

At the Confluence: Energy, Water, and Climate Change in the South Platte Basin

**South Platte Forum
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WESTERN RESOURCE
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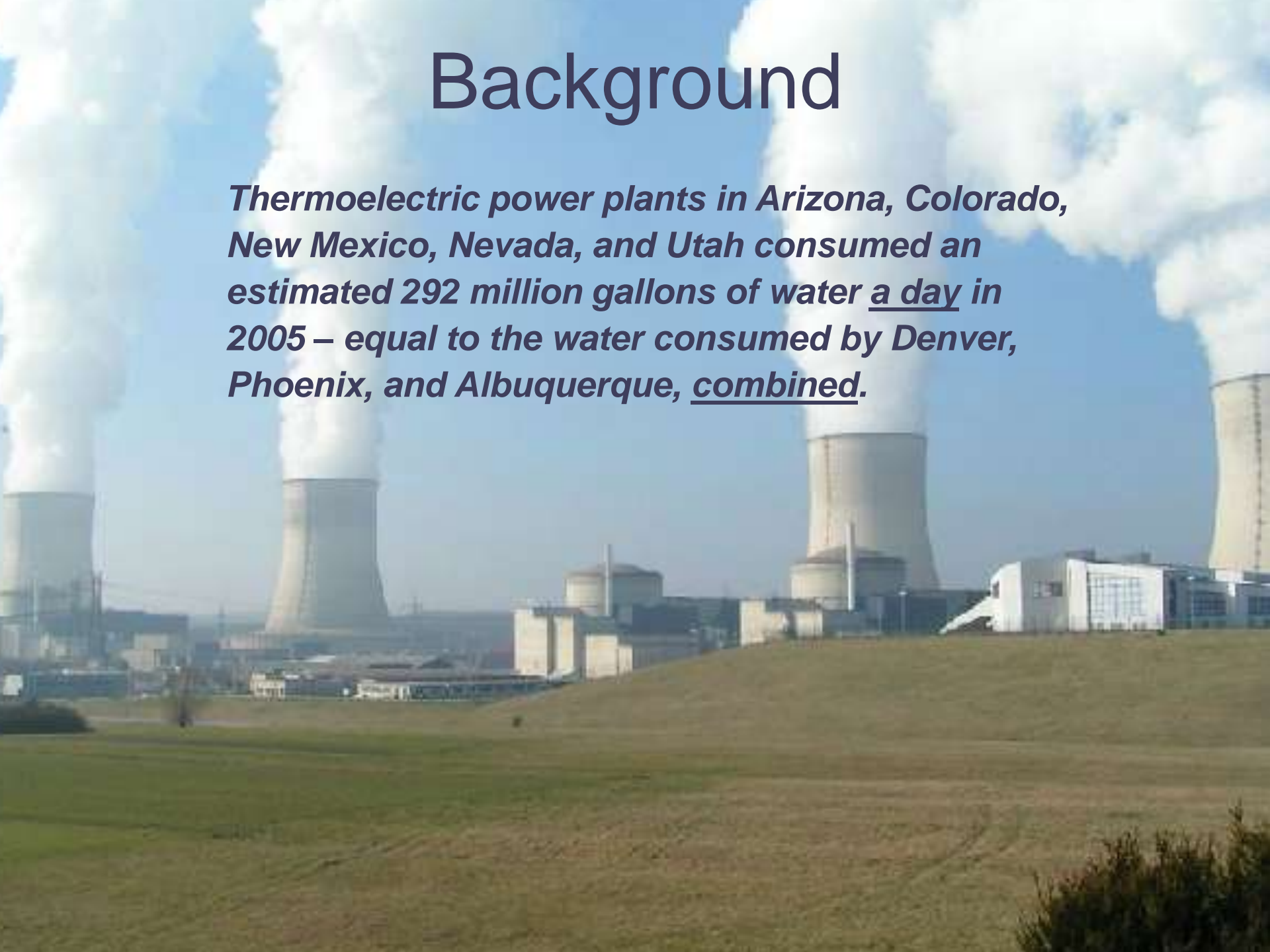
Outline

- Background
- South Platte Study
 - Energy demands
 - Climate change impacts
 - Municipal demands
 - Impacts on Agriculture
- Impact on decision-making?
- Recommendations

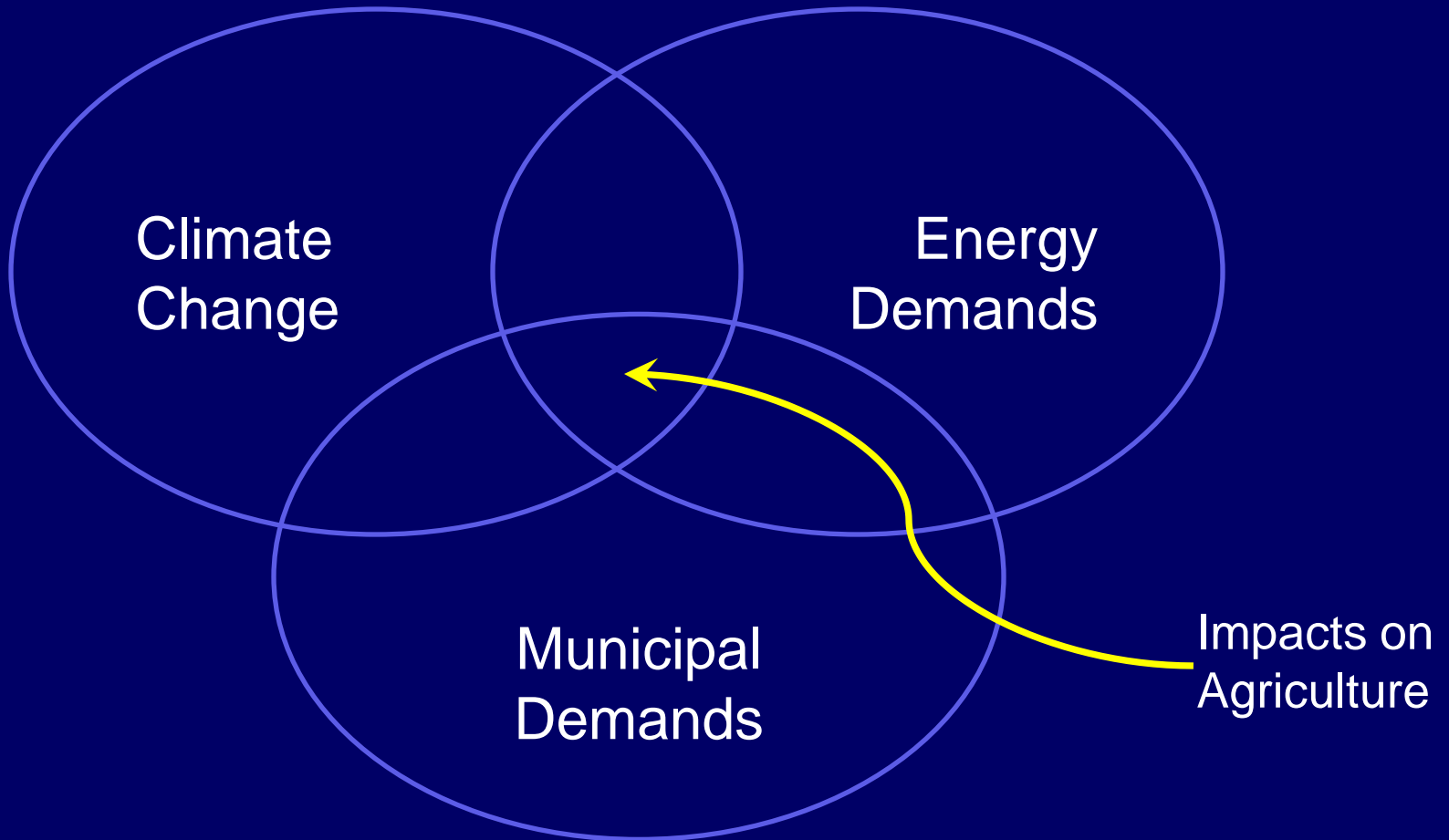


Background

Thermoelectric power plants in Arizona, Colorado, New Mexico, Nevada, and Utah consumed an estimated 292 million gallons of water a day in 2005 – equal to the water consumed by Denver, Phoenix, and Albuquerque, combined.



Background

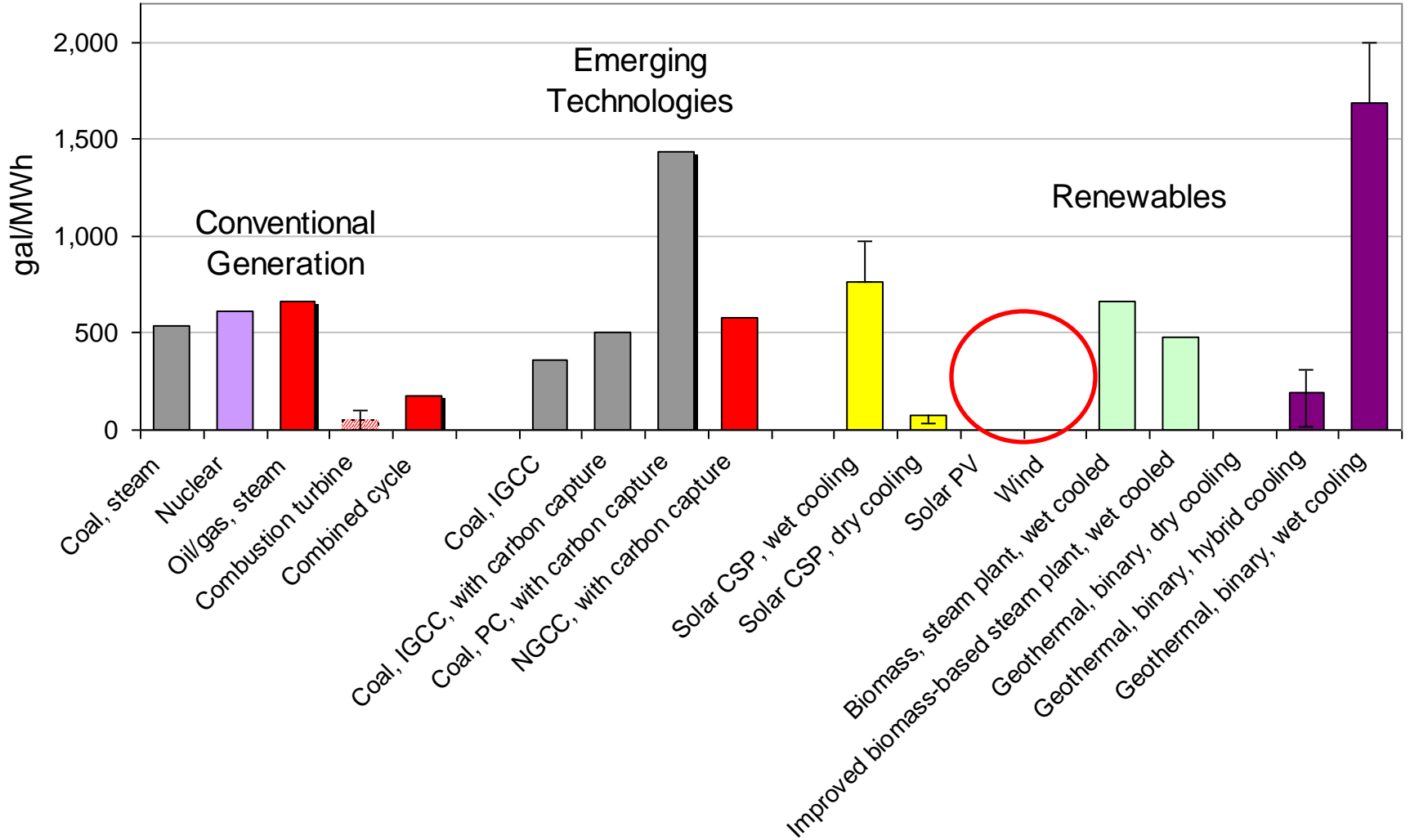




Graphic: USGS. National Water Quality Assessment Program, South Platte River Basin. Accessed April 5, 2011. <http://co.water.usgs.gov/nawqa/splt/>



Water Intensity of Electricity Generation



Coal
 Nuclear
 Natural Gas
 Solar
 Wind
 Biomass
 Geothermal

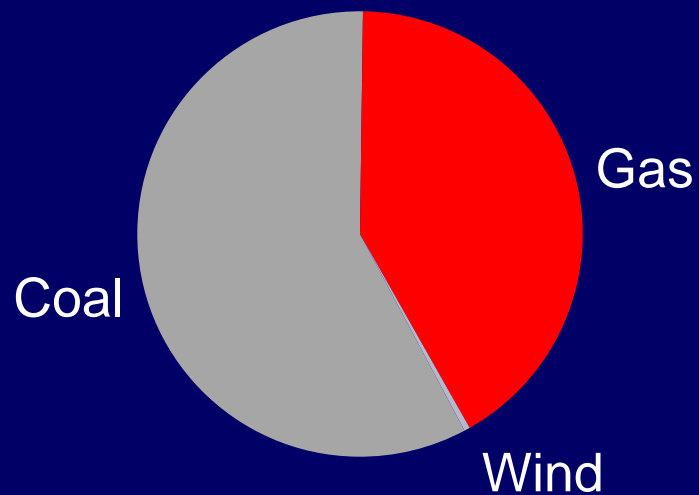


Power Plants in the South Platte



Energy Scenarios

1. Reference case
2. High wind
3. High gas
4. IGCC coal with CCS



Energy Scenarios – Reference Case

- Based on Colorado's Clean Air, Clean Jobs Act (2010)
 - Retire/repower/retrofit ~900 MW of coal plants on the Front Range (incl. Cherokee, Valmont, Arapahoe)
 - “Free up” 5,200 AF of water
- Assumes: older coal plants convert to using natural gas.



Energy Scenarios

High Wind:

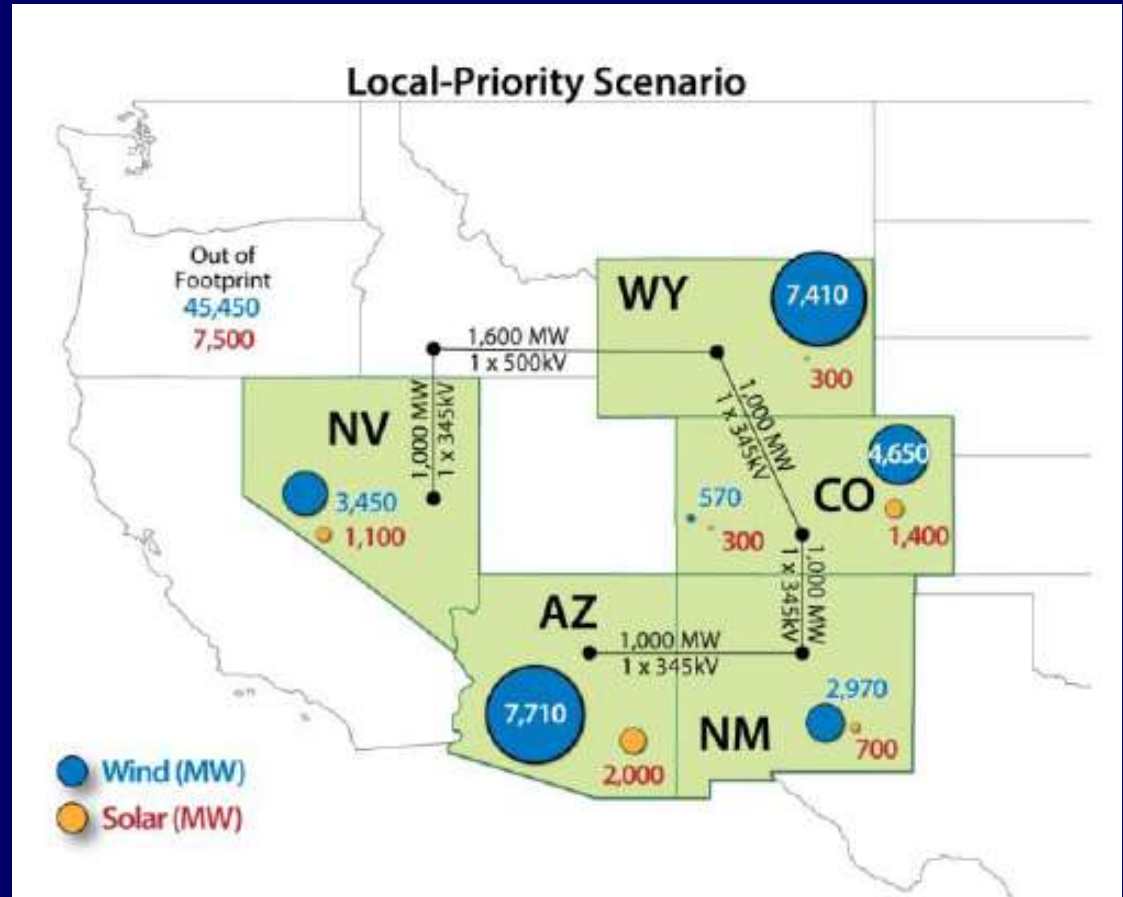
- Colorado exports wind to other states
- Additional transmission (if needed) exists

Gas:

- Colorado exports energy from gas plants

Coal:

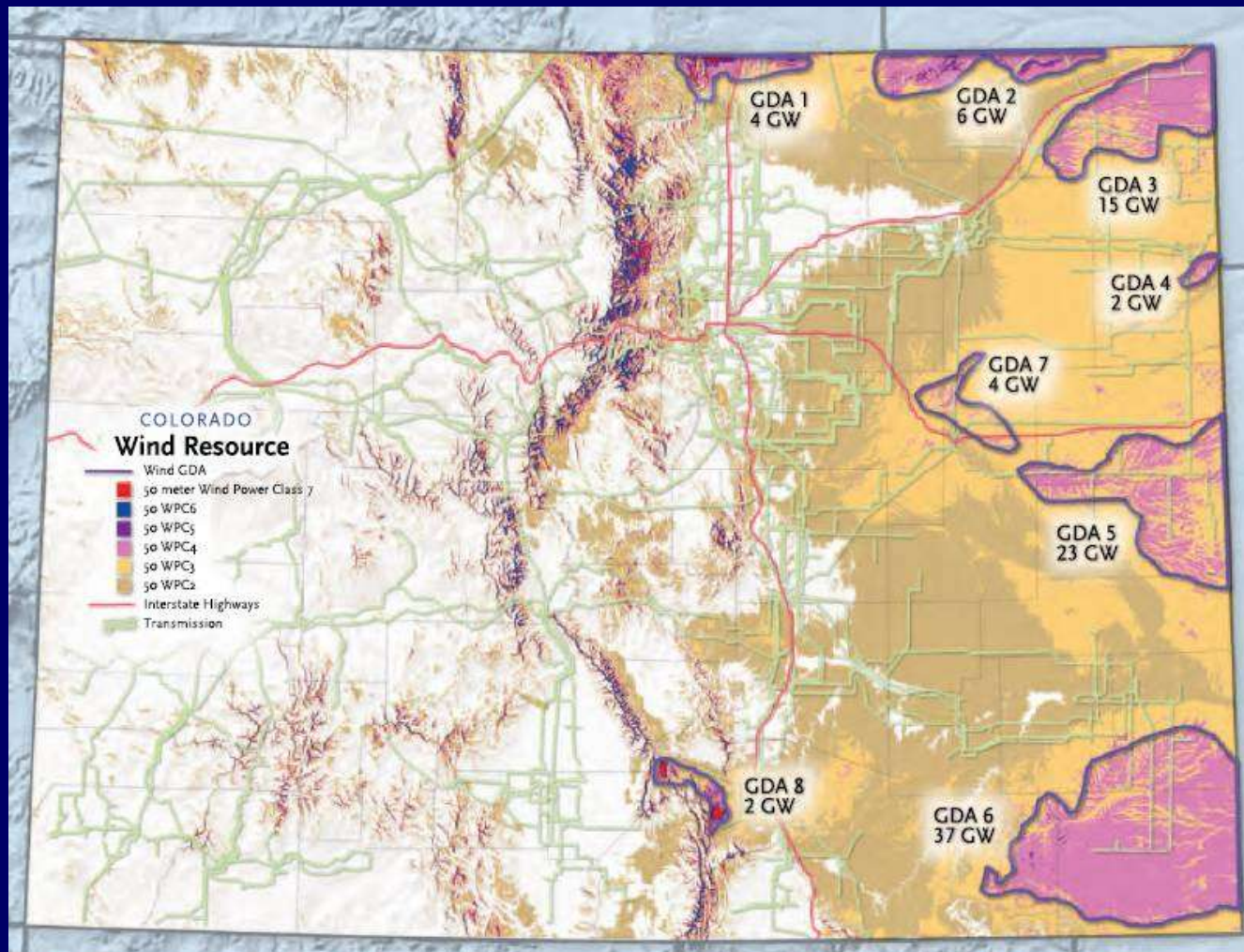
- Colorado exports energy from IGCC plants with CCS



Western Wind and Solar Integration Study, National Renewable Energy Lab
<http://www.nrel.gov/wind/systemsintegration/wwsis.html>



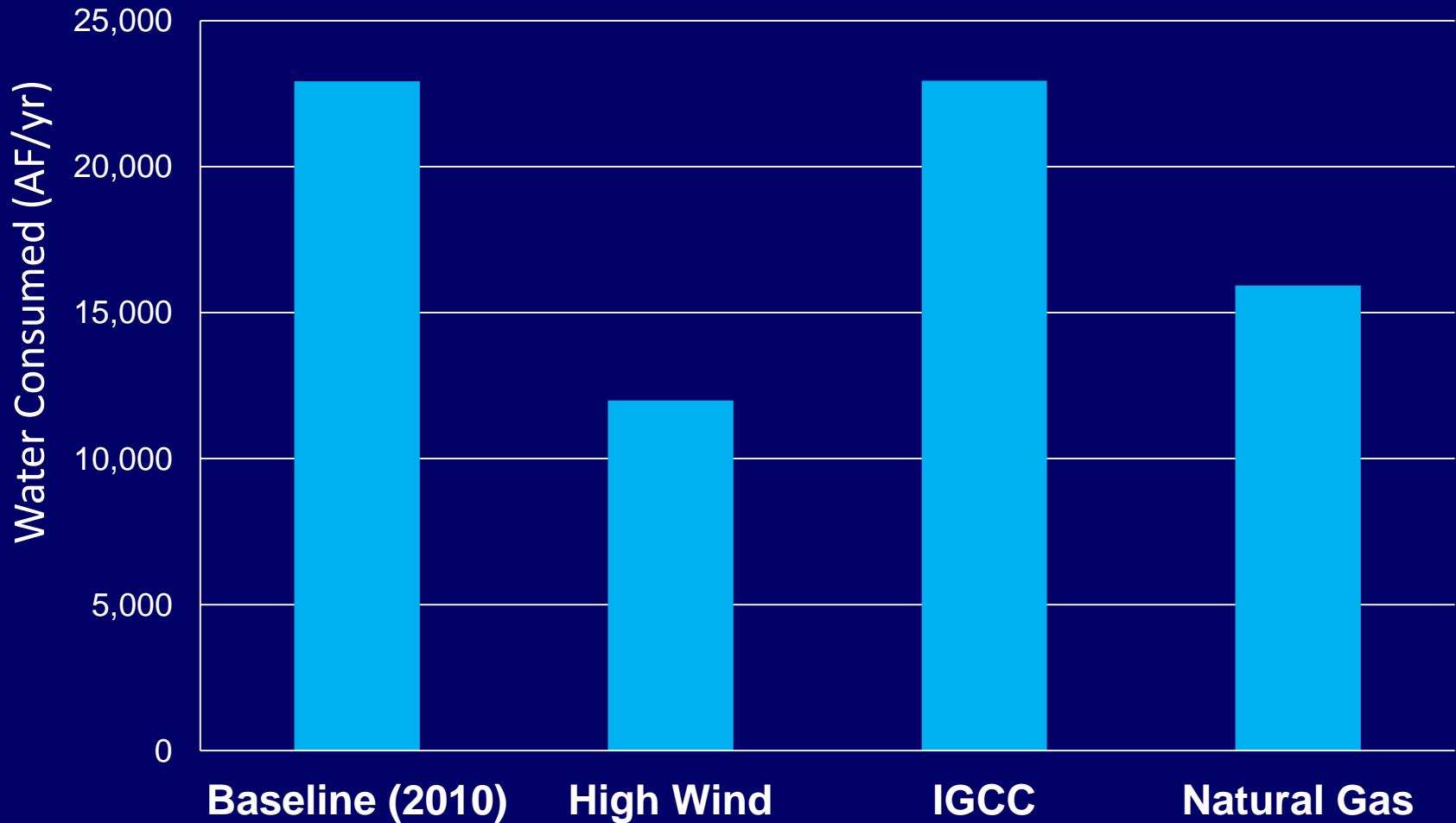
Electricity: Renewable Potential



**Total Capacity:
96 GW**



Water Use: Energy Scenarios

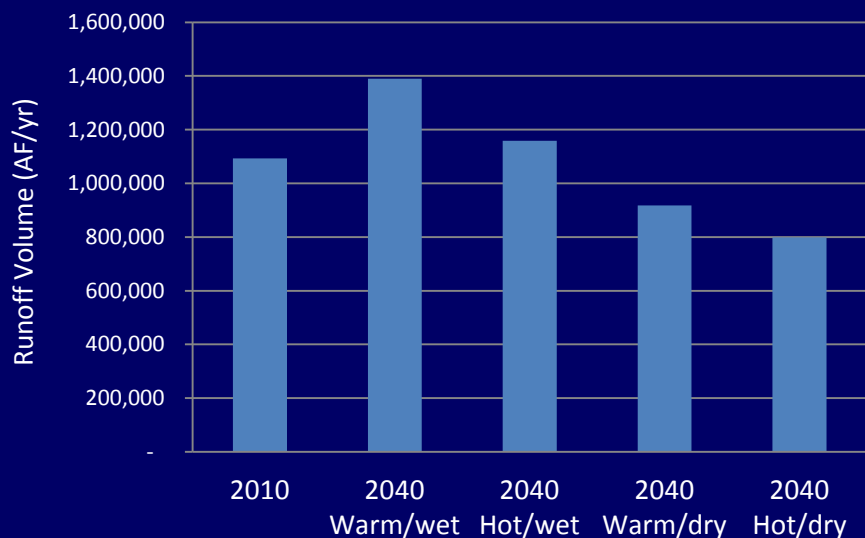


Climate Impacts & Municipal Growth

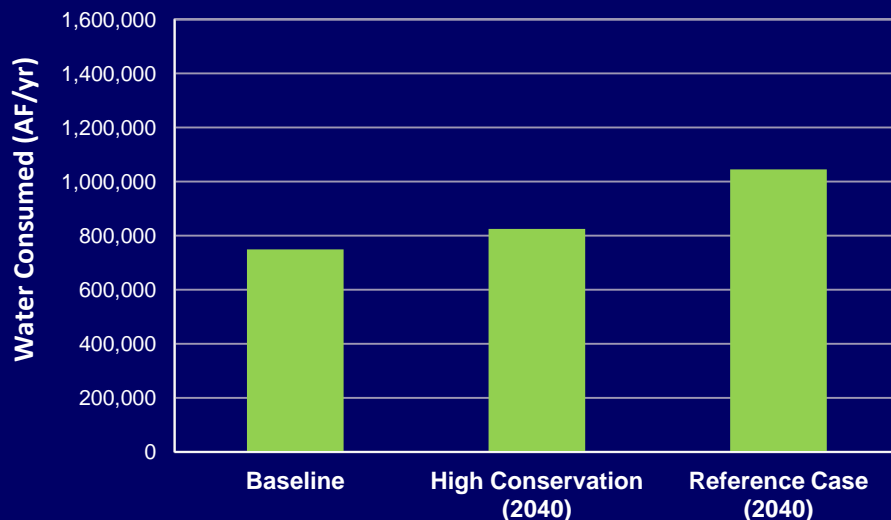
- Data from Joint Front Range Vulnerability Study
- SACRAMENTO hydrology model

- Based on CWCB's *State of Colorado 2050 M&I Water Use Projections*
- Reference Case reflects passive conservation only
- "High Conservation" - 127 gpcd in 2040

South Platte Runoff

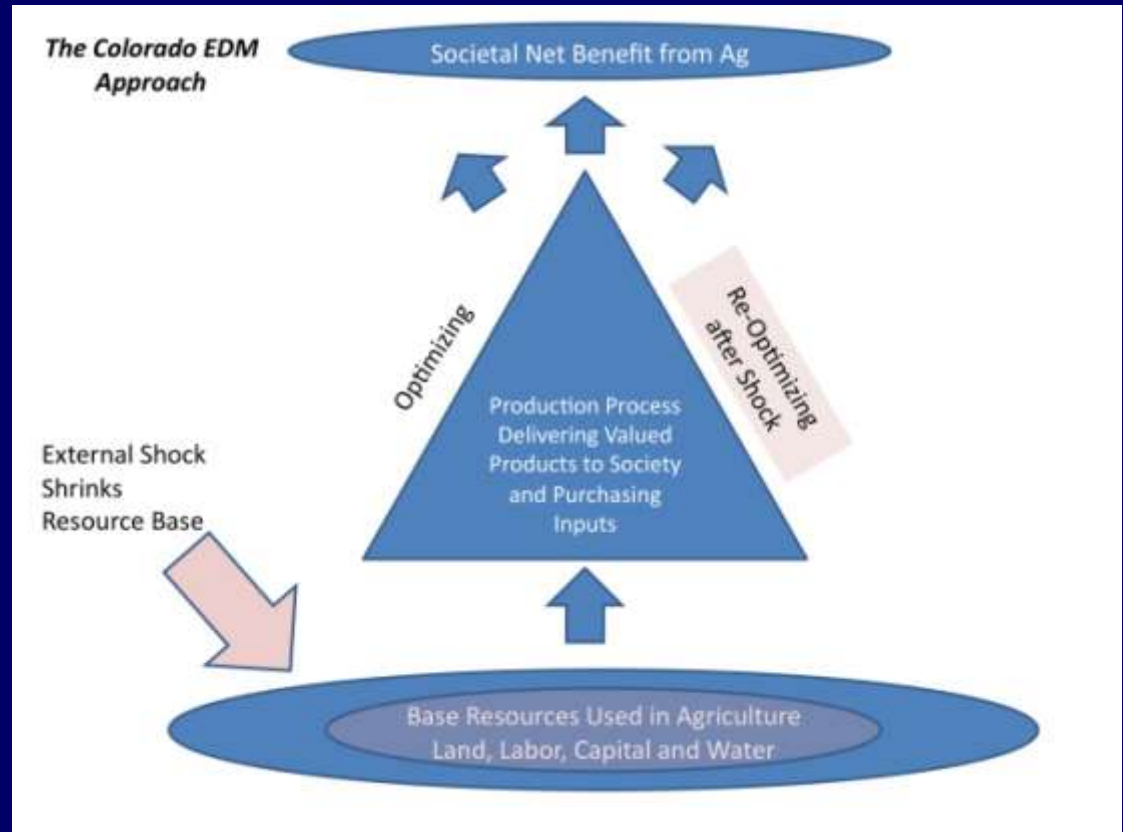


Water Use: Municipal Scenarios



Impacts on Agriculture

- Model by CSU
- Water availability is used to “shock” the model
- Assumes “profit maximizing behavior”



Relevance?

- WGA and WECC – long range transmission planning
- Colorado PUC decisions
- Energy utilities' resource planning



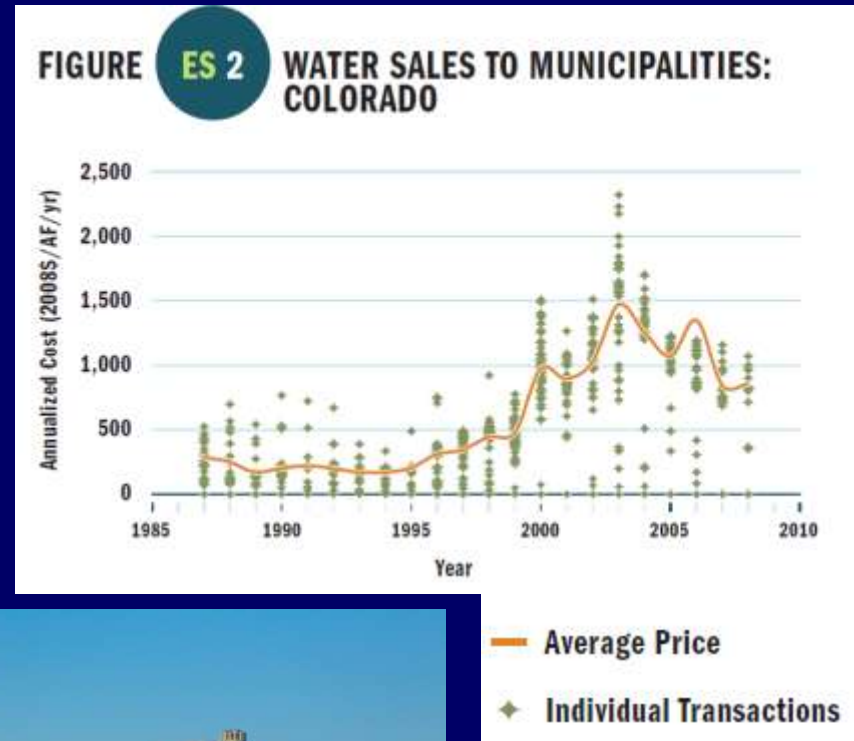
Colorado Energy-Water Policies

- Amendment 37 – Colorado’s Renewable Energy Standard
 - Utilities report water use in resource plans
 - Xcel’s proposed solar plant – dry cooled
 - Water cited in past PUC decisions
-
- Next steps: value water used for power generation



Energy Decisions: Incorporating Water

- *Competing uses*
- *Scarcity*
- *Risk*
- *Cost/Value*



Municipal Water Policies

Conservation saves energy
and water

Example:

SNWA's "cash for grass" program
saves

- 77,000 AF/yr
- 160,000 MWh/yr
- 86,300 tons CO₂/yr

Indoor conservation would save
more energy

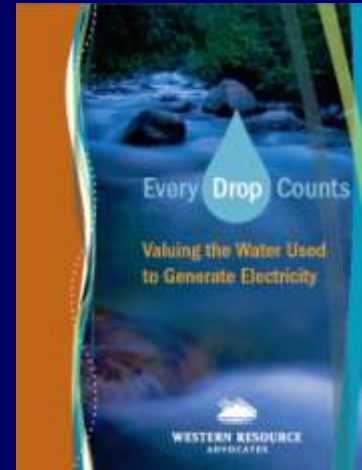
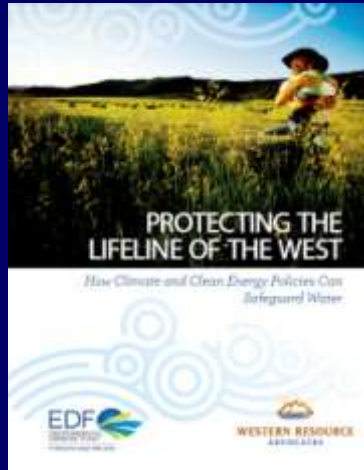


Key Recommendations

- ✓ Renewable energy
- ✓ Conservation & efficiency
- ✓ Recycled water
- ✓ Flexible leasing arrangements
- ✓ Value water and energy accurately



Thank you



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