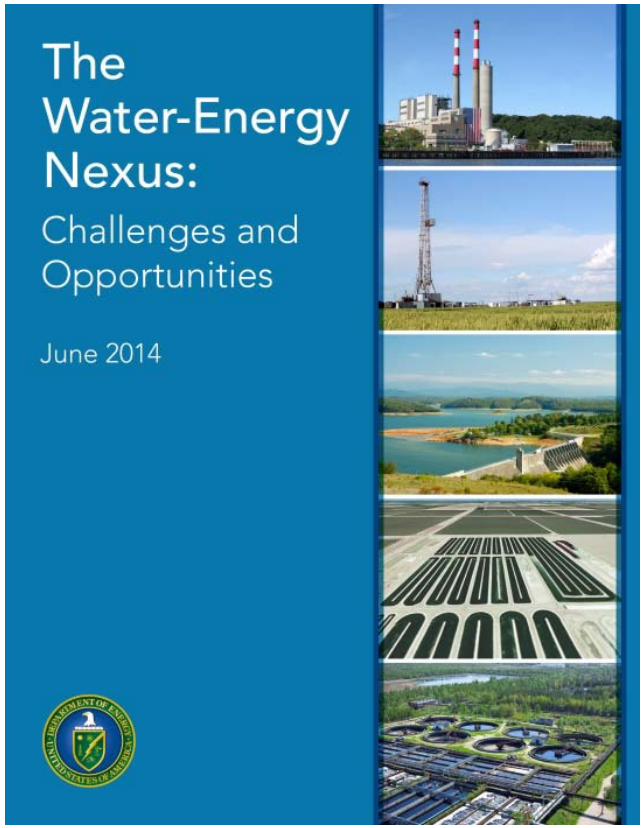
Energy-Water State Sankey Diagrams
Interstate Commission on the Potomac River Basin

March 2 , 2017

Zachary Clement
Office of Energy Policy and Systems Analysis
Department of Energy

Energy-Water Nexus: Why DOE? Why Now?

- Energy and water are interdependent.
- Water scarcity, variability, and uncertainty are becoming more prominent.
  - This is leading to vulnerabilities of the U.S. energy system.
- We cannot assume the future is like the past in terms of climate, technology, and the evolving decision landscape.
- Aging infrastructure provides an opportunity for some changes.
- DOE has strong expertise in technology, modeling, analysis, and data and can contribute to understanding the issues and pursuing solutions across the entire energy-water nexus.



Download the full report at
energy.gov/water-energy-tech-team

Strategic Pillars

- Optimize the freshwater efficiency of energy production, electricity generation, and end use systems
- Optimize the energy efficiency of water management, treatment, distribution, and end use systems
- Enhance the reliability and resilience of energy and water systems
- Increase safe and productive use of nontraditional water sources
- Promote responsible energy operations with respect to water quality, ecosystem, and seismic impacts
- Exploit productive synergies among water and energy systems

Overview of State Sankey Diagram Project

- Realize regional nature of energy-water nexus issues
  - Different climates
  - Different policies
  - Different water & energy resources with diverse technologies deployed
- Examples
  - Maryland: saline water for thermoelectric cooling
  - Texas & Oklahoma: produced water
  - California: energy for moving and treating water
- Create State Level Diagrams representing 2010
  - Identify data gaps
  - Laid groundwork for updates with new data as it is released
- Report contains diagrams, tables, and data sets

Example States MD, VA, WV

- Lets look at our example states - MD, VA, WV.
- How much energy and water does each state use?

State	Energy (Trillion BTU)	Water (Million gal/day)
Maryland	1,280	7,382
Virginia	2,122	7,648
West Virginia	1,056	3,533

Example Tables and Charts

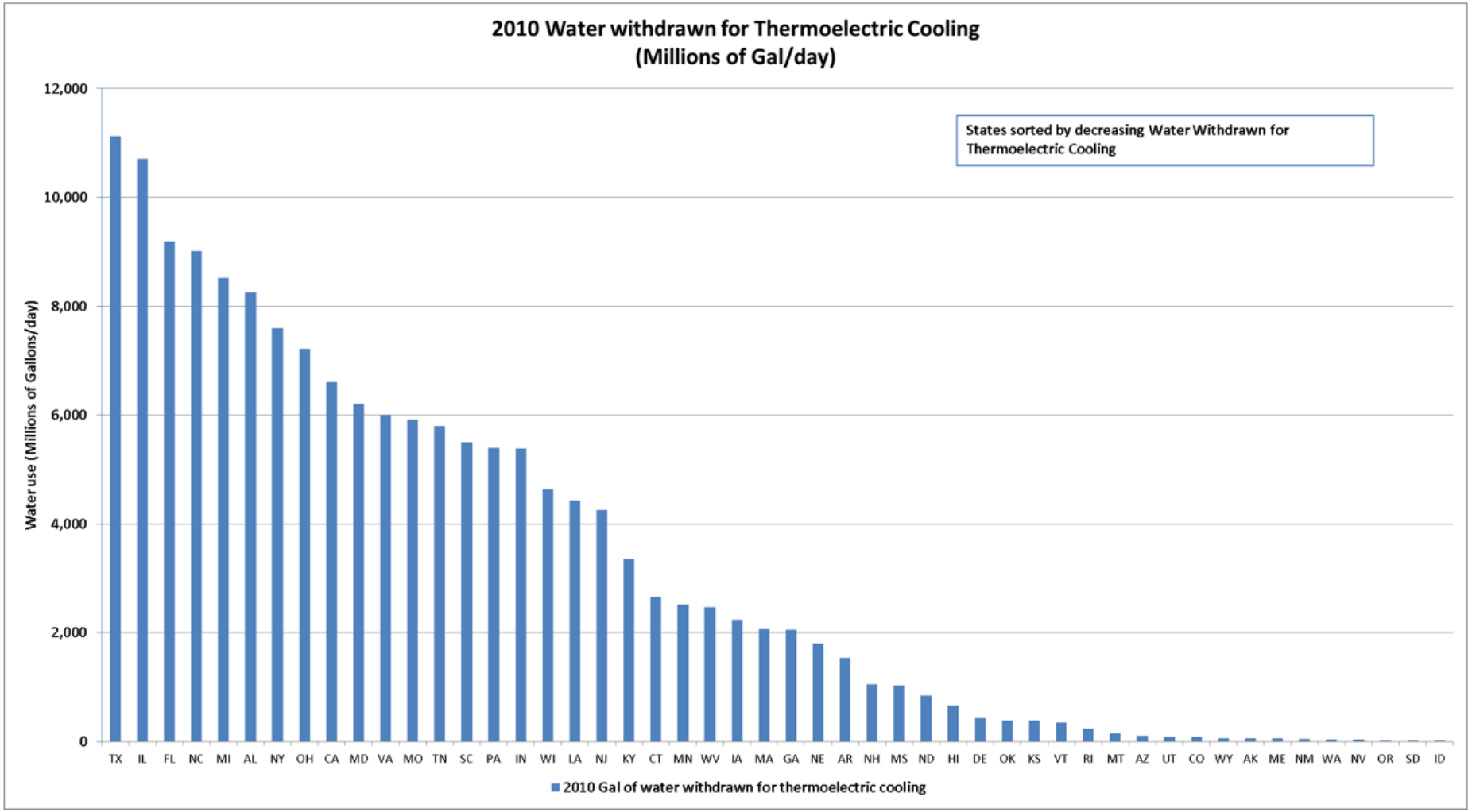
- Helpful for comparing across states

- Tables and figures include:

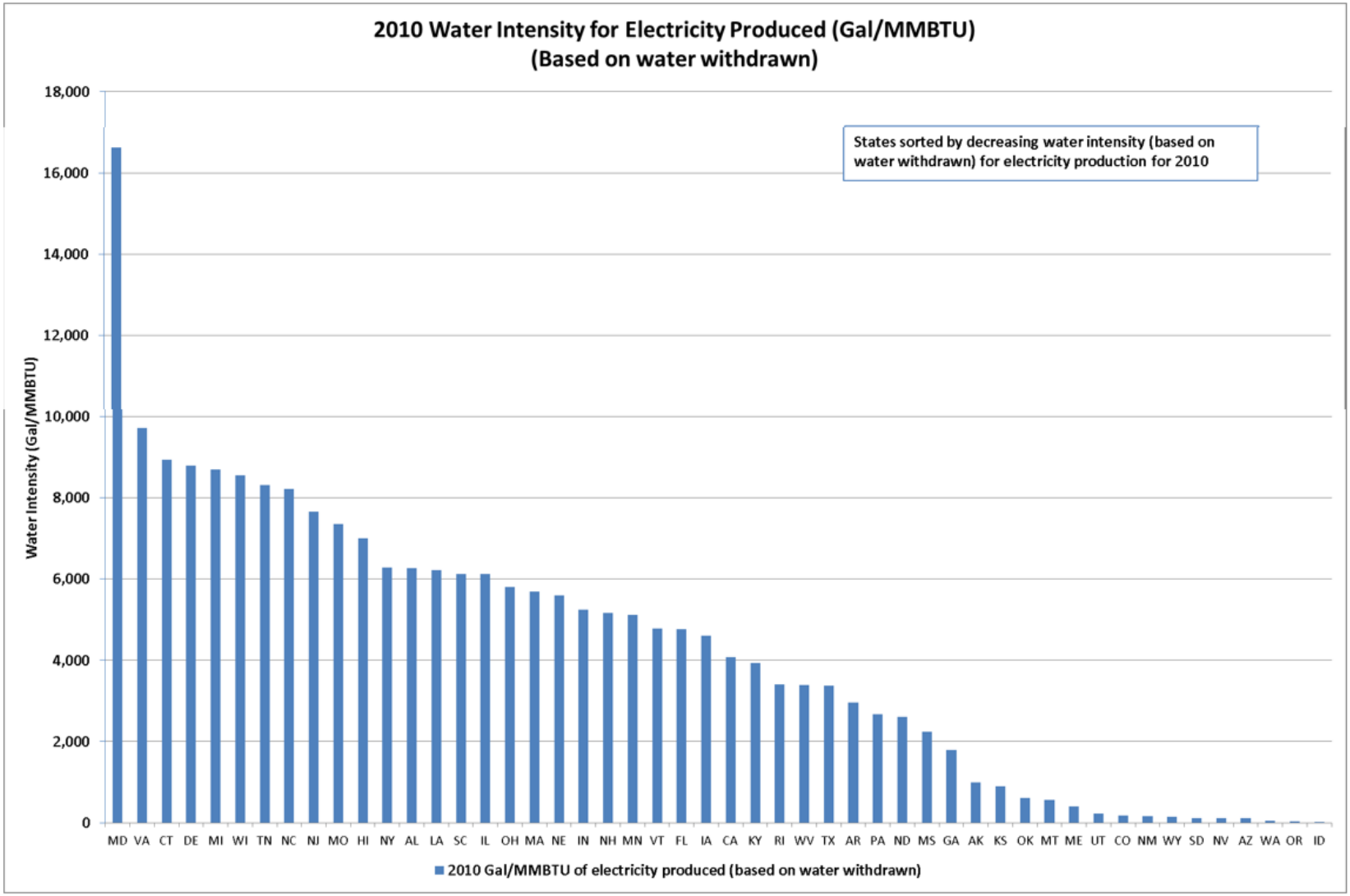
1. **Water withdrawn for electricity production**
2. **Water consumed for electricity production**
3. **Water intensity for electricity production**

4. Water withdrawn and intensity for oil and gas production
5. Produced water for oil and gas extraction
6. Water withdrawn and intensity for bio-feedstock production
7. Energy use and intensity for agriculture water pumping
8. Energy use and intensity for public water supply
9. Energy use and intensity for wastewater treatment

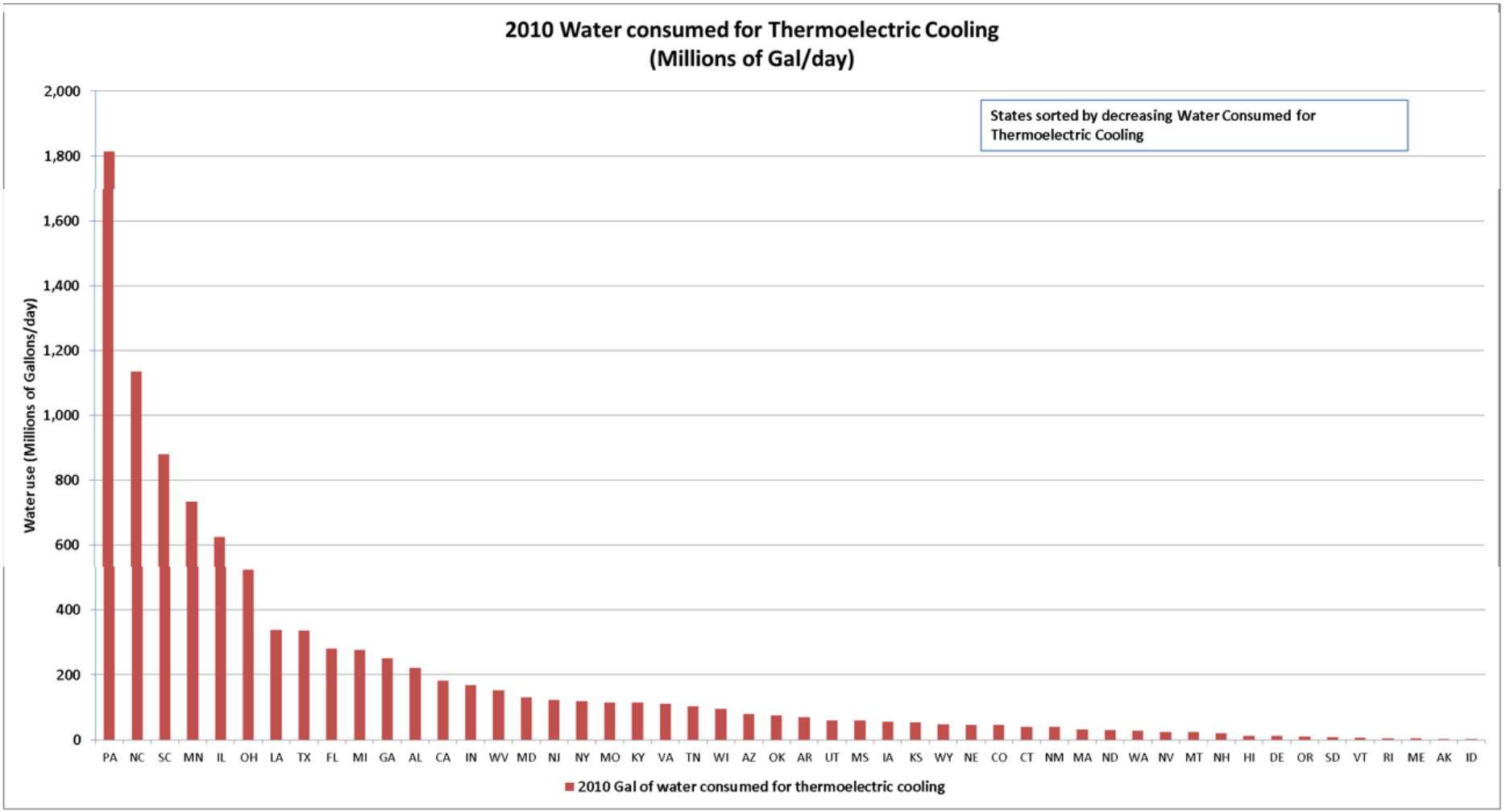
Water Withdrawal for Electricity Generation



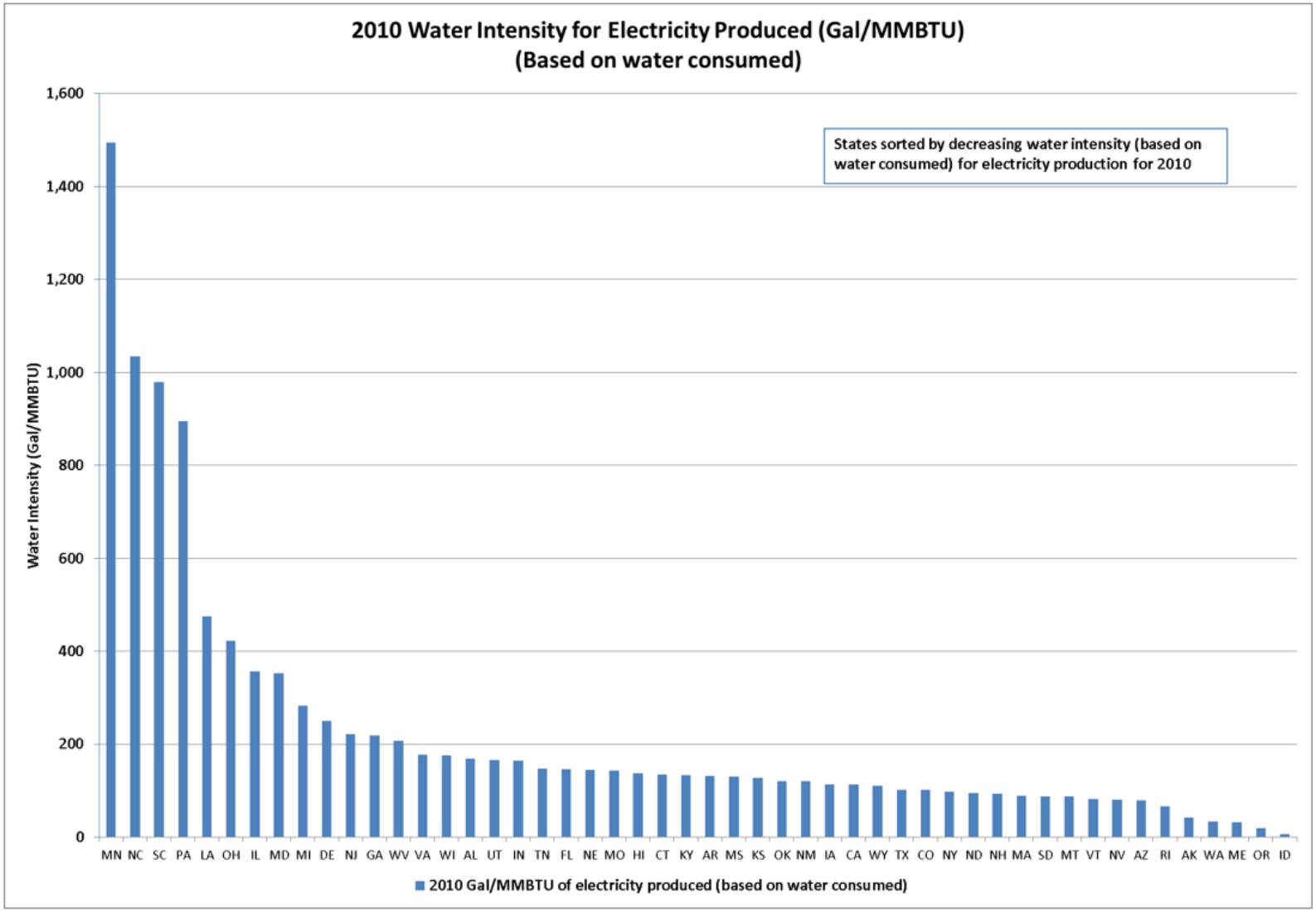
Water Withdrawal Intensity



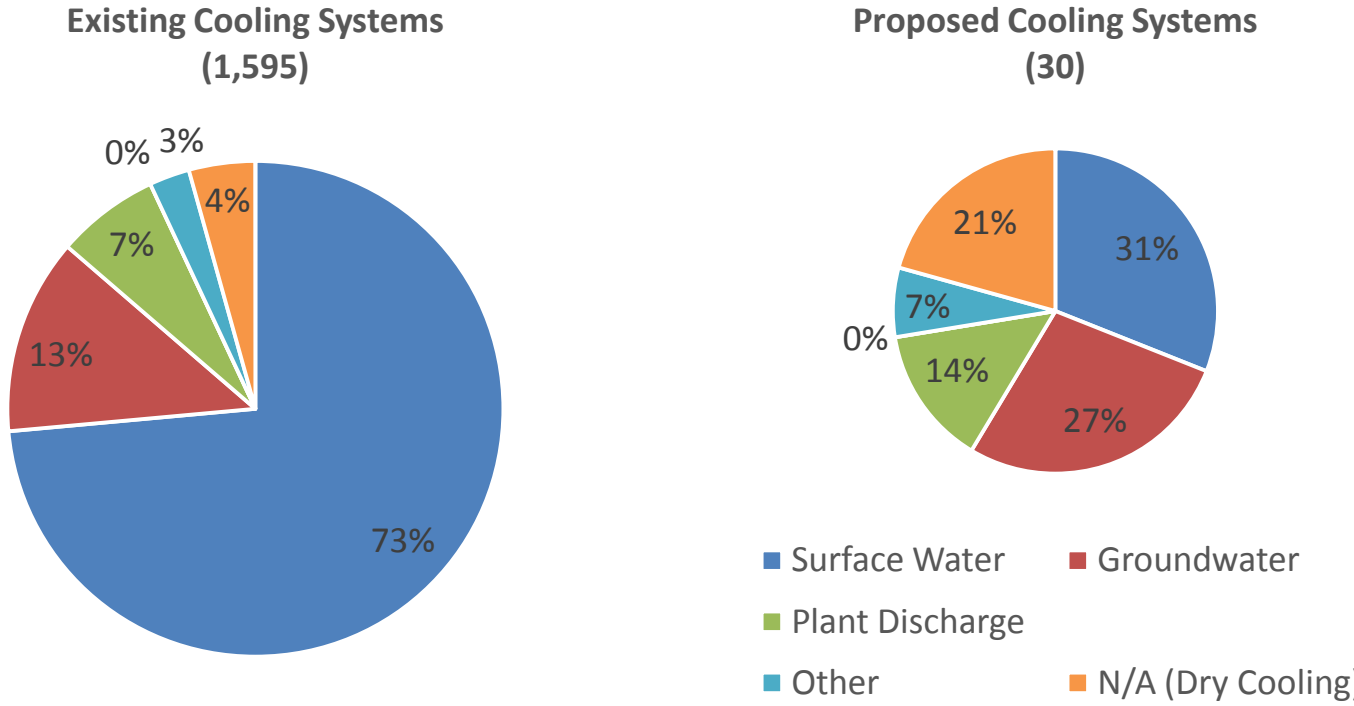
Water Consumption for Electricity Generation



Water Consumption Intensity



U.S. Power Sector is Responding With Increased Utilization of Dry Cooling and Nontraditional Water



Data Source: EIA (2015)

However…

- Current dry cooling technologies are more expensive and come with efficiency penalties (and associated higher emissions).
- Using nontraditional water usually means more electricity for pumping and treatment (and associated higher emissions).

Peer Review and Stakeholder Outreach

- Finishing report summer 2017
- Currently holding peer review and stakeholder outreach sessions of current draft.
- If interested in participating please contact me

Contact info:
Zachary Clement
Office of Energy Policy and Systems Analysis (EPSA)
Department of Energy
Zachary.clement@hq.doe.gov
(202) 586-7537

Questions?

Zachary Clement
Office of Energy Policy and Systems Analysis (EPSA)
Department of Energy
Zachary.clement@hq.doe.gov
(202) 586-7537

Diana J. Bauer, Ph.D.
Office of Energy Policy and Systems Analysis (EPSA)
Department of Energy
diana.bauer@hq.doe.gov
(202) 287-5773

DOE Energy-Water Nexus Crosscut Team:
http://www.energy.gov/under-secretary-science-and-energy/water-energy-tech-team

EPSA Energy-Water Initiative
http://energy.gov/epsa/energy-water-nexus