

EPRI Water Management Research & Perspectives

Tom Alley
Vice President, Generation

**Water and Sustainability
+ MATCHING Workshop**
2 October 2018



MATChING's Objectives

Objective 1

How can we save water in a power plant equipped with a traditional cooling system

Objective 2

And how can we do it in an economically affordable way?

MATChING's ambition is to provide an adequate answers to these questions.

Generation Sector R&D Drivers

Objective 1

How can we save water in a power plant equipped with a traditional cooling system

Objective 2

And how can we do it in an economically affordable way?



**Economics and
Markets**

**Drive to a Flexible
Generation Mix**

**Technology
Deployment**

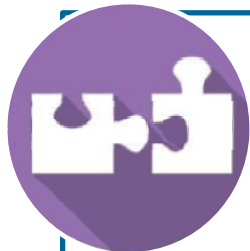
EPRI Research Activities



Thought
Leadership



Technology
Innovation



Technology
Transfer



Modeling &
Analysis

Thought Leadership



Global Points of View

Common Characteristics for Future Scenarios

Water

- Increasingly water-constrained future over the long term
- Water-energy interfaces continue to expand

Customer Expectations

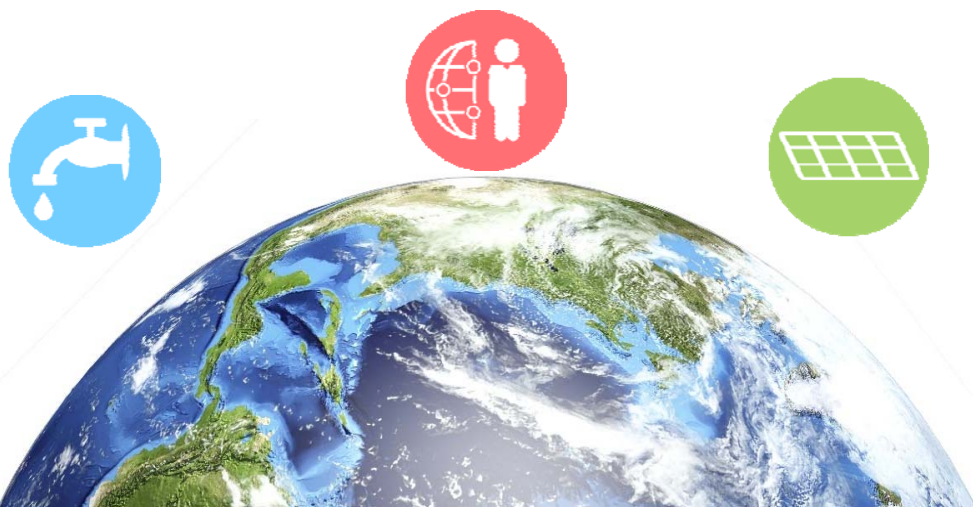
- Primary drivers: choice, control, comfort, & convenience
- IoT will digitally connect every customer to every thing
- Increased dependence on electricity requires higher reliability and power quality
- Increased resiliency to physical/cyber/weather events

Efficiency and Renewables

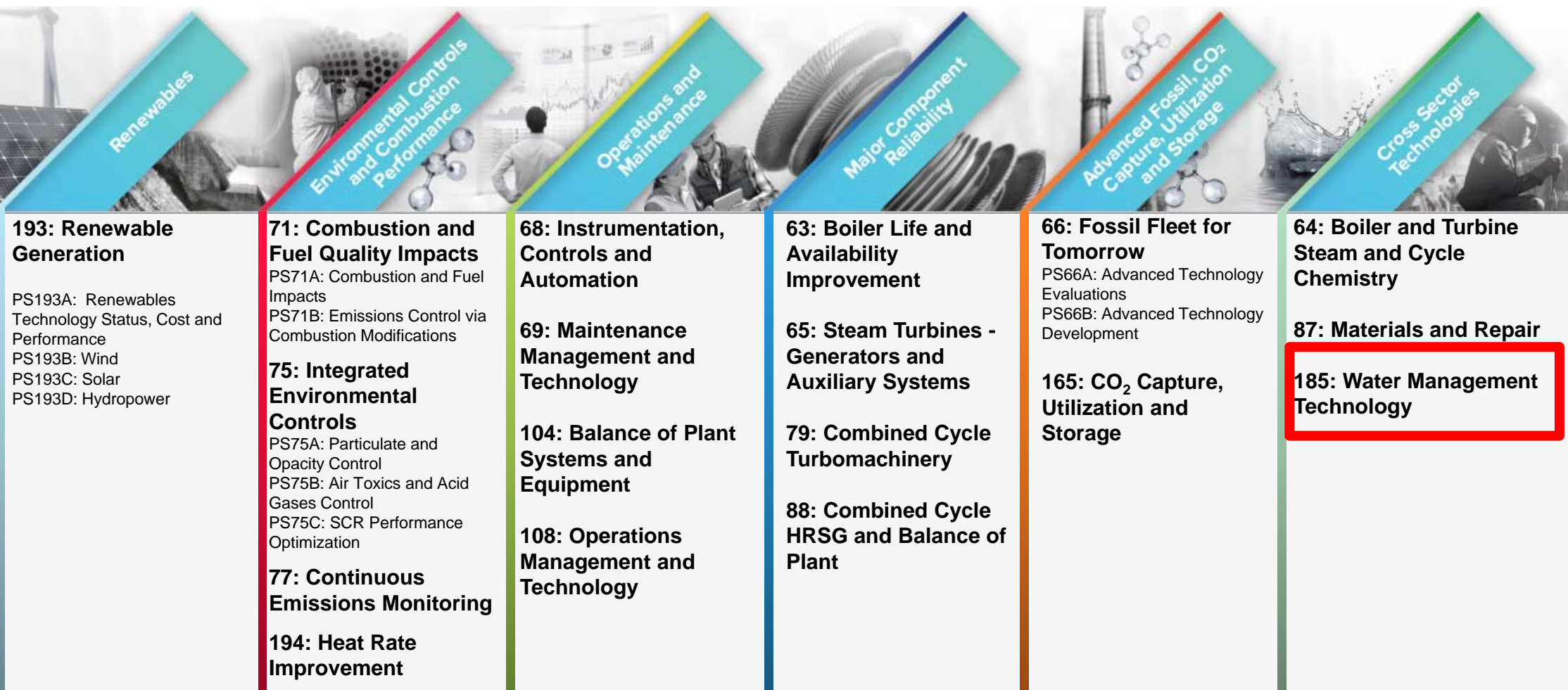
- Energy efficiency gains will be made across the energy value chain
- The cost of wind and solar energy will decrease; global deployment to increase

Energy and Emissions

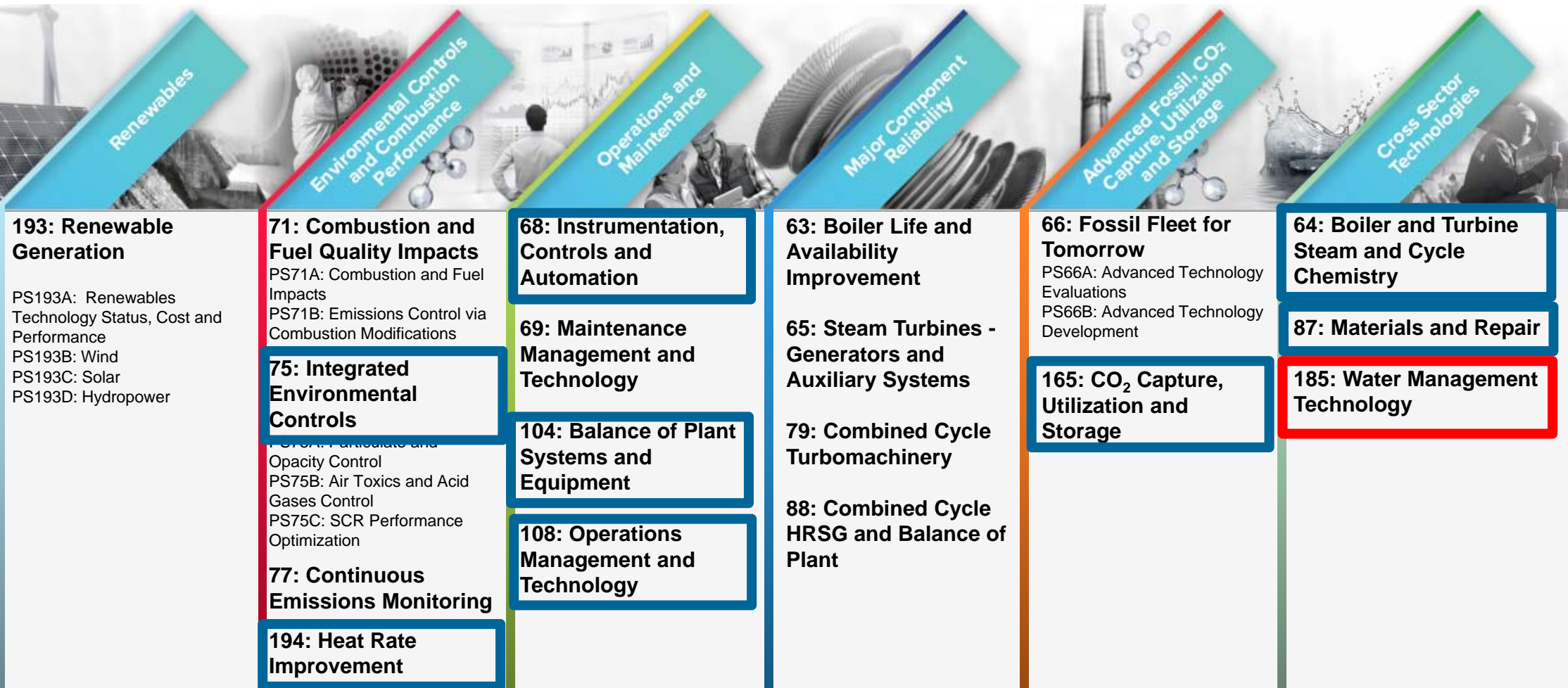
- Reducing emissions will remain a long-term global issue
- Global energy demand will remain flat in OECD; grow in non-OECD



Generation Research Portfolio



Water Research Alignment Across the Portfolio



Key Water Research Drivers

Fresh Water Demand and Availability



Water Treatment and Quality Management

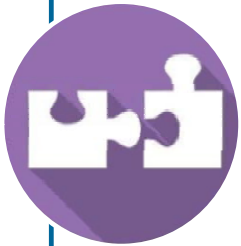


EPRI Research Activities



Technology Innovation

- Improving commercially available technologies
- Developing new technologies
- Integrating technologies/systems for flexible operations



Technology Transfer

- Developing guidelines for water management systems
- Identifying opportunities to reduce operating costs
- Analyzing technology development for multiple applications

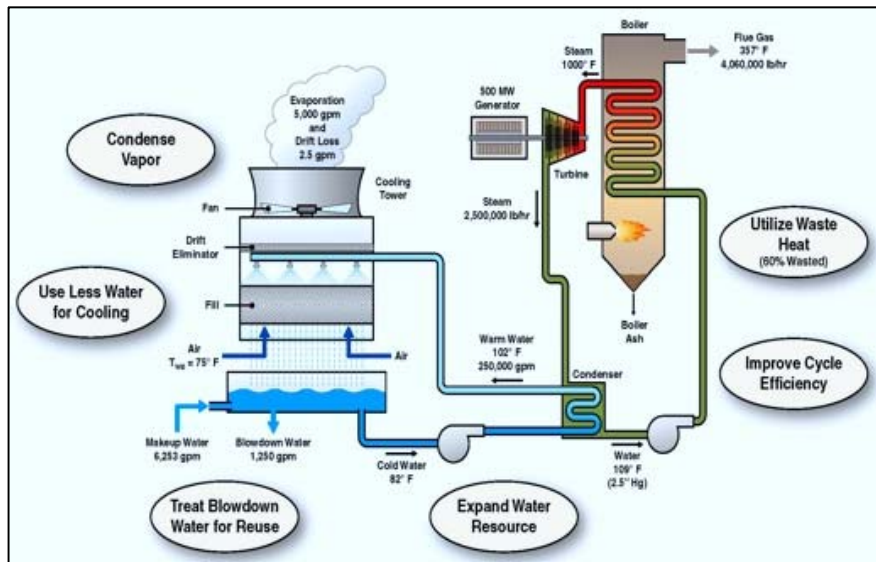


Modeling & Analysis

- Evaluating techno-economic factors
- Documenting operating cost factors from site testing
- Modeling water and energy resources and trends

Areas of Water R&D

Cooling System Research



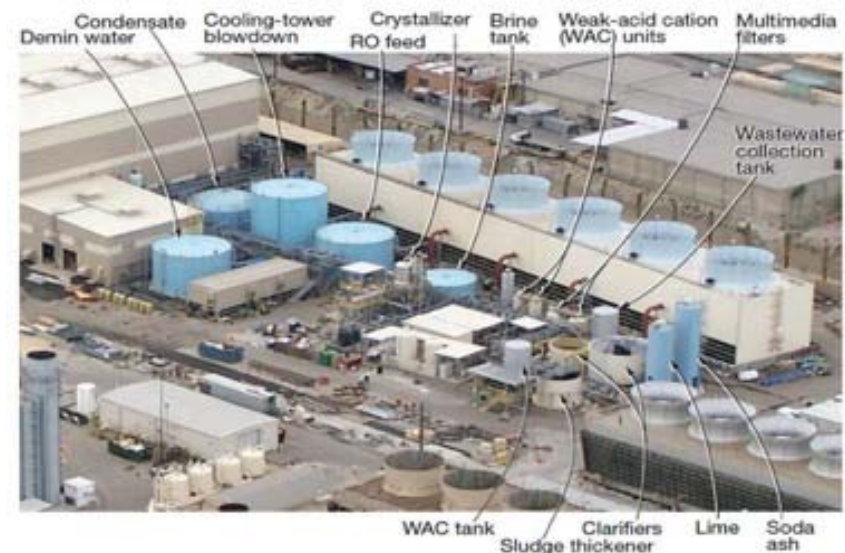
Reduce reliance on fresh water availability

Alternatives to traditional water and air-cooled systems

Evaluate **early-stage technologies**

Accelerate technology **commercialization**

Water and Wastewater Management Research

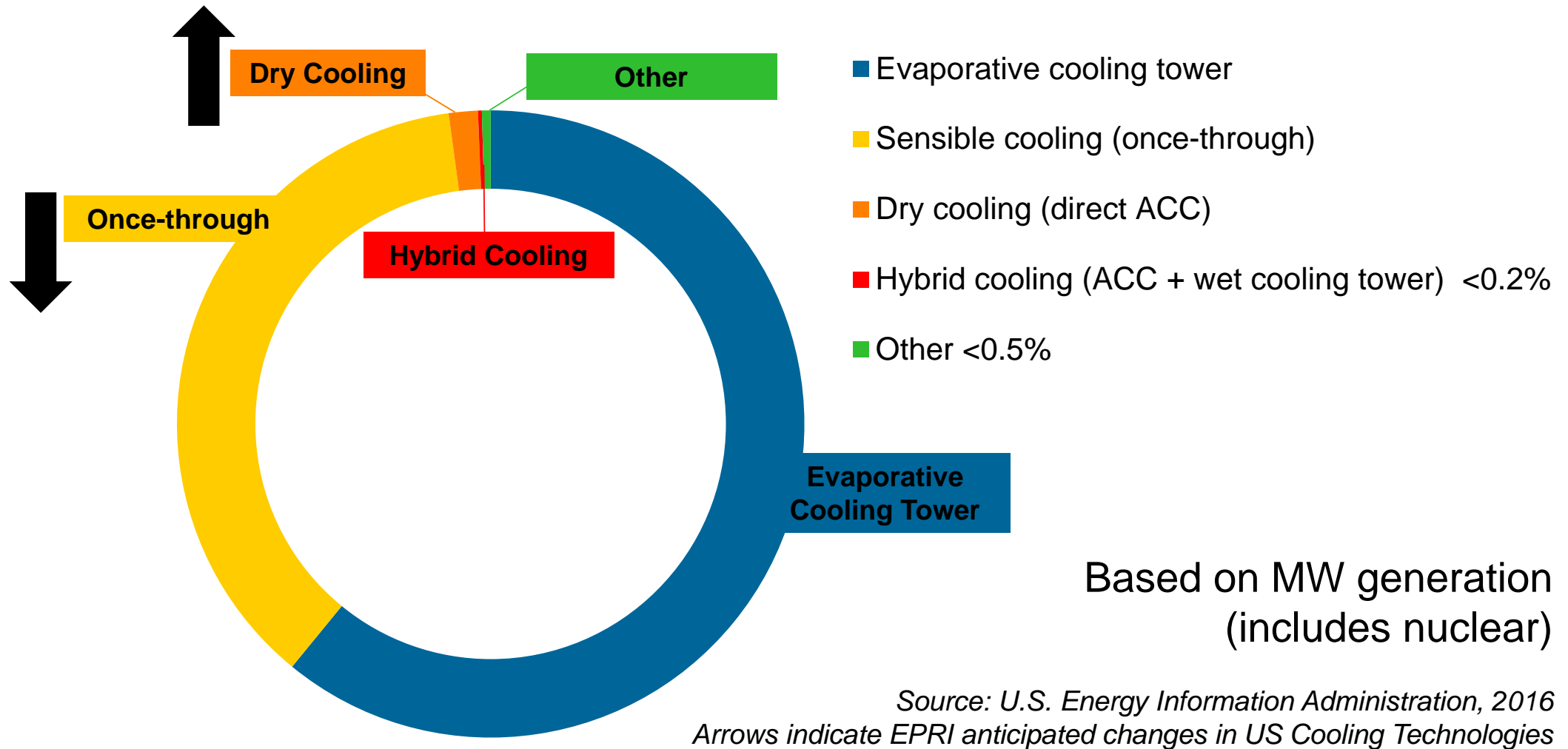


Understanding of **environmental impacts** and long-term **wastewater and byproduct management**

Improve and **integrate** commercially available technologies

Evaluate and integrate **new technologies**

Existing U.S. Power Plant Cooling Technologies

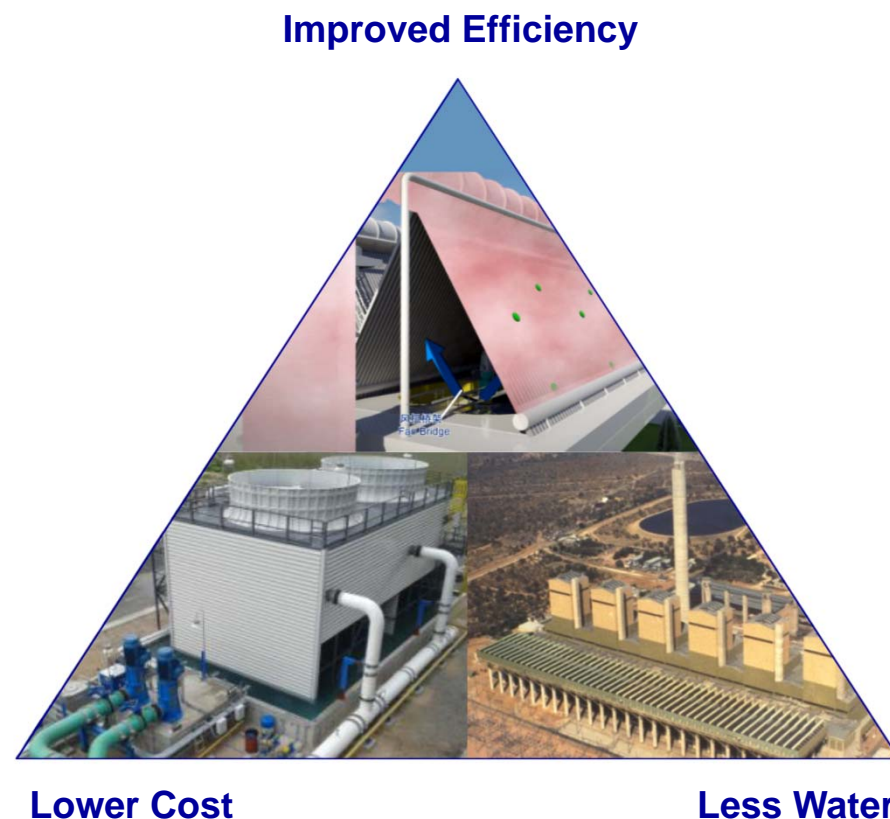


Cooling System Research Objectives

Identify and evaluate **advanced cooling technologies** and provide resources for **optimizing cooling systems** through improved **efficiency** and **reduced water use**

Research Needs

Heat Transfer – Materials – Energy Storage
– Modeling – Controls – Measurement



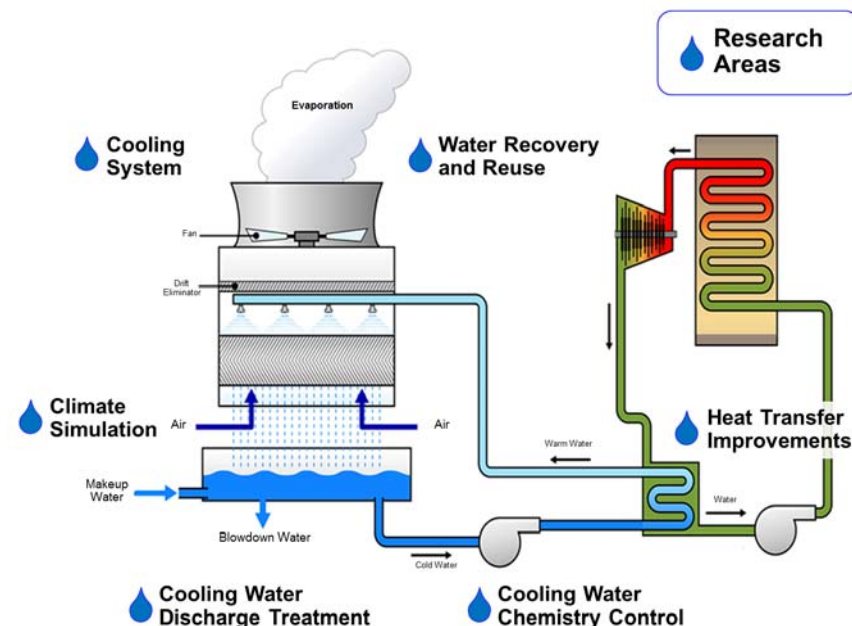
Water Research & Conservation Center

Objectives and Scope

- Develop a world-class R&D test center to address mid- to long-term needs in power plant cooling applications
- Cooling R&D focused on advanced and alternative cooling systems, cooling water chemistry control, and heat transfer improvements

Value

- Accelerate technology development to meet anticipated future needs
- Address research gaps to facilitate development of technologies that provide cost-effective solutions
 - Reduced water withdrawal and consumption for thermoelectric cooling
 - Improved heat transfer and plant efficiency



SPN: [3002009809](#)

White Paper: [3002011273](#)

Comprehensive test center to expand cooling system and heat transfer research

Test Center Initial Research Portfolio

Water Management

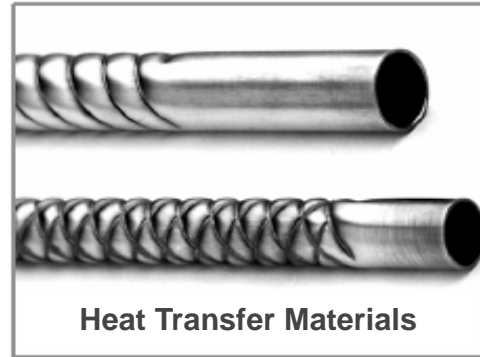


Mitigate Corrosion & Fouling



Alternative Chemicals

Heat Transfer



Heat Transfer Materials

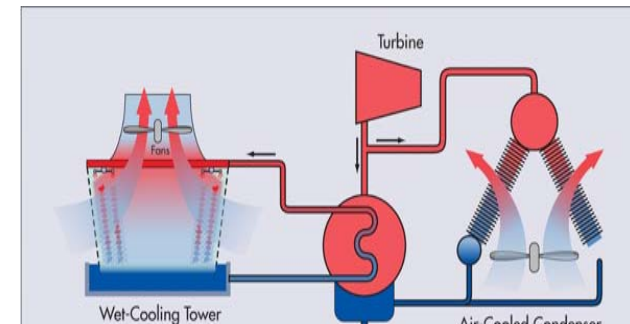


Cooling Performance & Designs

Advanced Cooling



Cooling System Flexibility



Advanced Cooling Systems

Water and Wastewater Management Research

Advanced Membrane Materials & Approaches



*Forward osmosis pilot
at the Water Research Center*

Recover a larger portion of **water for reuse**
Improve efficiency in high salinity conditions

Use of **degraded water sources**

Using low-grade plant **waste heat**

Reduce desalination **costs**

[3002004732](#)

Novel Evaporation Technologies



*Evaporator pilot
at the Water Research Center*

Improved understanding of **thermal treatment operations** and capabilities

Techno-economic performance of
emerging technologies

Water **quality** and **recovery** capabilities

[3002008865](#)

Encapsulation for Waste Streams & Byproducts



*FGD wastewater brine from evaporator & solidified
brine material using fly ash*

Methods to stabilize
soluble metals and **halogens**
Solidification processes to **mitigate**
leachate impacts

[3002007230](#)

Closing Thoughts

- Water is truly a global challenge
- Alignment across EPRI & MATChING objectives and technology pathways
- Continued R&D and collaboration critical to the success of water research



Thought Leadership



Technology Innovation



Technology Transfer



Modeling & Analysis



Together...Shaping the Future of Electricity