

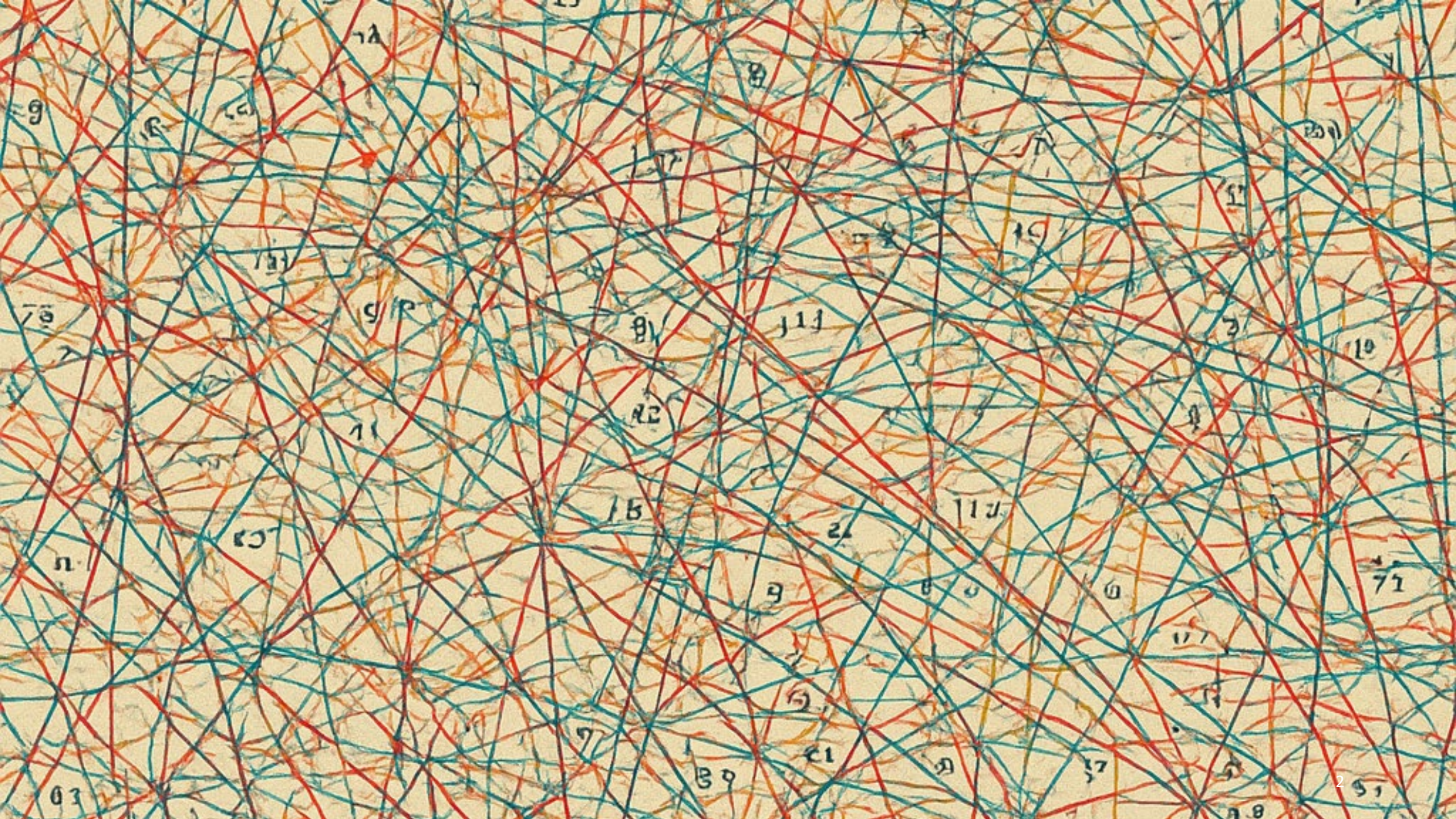


Hydropower in the context of GCDAMP

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Hydropower Workshop Meeting
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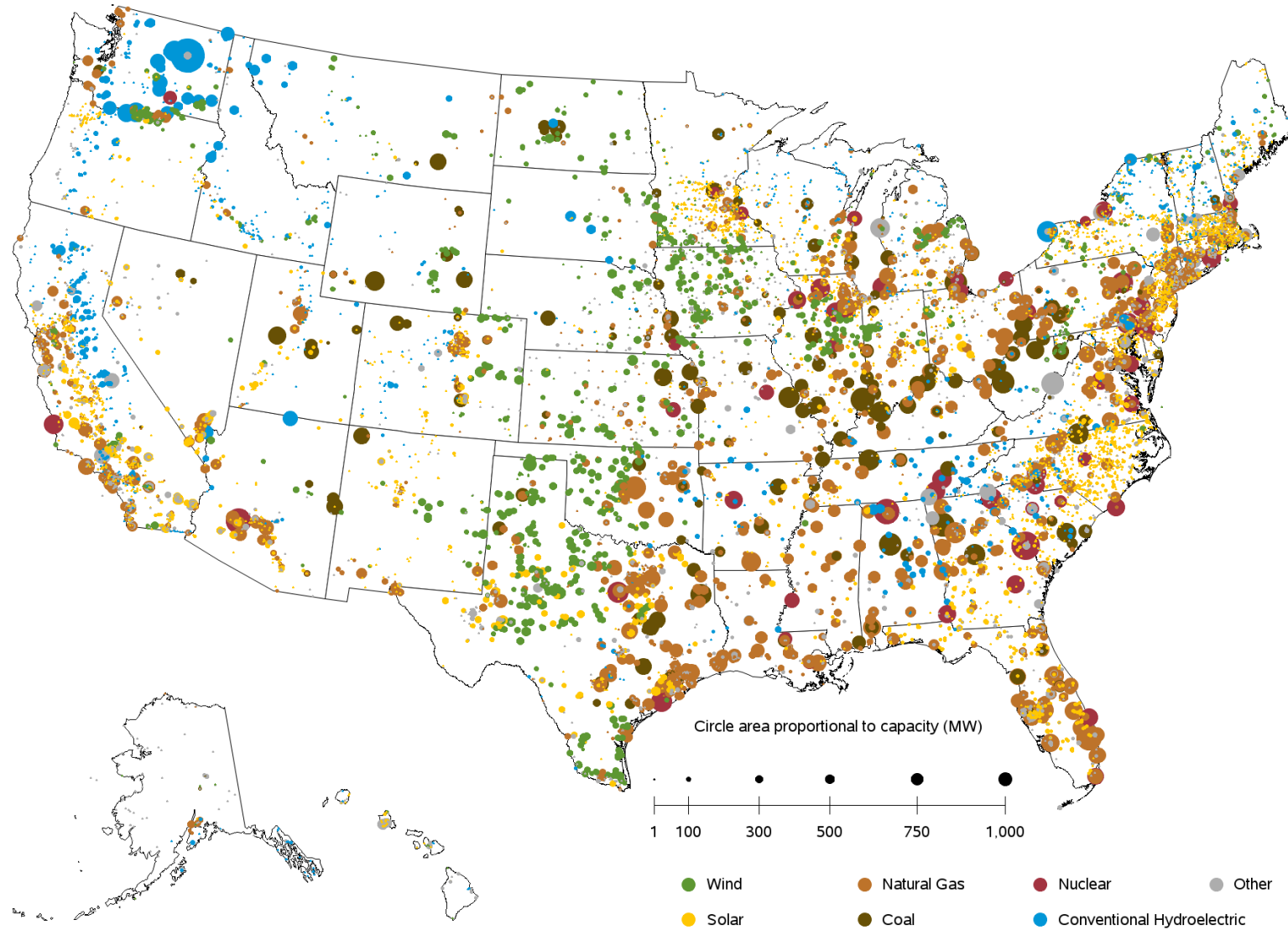
Hydropower and Energy Goal

- Maintain or increase Glen Canyon Dam electric energy generation, load following capability, and ramp rate capability, and minimize emissions and costs to the greatest extent practicable, consistent with improvement and long-term sustainability of downstream resources.
- This goal is constrained by operations under LTEMP that deliver water in a manner that is consistent with and subject to the Law of the River.

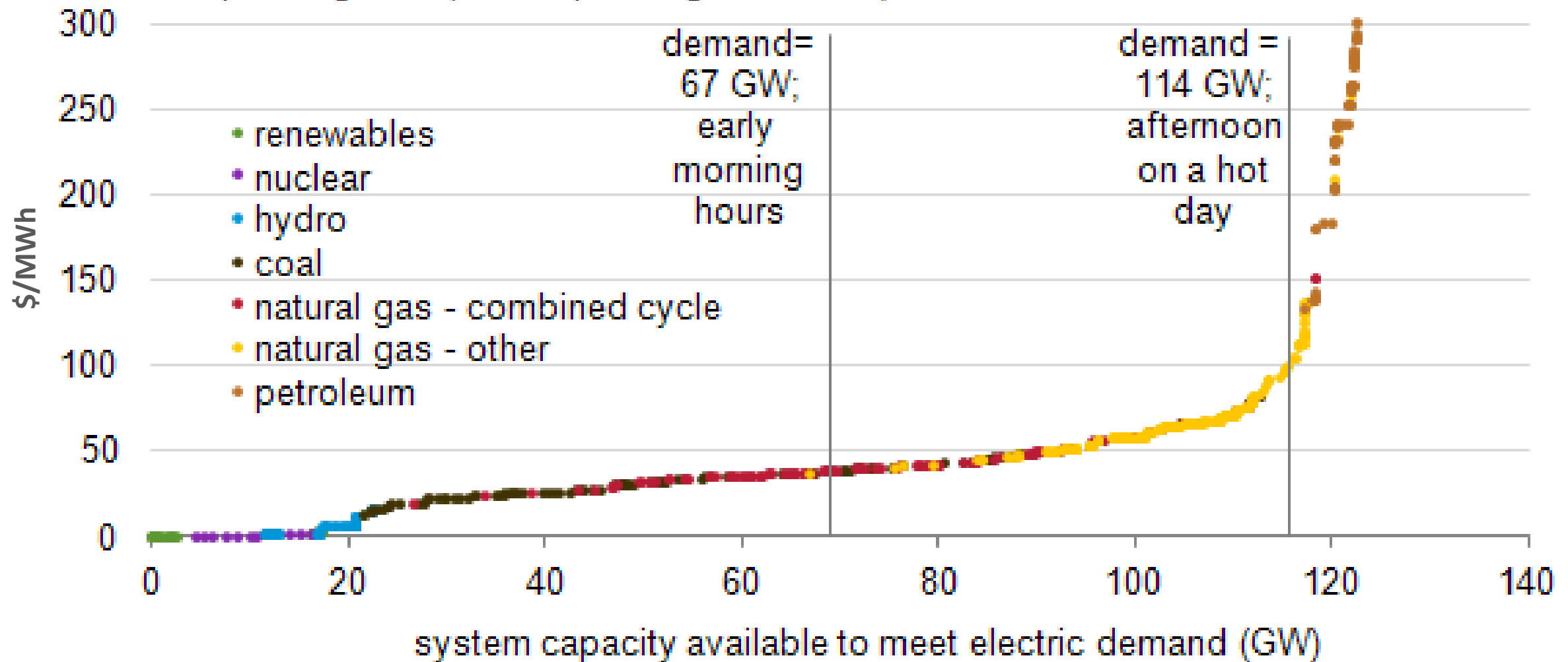
Power System Goals

- **Reliability:** The power system's ability to consistently deliver electricity when and where it's needed, maintaining service and quickly recovering from outages.
- **Affordability:** Electricity that is reasonably priced and accessible to households and businesses.
- **Sustainability:** Providing electricity in ways that protect the environment and communities.

Operable Utility Scale Generating Units

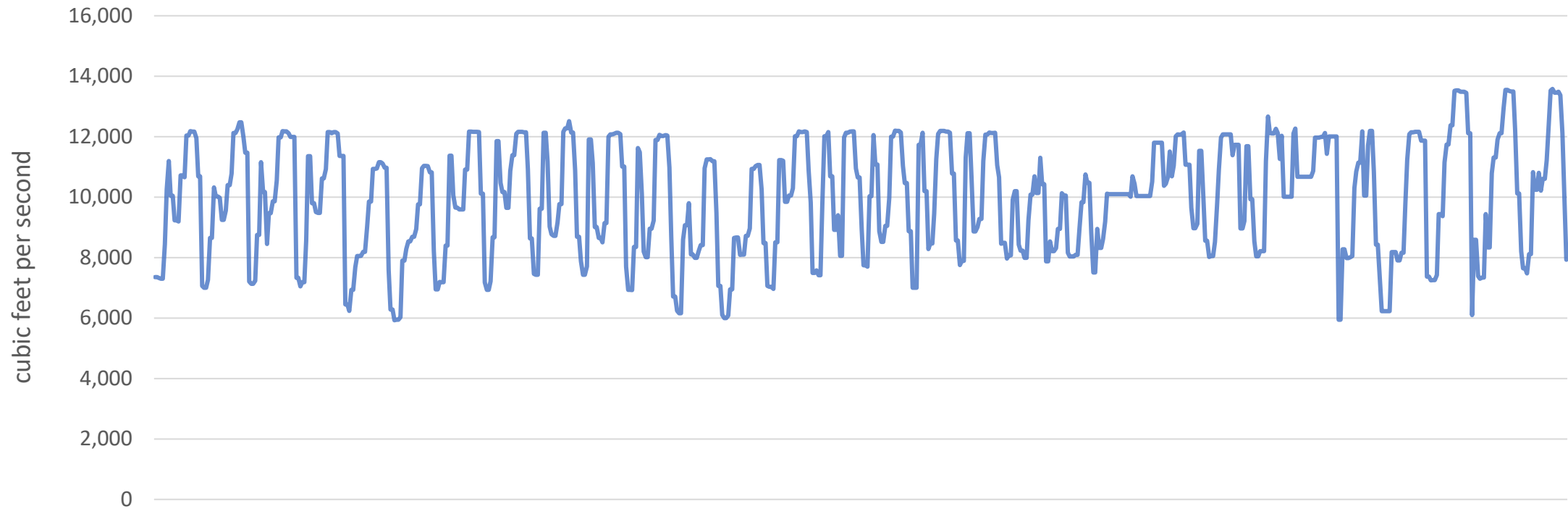


Hypothetical dispatch curve for summer variable operating cost (dollars per megawatthours)



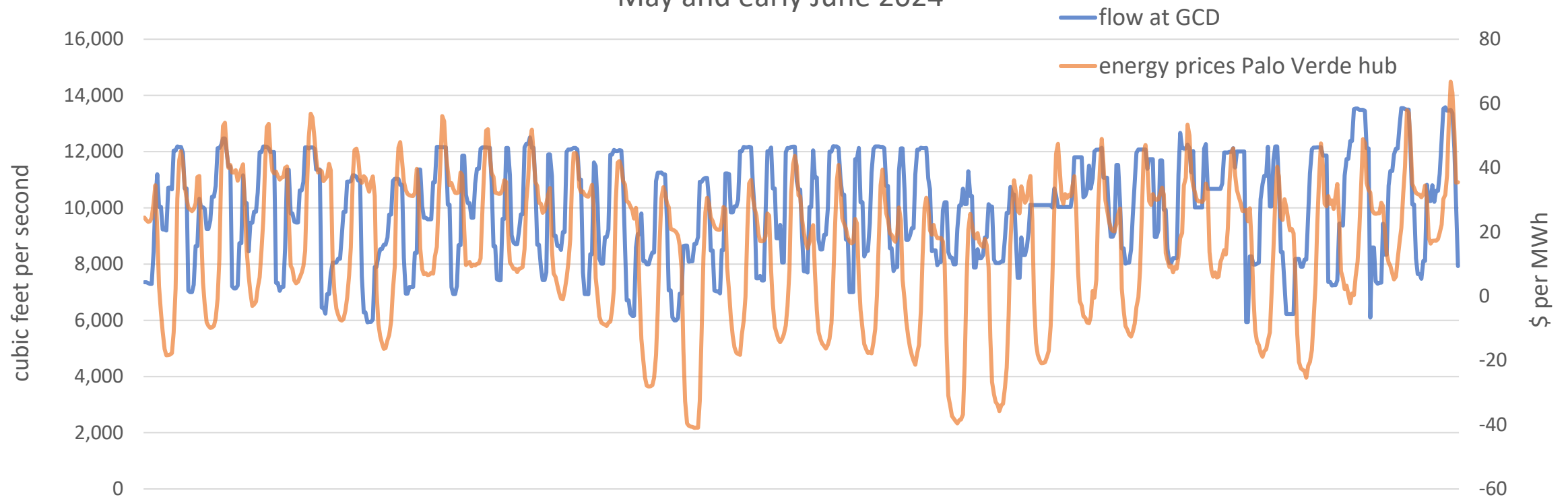
Energy Generation at Glen Canyon Dam

May and early June 2024



Energy Generation at Glen Canyon Dam

May and early June 2024



LTEMP Hydropower and Energy Metrics

- Performance Metric 10.—Value of hydropower capacity (million dollars per year). For the purpose of the LTEMP EIS, the value of capacity is the replacement cost of lost capacity (dollars per MW-year).
- Performance Metric 9. —Value of hydropower generation (million dollars per year). The value of hydropower energy production over a 20-year trace is discounted at 3.375 percent per year. The total net present value of energy production is divided by 20 to provide an annualized measure.

Runge, M.C., LaGory, K.E., Russell, Kendra, Balsom, J.R., Butler, R.A., Coggins, L.G., Jr., Grantz, K.A., Hayse, John, Hlohowskyj, Ihor, Korman, Josh, May, J.E., O'Rourke, D.J., Poch, L.A., Prairie, J.R., VanKuiken, J.C., Van Lonkhuyzen, R.A., Varyu, D.R., Verhaaren, B.T., Vesekla, T.D., Williams, N.T., Wuthrich, K.K., Yackulic, C.B., Billerbeck, R.P., and Knowles, G.W., 2015, Decision analysis to support development of the Glen Canyon Dam Long-Term Experimental and Management Plan: U.S. Geological Survey Scientific Investigations Report 2015–5176, 64 p., <http://dx.doi.org/10.3133/sir20155176>.

LTEMP Hydropower and Energy Analysis

- Conducted three analyses of hydropower electricity production including powerplant capacity, energy costs, and electricity service charge rates.
- Evaluated the impacts of changes in Glen Canyon Dam operations associated with LTEMP alternatives on the economic value of the powerplant's capacity and energy production.
- The impacts were measured in terms of changes in the value of regional power system capacity and overall system-level electricity production costs, comparing a baseline to multiple alternatives.

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Photo credit: National Park Service

LTEMP Goal Outcome Metrics

- **Metric 4.1: Energy Production**
- **Metric 4.2 Economic Value of Electrical Energy Production**
- **Metric 4.3 Marketable Capacity**

The economic value of marketable capacity will be reported on as methods are advanced and funding is available for analysis.

LTEMP Goal Outcome Metrics

- **Metric 4.1: Energy Production**

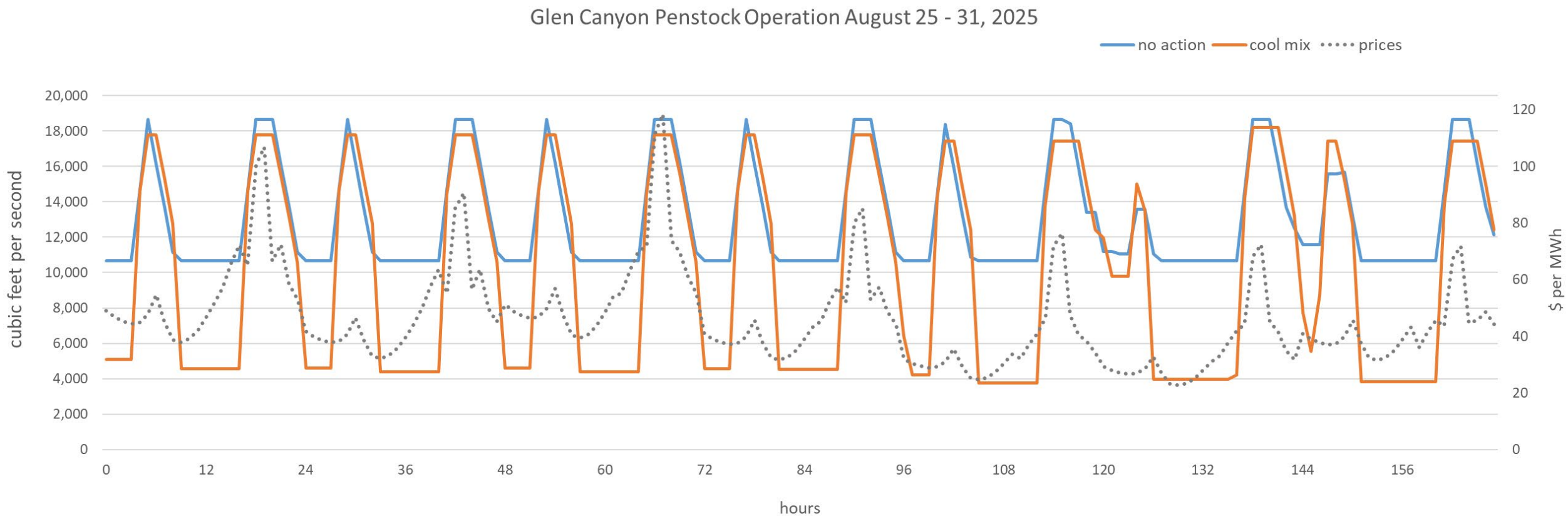
Estimate monthly change in energy production by comparing expected baseline generation with observed generation.

- **Metric 4.2 Economic Value of Electrical Energy Production**

Estimate monthly change in the economic value of electrical energy production by comparing expected baseline generation with observed generation and prices.

- Baselines are typically established from scheduled hourly energy generation provided by WAPA's customers and observed hourly energy prices at the Palo Verde hub.

Molded Energy Glen Canyon Dam Operations



Uncertainty in the electricity sector

- Generating units
 - Fossil fuel retirements
 - Future mix of renewables
 - Battery storage
- Aggregate demand
 - Data centers
 - Electric vehicles
 - Manufacturing
 - Climate change
- Institutional structure
 - Ancillary services
 - Carbon pricing

Questions?

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Photo Credit: Richard McLeish

