
- 3rd PH added 1966
- Capacity 6,800 MW

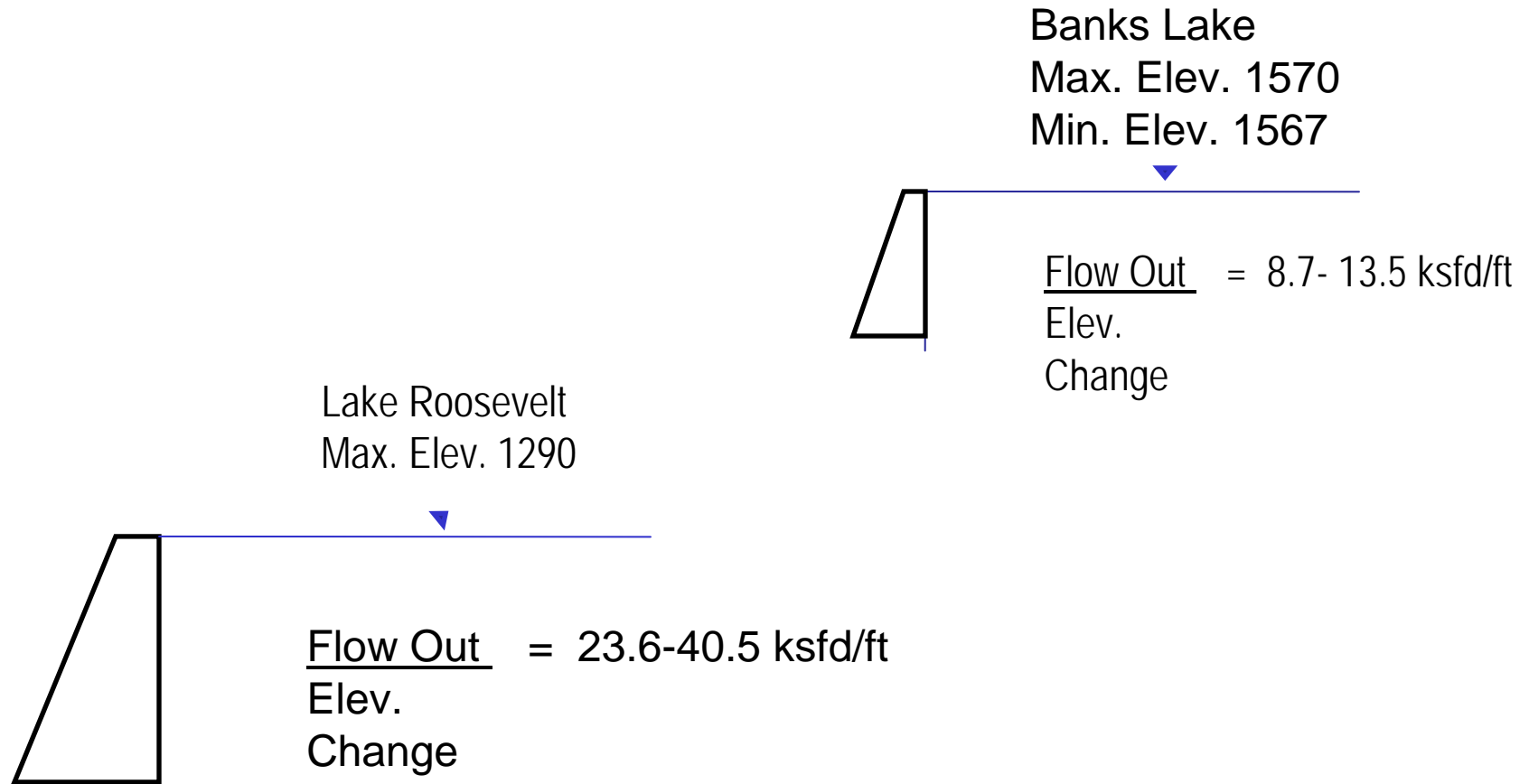


Grand Coulee Dam & Pump Complex

- Pumping Complex Complete '53 - PGs added '73-'84
- Capacity 600 MW Pumping -300 MW Generation



Grand Coulee Schematic



Assumptions

- 86% Average Pump Efficiency for both Pumps and PGs.
- 90% Average Generation Efficiency of PGs.
 - Result: You lose 24% of energy during Pump Storage Cycle.
- A \$300 cycle cost for the PG generator.
- A \$500 cycle cost on both pumps and PG pumps.
- The forebay at North dam in Banks Lake can vary between 1,570 and 1,567 elevation.
- There are 6 pumps and 6 pump/generators at the Coulee pumping plant.
- The Banks Lake feeder canal has a capacity of 26 kcfs.



Pump Storage During Irrigation Season

(March through October)

- During height of the irrigation season, Coulee pumps 8 hours per weekday and all weekend. (Occasionally Coulee will increase these pumping hours) This equals 88 hours/week pumping for irrigation.
- Coulee can operate a minimum 80 hours per week in the pump storage mode.
- The 12 pumps can pump approximately 19.6 kcfs, depending on head.
- Banks Lake Elevation will increase by approximately 1.5 feet if 19.6 kcfs is pumped for a 24-hour period and no withdrawals from Banks lake are made.
- The 12 pumps draw approximately 570 MW depending on head.
- The 6 PGs can produce over 300 MW in the generation mode.



Pump Storage During the Non-irrigation Season

(November through February)

- Coulee can operate in pump storage mode during more hours, depending on non-irrigation restrictions.
- The capacity numbers are slightly different than those used in the Irrigation Season analysis due to head differences and some pump inlet restrictions.
- Main restrictions are: 2 PGs will not pump when Lake Roosevelt is below elevation 1,263. The remaining 4 PGs will not pump below elevation 1,240.
- Currently used for operating flexibility and market opportunities.



Other Considerations

- Need to investigate re-engineering the phase reversal switches on the 6 PGs.
- Need to work with Reclamation to evaluate flexibility.
- Increased amount of pump/generation cycles will increase maintenance requirements and shorten the life on the pumps and PGs
- Need to evaluate start/stop cycling cost on both pumps and generators.
- Need to investigate the benefits and impacts at other hydro projects, especially Chief Joseph Dam.
- Much more detailed analysis is needed to develop an algorithm that considers price of power, water flow impacts, reserves and project efficiency gains.
- Analyze current uses and perform specific investigation into wind support.

