

Water Management Program Update





Briggs White Technology Manager

Annual Project Review Meeting September 3, 2020





Diverse Portfolio of Programs







In a shifting generation paradigm, waterdependent technologies stay in the mix





Adding CCS can increase water consumption

+ a Global Trend Through 2050:
30% ↑ total water withdrawals
85% ↑ energy water usage



2020

2050









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USEA-hosted Workshop

July 23

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DATE & TIME

pm EDT

LOCATION

United States Ene

United States SPEAKERS

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July 23, 2020 - 9:00 am to 12:00

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STEVE WINBERG

DANIEL SIMMONS

MARY-ROSE DE



USDOE Office of Fossil Energy R&D Enabling a Sustainable Hydrogen Economy

elow for DOF-FE's Hydrogen Request for information as well as a link to its Hydrogen Strategy Documen

Strategy Document - July 2020

For inquiries about the presentation on Global Perspectives on Hydro U.S. Department of Energy please kindly contact her at Maryrose, devalladares@gmail.com or 202 409 4240. MARY-ROSE D

Click <u>here</u> to download presentations

Hydrogen RFI

Responses Due August 24

- 1. Natural Gas Hydrogen Production, Transport, and Storage;
- 2. Hydrogen Production from Gasification of Wastes
- Hydrogen Turbines 3.
- Hydrogen Storage
- Hybrid Energy Systems with R **SOFCs**
 - Click here for RFI

Office of Fossal Energ

DE-FOA-00023



Droughts Have Caused Energy Shortages





RESEARCH

NATIONAL

Energy Technology

CROSSCUTTING TECHNOLOGY **Energy-Water Issues are Highly Regional**

Available Water versus Thermoelectric Power Plants



Trends

- Population Growth
- Power Generation
 - Fuel
 - Prime Mover
 - Cooling
- Environment



ESEARCH

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Water Quality Needs for Coal Power

Heavy metals naturally occur in coal and must be captured prior to discharge



For **70%** of US coal capacity, pollutants are collected by wet FGD New Se regulations require **\$20-50M capital upgrades** to average FGD WW treatment systems

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Market Challenges



Portfolio aligned with existing markets and subset of challenges

Market Segments





Water Management R&D is organized to continually address these challenges







Annual budget has experienced steady growth creating a diverse portfolio







Recent FOAs have focused on gaps, regulatory forcing functions



DE-FOA-0002001 Cooling Technologies 5 projects, \$7.5M Plant efficiency, Reduce water demands DE-FOA-0002146 (SBIR) Real-Time Effluent Sensors 3 projects, \$0.75M Sensors for ELG metals

<u>Water Security Grand Challenge RFI</u> on potential prize competition in thermoelectric cooling innovation now active



FE technologies have led to measurable improvements in the fleet







Impact of the portfolio

Modeled Water Savings in year 2043









Combined Technologies Could Reduce Thermoelectric Water Withdrawal by 603 BGY (1,653 MGD) Consumption by 154 BGY (423 MGD)





Based on a 50% market penetration and implementing 5 technologies



CURRENT PORTFOLIO HIGHLIGHTS



Condensers

Improving overall plant efficiency, O&M by enhancing surface properties



Technology demo'd in power plant







Wastewater Treatment

Addressing heavy metals in effluents



Encapsulation

EPRI





ES Engineering



Non-biological

U. Kentucky







Water Recovery From Internal Sources

Forward and reverse osmosis approaches with reduced energy demands from novel materials



Degraded waters

Cooling, boiler, or FGD blowdown









InfiniteC∞ling Water recovery from cooling tower plumes

- Reduced evaporative loss and makeup requirement
- Lower condenser feed temperatures



Cold-energy storage to enhance dry cooling









NETL is working toward commercializing its water capabilities

Basic Immobilized Amine Sorbents

Tailored, high-selectivity trace metal capture:

Se from FGD Effluents

Low-cost compliance with Effluent Limitation Guidelines

Rare Earths from Coal Waste

Value-add waste remediation of coal mining waste

Pb from Municipal Water

Avoid costly infrastructure replacement with point of use water treatment

Mechanical Vapor Recompression Testing

- MVR = Commercially available route for ZLD & brine concentration
- Demonstrated at UND BEST facility













- Update you on FE's Water Management program
- 2. Share useful information on Energy-Water
- 3. Highlight projects
- 4. Hear and learn from you





Key Takeaways



- Water critical, especially w/ $H_2 \& CCS$
- Coal, gas, H₂ applications
- Improving water quality
- Reducing water intensity
- Decreasing fouling, O&M
- Improving heat rate
- Enabling decarbonization

Calls to Action

- 1) Check out <u>website</u>
- 2) Let us know if you're interested
- 3) Wastewater treatment and condensers need matured
- 4) Se sensor technologies ready for field testing hosts?
- 5) Sign up on <u>FedConnect</u> to receive FOA information



Water Management Program Contacts



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

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