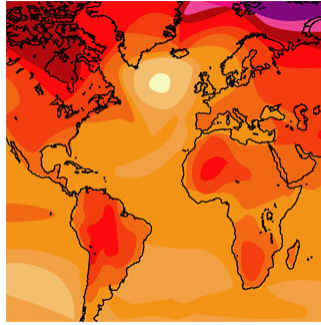


## Appendix L: Climate Change and Power Planning



Power Committee Webinar  
June 3, 2009

## Outline

- • Climate Change Data
- Assessing impacts to the power system
- Dealing with climate uncertainty

# Global Climate Models



- Climate Impacts Group – University of Washington
- Up to 20 climate models
- At least 2 GHG scenarios
- Downscaled for the NW

Provide forecasts for:

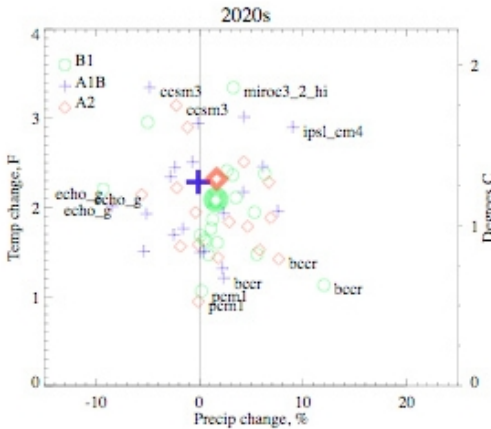
- ✓ Temperature changes
- ✓ Altered river flows

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# GCM Changes to NW Temperature and Precipitation



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# CIG Forecast Changes

- **Runoff volume and river flow**
  - ✓ Volume not likely to change significantly
  - ✓ Higher winter flows, lower summer flows
- **Temperature**
  - ✓ More likely to increase than decrease
  - ✓ Median case 2.05 degrees °F higher by 2030

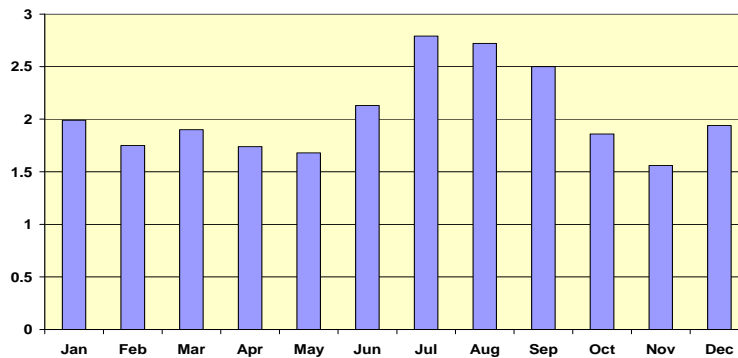
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# Projected Monthly Temperature Changes

Monthly Distribution of Increase in Temperature-  
Degree F (2030)

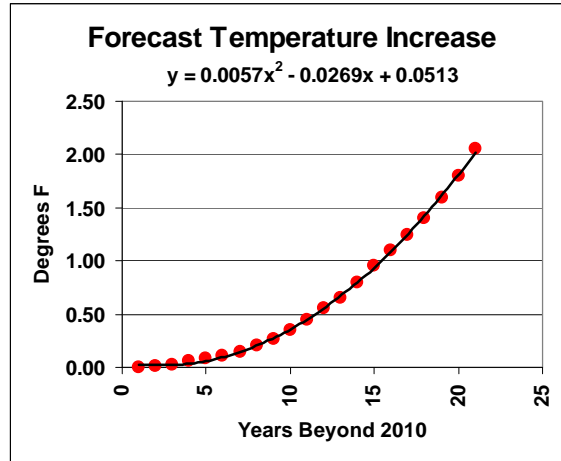


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## Projected Annual Temperature Change

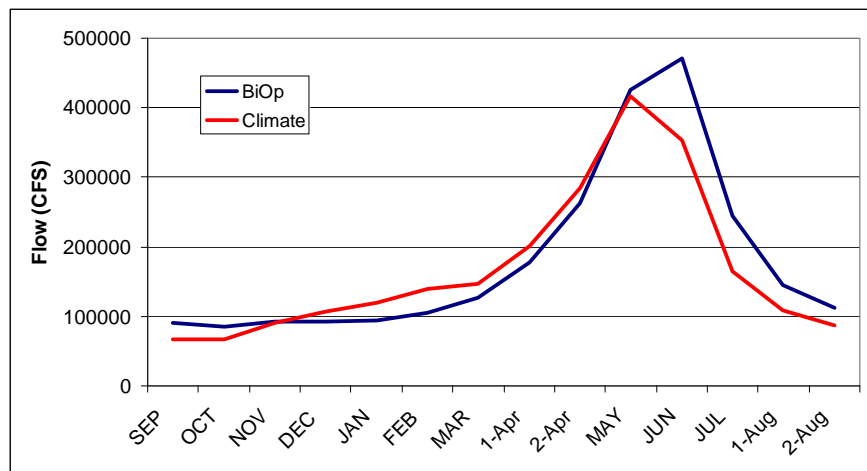


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## Change in Natural Flows @ The Dalles (2045)



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# Outline

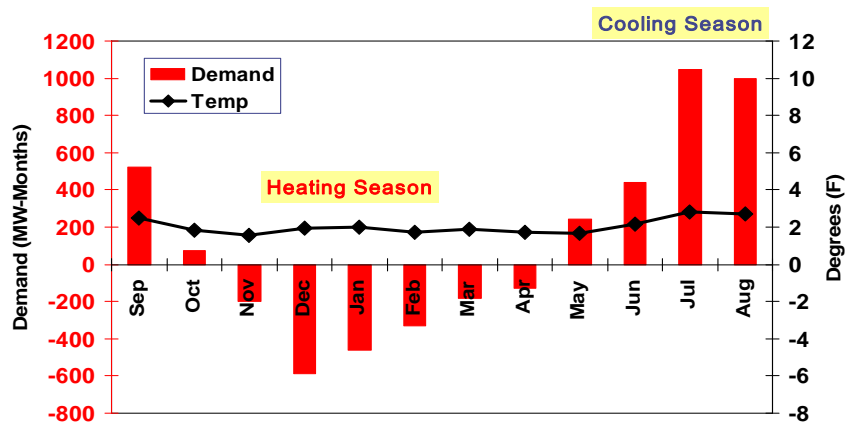
- Climate Change Data
- • Assessing impacts to the power system
- Dealing with climate uncertainty

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## Temperature Effects on Demand (Average Energy 2030)

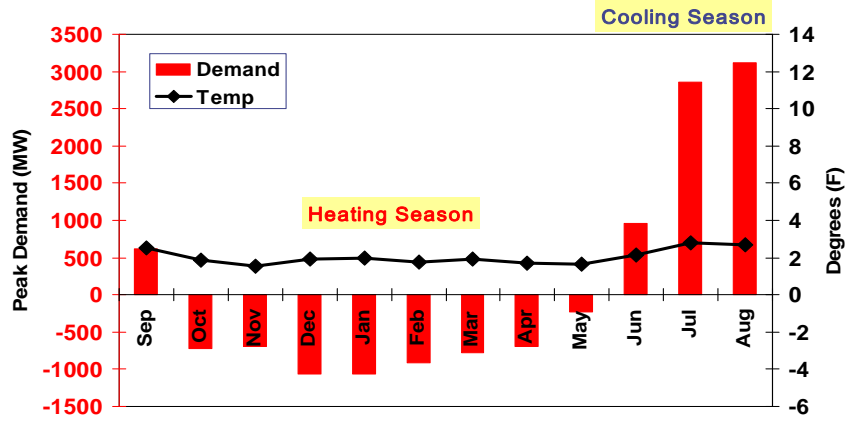


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## Temperature Effects on Demand (Peak Hour 2030)

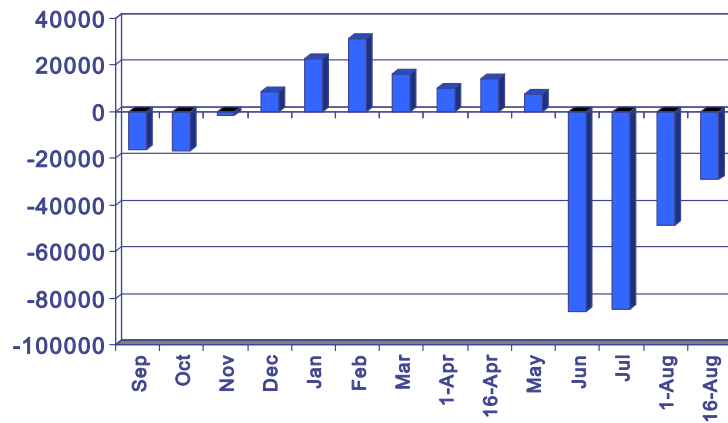


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## Change in Regulated Flow @ The Dalles Forecast for 2045



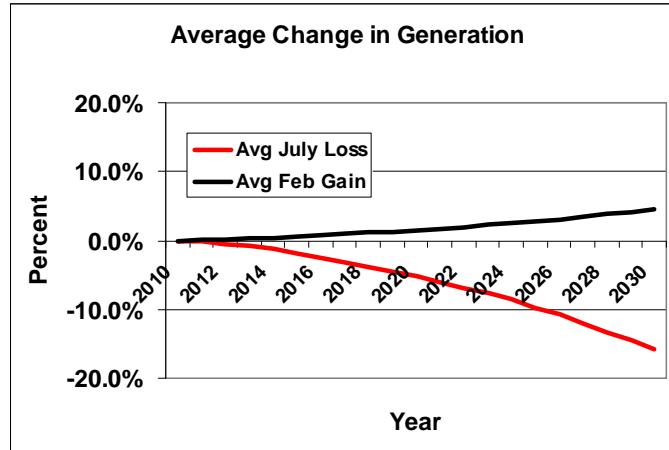
Median GCM Case

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## Projected Change in Hydro Generation (%)

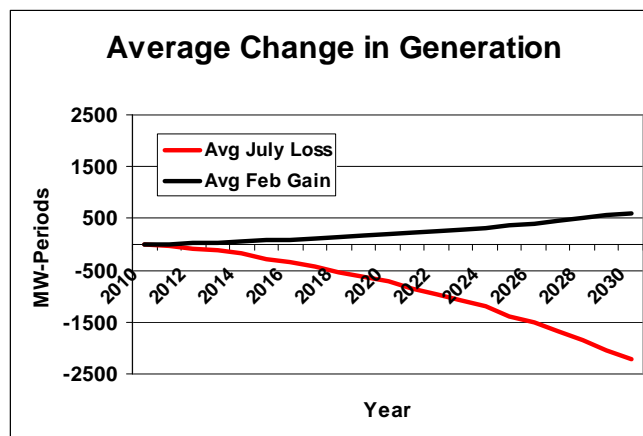


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## Projected Change in Hydro Generation (MWa)



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## Summary of Impacts

Changes to:	Winter	Summer
Flows	Higher	Lower
Demand	Lower	Higher
Impacts to:		
Power	Better	Worse
Fish	Neutral	Worse
Revenue*	Higher	Lower

\*Overall cost or benefit highly dependent on total runoff volume

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## Outline

- Climate Change Data
- Assessing impacts to the power system
- • Dealing with climate uncertainty

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## Adding Climate Change as an Uncertainty is Difficult

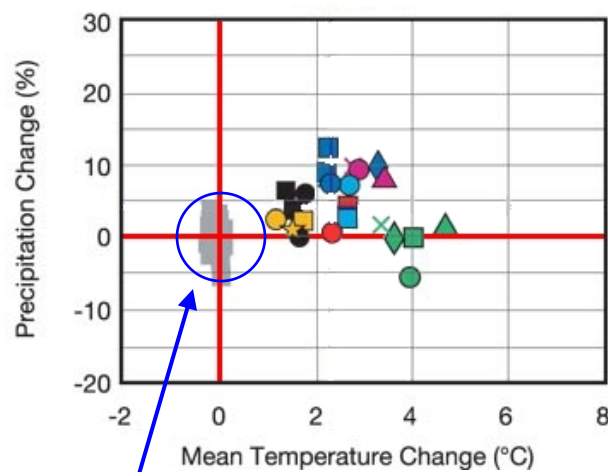
- ✓ Can incorporate climate change into the Portfolio Model as a random variable, but
- ✓ Need to know the likelihood of occurrence for each GCM scenario

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## Illustration of Uncertainty in Climate Models

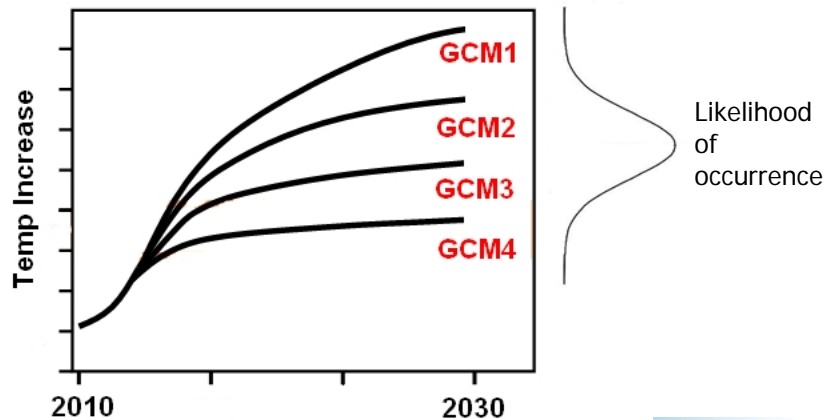


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## Draw from GCM Scenarios based on the Likelihood of Occurrence



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## Adding Climate Change as an Uncertainty is Difficult

- ✓ Need to know the likelihood of occurrence for each GCM scenario
- ✓ Also, for each year of each scenario:
  - Adjusted streamflows (70 sets)
  - Adjusted demand (70 sets)
  - Modified flood control levels (70 sets)
  - Modified refill levels (70 sets)
  - Modified max drafting limits (70 sets)

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