Chris Golightly and Ed Sheets
Columbia River Inter-Tribal Fish Commission

Data Centers Impacts on Energy and Reliability

Presentation to Oregon Data Center Advisory Committee

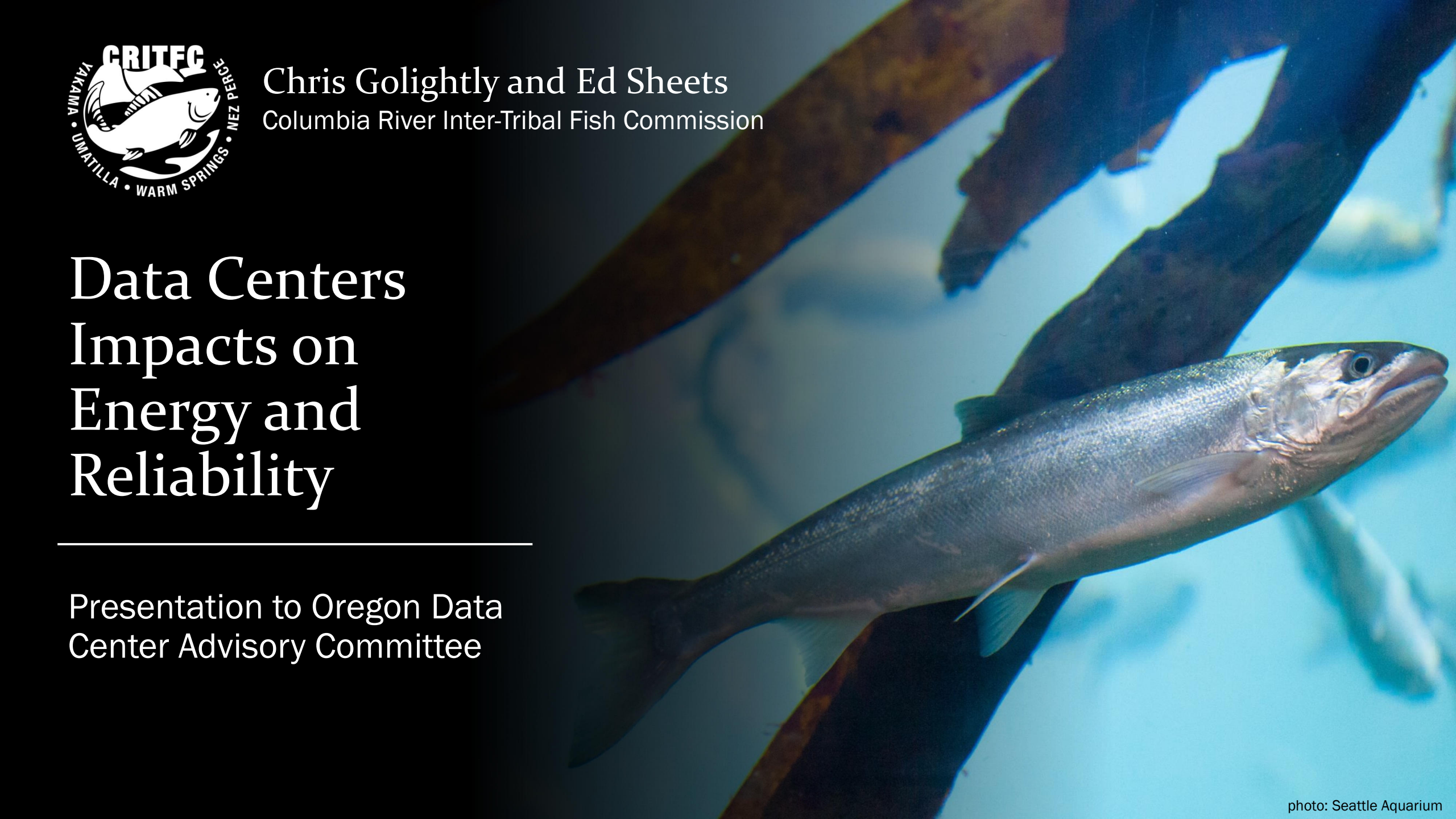


photo: Seattle Aquarium

The Baseline Energy Burden: A River Changed

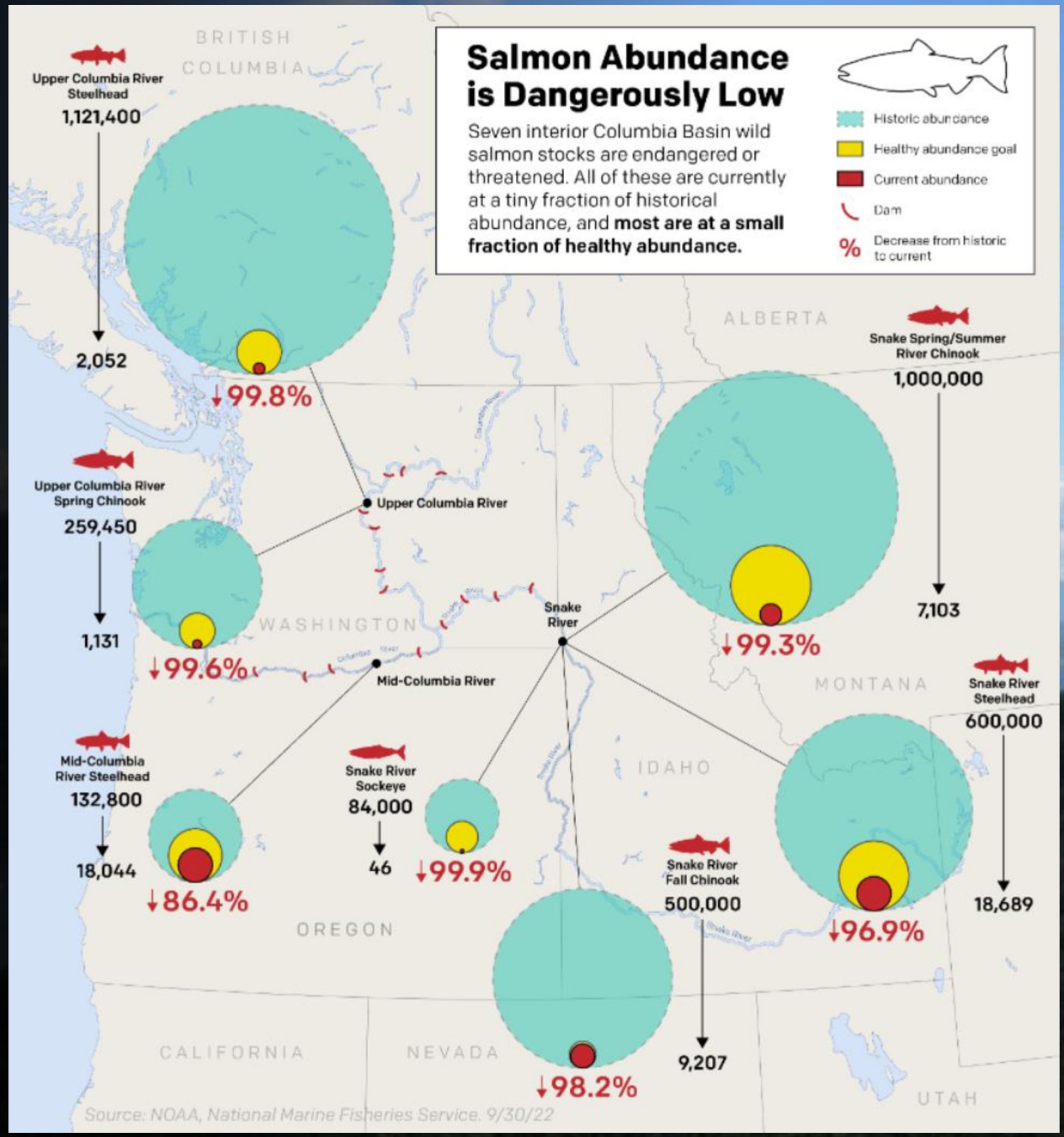
Columbia River Tribes bore the brunt of NW energy development

Salmon navigate a fragmented, engineered river.

Tribal and state fish managers have called for higher spills and reservoirs at minimum operating pool.

Hydroelectric System Built for Power, Navigation, Irrigation—Not Fish

- Blocked migration to half of Columbia Basin
- Altered flow timing
- Warmer waters
- Turbine mortality



Source: Six Sovereigns

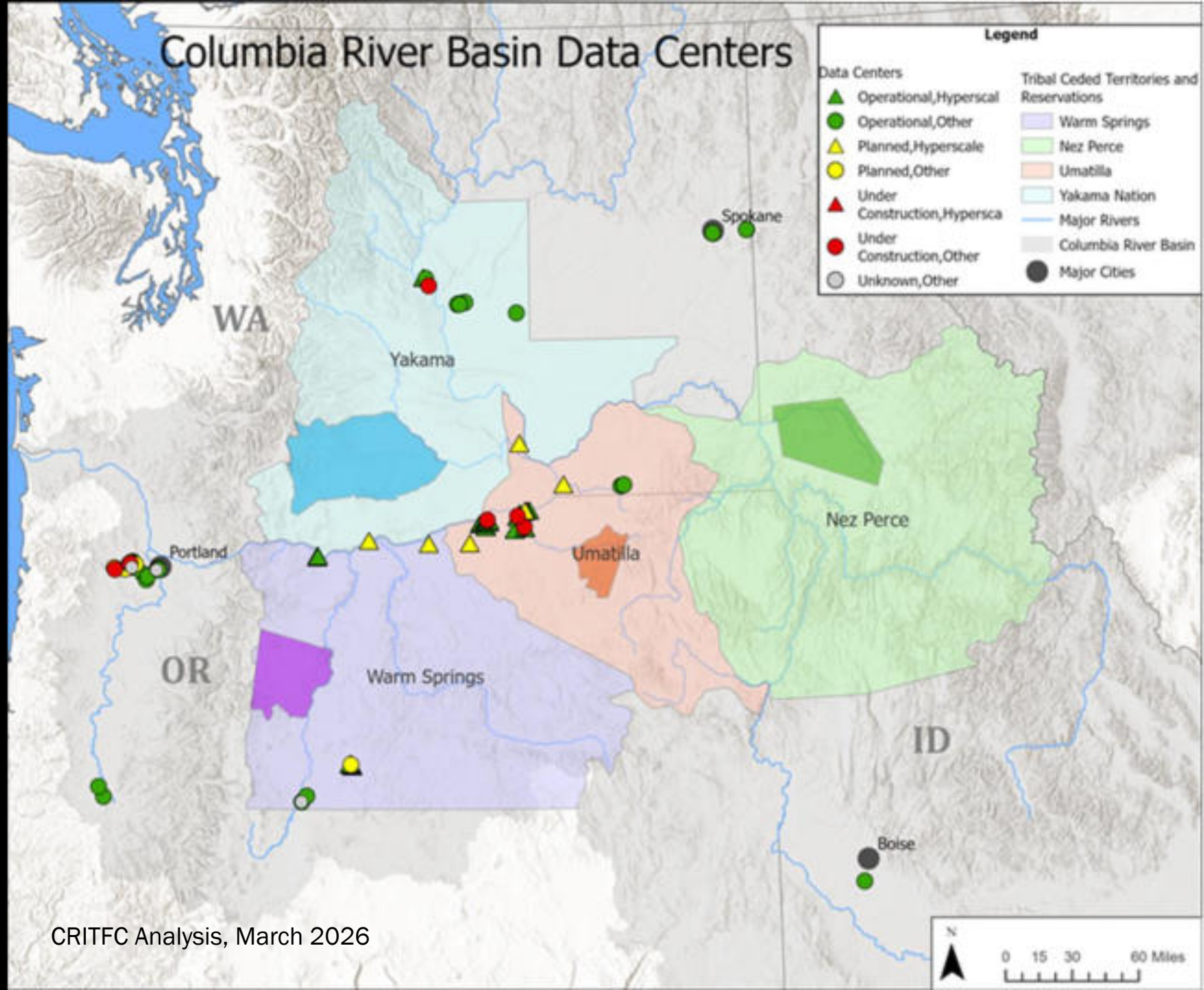
CRITFC 2022 Energy Vision

www.critfc.org/energy-vision/

- Provides a plan for an energy transition that **protects salmon and steelhead** populations and other **tribal resources** while still **providing for clean, reliable and affordable electricity**
- Puts **conservation and efficiency first** as most fish friendly energy resources and focuses on **reducing peak energy demands**
- Published May 2022

Data Centers: A New Demand on a Stressed System

The cloud is physically rooted in rivers salmon depend on.



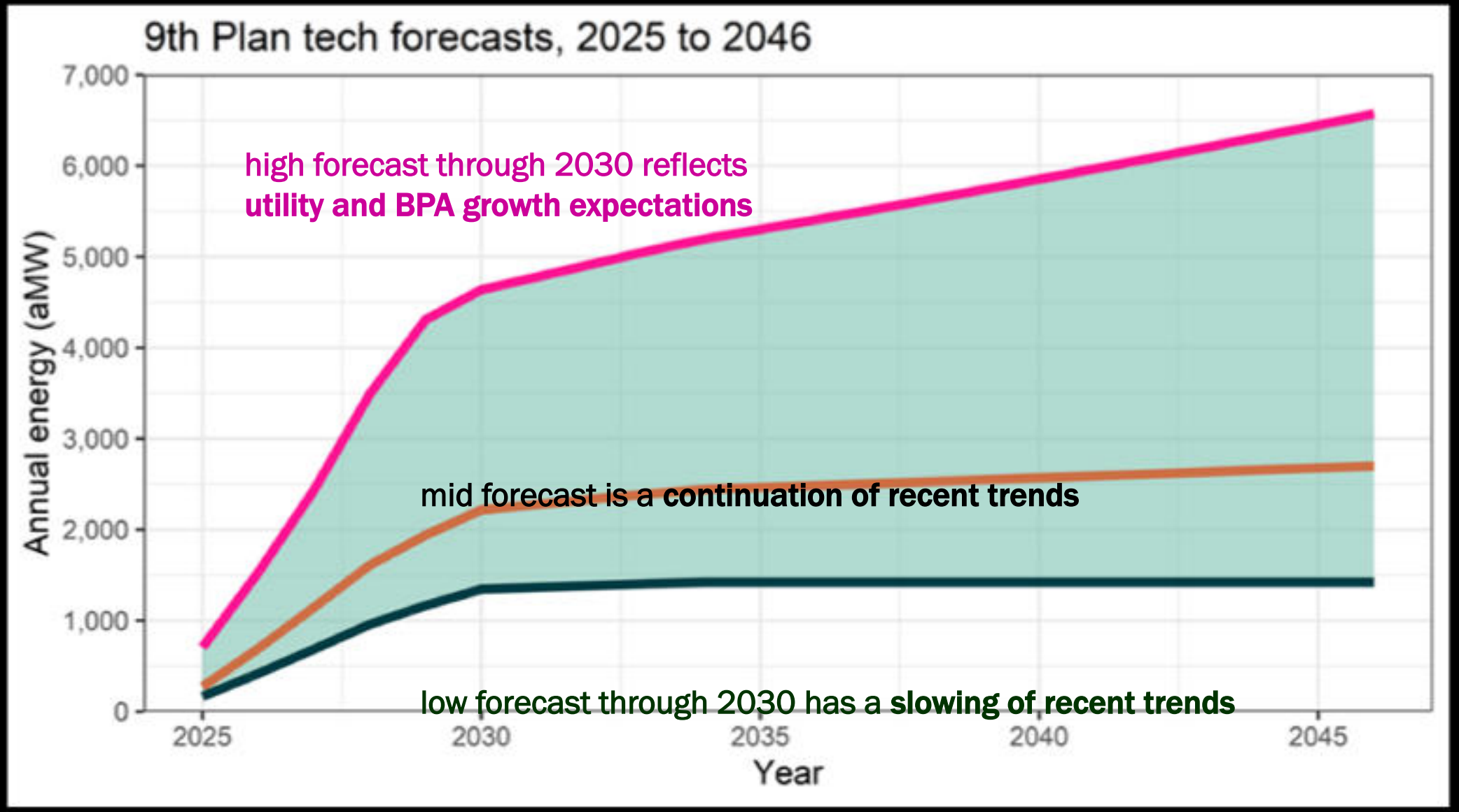
Energy Grid Impacts:
Massive electricity load demand

- Increases demands on the power system.
- Increases peak demands.
- Impacts reliability.
- Increases resource needs.

Tribal Impacts:
Massive electricity load demand

- More damage to tribal lands and resources.
- Reduces flexibility for fish-friendly flows.
- Power emergencies can eliminate fish protections.
- Pressure to maintain fossil-fired resources and Lower Snake River Dams.

Draft Data Center Forecast

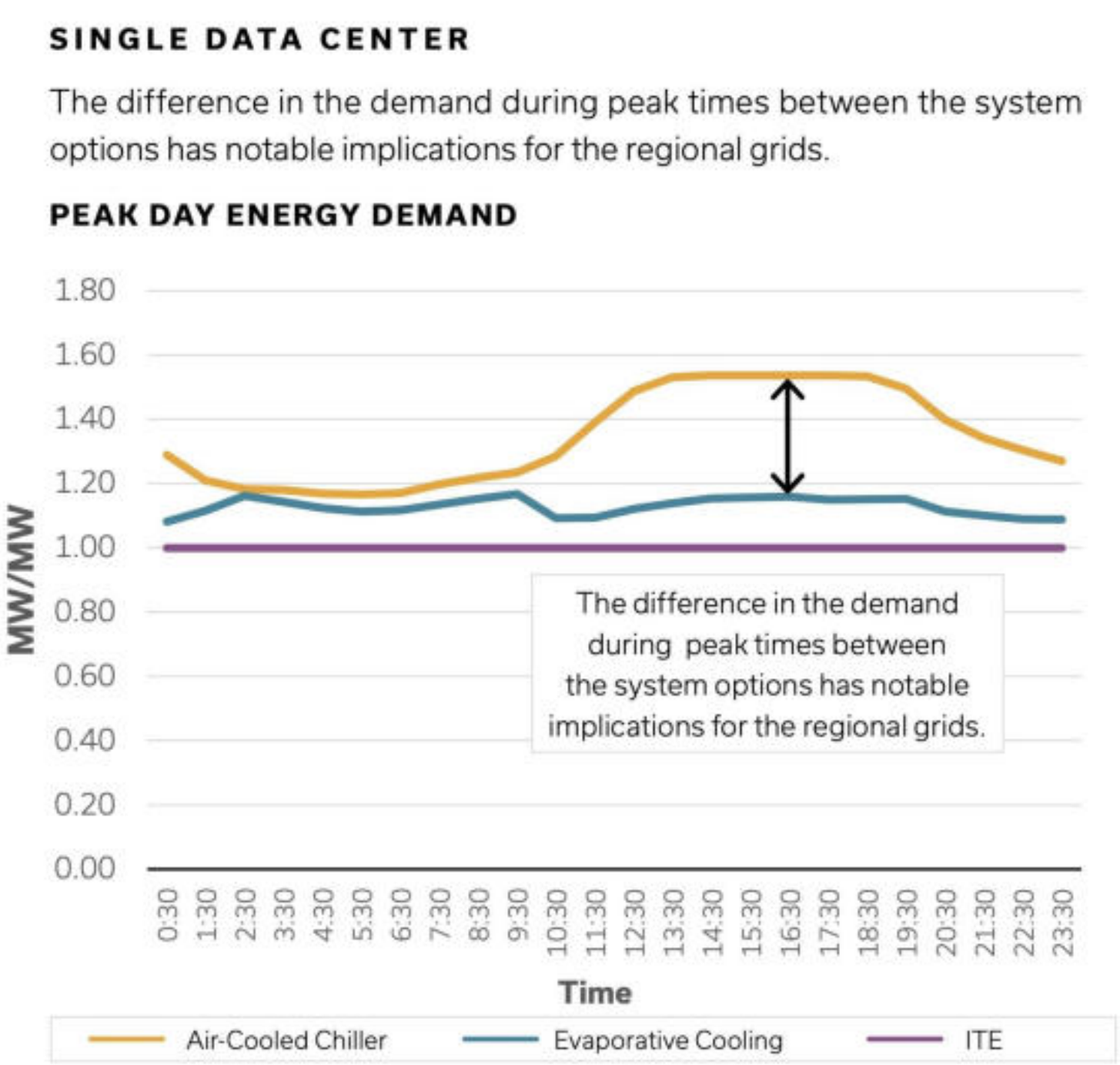


Source: Northwest Power and Conservation Council, *Ninth Plan Demand Forecast* (April 2025)

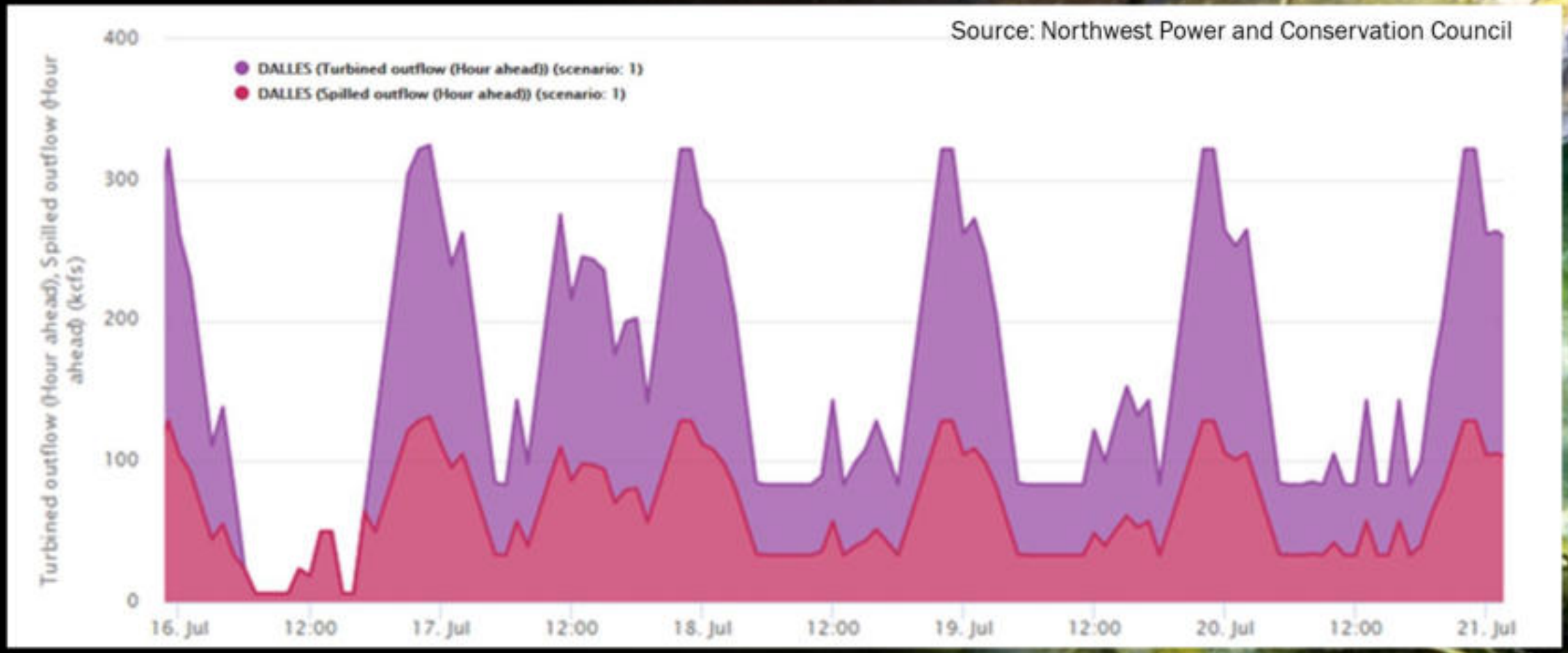
Data Centers Increase Peak Loads

Air-cooled systems add 50 percent to base load during peak hours

Source: PAE Engineers, *Energy & Water Use Impacts of Building System Design for Data Centers, Design Considerations for Oregon & Washington*



Major Flow Changes Harm Migrating Salmon



Modeled 2032 flows at The Dalles Dam (preliminary analysis for 8th Power Plan)

Potential Energy Savings in Data Center Cooling

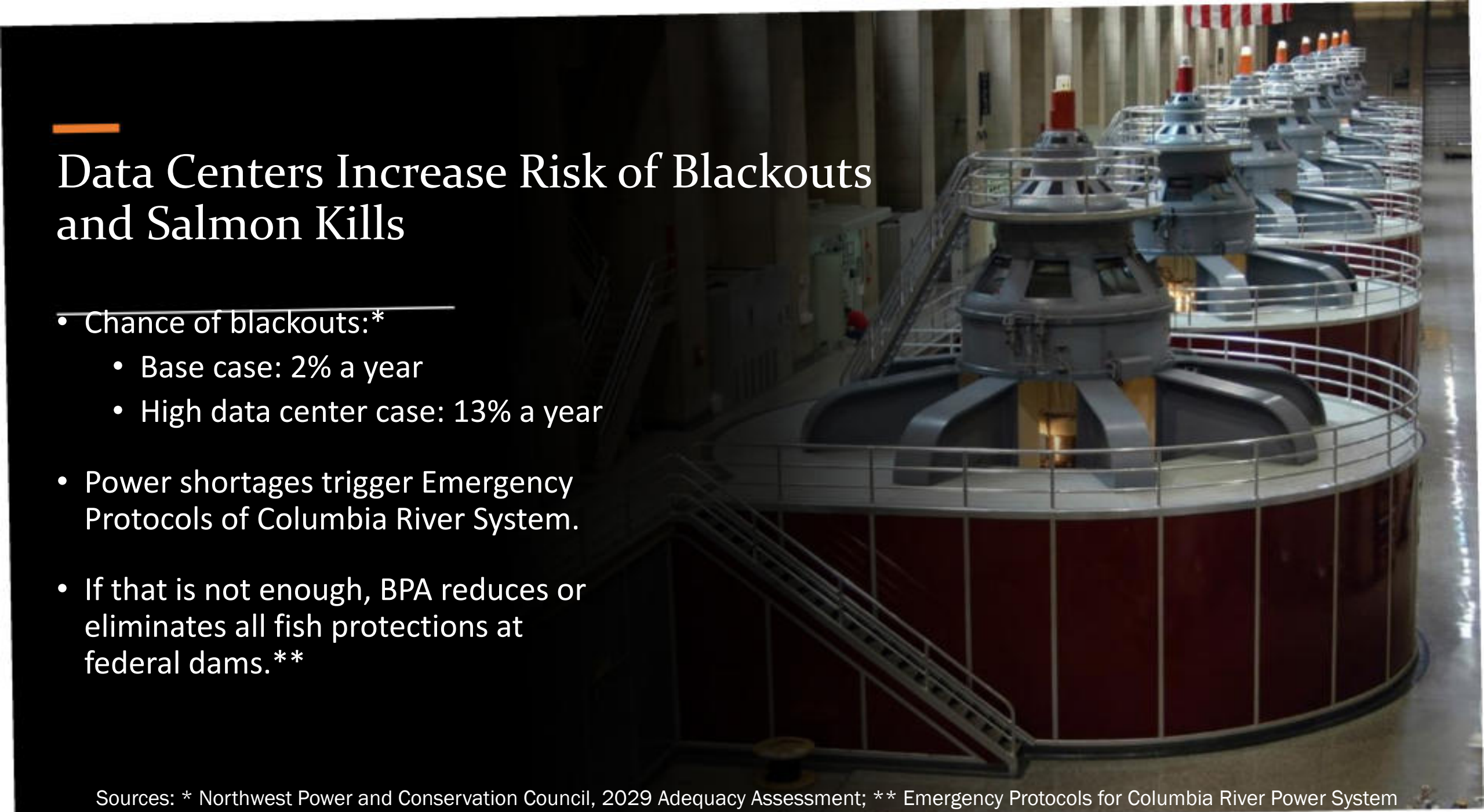
Efficient cooling systems can yield:

- Some of the most significant energy saving available in the region
- Annual energy use savings of 2 million to 4 million megawatt hours
- Reduce peak loads by 1,000 megawatts
- Evaporative cooling uses more water

Source: PAE Engineers, *Energy & Water Use Impacts of Building System Design for Data Centers, Design Considerations for Oregon & Washington*

Data Centers Increase Risk of Blackouts and Salmon Kills

- Chance of blackouts:*
  - Base case: 2% a year
  - High data center case: 13% a year
- Power shortages trigger Emergency Protocols of Columbia River System.
- If that is not enough, BPA reduces or eliminates all fish protections at federal dams.**



Sources: * Northwest Power and Conservation Council, 2029 Adequacy Assessment; ** Emergency Protocols for Columbia River Power System

How Fish Get Around a Dam

Spillway

Highest juvenile fish survival

Bypass system

Intermediate juvenile fish survival

Turbines

Lowest juvenile fish survival

Sources: CRITFC & Fish Passage Center

Spill

- Water over the dam doesn’t generate electricity
- Best way to pass juvenile salmon downstream
- In an energy emergency all the water goes through the dam.

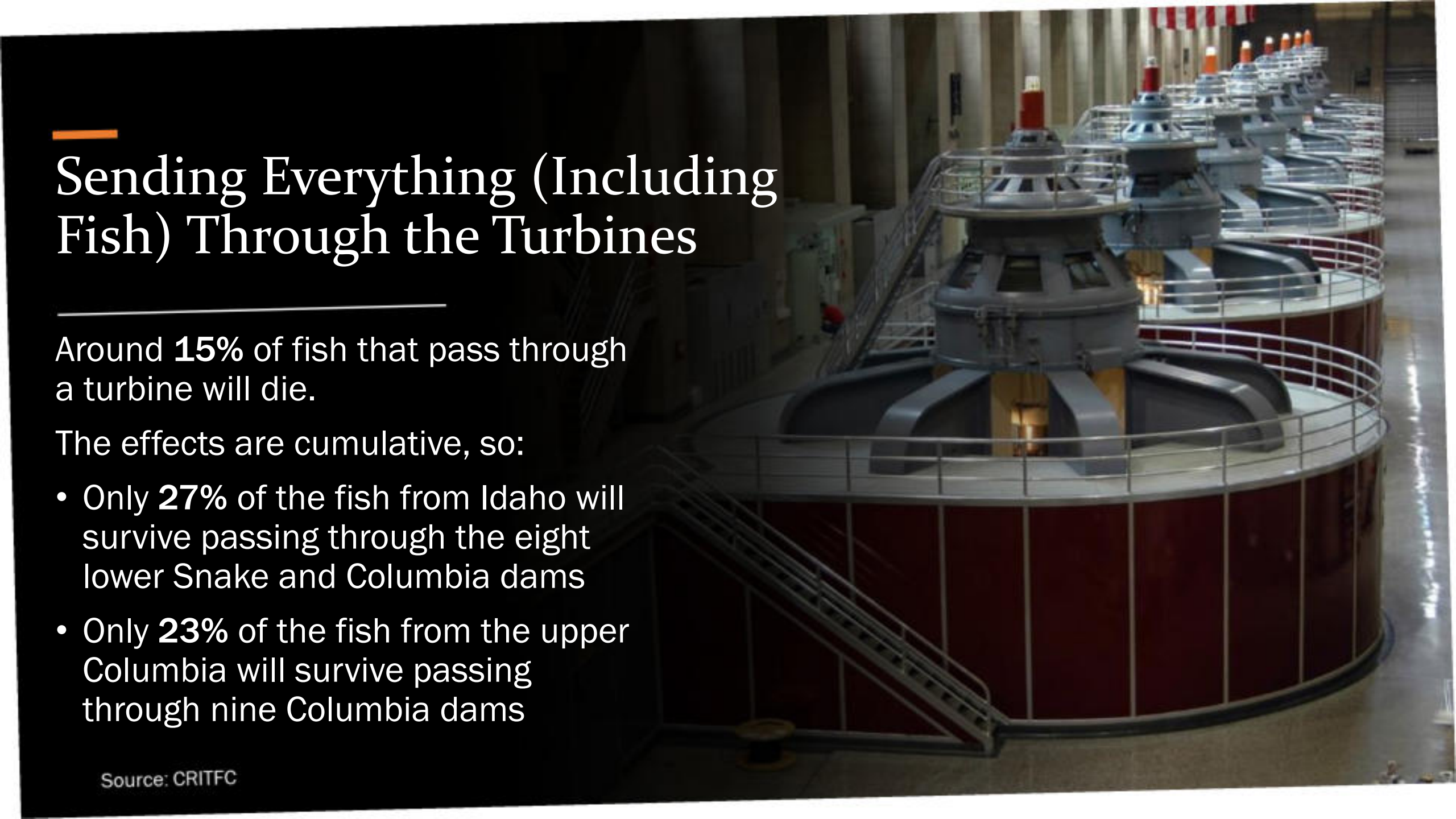
Sources: CRITFC & Fish Passage Center

Sending Everything (Including Fish) Through the Turbines

Around **15%** of fish that pass through a turbine will die.

The effects are cumulative, so:

- Only **27%** of the fish from Idaho will survive passing through the eight lower Snake and Columbia dams
- Only **23%** of the fish from the upper Columbia will survive passing through nine Columbia dams

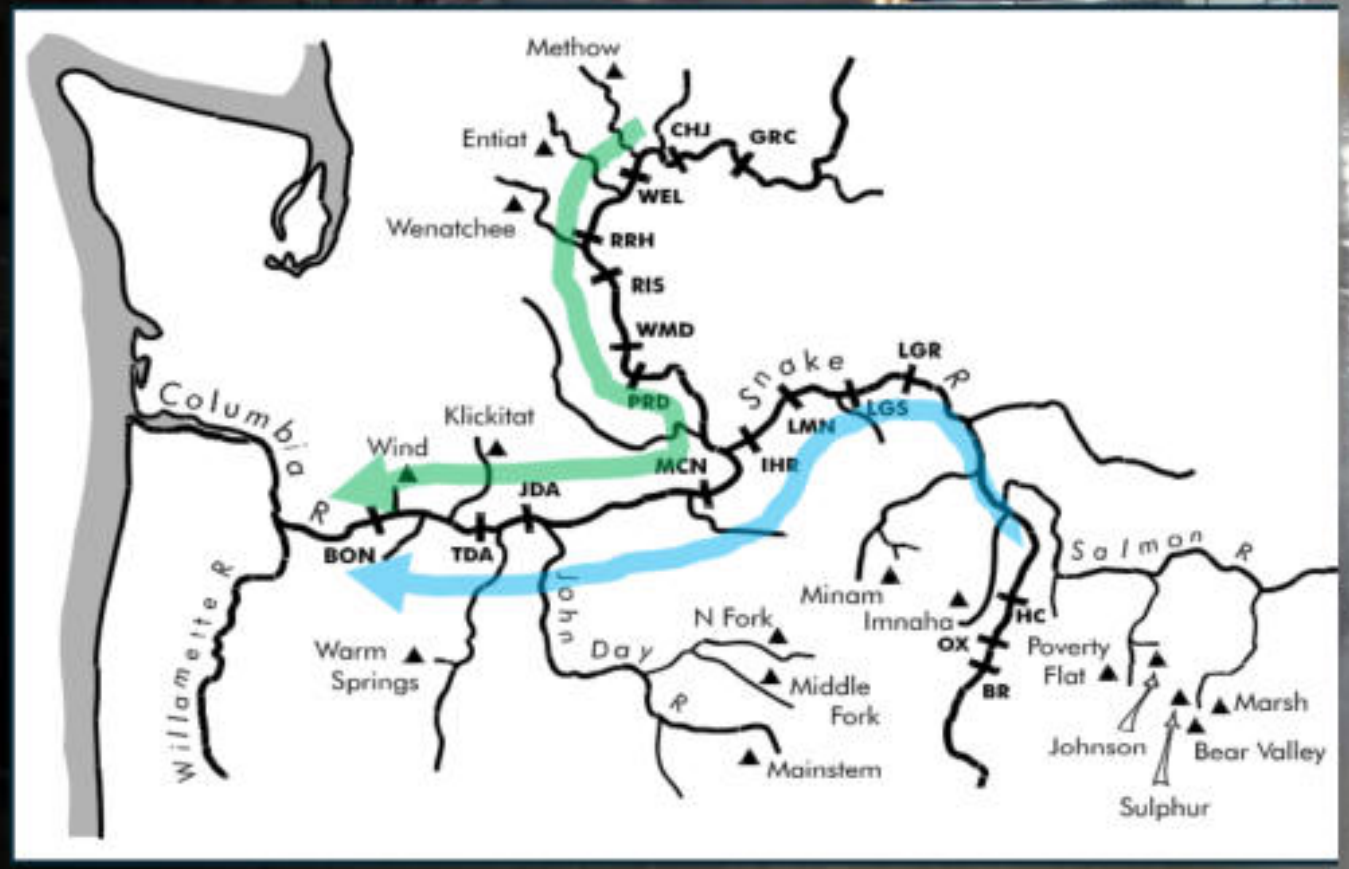


Source: CRITFC

Sending Everything (Including Fish) Through the Turbines

If 1,000,000 salmon started above Wells Dam, 768,000 would be killed passing nine dams.

During last emergency tens of millions of migrating salmon were killed



Source: CRITFC

Recommendations

Protect Resource Adequacy

- Ensure that data centers have sufficient energy and transmission prior to interconnection.
- Allow utilities to reject or delay data centers that affect reliability, costs, and environmental & climate protections.
- Promote data center development of their own, clean resources.

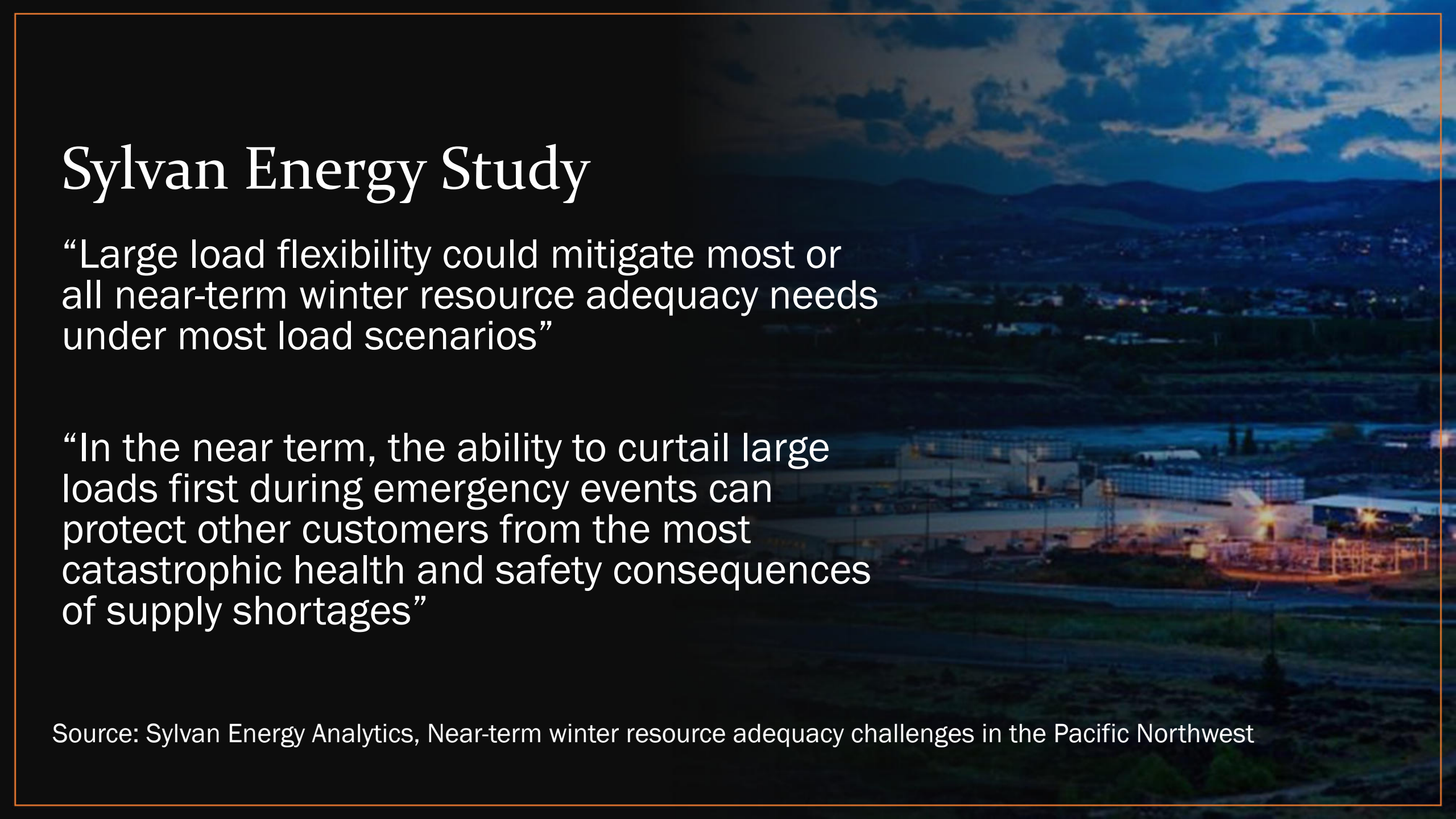
Protect Power Reliability

- Ensure that new loads don’t affect power system reliability
- Data centers should reduce loads during energy emergencies and peak loads.

Sylvan Energy Study

"Large load flexibility could mitigate most or all near-term winter resource adequacy needs under most load scenarios"

"In the near term, the ability to curtail large loads first during emergency events can protect other customers from the most catastrophic health and safety consequences of supply shortages"



Source: Sylvan Energy Analytics, Near-term winter resource adequacy challenges in the Pacific Northwest

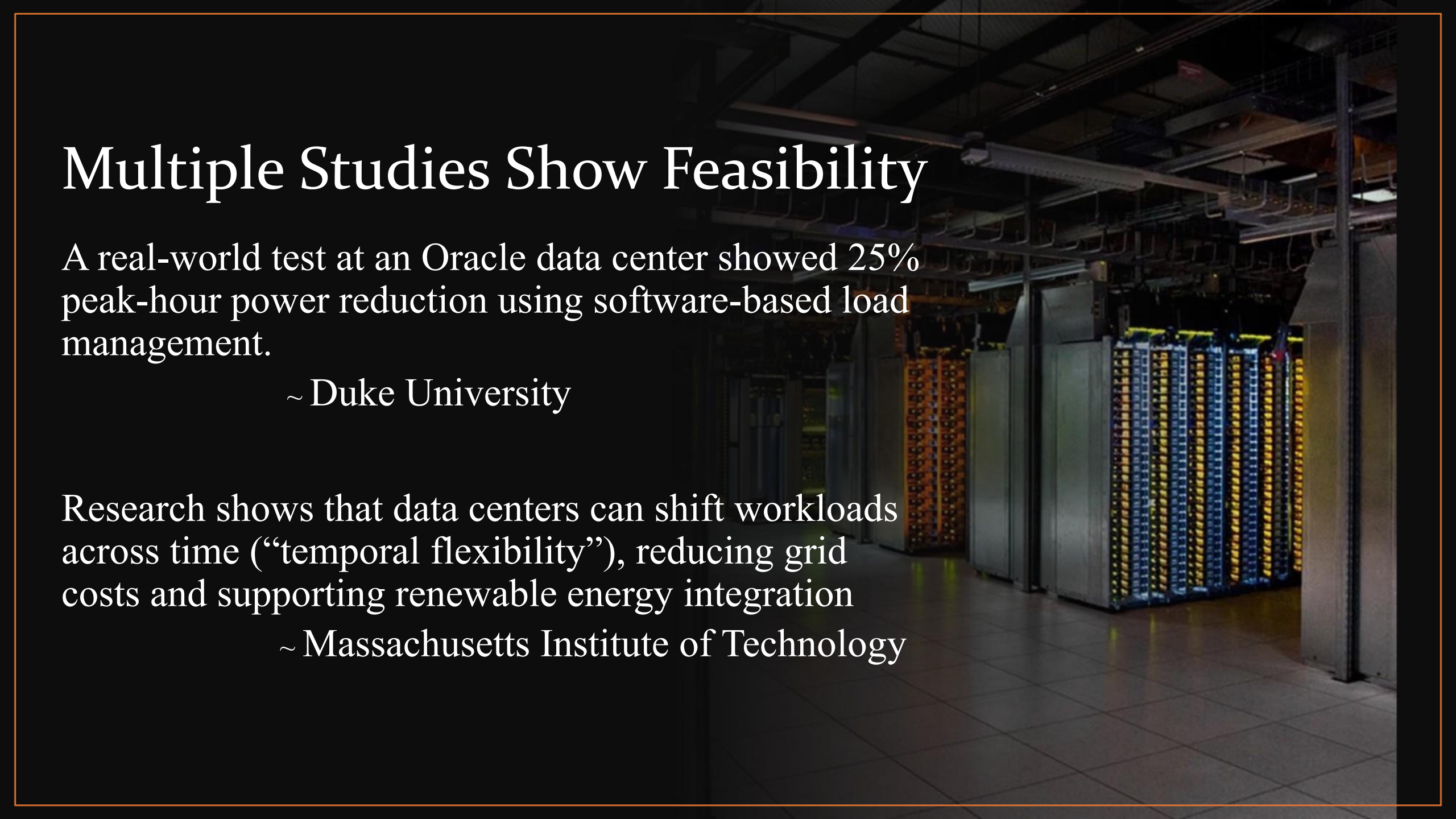
Multiple Studies Show Feasibility

A real-world test at an Oracle data center showed 25% peak-hour power reduction using software-based load management.

~ Duke University

Research shows that data centers can shift workloads across time (“temporal flexibility”), reducing grid costs and supporting renewable energy integration

~ Massachusetts Institute of Technology



Develop Clean Energy

- Develop resources consistent with Tribal Energy Vision, Columbia Basin Restoration Initiative, and state laws
- Improve data center efficiency, reduce peak loads, and contribute to regional clean energy and conservation efforts.

Data Center Rate Class: Reliability and customer protections

OPUC Order in UM2377 (May 7, 2026)
RE: PGE's new large load customer class for data centers.

- Pay for peak growth, transmission, infrastructure
- Report energy usage and demand growth
- Interconnect clean, reliable energy first
- Contribute to community energy benefits (*users > 100MWa)*
- Utility engagement with affected tribes

PGE/ IOUs, but model for baseline energy protections for region.

My Strength is From the Fish

The question isn’t whether we can power the digital world. It’s whether we can do it without severing the ancient currents that sustain life in the Pacific Northwest.

CRITFC

YAKAMA • UMATILLA • WARM SPRINGS • NEZ PERCE

Source Information:

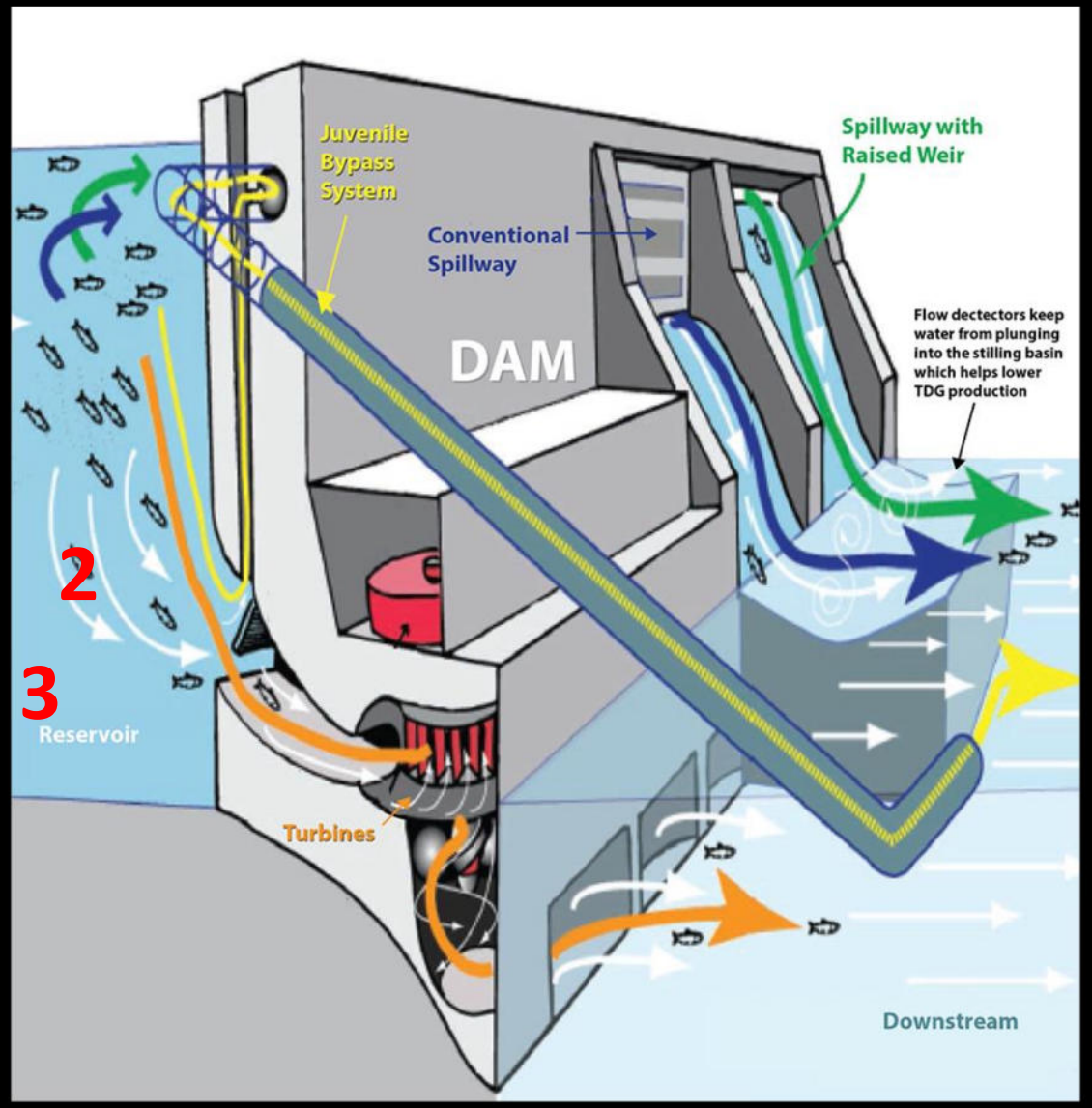
- PAE Engineers, *Energy & Water Use Impacts of Building System Design for Data Centers, Design Considerations for Oregon & Washington,*, Feb. 14, 2025, https://critfc.org/documents/energy-water-use-impacts-of-building-system-design-for-data-centers/; *see also Panel on data centers efficiency and flexibility opportunities*, presenting study to Council on January 14, 2026, available at whttps://ww.nwcouncil.org/calendar/council-meeting-2026-01-13/.
- Northwest Power and Conservation Council, *Ninth Plan Demand Forecast (staff presentation to Council),* Slide 31 (May 29, 2025), https://www.nwcouncil.org/fs/19380/2025_0429_2.pdf; see also *Council releases initial 20-year forecast for Pacific Northwest electricity demand* (May 2025), https://www.nwcouncil.org/news/2025/05/02/pacific-northwest-load-forecast-2025/.
- Northwest Power and Conservation Council, 2029 Adequacy Assessment, page 28 (August 2024), https://www.nwcouncil.org/fs/18853/2024-4.pdf.
- Technical Management Team, *Emergency Protocols for Columbia River System* (Updated December 5, 2025) attached as Appendix 1 to Corps of Engineers, 2026 Water Management Plan; available at https://public.crohms.org/tmt/documents/wmp/2026/ .
- Brancucci, et. al, *Flexible Data Centers: A Faster, More Affordable Path to Power.* Camus, encoord, and Princton ZERO Lab (December 2025), https://zero.lab.princeton.edu/wp-content/uploads/2025/12/Flexible-data-centers-report-dec-2025.pdf.
- Oregon Public Utility Commission, Order No. 26-154, UM 2377, Investigation into Marginal Costs for Large Customers and Further Modifications to Portland General Electric Company's Rule C and Rule I (May 7, 2026), https://apps.puc.state.or.us/orders/2026ords/26-154.pdf
- Sylvan Energy Analytics, *Near-term winter resource adequacy challenges in the Pacific Northwest*, January 2026, https://www.sylvan.energy/s/NW_RA_Study_Review_Final.pdf.
- Duke University, https://www.aceee.org/white-paper/2025/10/opportunities-use-energy-efficiency-and-demand-flexibility-reduce-_data-center
- MIT Energy and Environmental Policy Research. https://ceepr.mit.edu/publications/

Extra Slides

Juvenile Passage Routes

- 3 options with different survival:
  - Spillway (1): conventional bay or with weirs = highest survival
  - Powerhouse:
    - (2) Bypass system = intermediate survival requires guidance system
    - (3) Turbine = lowest survival

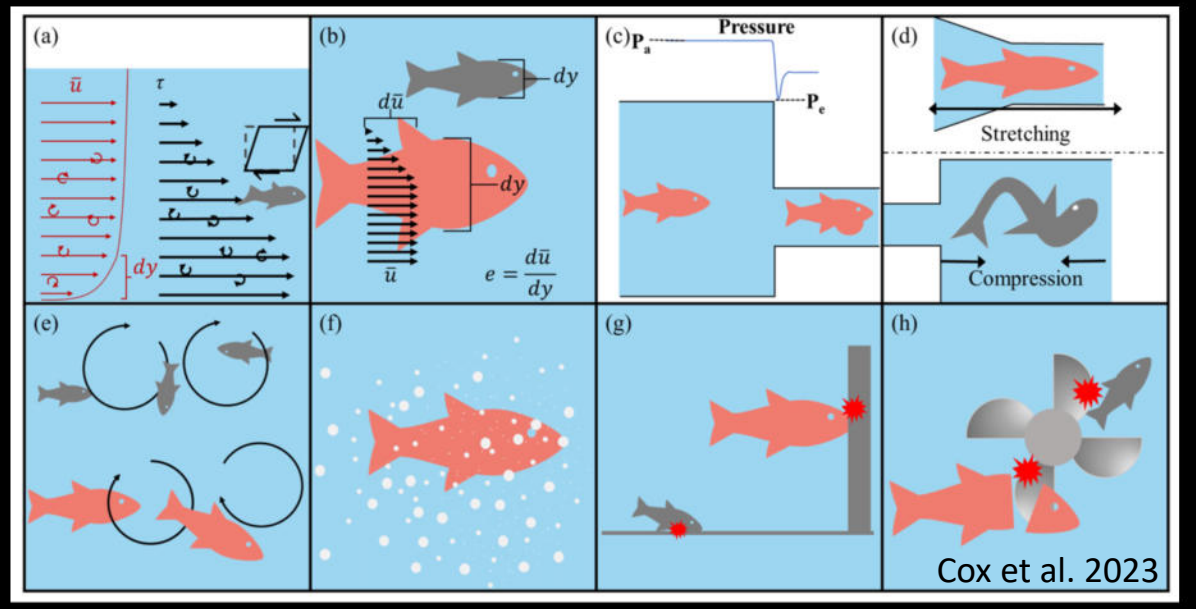
- *During a Power Emergency spill is stopped and all species then go through Powerhouse/Turbines*



Source: Fish Passage Center

Impact of Powerhouse Passage on Fish

- Immediate turbine and bypass passage effects:
  - Pressure changes
  - Injuries from turbine blade strike or contacting other structures
  - Shear injuries
  - Greater susceptibility to predators
- Impact of injury, trauma, stress often occur farther downstream
- Compounded by multiple dam encounters



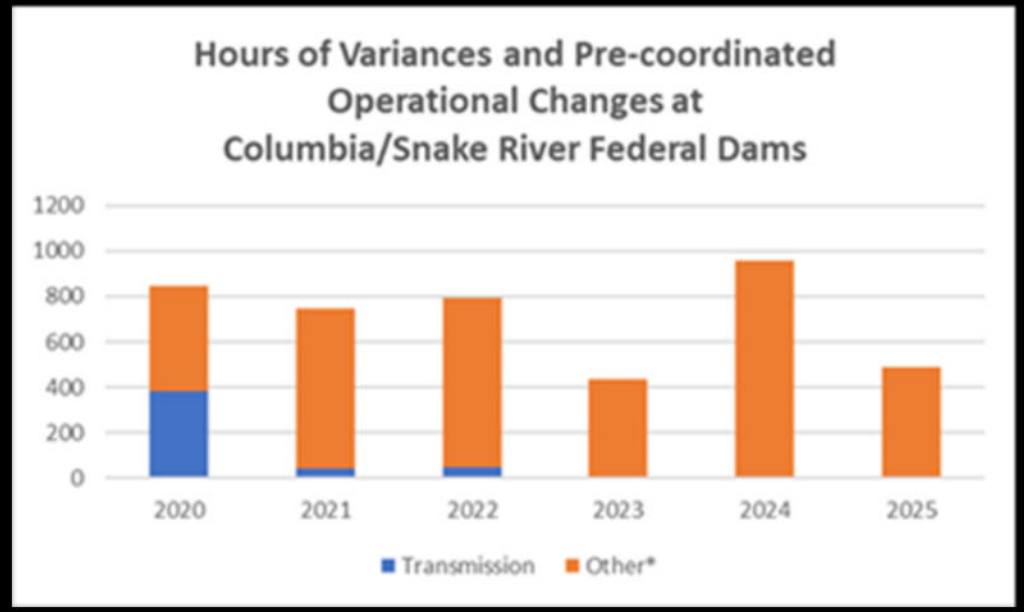
Cox et al. 2023


Image: FISHBIO

Source: CRITFC

Other Actions Affect Salmon Protections

- Variances change spill levels for
  - Human and program error, maintenance, navigation, and debris issues
  - Transmission reliability
- The federal dams have adjusted spill operations for 4,269 hours between 2020 and 2025



Source: Yakama Nation graphic based on Fish Passage Center data

SALMON DECLINE

Returning Columbia River salmon (chinook, steelhead, sockeye, coho)