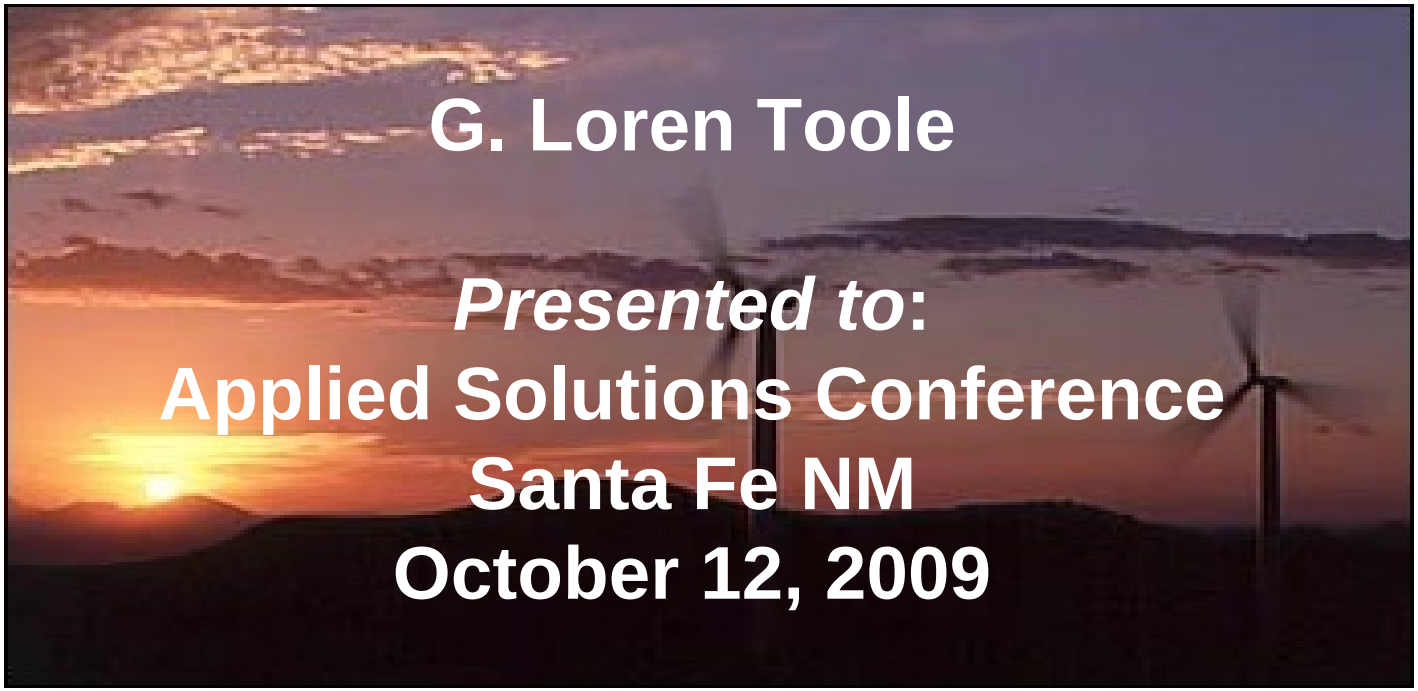
Electric Infrastructure, Local Utilities, and ROI of New Infrastructure



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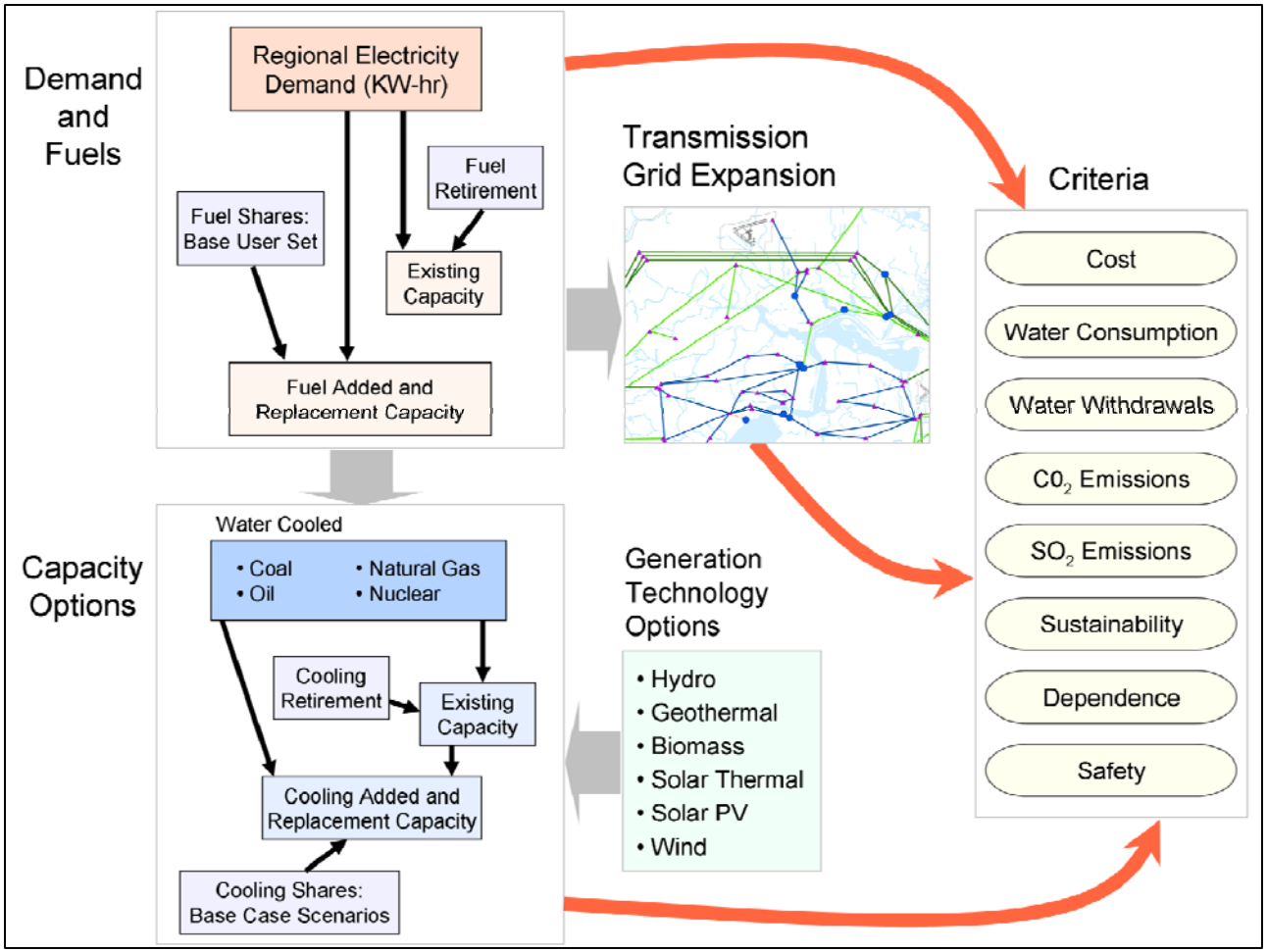
NEXUS Energy-Water Study

- *NEXUS* focused on identifying ***sustainable electric generating and delivery resources*** in the 14-state Western US region
- ***Goal:*** Analyze interdependencies in electric and water supply infrastructure
- ***Four scenarios were evaluated***
  [1] Business as usual
  [2] Increase renewable energy to 25%
  [3] All new generation nuclear with dry cooling
  [4] “Super Grid” with no transmission bottlenecks

NEXUS Model and Process

Integrated Energy Analysis including Supply-Demand, Emissions, Delivery, Fuels/Water, and New technology



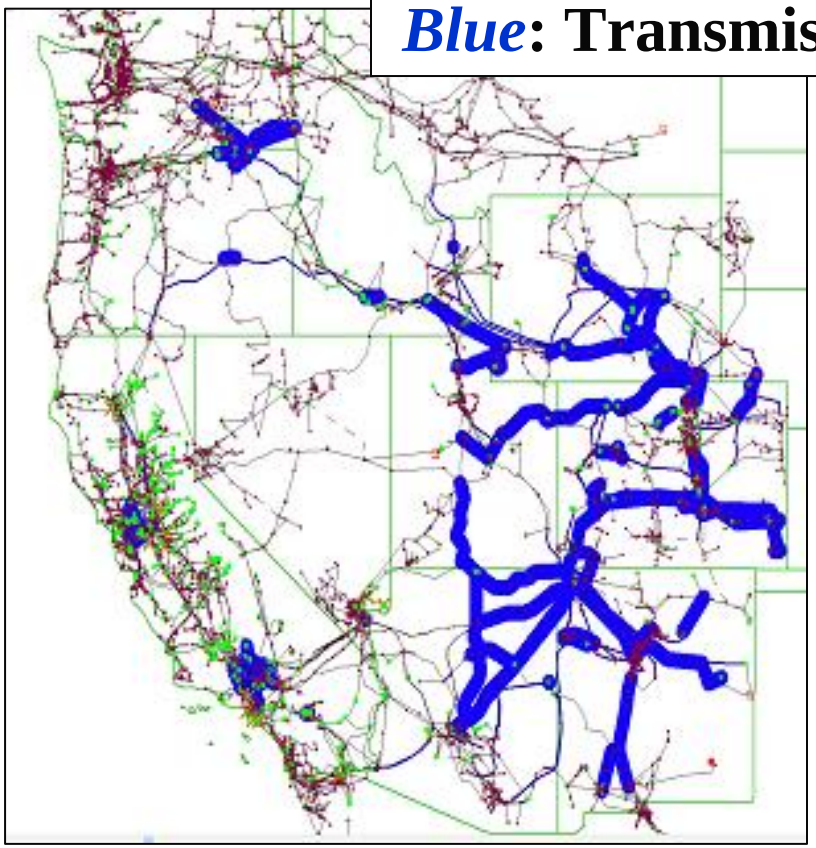
Process developed collaboratively by Los Alamos, Sandia and Argonne National Laboratories

NEXUS Evaluation Criteria and "ROI"

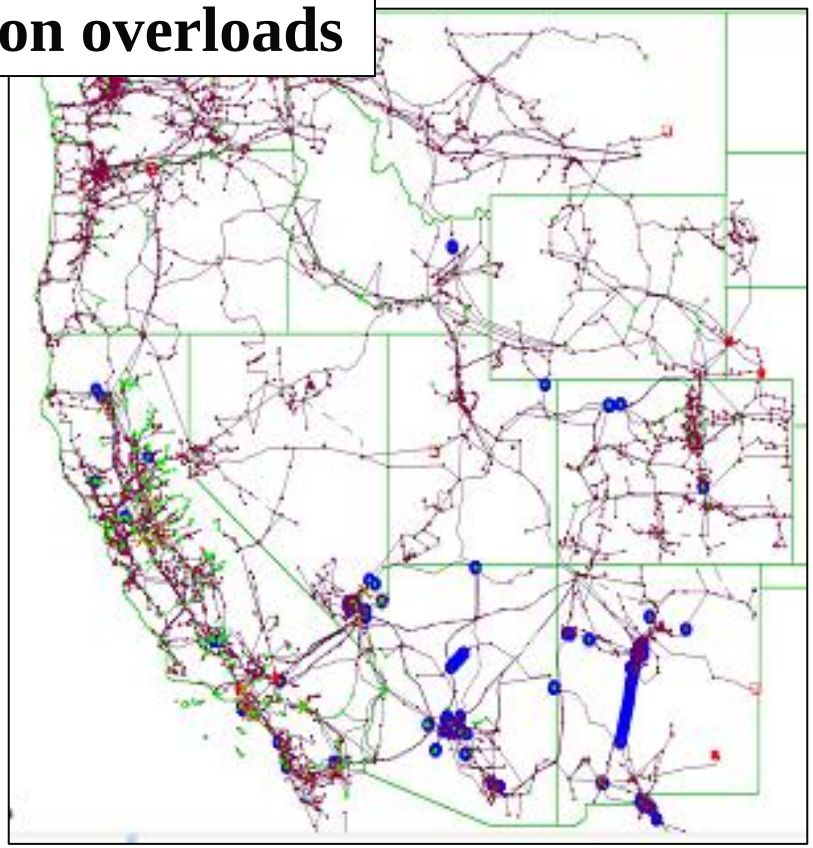
- Eight weighted criteria were simultaneously applied
- Method included ***pair wise comparisons*** for ranking the importance of each criterion
- ***Observation:*** Classic Return-on-Investment (ROI) analysis does not usually include complex decision variables such as Sustainability, Dependence and Safety
- "Sustainability" requires a ***new ROI formulation*** incorporating qualitative factors, policy drivers, and other non classic decision variables

Example: Western Electric Grid 2025

***Blue*: Transmission overloads**

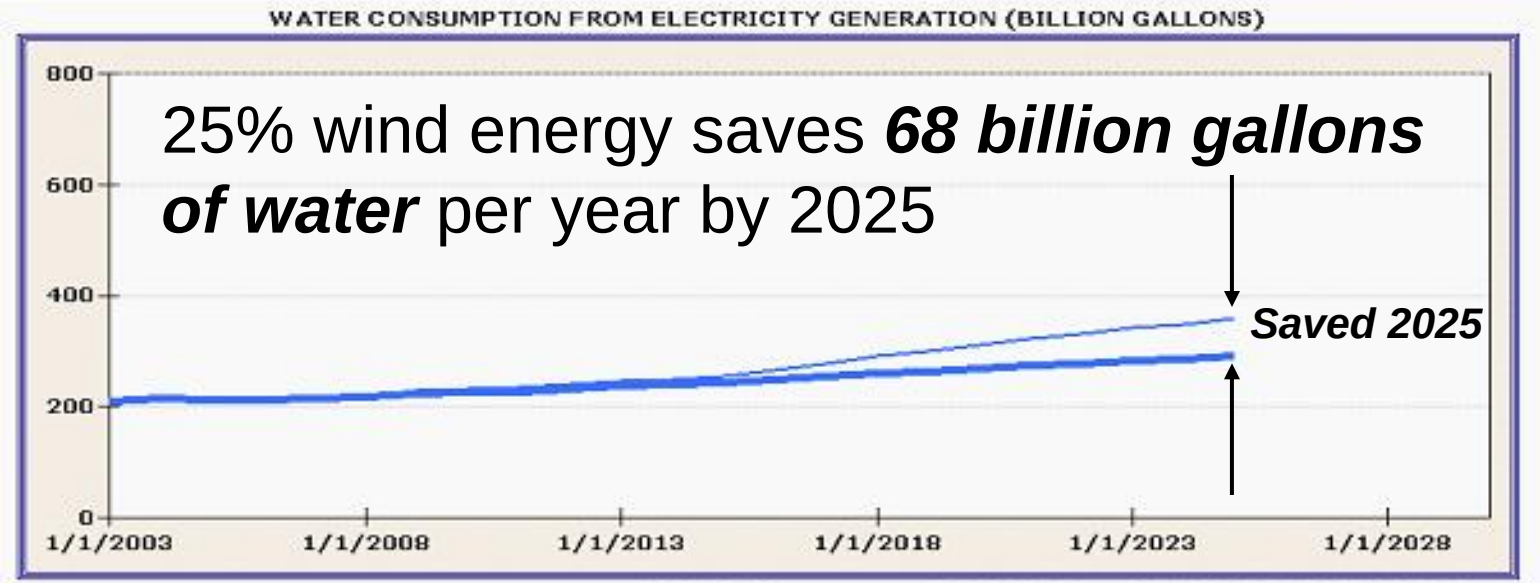


25% wind energy



No added wind energy

Example: Western Water Usage 2025



WATER CONSUMPTION (BILLION GALLONS)

	COAL	OIL	NATURAL GAS	NUCLEAR
ONCE THROUGH	0.33	0.02	0.00	8.12
WET	82.38	0.22	10.01	11.97
POND	176.24	6.36e-3	1.91	0.00
DRY	0.00	0.00	0.00	0.00
HYBRID	0.00	0.00	0.00	0.00

NEXUS Study Results

- Technology options exist for ***reducing water intensity and increasing electric power sustainability*** in the Western US by 2025
- Full realization of NEXUS would require regulations, and will result in consumer electricity cost increases, ***plants using less water cost more to build and will use more fuel***
- Climate change resulting in higher ambient temperatures will force the entire western US to accelerate ***new electric capacity additions while minimizing water use… a Catch 22***