Colorado River Storage Project Management Center

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WAPA is part of DOE

- One of four PMAs under DOE
- Wholesale electricity supplier
- Around 700 customers
- Customers, in turn, serve 40 million Americans in the West
CRSP Management Center

- 11 power plants
  - 24 generating units
  - 1,816 MW total installed generation (73 percent from Glen Canyon)

- Annual generation would meet the electricity needs for 384,000 residential utility customers or the entire population of New Orleans

- 2,325 circuit miles of transmission lines (Arizona, Colorado, New Mexico, Utah, Wyoming)
CRSP Firm Electric Service Deliveries

- 130 Long-Term Firm Electric Service Customers
- Long-Term Customers located across 6 states
- 54 Native American Tribes
- 76 municipalities, rural cooperatives, irrigation districts
- About 5 million end-use consumers, mostly in rural areas.

Note: Red dots are municipalities; solid-colored blocks are rural electric cooperatives; cross-hatched areas are Tribes.
CRSP Management Center and the Upper Colorado River Basin Fund

The CRSP Management Center is responsible for the Basin Fund, which is a unique funding mechanism separate from normal appropriations processes.

- CRSP management bears responsibility for maintaining sufficient revenue and has fiduciary responsibilities for those revolving fund dollars.

- CRSP operates on cash revenues rather than appropriations or advance funding from its power customers. Congress gave specific permission and direction to operate the Basin Fund.
Historically funded by CRSP electric power revenues:

- Upper Colorado Recovery Program (including San Juan) – endangered fish species program - $9 million, annually
- Glen Canyon Dam Adaptive Management Program – environmental program in the Grand Canyon - $11.5 million, annually
- Quality of Water and Consumptive Use – $1 million, annually
- Salinity Control Program – reduce salt in Colorado River water - $2 million
- Experiments
Drought Issues

• The current drought has persisted for over 20 years.
• Affects and interacts with all decisions at CRSP
  • Fish Recovery
  • Funding for operation and maintenance for WAPA and Reclamation
  • Rate Increases
  • Operations and system reliability
  • Replacement power – likely coal and natural gas
State of the System (Water Years 1999-2022)\(^1,2\)

Unregulated Inflow into Lake Powell
Powell-Mead Storage and Percent Capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume in MAF</th>
<th>Powell and Mead Percent Capacity</th>
<th>Unregulated Inflow into Powell (MAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>45</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>40</td>
<td>88%</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>35</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>30</td>
<td>64%</td>
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</tr>
<tr>
<td>2003</td>
<td>25</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>20</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>15</td>
<td>52%</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>10</td>
<td>54%</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>54%</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>112%</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>78%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
<td>94%</td>
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<tr>
<td>2015</td>
<td>0</td>
<td>94%</td>
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<td>2016</td>
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<td>2017</td>
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<td>94%</td>
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<tr>
<td>2018</td>
<td>0</td>
<td>94%</td>
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<tr>
<td>2019</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>0</td>
<td>94%</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Values for Water Year 2022 are projected. Unregulated inflow is based on the latest CBRFC forecast dated September 16, 2022. Storage and percent capacity are based on the September 2022 24-Month Study.

\(^2\) Percentages on the light blue line represent percent of average unregulated inflow into Lake Powell for a given water year. The percent of average is based on the period of record from 1981-2010 for Water Years 1999-2021. Water Year 2022 percent of average is based on the period of record from 1981-2020.
Prior to the beginning of the drought in 1999, Lake Powell was last at elevation 3,539.81 feet in January 1989. In April 2022, Lake Powell was at its lowest elevation of 3,522.22 feet since it first began filling in the 1960s.
Water Year Snowpack and Precipitation\textsuperscript{1,2,3} as of October 11, 2022

\textbf{Colorado River Basin above Lake Powell}

\begin{itemize}
  \item Water Year 2022 Precipitation (observed) 101\%
  \item Water Year 2023 Precipitation (year-to-date) 91\% of average
  \item Current Snowpack NA\% of median
\end{itemize}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Colorado_River_Basin_Above_Lake_Powell}
\caption{Water Year Snowpack and Precipitation as of October 11, 2022.}
\end{figure}

\textbf{Colorado Basin River Forecast Center}

<table>
<thead>
<tr>
<th></th>
<th>maf</th>
<th>% of Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Powell Unregulated Inflow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April – July 2022 (observed)</td>
<td>3.75</td>
<td>59%</td>
</tr>
<tr>
<td>Water Year 2022 (preliminary observed)</td>
<td>6.08</td>
<td>63%</td>
</tr>
</tbody>
</table>

\textsuperscript{1Percent of normal precipitation is based on an arithmetic mean, or average; percent of normal snowpack is based on the median value for a given date.}
\textsuperscript{2Statistics are based on the 30-year period of record from 1991-2020.}
\textsuperscript{3Precipitation values may vary significantly from week-to-week this early in the water year.}
Lake Powell Unregulated Inflow
Water Year 2023 Forecast *(issued October 4)*
Comparison with History

**Water Year 2023 Forecast**
- Oct Min Prob: 4.80 maf (50%)
- Oct Most Prob: 8.10 maf (84%)
- Oct Max Prob: 15.50 maf (161%)

**Water Year 2022 Observed**
- April-July: 3.75 maf (59%)
- Water Year: 6.08 maf (63%)

Average: 9.60 maf (1991-2020)
Lake Powell End-of-Month Elevations\(^1\)

CRMMS Projections from August and September 2022

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**Pool Elevation (ft)**

- Equalization Tier (ET)
- Upper Elevation Balancing Tier (3,575' to ET)
- Mid-Elevation Release Tier (3,525' to 3,575')
- Lower Elevation Balancing Tier (<3,525')
- Minimum Power Pool (3,490')

**Storage (maf)**

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**Projections**

- September 2022 DROA Probable Minimum 24-Month Study
- August 2022 Probable Maximum 24-Month Study
- September 2022 Most Probable 24-Month Study

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\(^1\) Projected Lake Powell end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.
Comparison of Current (August 2022) and Last Published (May 2022) CRMMS-ESP 5-Year Projections
Chance of Lake Powell Falling Below Critical Reservoir Elevations in any Month of the Water Year (WY)

<table>
<thead>
<tr>
<th></th>
<th>Run</th>
<th>WY 2023</th>
<th>WY 2024</th>
<th>WY 2025</th>
<th>WY 2026</th>
<th>WY 2027(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Powell less than 3,525 feet</td>
<td>May 2022</td>
<td>90%</td>
<td>50%</td>
<td>37%</td>
<td>30%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>August 2022</td>
<td>100%</td>
<td>50%</td>
<td>37%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>Lake Powell less than 3,490 feet (minimum power pool)</td>
<td>May 2022</td>
<td>3%</td>
<td>23%</td>
<td>17%</td>
<td>23%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>August 2022</td>
<td>10%</td>
<td>30%</td>
<td>20%</td>
<td>17%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>7%</td>
<td>7%</td>
<td>3%</td>
<td>-6%</td>
<td>0%</td>
</tr>
<tr>
<td>Lake Powell less than 3,375 feet (dead pool = 3,370 feet)</td>
<td>May 2022</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>August 2022</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

All results are computed based on projected physical elevations for Lake Powell.

\(^1\) For modeling purposes, simulated years beyond 2026 assume a continuation of the 2007 Interim Guidelines, the 2019 Colorado River Basin Drought Contingency Plans, and Minute 323, including the Binational Water Scarcity Contingency Plan. Except for certain provisions related to ICS recovery and Upper Basin demand management, operations under these agreements are in effect through 2026. Reclamation anticipates beginning a process in early 2023 to develop operations for post-2026, and the modeling assumptions described here are subject to change for the analysis to be used in that process.
Generation and Benchmarks

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3700</td>
<td>100%</td>
</tr>
<tr>
<td>3600</td>
<td>82.6%</td>
</tr>
<tr>
<td>3530</td>
<td>70.4%</td>
</tr>
<tr>
<td>3500</td>
<td>65.2%</td>
</tr>
<tr>
<td>Below 3490</td>
<td>0%</td>
</tr>
</tbody>
</table>

GCD Efficiency

Total Annual SLIP Generation 1971-2022

- Total Annual Gen
- 1971-2000 Avg Gen
- 2009-Present SHP
- 1971-2000 Median Gen

MWh:
- 6,450,421
- 5,733,952
- 5,151,100
Projected 2023 Generation

$161.8M

Estimated replacement power costs
Impacts of loss of Generation at Glen Canyon Dam

- Replacement Power by CRSP Customers
- Potential overloads on several transmission lines in order to bring in replacement power to meet electrical demands
- Difficulty in providing regulation and reserve of the Balancing Authority
- Inability to provide emergency black start service
- Inability to provide emergency power to other utilities
- Deficiency of funds in the Colorado River Basin Fund
Questions?
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