Water: Risks and Impacts of Changing Conditions

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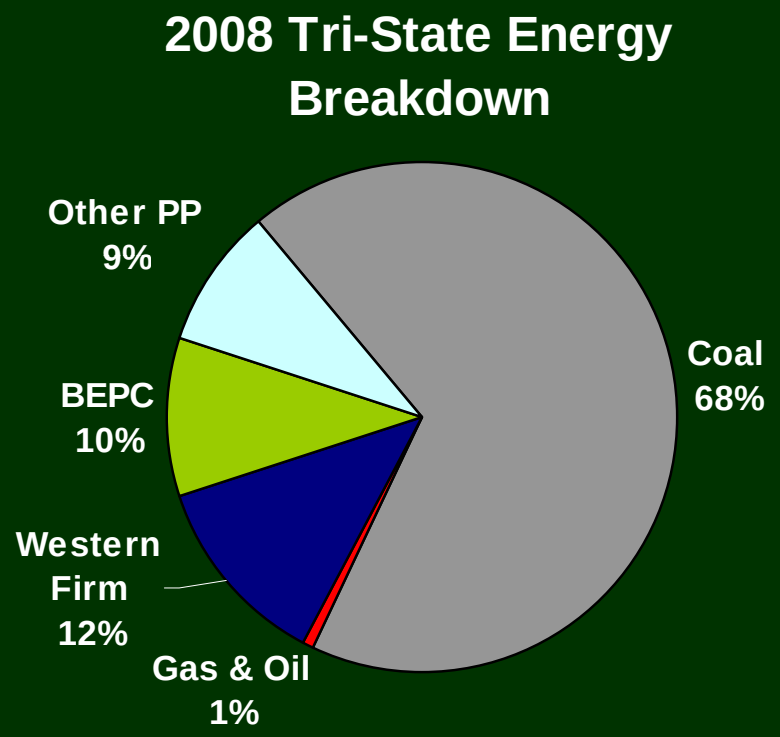
WESTERN RESOURCE
ADVOCATES

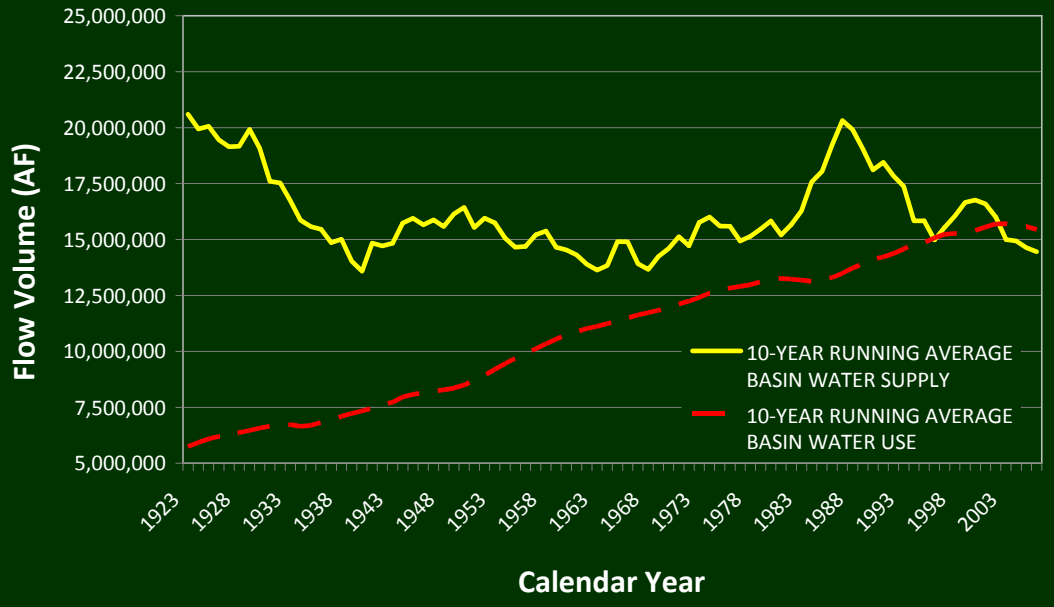
Tri-State & Water Resources

- WAPA
  - Salt Lake City Projects:
    - 236/251 MW (summer/winter)
    - 1,442 GWh (annually)
    - Energy deliveries have been reduced by drought, and may be reduced by drought in the future
  - Loveland Area Projects:
    - 348/283 MW (summer/winter)
    - 899 GWh (annually)
  - Contracts through September, 2024
- Thermoelectric Generation –
  - Plants rely on water from the Platte, Yampa, San Juan, and San Miguel Rivers



Risk: Changes in Water Supply

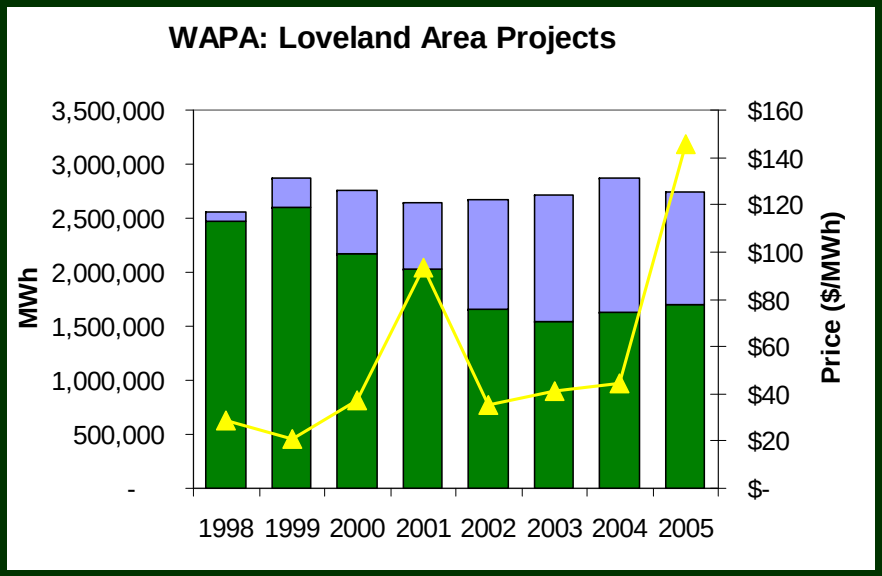
- Colorado River Basin
  - River is over-allocated and fully used.
  - New Upper Basin municipal water projects will increase water withdrawn from the river.
  - At mid-century, 23 out of 24 climate models project decreases (on the order of 5 – 20%) in runoff in the Upper Colorado.
- Loveland Area Projects
  - Climate change impacts on water supplies are less clear.

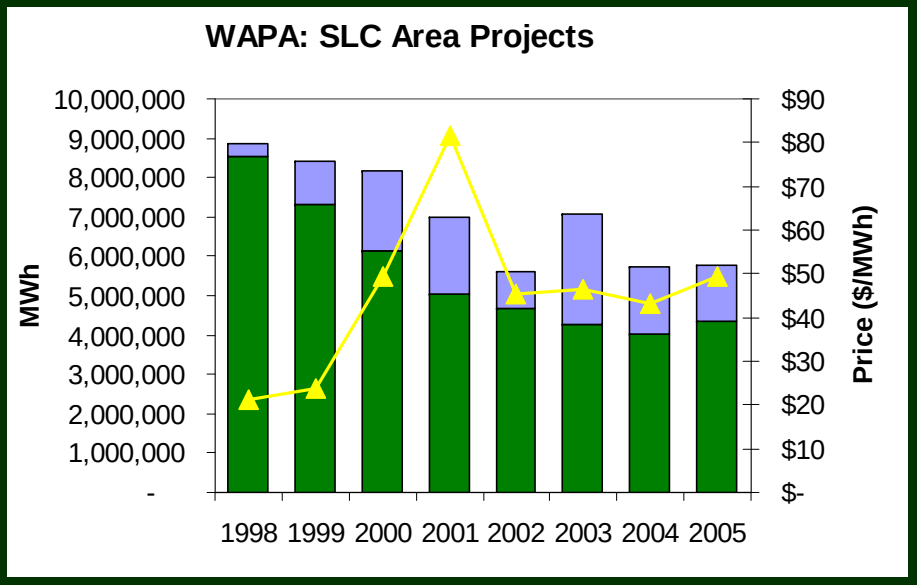


Source: Bureau of Reclamation

Impacts: WAPA Hydro Resource

- Drought has reduced hydroelectric generation for SLC and Loveland Area Projects.
- Climate change-driven drought and new municipal diversions will likely reduce future hydroelectric generation.
- Reduced hydro generation leads to increased power purchases, with potentially higher costs for market purchases and greenhouse gas emissions.

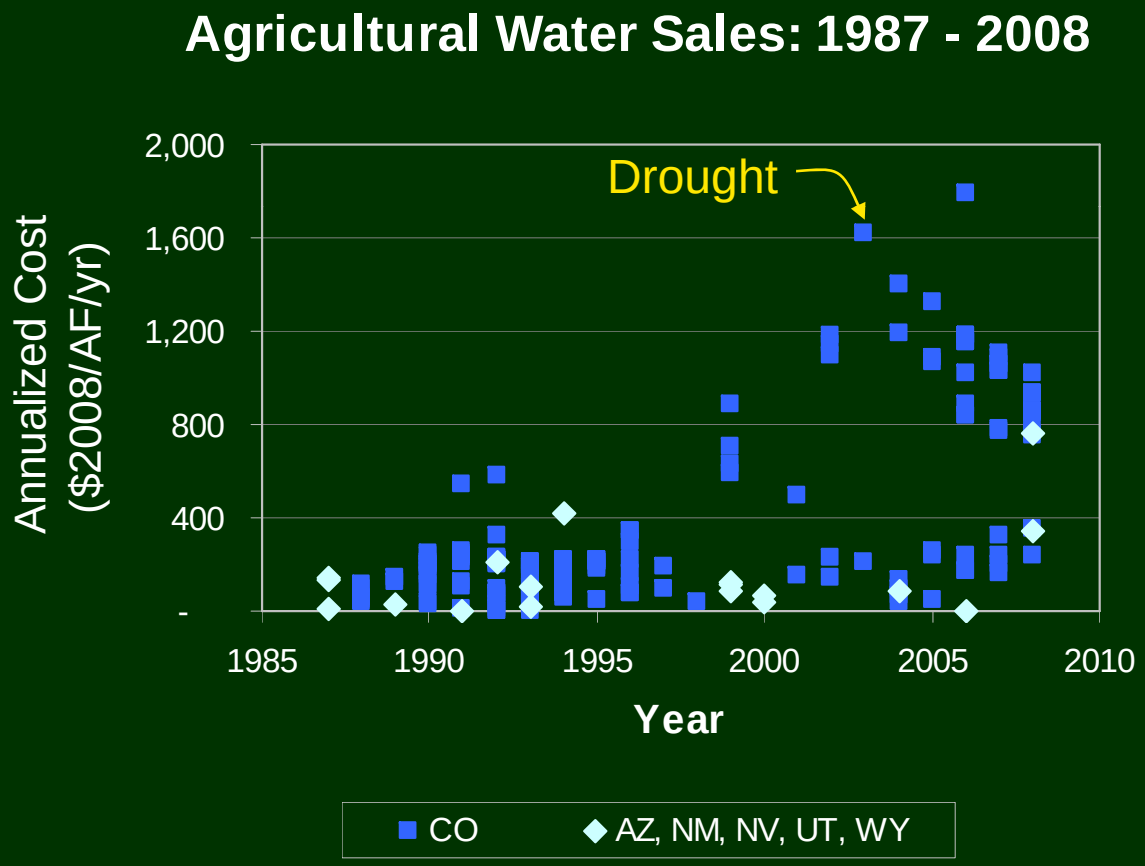




Net generation | WAPA Purchases | Purchased Power Price

Risk: Cost of Water

- The cost of water has risen in recent years
- Median annualized cost ranges from $16/AF/yr in WY to $350/AF/yr in NV
- Prices spiked in Colorado with population growth, the drought in 2002/2003
- History offers clues to future trends in the price of water
- Water transfers create political issues, especially in Colorado



Impacts of Drought on Thermoelectric Generation

Drought Scenario Impacts

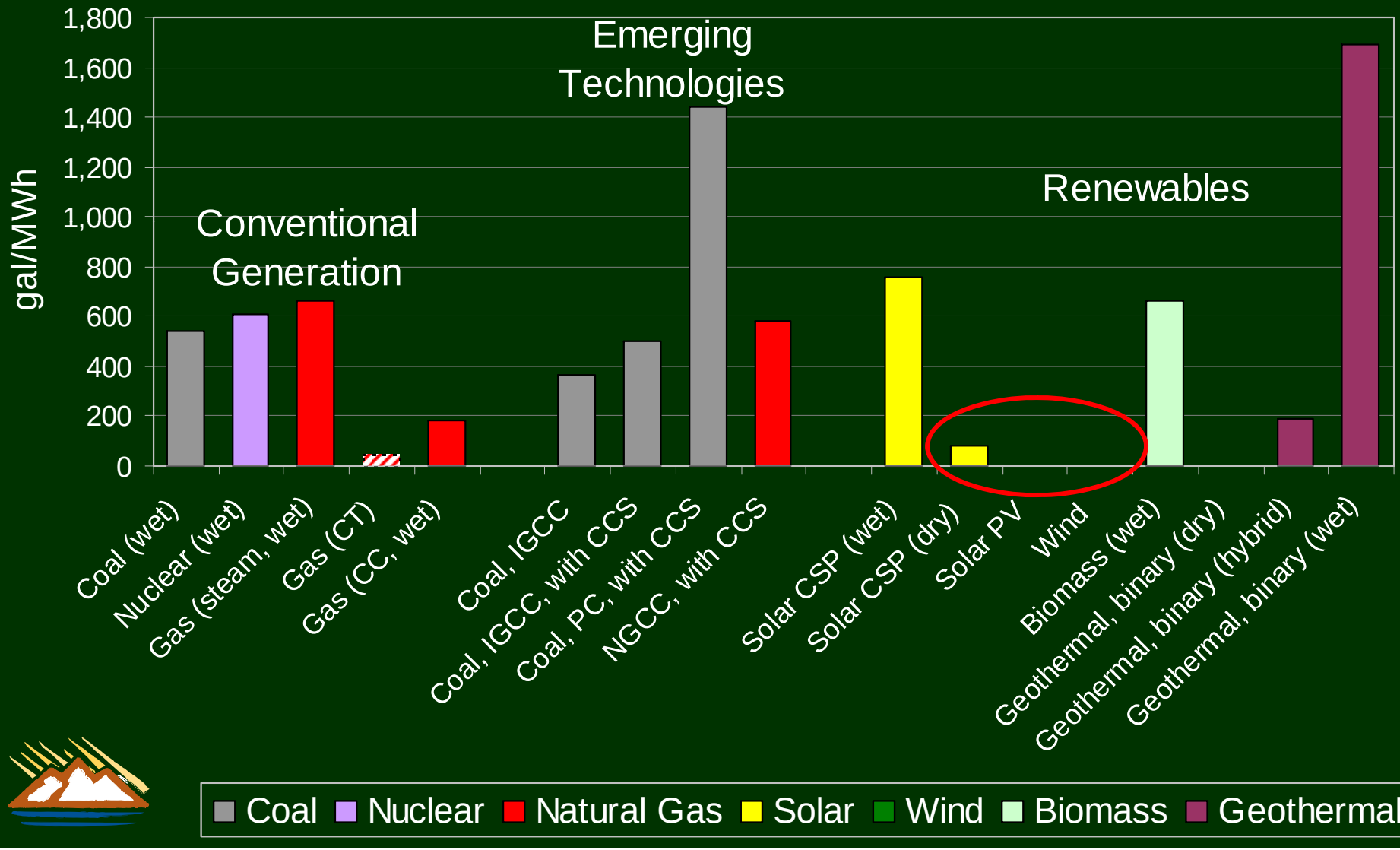
Coal Generation: Decreased
Gas Generation: Increased
Hydro Generation: Decreased
Renewable Generation: No change
Energy Not Served: Increased
Electricity Cost: Increased, especially in summer months (by as much as 30%)
CO_2 Emissions: Increased

- *Actual* impacts will depend on water rights and other factors.
- *Long-term, technology choices can act as a hedge against drought*

NETL: *An Analysis of the Effects of Drought Conditions on Electric Power Generation in the Western United States, 2009.*

Managing Risk

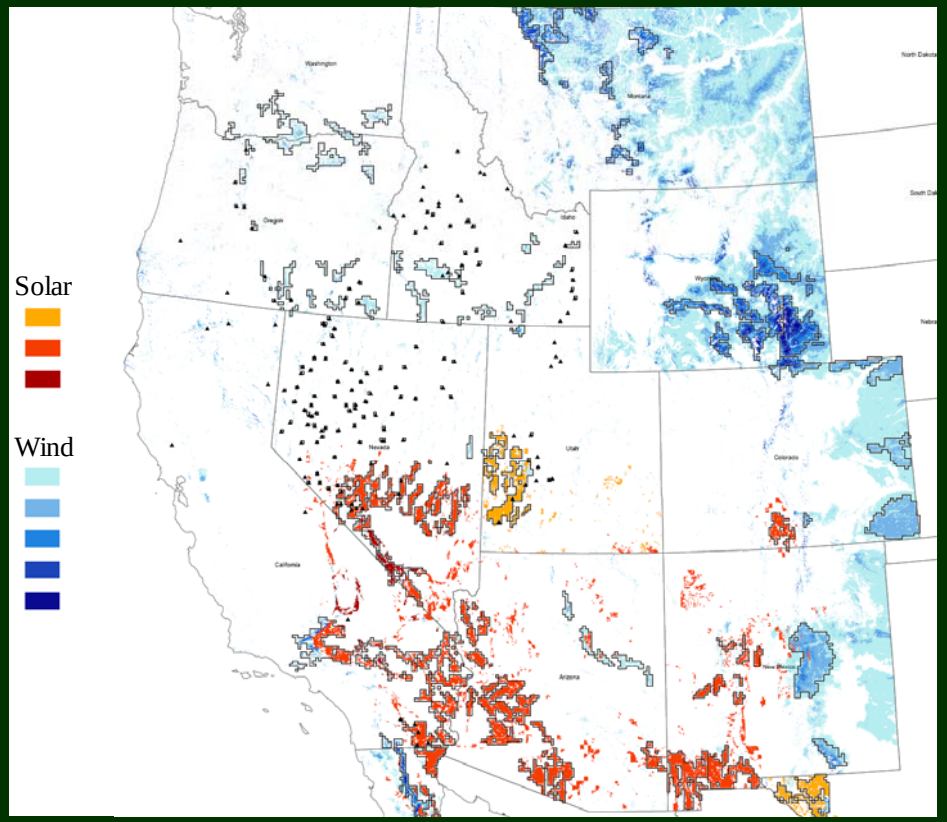
Water Intensity of Electricity Generation



Managing Risks – Resource Selection & Planning

Robust Resources

1. Energy efficiency
   - reduces/delays the need to develop new power plants that would use water.
   - Some measures save water (e.g. showerheads)
2. Certain renewables
3. Dry/hybrid cooling systems



Planning & Siting

1. Transmission Lines
   - Avoid wetlands, riparian areas
   - Coordinate with WGA planning efforts that may include drought scenarios
2. Thermal facilities
   - Minimize impacts on stream flows

Summary

✓Water is a scarce and valuable resource

✓As climate change advances and the West's population grows, water will become scarcer and more valuable

✓Short- and long-term drought can directly impact:

- WAPA hydro
- Thermal facilities

✓Secondary impacts: increased reliance on natural gas and market purchases, higher electricity costs, reduced reliability, and increased CO_2 emissions

✓Water quality & wildlife issues - new generation and transmission lines should avoid wetlands and riparian areas, and minimize impacts on streamflows