Disclaimer

Attribution

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Solutions for Today | Options for Tomorrow

The 2018 Water Brief

Crosscutting Annual Review Meeting

April 10th, 2019

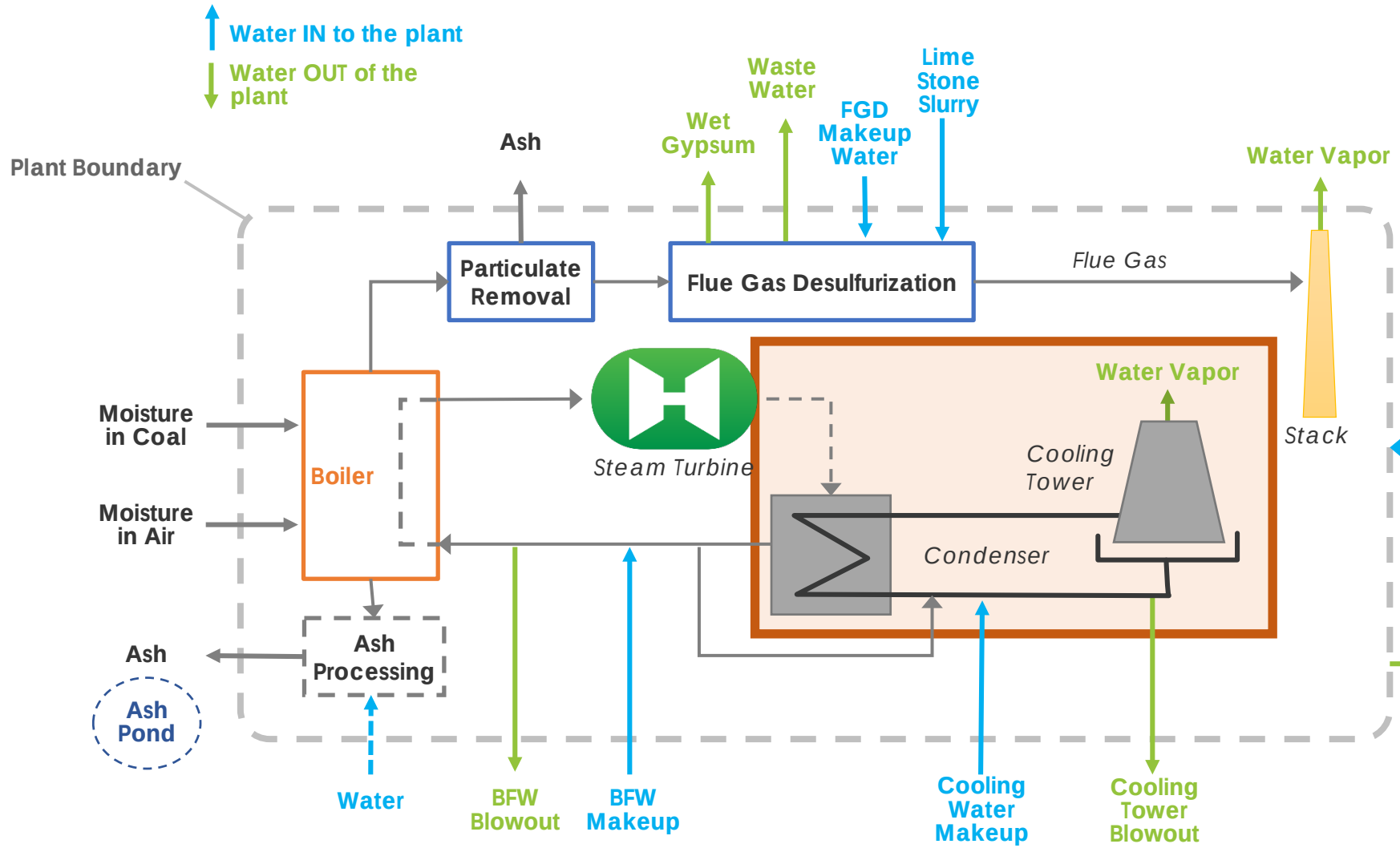
Jocelyn Kate Mackay

Energy Engineer

National Energy Technology Laboratory

KeyLogic Systems

Water Use in Power Plants



Integrated System Studies

Plant Level and Existing Fleet Water Availability

(e.g. surface water, ground water, brackish water)

Water Demand

(e.g. power, agriculture, municipal, industry)

Water Source
(river, lake, municipal system)

Water Reuse

Recent Energy-Water Legislation

Energy and Water Research Integration Act of 2019

H.R. Bill 34, tasks DOE with creating strategic plan that integrates water considerations by —

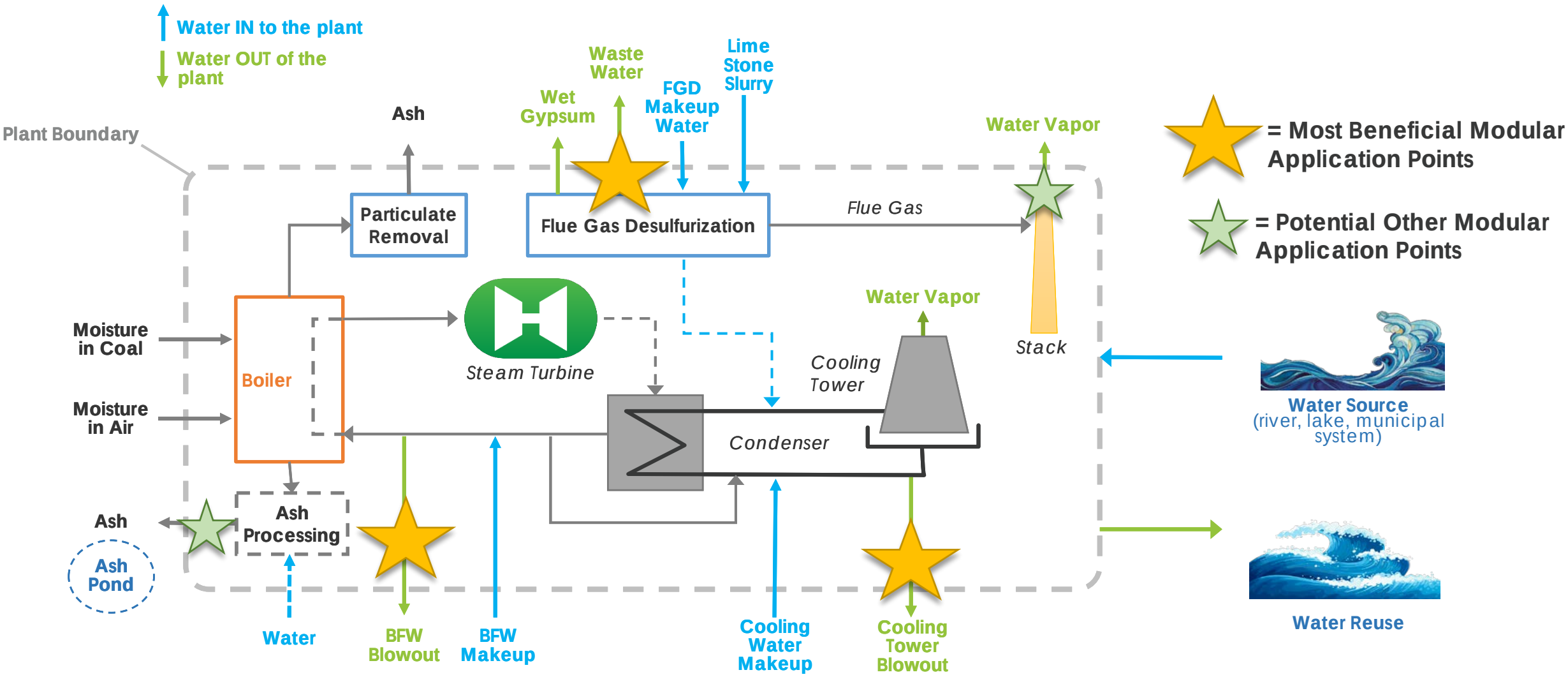
- Advancing technologies that:

  1) Minimize freshwater withdrawal and consumption

  2) Increase water use efficiency

  3) Utilize nontraditional water sources

Modular Treatment Systems Applications



Crosscutting Water Management Goal

Mission: Provide **leadership,** raise **awareness,** and offer **cost-effective technical solutions** regarding potential national **issues** in **water quality and availability**.

How?

Projections:
national perspectives, temperature extrapolations, models

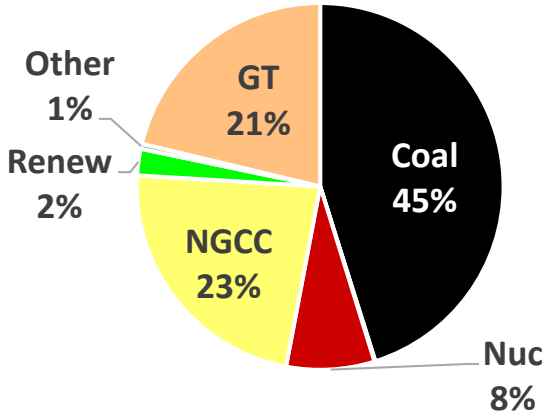
Pinch Points:
Identifying and analyzing regions, recommending R&D technologies

Strategies to Reduce Risk:
management techniques, automation, advanced R&D suggestions

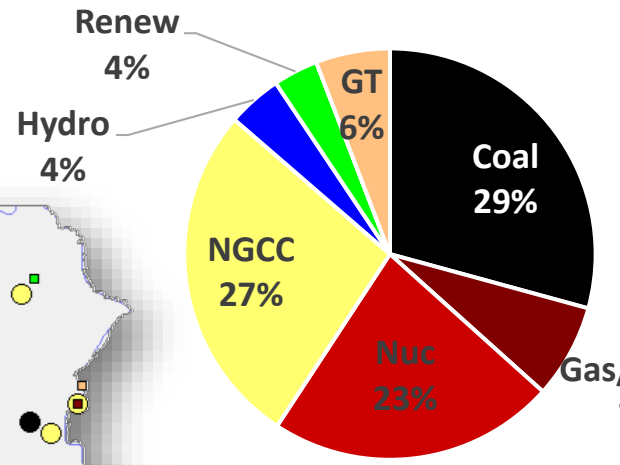
Tri-State Capacity

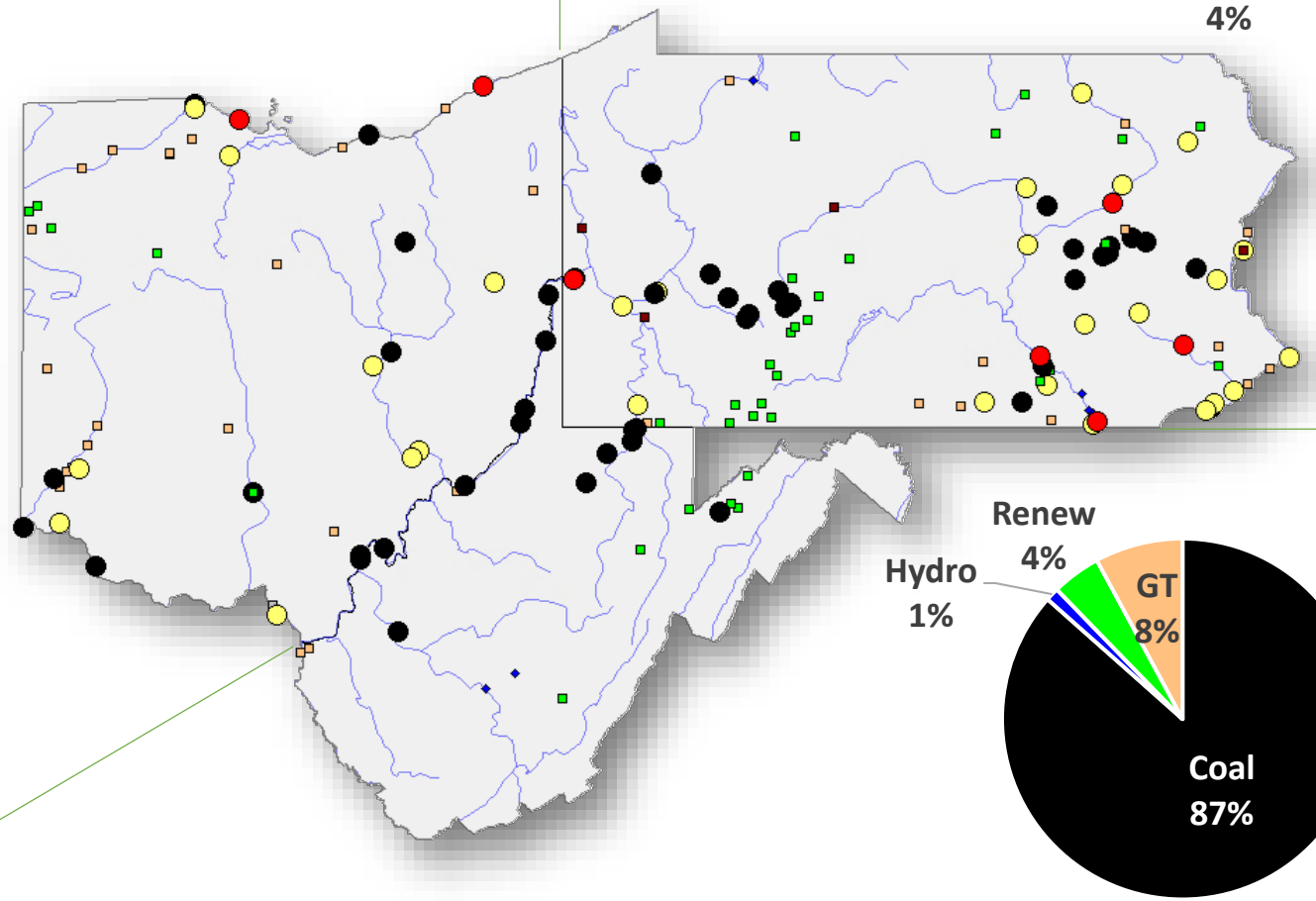
Thermoelectric dependence on water

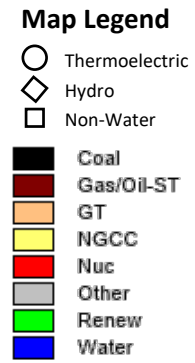
OH – 76% Capacity is Thermoelectric



PA – 86% Capacity is Thermoelectric







WV – 87% Capacity is Thermoelectric

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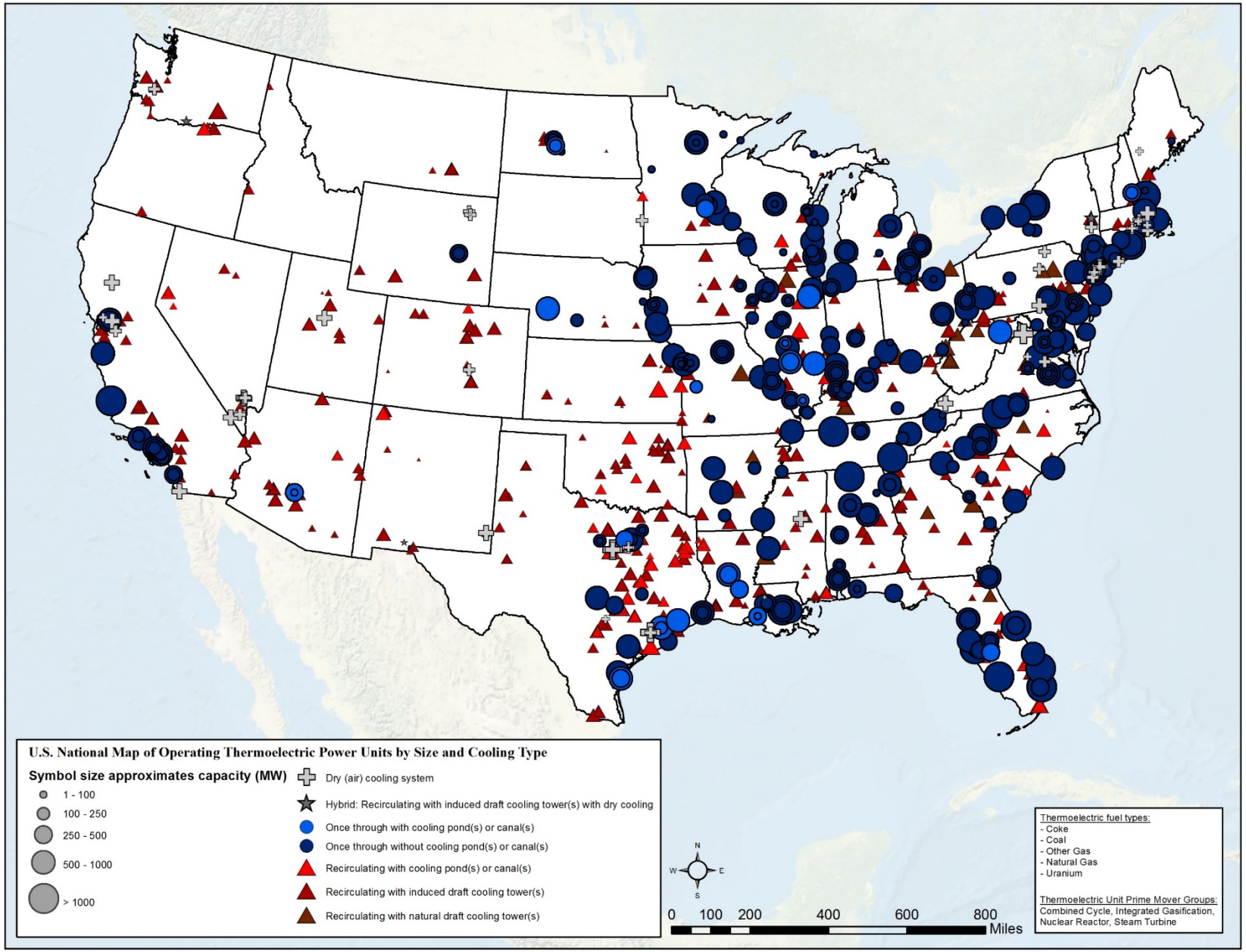
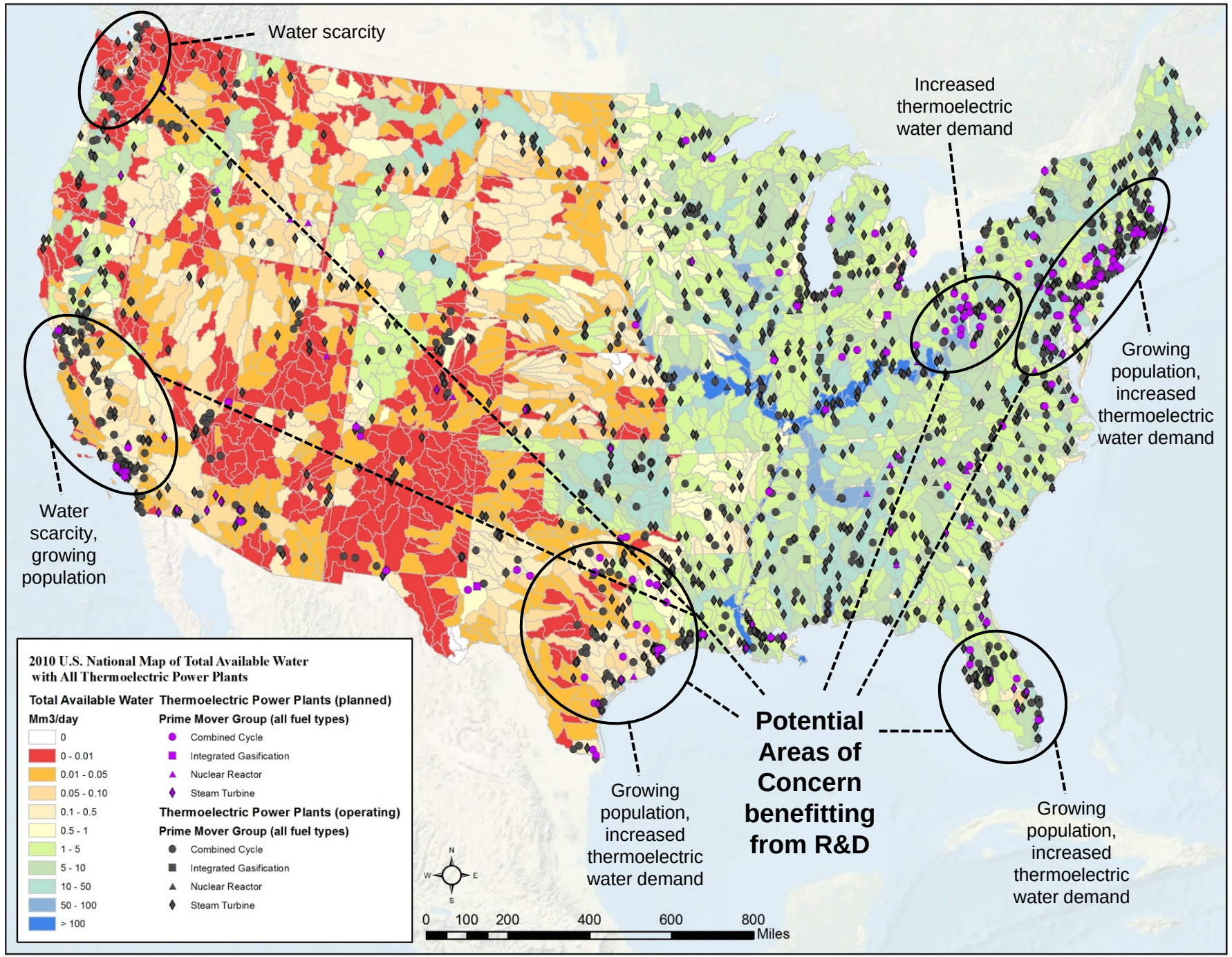


Current U.S. Power Plant Cooling Systems

- 3.6% Dry cooling and Hybrid
- 43% Once Through
- 53% Recirculation

Data is from ABB Velocity Suite.


NATIONWIDE PERSPECTIVES



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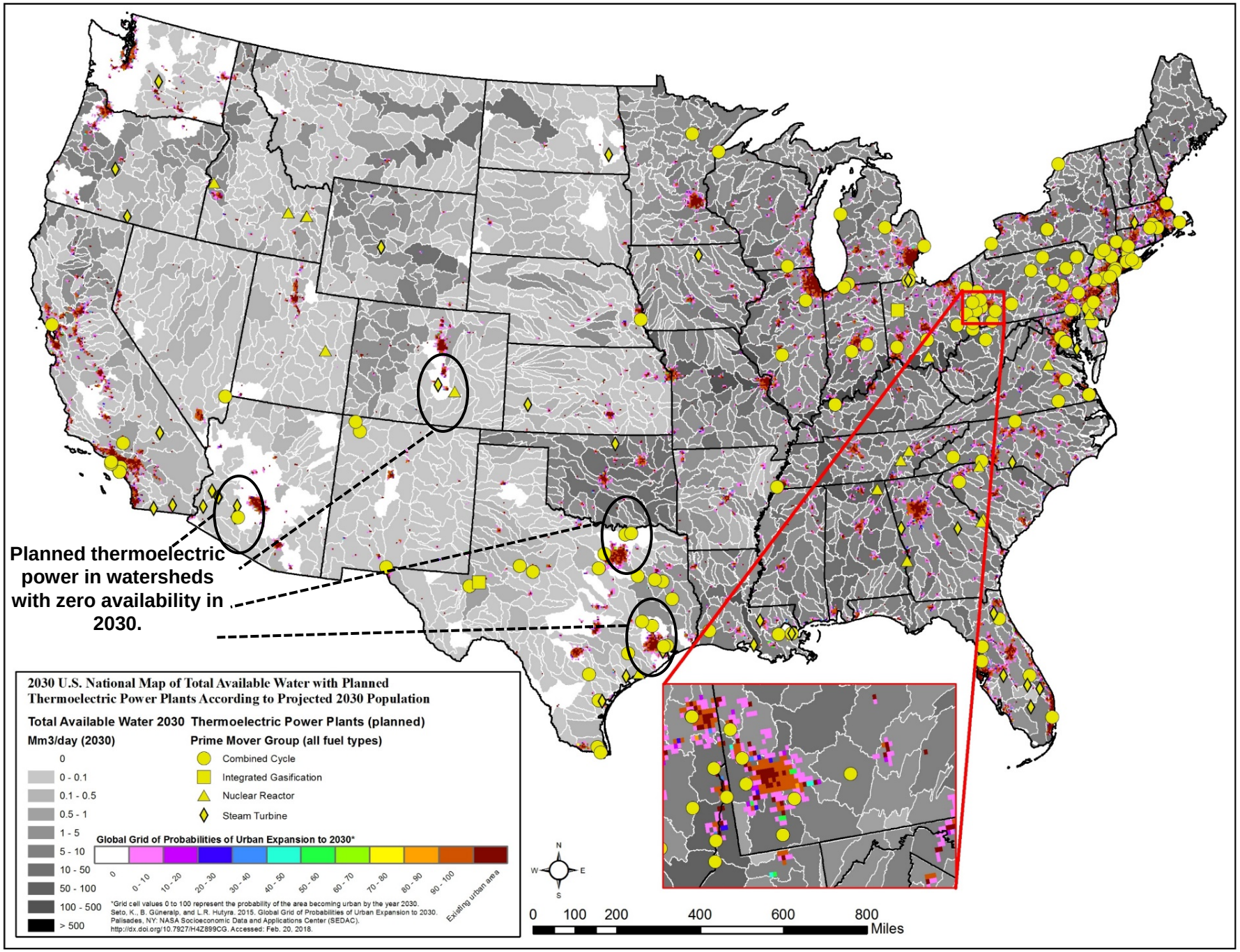
Thermoelectric Power Generation and Total Available Water

Six potential areas of concern (AOCs) highlight regions for R&D opportunities.

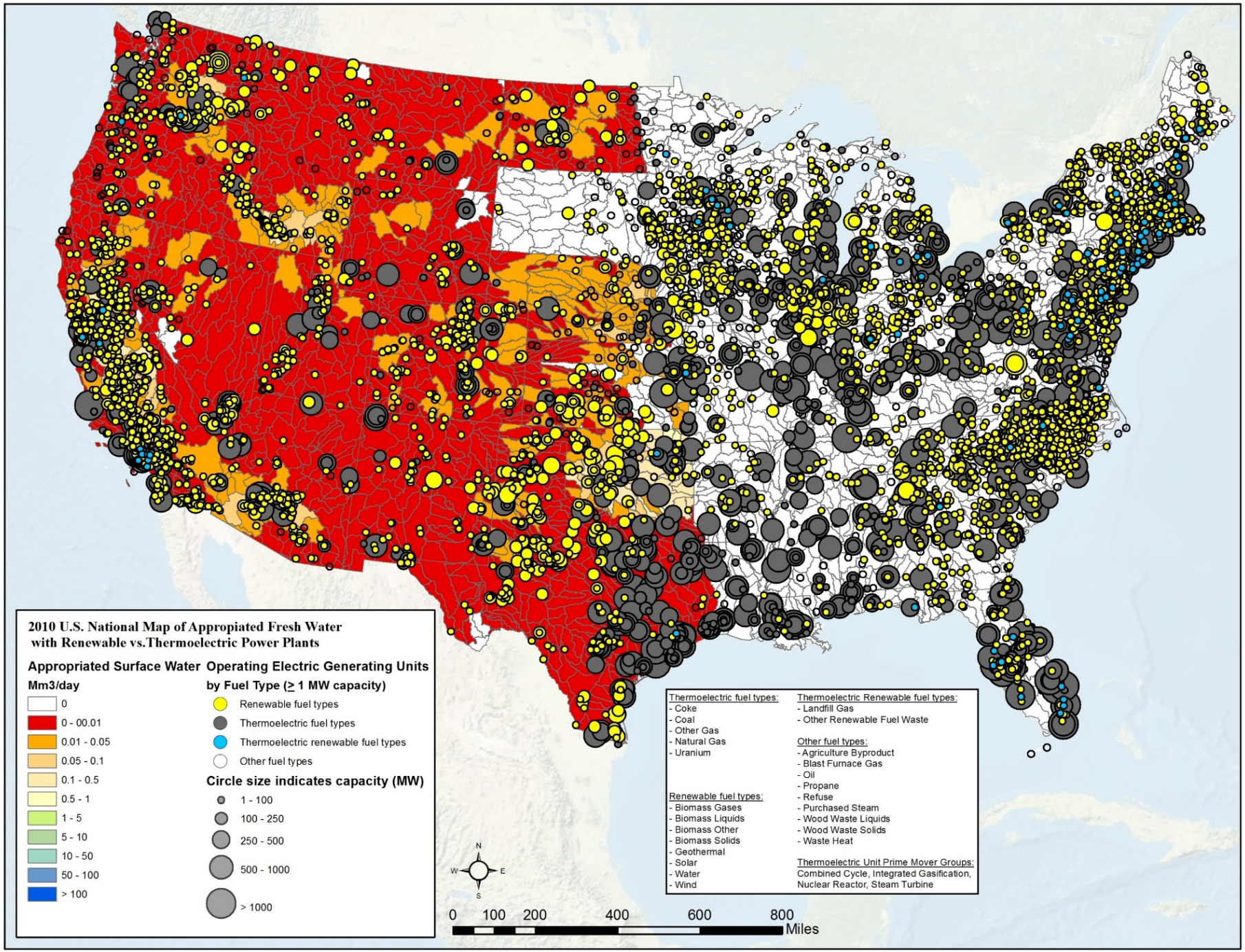
Data is from Sandia National Laboratories and ABB Velocity Suite.



Projected 2030 Total Available Water and Planned Thermoelectric Power

Four HUC8 watersheds are projected to have zero water availability in 2030.

Data is from Sandia National Laboratories and ABB Velocity Suite.



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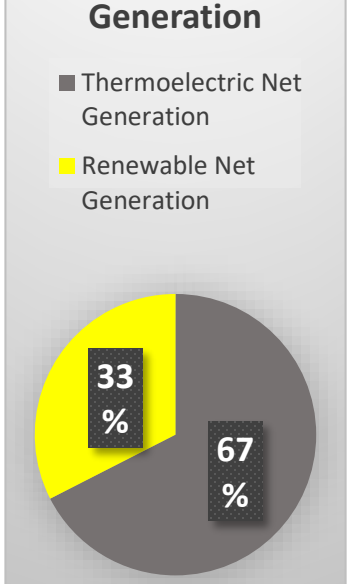
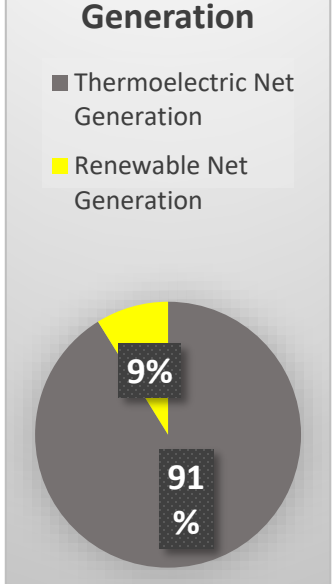
Appropriated Water and Power Sources

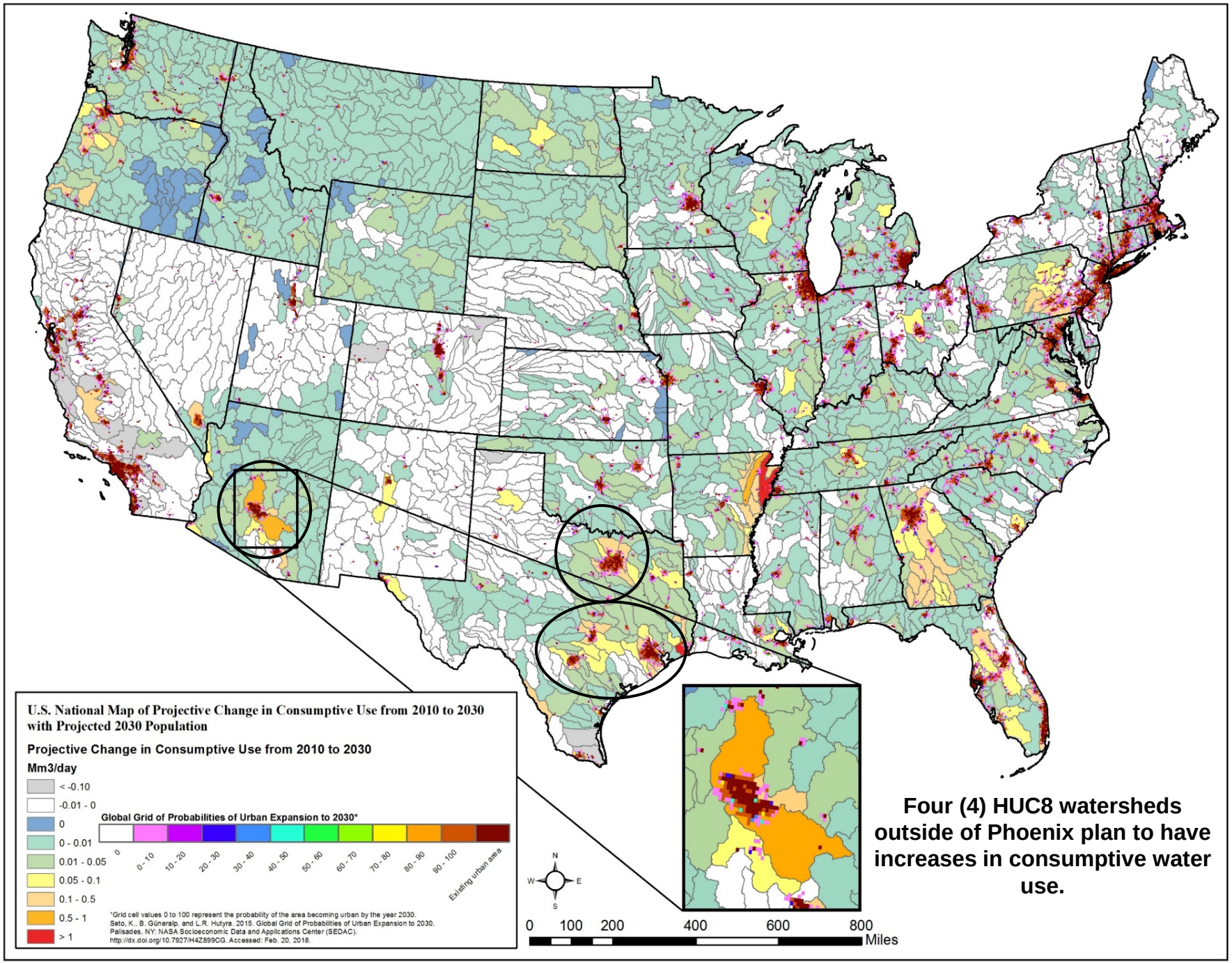
Western States Net Power Generation



Eastern States Net Power Generation



Data is from Sandia National Laboratories and ABB Velocity Suite.

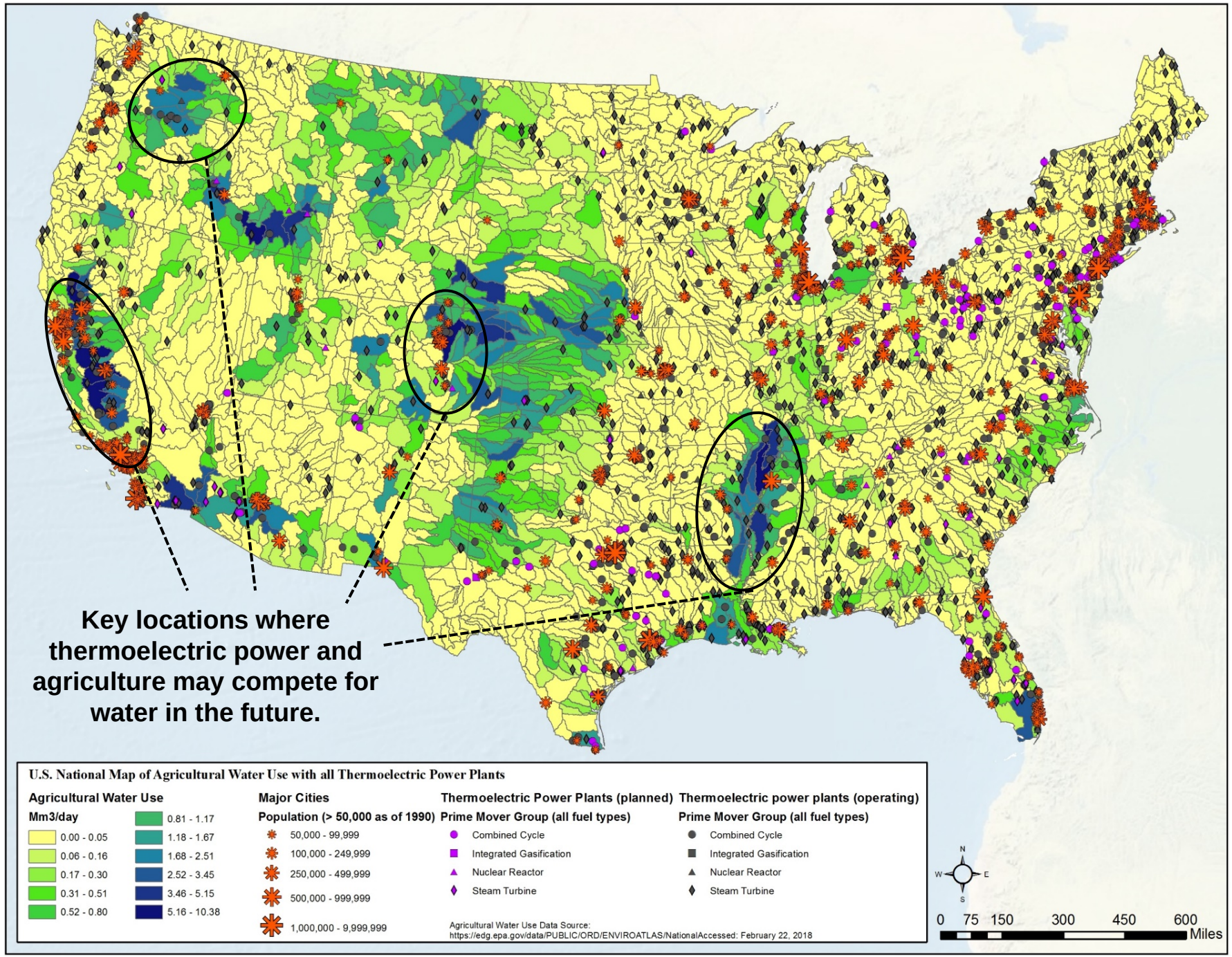


Four (4) HUC8 watersheds outside of Phoenix plan to have increases in consumptive water use.

Change in Consumptive Use and Growth in Population

Three potential areas of concern (AOCs) highlight regions for R&D opportunities.

Data is from Sandia National Laboratories and ABB Velocity Suite.



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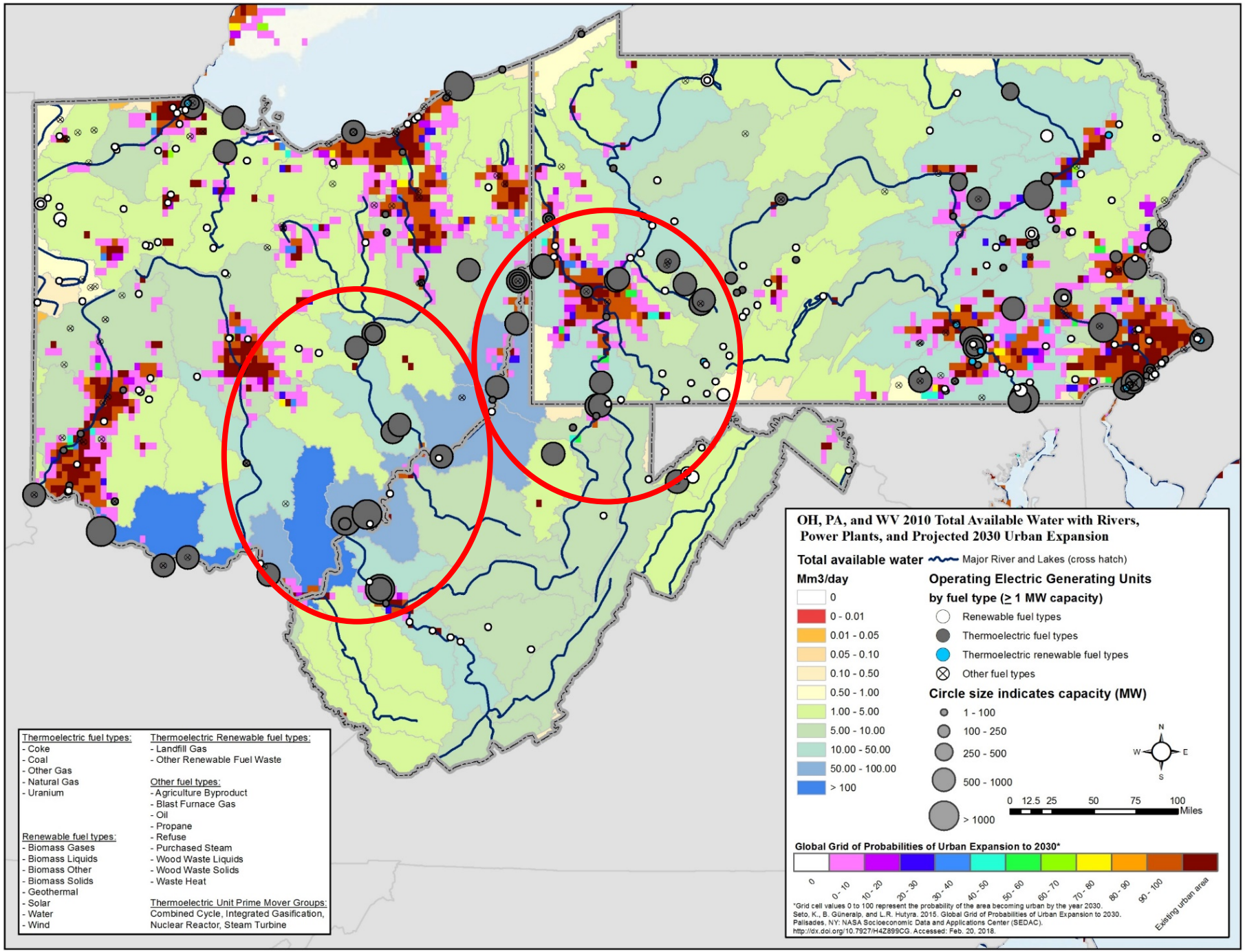
Agriculture and Thermoelectric Power

Agriculture and thermoelectric power are not active competitors for water.

Data is from Sandia National Laboratories and ABB Velocity Suite.

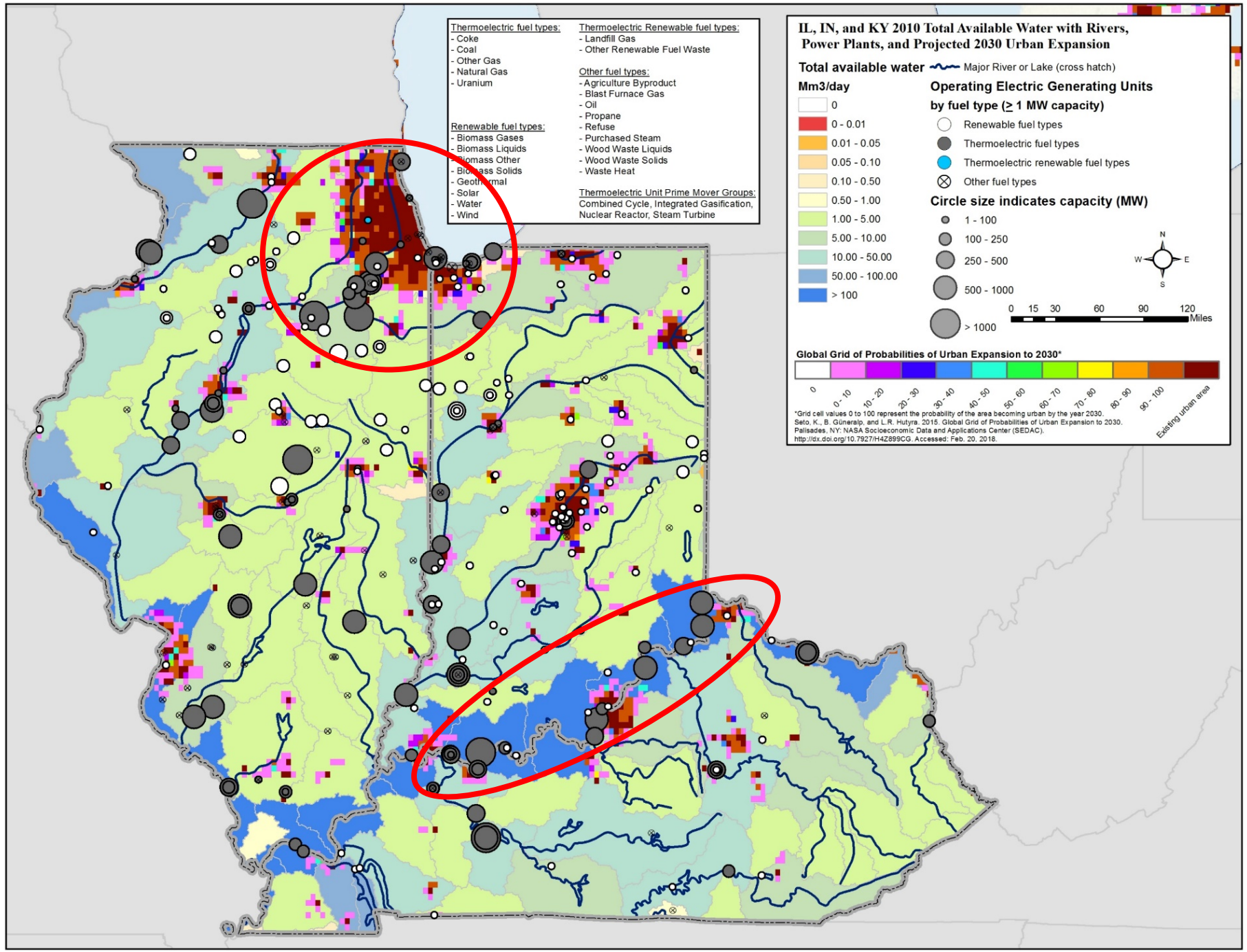
REGIONAL PERSPECTIVES



Northern Appalachia

Density of thermoelectric power may impact effluent temperatures and water quality.

Data is from Sandia National Laboratories and ABB Velocity Suite.



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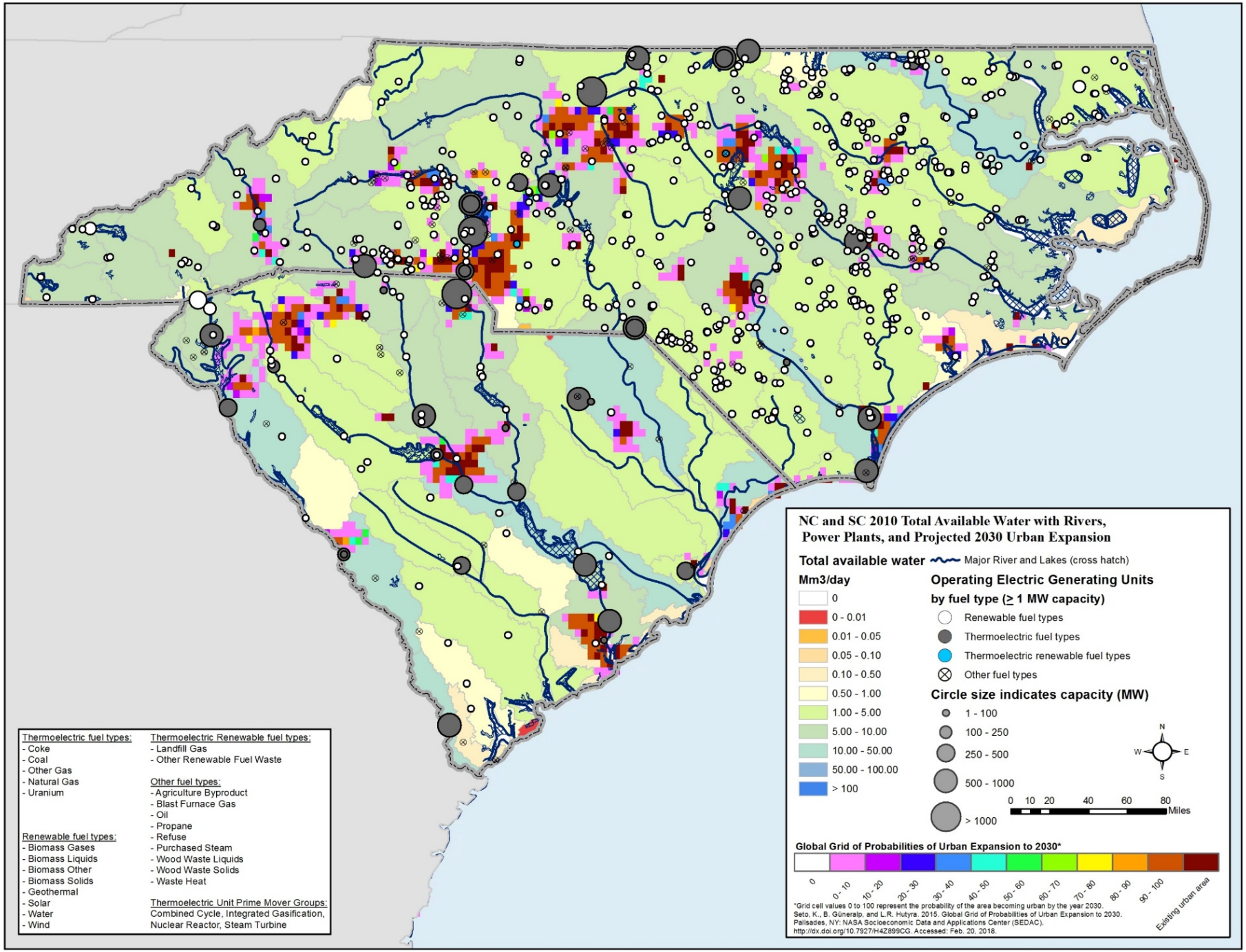
Midwest

Agriculture is central to the region; advancements in water reuse may benefit the region.

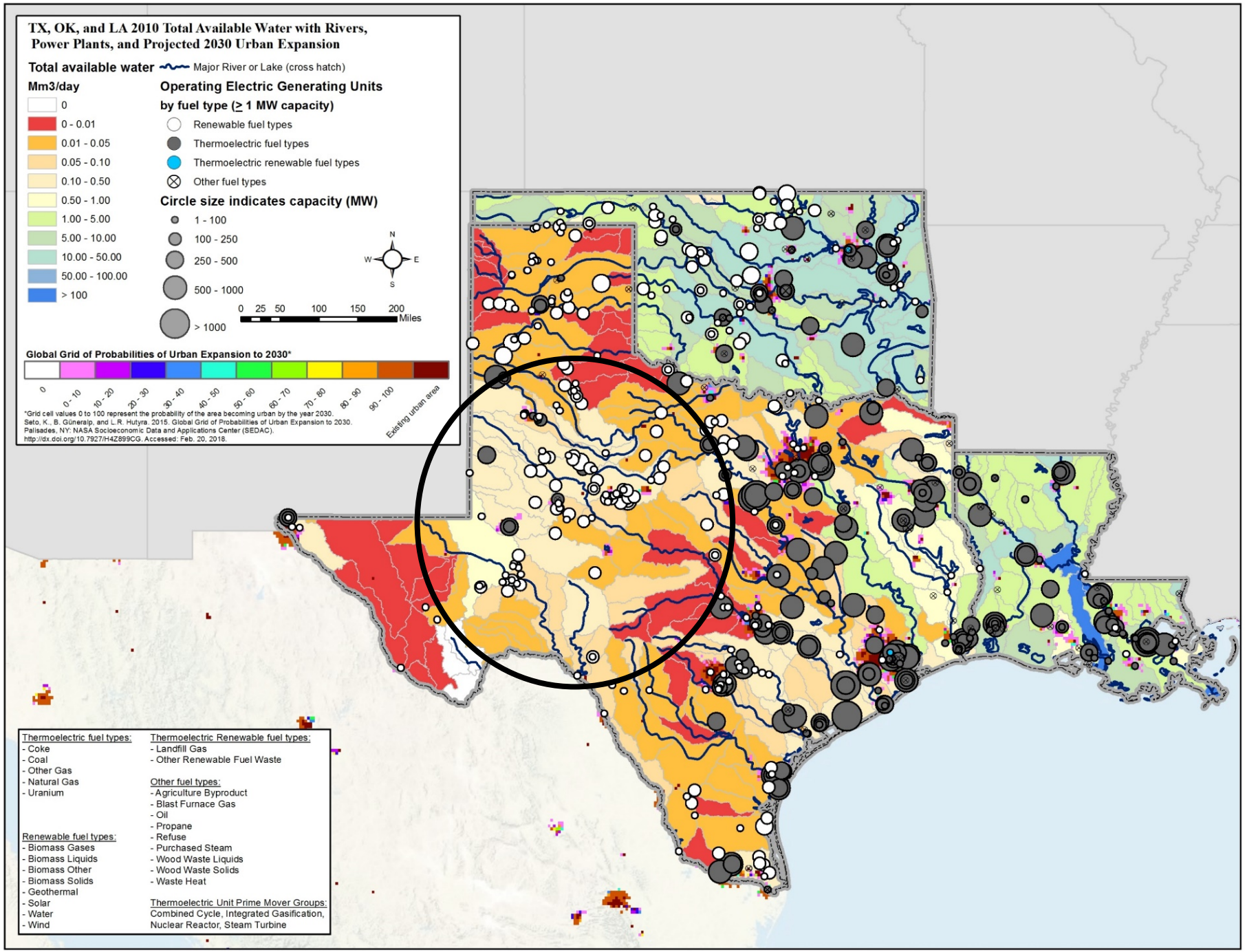
Data is from Sandia National Laboratories and ABB Velocity Suite.



Southern Atlantic Coast

Highly diversified energy portfolio between renewables and thermoelectric power generation.

Data is from Sandia National Laboratories and ABB Velocity Suite.



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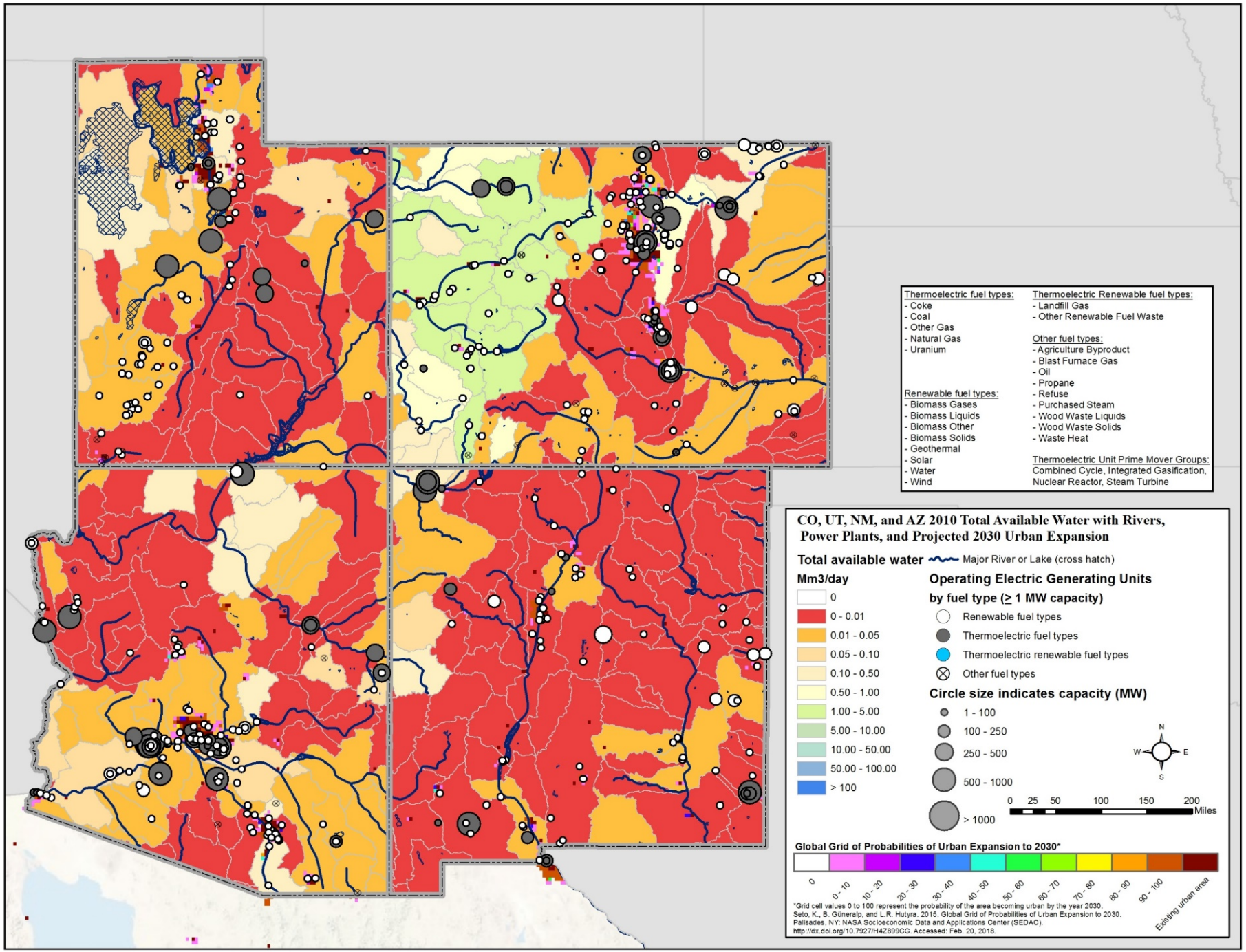
Western Gulf Coast

Permian basin has a high concentration of renewables, but struggles with water availability.

Data is from Sandia National Laboratories and ABB Velocity Suite.



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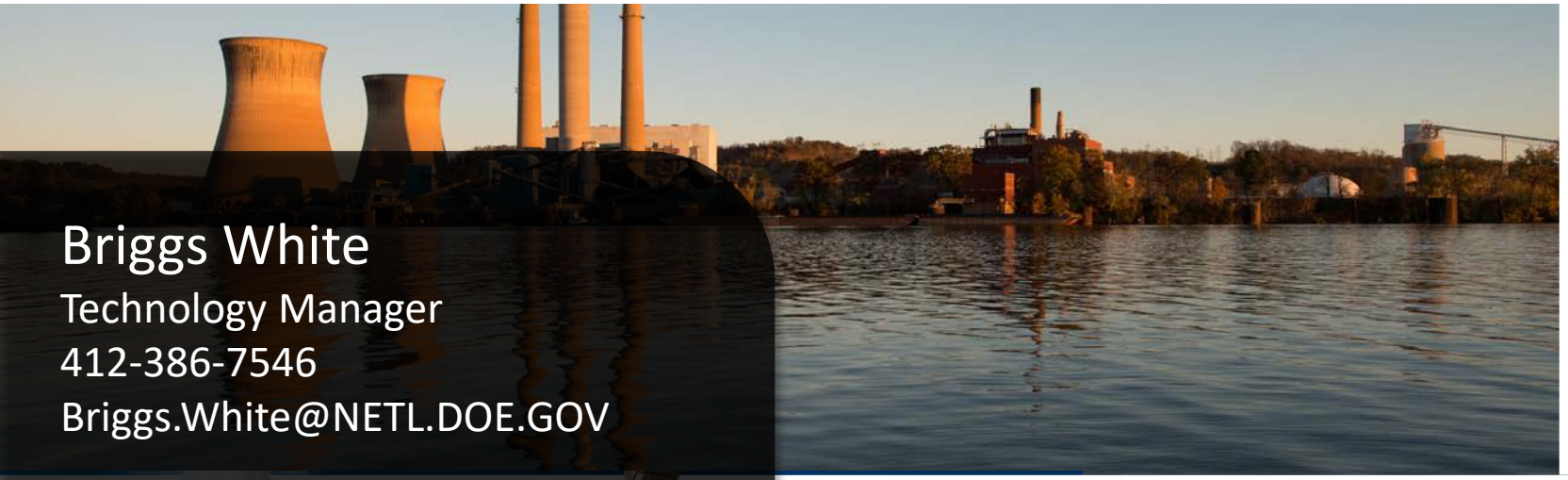
Mountain West

Region is well-known for water scarcity challenges.

Data is from Sandia National Laboratories and ABB Velocity Suite.

Crosscutting Research Contacts

https://www.netl.doe.gov/research/coal/crosscutting



Briggs White
Technology Manager
412-386-7546
Briggs.White@NETL.DOE.GOV

Patricia Rawls
Supervisor, ETP Team
412-386-5882
Patricia.Rawls@NETL.DOE.GOV

Regis Conrad
Director, AES & Crosscutting
301-903-2827
Regis.Conrad@HQ.DOE.GOV

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Thank you.

Questions?

References

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4. USGS 2010 Watershed Availability Data
5. EPA EnviroAtlas – Agricultural Water Demand by 12-Digit HUC for the Conterminous United States (2010)
6. EPA EnviroAtlas – Thermoelectric Water Use by 12-Digit HUC for the Conterminous United States (2016)
7. ABB Velocity Suite, 2018
8. NASA – Global Grid of Probabilities of Urban Expansion to 2030

Eastern States include: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, New York, Pennsylvania, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Michigan, Ohio, Indiana, Kentucky, Tennessee, Alabama, Mississippi, Wisconsin, Illinois, Minnesota, Iowa, Missouri, Arkansas, and Louisiana.

Western States include: North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Montana, Wyoming, Colorado, New Mexico, Idaho, Utah, Arizona, Washington, Oregon, Nevada, and California.

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