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April 26, 2006

MEMORANDUM

TO: Power Four Committee Members

FROM: John Fazio, Senior System Analyst

SUBJECT: Climate Change - Council's Role

Action item MON-4 in the 5th Power Plan calls for the Council to monitor climate change science and policy. In partial response to that action item, Dr. Philip Mote of the Climate Impacts Group at the University of Washington will make a presentation on the state of the science at the May 10th Council meeting in Walla Walla, Washington.

Council staff continues to work with University of Washington scientists to keep abreast of current climate change analysis. Effects of global warming, related to the power system, fall into two general categories: 1) the impacts to temperature (thus demand), precipitation (thus river flows) and hydroelectric generation and 2) the effects of potential carbon tax on resource planning. Global warming can also lead to more adverse conditions for fish and wildlife in that: 1) flows in the spring and summer are projected to be lower and 2) water temperatures may rise due to higher air temperatures and lower river flows.

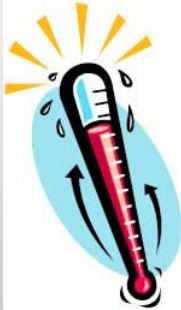
There are a number of actions the region can take in response to climate change. Besides keeping abreast of the science, planners should work together to devise strategies that would mitigate the effects of climate change. One possible mitigating strategy is to reconsider the current pattern of drafting and refilling reservoirs. Perhaps that operation can be better tied to volume forecasts so that the system could respond to changes in climate more automatically. If that path is taken, forecasting methods, especially for fall, must be improved.

Actions the Council could take are to; 1) monitor advances in the science, 2) monitor climate change policies, especially with regard to carbon tax, 3) release a white paper to keep the public informed of progress in this area, 4) direct staff to continue to work with others in the region to devise mitigation strategies, 5) direct staff to work with others to improve forecasting methods and 6) direct staff to re-analyze impacts to the power system whenever appropriate (University of Washington scientists expect new results from their climate models in early fall).

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Climate Change:

Council's Role



Power Four Committee
May 10th, 2006
Walla Walla, Washington

Outline

- Organizations involved
- How can climate change affect the hydro system?
- What does that mean for power and for fish and wildlife?
- What can we do about it?
- Council's Role

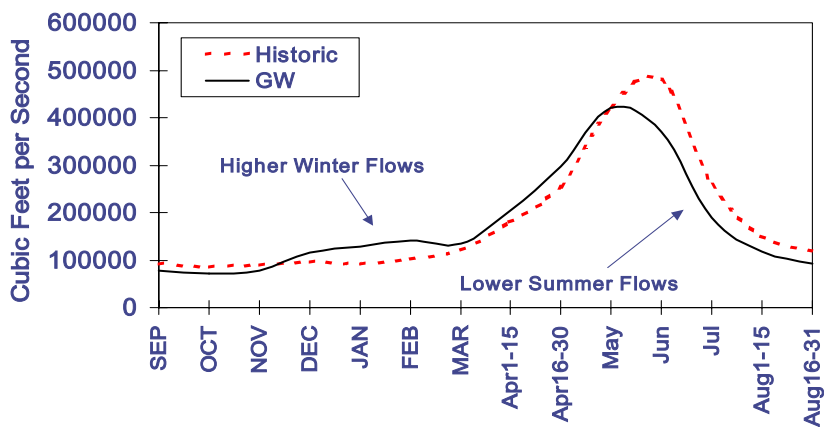
Organizations Involved

- **Climate Impacts Group (U of W):** an interdisciplinary research group studying the impacts of natural climate variability and climate change in the Pacific NW
- **NW River Forecast Center:** provides weather, hydrologic, and climate forecasts and warnings for the NW
- **EPA:** to protect human health and environment
- **DEQ:** to ensure clean air, water, and land in the NW and to protect citizens from the adverse health impacts of pollution
- **National Climate Data Center:** the world's largest active archive of weather data
- **Federal Agencies:** BPA, Corps, BOR, NOAA Fisheries

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How GW can affect Hydro



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Summary of Potential Impacts

	Winter	Summer	Annual
Flow	Higher	Lower	Varies
Power	Higher	Lower	Varies
Fish	Neutral	Worse	N/A
Hydro Revenues	Higher	Lower	Varies

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Other Impacts of Global Warming

- Wetter AND dry conditions at different times in the future
- Perhaps higher frequency of extreme events
- Canadian hydropower is much less sensitive to global warming
- Impacts to Canada's river flows should be smaller
- Canadian fraction of the snow pack will increase over time (relative to US)
- May lead to an "imbalance" in the current coordination agreements

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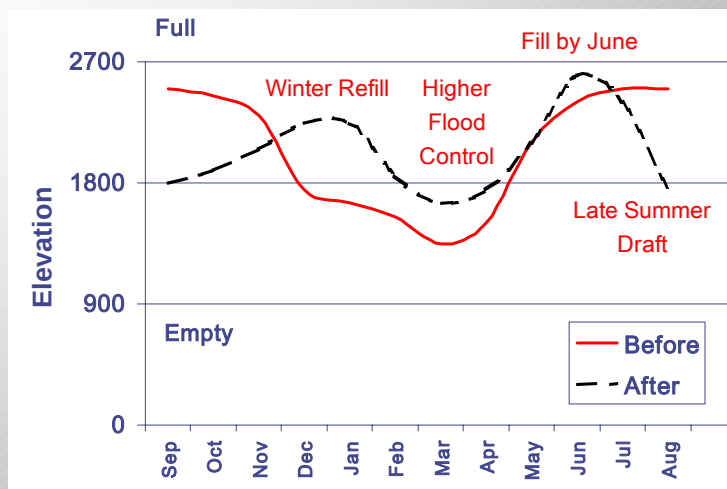
What can we do about it?

- Fill all reservoirs by June
- Draft US reservoirs lower in summer
- Draft more Canadian water in summer
- Refill all reservoirs as much as possible in winter
- If necessary, acquire non-hydro replacement resources for winter

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Effects of Mitigating Actions



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Proposal: Adaptive Management

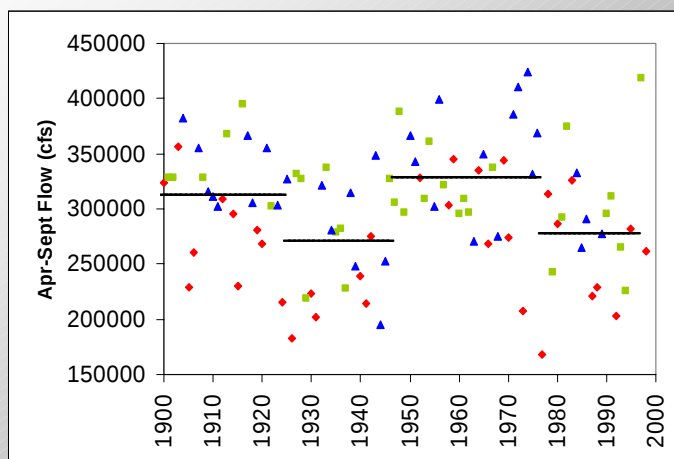
- No climate change “bright line”
- Link operations to forecasts
- Mitigating actions built in
- Better forecasting



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Will the Future be Wetter or Drier? Probably Periods of Both

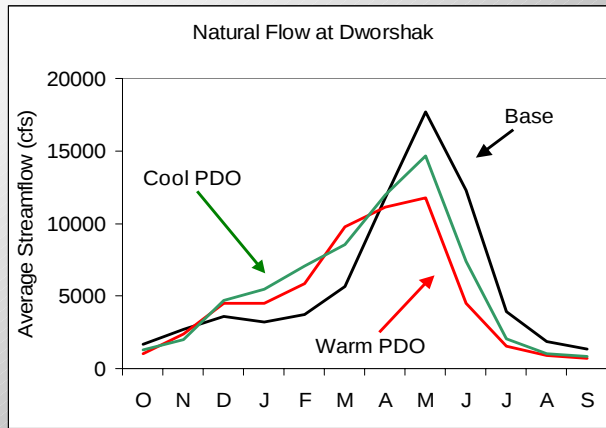


Source: CIG University of Washington

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How good are our forecasts? (PDO: Pacific Decadal Oscillation)



Source: CIG University of Washington



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Council's Role?

- Monitor advances in the science
- Monitor policy developments, especially in regard to carbon
- Periodically update power system analysis
- Release white paper to keep public informed
- Work with others to develop mitigating actions and planning strategies for both fish and power
- Work with others to improve forecasting methods



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