Introduction to MC Hourly Coordination

Tim Culbertson

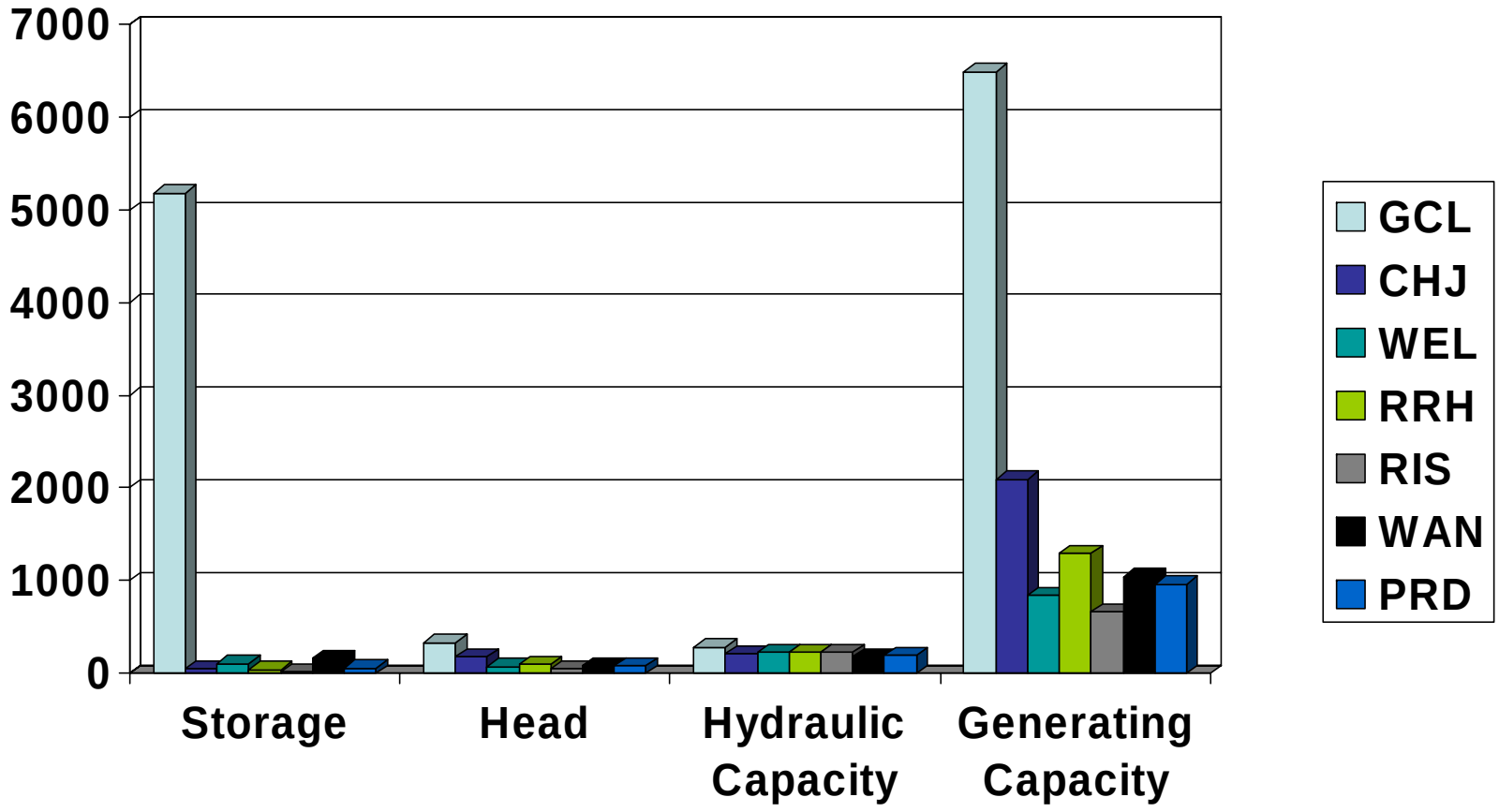
General Manager

May 2, 2008

Introduction of the MC System

- The MC system consists of 7 multi-purpose projects located on the Columbia River.
- The projects include: Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids.

The MC System Projects - All



The MC System - Roles

- The MC system projects are relied upon to provide the following services:
  - Support for Biological Activities
  - Recreation
  - Power Supply
    - Energy production
    - Load Following
    - Peak Shaving
    - Regulation
    - Contingency Reserves

Introduction to MC Parties

- The “major” MC parties are AVA, PSE, PGE, PCW, GCPD, CHPD, DOPD, and BPA.
- These major MC parties are all heavily dependent upon the MC system for more than just energy production.
- The majors rely heavily upon the MC for critical ancillary services for which no substitute is readily available

Introduction to MC Parties

- For CHPD, GCPD, DOPD, and PSE the MC projects are the only source of reserves, load following and regulation available.
- For BPA, PGE, and PCW the MC system provides the majority of their reserves, load following and regulation.
- These are services are not easily replaced elsewhere.

What is Hourly Coordination?

- The implementation of the 1997 Agreement .
- The Agreement establishes the desire of the parties to coordinate the project operations for mutual benefit.
- The Agreement preserves all party project rights & attempts to limit “harm”.
- Rights, Obligations, & Coordination are not explicitly defined. Explicit details were purposely left to the implementation efforts.
- This has both Pros & Cons

What is Hourly Coordination?

- The primary objective is to coordinate the hydraulic operation of the Projects. The intended result is to ***optimize*** the amount of energy from the available water consistent with the needs to both (i) adjust the total actual generation to match the total requested generation, and (ii) operate within all Parties' power and non-power requirements.
- The secondary objective is to provide flexibility and ease of scheduling generation for the Projects through centralized coordinated scheduling, and to provide flexibility in scheduling Project generation through the use of composite scheduling and accounting procedures.
- The tertiary objective is, to the extent such can be made consistent with the primary and secondary objectives, to minimize unnecessary Project generation changes, including unit starts and stops.

History of Hourly Coordination

- Result of GCL Third Powerhouse authorization in late 1960s.
- PUDs concerned with hydraulic mismatch between GCL & downstream projects.
- Political wrangling led to the infamous “commitment” – Feds committed to hydraulic coordination with PUDs in post 3rd powerhouse era.
- To this day, varying interpretations of the actual commitment exist. The historical record is not complete and this fuels contention over implementation.

History of Hourly Coordination

- Initial studies began in 1968.
- Several short term agreements in mid-1970s.
- Followed up by 10 year agreements 1977 & 1987.
- Currently, a 20 year agreement is in place.
- Implementation has evolved over time & is poised for a major revision again.

Dimensions of the Problems Faced with Hourly Coordination

- Technical / Engineering
- Economic
- Political

The Function of MC HCD

- The operating strategy of HCD is based upon the Power Equation.
- HCD attempts to coordinate requests for power from individual parties in such a way as to maximize the potential for power production.
- The potential for power production is greatly affected by the power and non-power constraints in force.

The Function of MC HCD

- It is important to remember that all HCD can do is attempt to better allocate whatever capability may be available – it does not increase capability.
- It also preserves all partys' rights (& obligations), so no party can rely on HCD to increase its own capabilities with any certainty.
- The benefits from HCD are systemic and come from the long run project head increase and waste energy reduction.

The Function of MC HCD

- Increase the head at all projects below GCL above the levels that would have occurred without HCD.
- Allow projects to operate at higher forebay elevations than otherwise would have been possible for a given level of risk of wasted energy.
- Lower the risk of overdraft of a project.

The Function of MC HCD

- So how can this be done?
- First, recall that power is linearly related to head. In order to maximize power (all else equal), increase head.
- HCD benefits by decreasing the head at GCL slightly to “prime” downstream forebays & boost downstream head.
- Due to volume differences, a net head gain is seen.

The Function of MC HCD

- The large pool raise results in a large gain in generating capability at the lower 6 projects while only reducing GCL's H/K by ~1%.
- HCD attempts to achieve these head gains via a quantity known as Bias.
- Bias is an amount of generation used to adjust a project's uncoordinated request to achieve a better overall hydraulic outcome for the system.

The Function of MC HCD

- The Bias can be used to achieve other desirable outcomes too.
- By adjusting the Bias at one or more projects, HCD is able to better manage overfilling or overdrafting situations (when compared to uncoordinated operations).
- Bias is a useful tool to create a better hydraulic operation but it has its limits.

The Function of MC HCD

- How can the Bias be limited?
  - First, in any interval, the sum of all project Bias values must equal zero.
  - Second, any project that is being Biased may already be fully utilized and not able to accept the Bias requested.
  - This is particularly true for GCL – often Bias level is limited due to the project being heavily constrained and the needs of the Federal system.

The Function of MC HCD

- Logistics of HCD
  - Parties request generation.
  - Central attempts to ***optimize*** generation requests, by project, while respecting all constraints.
  - Projects generate relative to their coordinated requests from Central (as closely as possible).
  - Central returns actual generation values to each party.

The Function of MC HCD

- Logistics of HCD
  - The strategy program runs every 4 seconds.
  - Bias adjustments are typically held constant for at least 20 minutes.
  - A human at Central is required to guide the operations at all times.

Operating Issues & Challenges

- Non-power constraints
- Inherent uncertainty of operating parameters
- Increased need for Ancillary Services
- Improving operating efficiency within the confines of “old” architecture
- Increased concerns regarding “wear & tear” on equipment
- Ensuring equitable sharing of burdens