

# Welcome: NETL Regional Workforce Initiative

Energy 101: The Water Energy Nexus

11/20/2020



[How do research breakthroughs and innovations create regional and national economic and workforce opportunities?](#)

Please join us as we return to our Energy 101 series which looks at cross-cutting research topics at NETL from a workforce and economic development perspective, while also providing useful information to our stakeholders about these technical topics that they can share with their colleagues! This month we will dive into the Water-Energy Nexus.

- All participants will be muted. If you hear yourself, please mute your line to help with assuring minimal background noise
- Presentations will be available at some point after the webinar
- Use the chat function for questions

We will begin Shortly

# Energy 101: The Water Energy Nexus

## Agenda



- **About the Energy 101 Series**

- The NETL RWFI Energy 101 Series provides a basic primer on the research conducted at NETL, including the challenges and potential economic and workforce opportunities that successful research into these topics and their related challenges may bring to the region and the nation. NETL researchers present information on their work in an easy to follow and thus easy to communicate fashion.

- **Preliminary Agenda**

- I. **Introduction to the NETL RWFI and Energy 101 Series**

- Anthony Armaly

- I. **The Energy Water Nexus**

- Nicholas Siefert

- I. **Workforce Discussion**

- Open Discussion

- I. **Conclusion**

**Slides Will be Available at the [NETL.DOE.GOV/RWFI](https://NETL.DOE.GOV/RWFI) Website at the Webinar Archives**

**Please Sign Up for our Monthly E-Note By Emailing us at [NETL.RWFI@NETL.DOE.gov](mailto:NETL.RWFI@NETL.DOE.gov)**

# NETL Regional Workforce Initiative (NETL RWFI)

A photograph of a male worker in a white hard hat, safety glasses, and a blue work shirt. He is wearing black gloves and is focused on measuring a metal component with a caliper. The background shows an industrial setting with various metal parts and machinery. The image is framed by large, diagonal, overlapping stripes of orange and green on the left and right sides.

A Focus on Appalachia and the future of Energy and Advanced Manufacturing Regional Workforce Readiness and Economic Development



# NETL RWFI Mission Statement

A photograph of a person wearing a dark blue or black jacket, holding a bright yellow hard hat under their arm. The background is a blurred industrial or laboratory setting.

NETL RWFI is a platform for engagement and collaboration with key stakeholders who are critical for the deployment of U.S. DOE and NETL Energy and Advanced Manufacturing technological research.

Supporting Regional Economic and Workforce Development opportunities.



# Collaboration, Coordination, and Communication

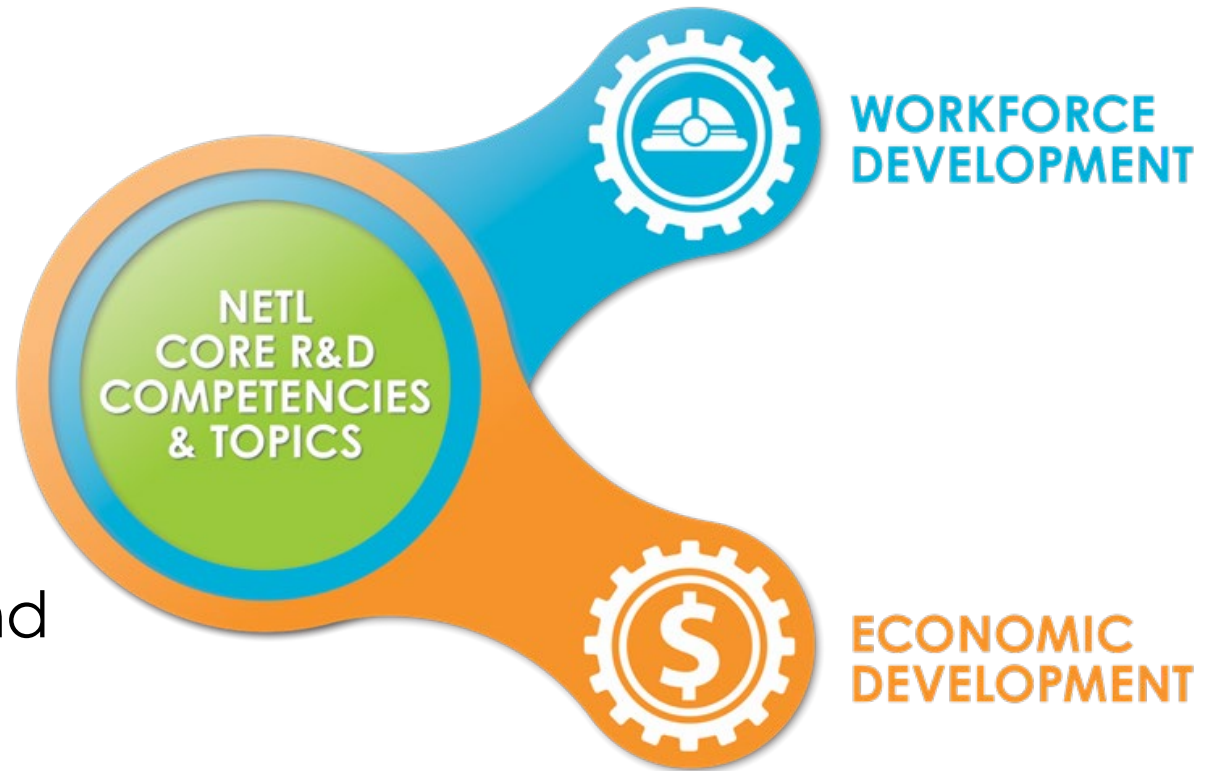
In the Energy and Advanced Manufacturing workforce



**Collaboration** with stakeholders and partners around workforce readiness and economic opportunities

**Coordinating** across economic development and workforce development initiatives

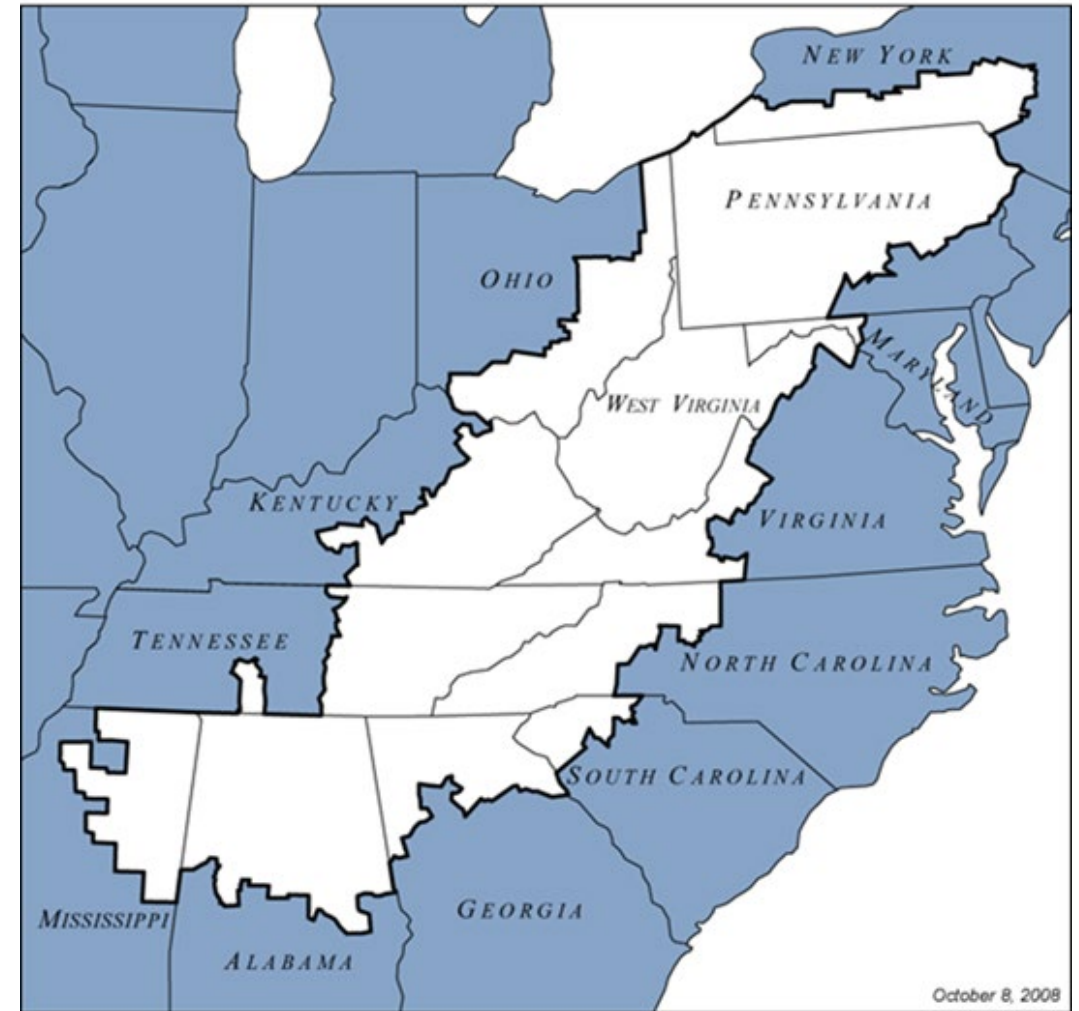
**Communicating** activities, research, and funding opportunities to stakeholders



# Appalachia at a Glance

## The Appalachian region is:

- a historically critical region for U.S. energy production, and will continue to be so
- a strategically important area for related technologies in advanced manufacturing and supercomputing
- expected to enjoy a manufacturing renaissance
- an area that has been adversely affected by changes in energy extraction and related manufacturing activity



Source: Appalachian Regional Commission



# Key NETL RWFI Metrics



700+

individual regional  
and national  
stakeholders

350+

institutions and  
organizations  
represented

200+

subscribed to the  
NETL RWFI e-Note  
Monthly Newsletter

1000+

registrants to the  
NETL RWFI Webinar  
Series



# Key Outcomes to Date



Establishment of a new network  
of regional stakeholders



Consistent engagement with key  
regional partners



Integration of Workforce Workplan



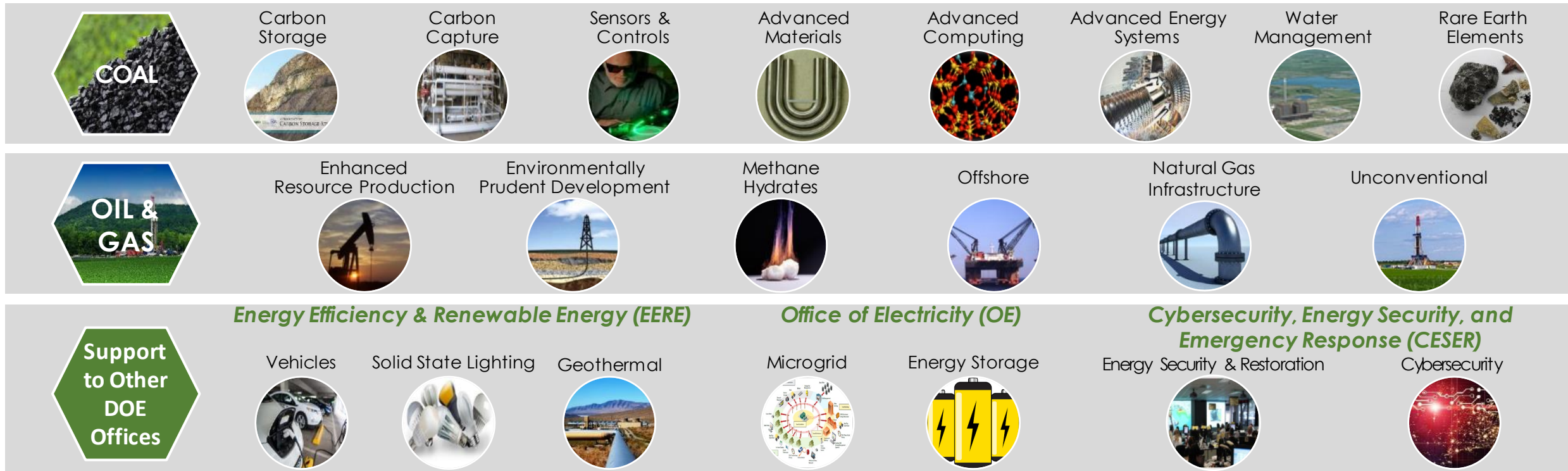
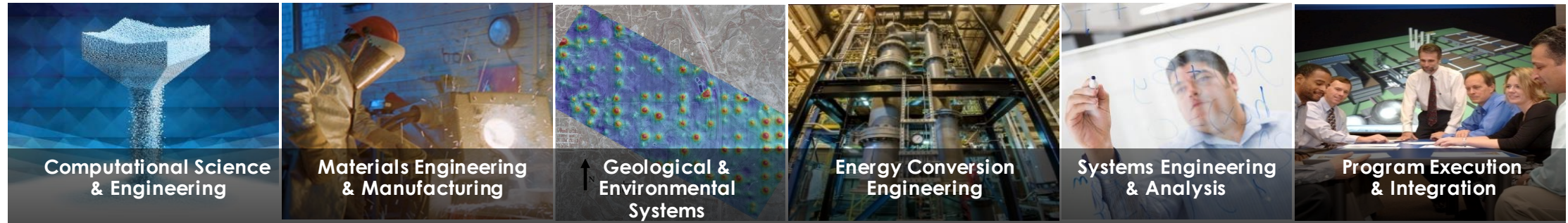
Increased communication of NETL mission



Increased growth for potential collaborative opportunities



# Core Competencies & Technology Thrusts





# Contact Information

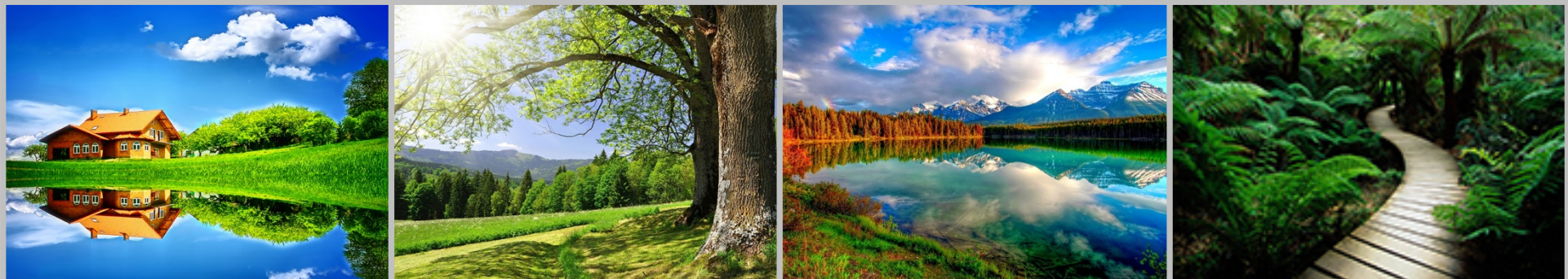


*For More Information, Contact Anthony Armaly*

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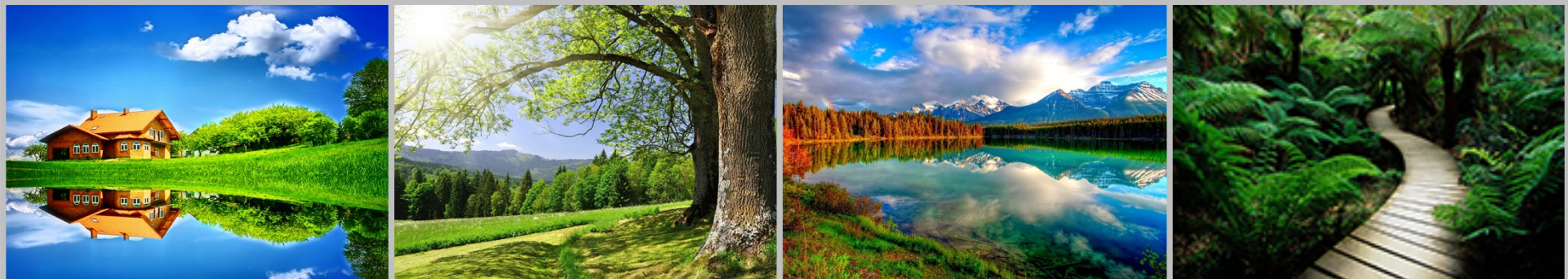


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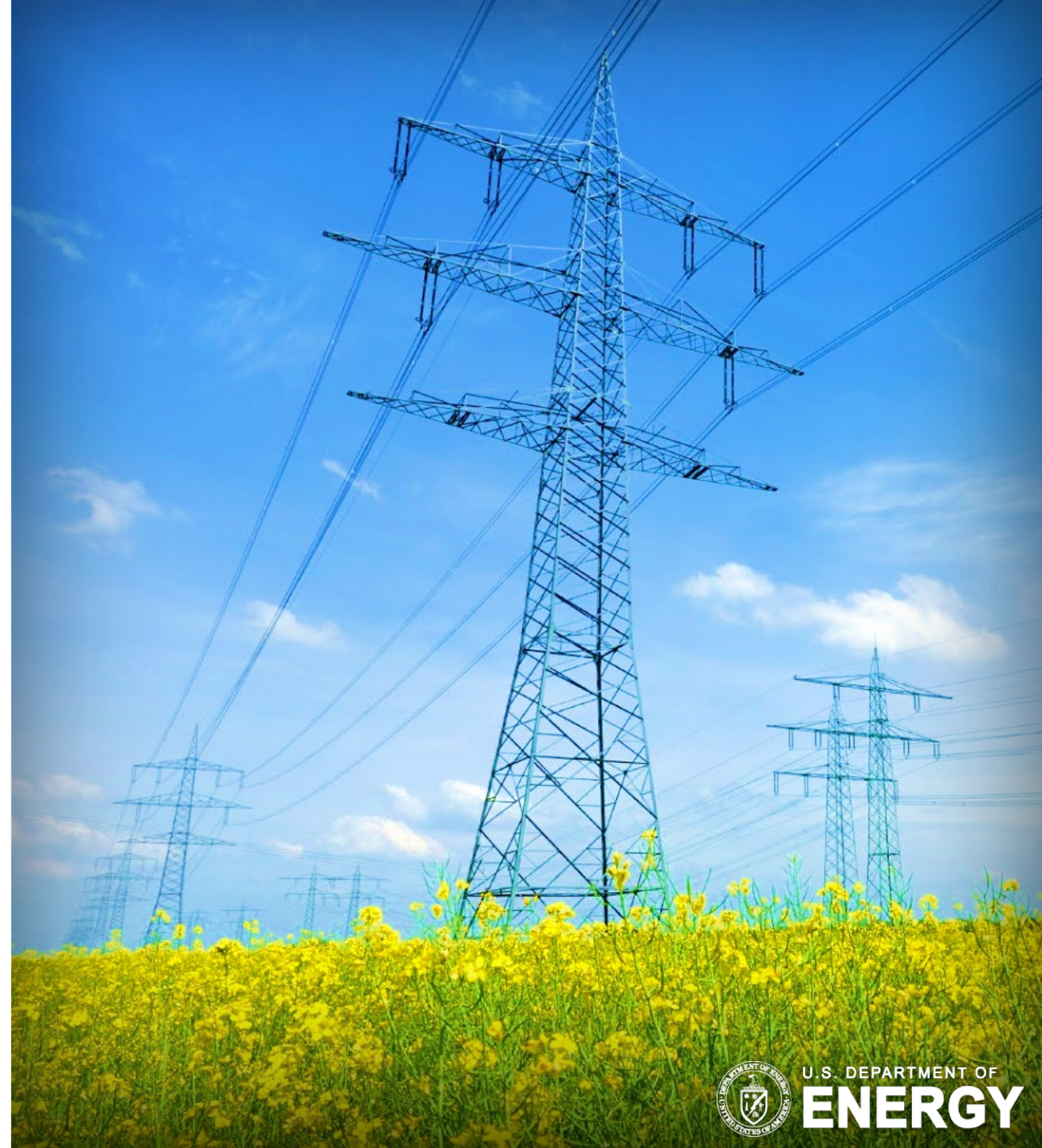
# Work Force Development

## Energy-Water Nexus

Technical Portfolio Lead: Nicholas Siefert

Technology Manager: Briggs White

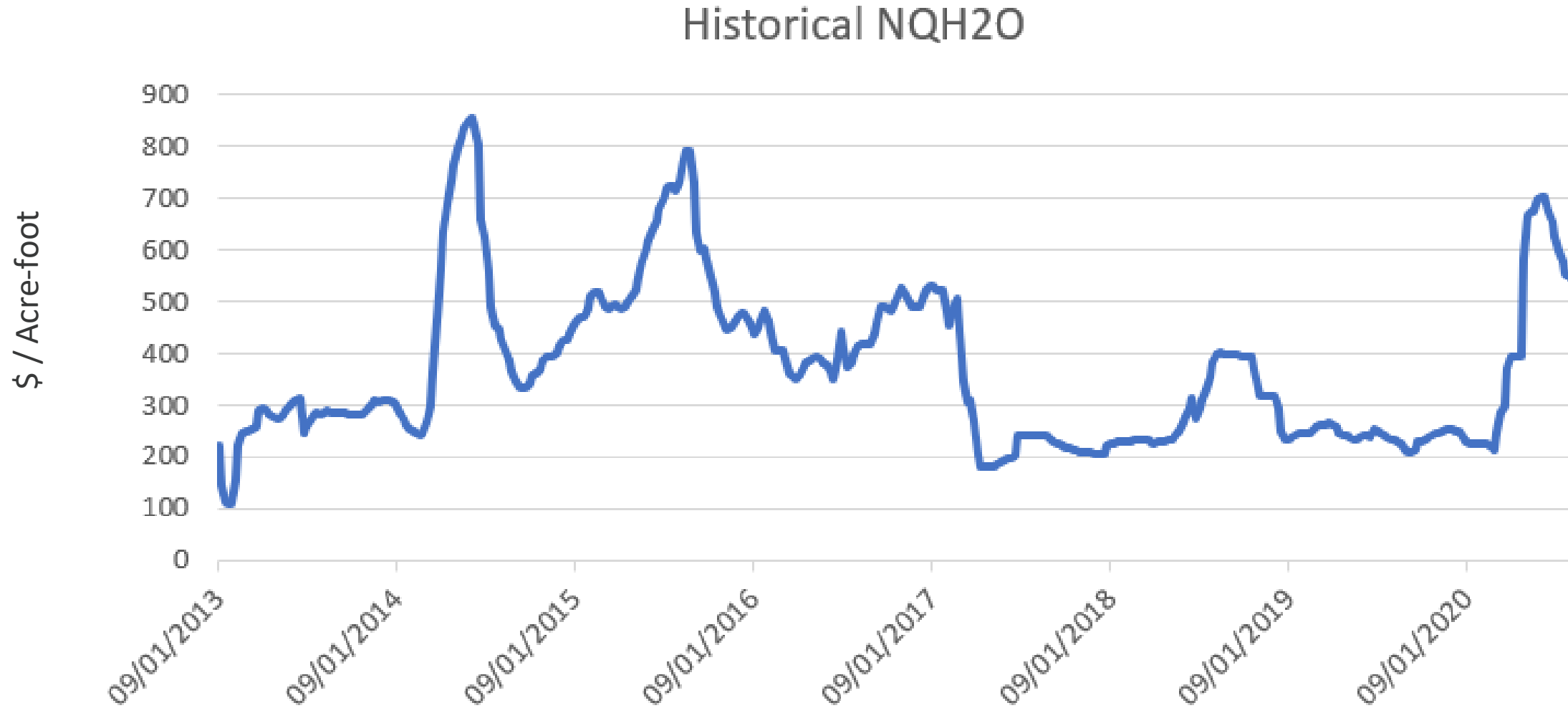
November 19, 2020





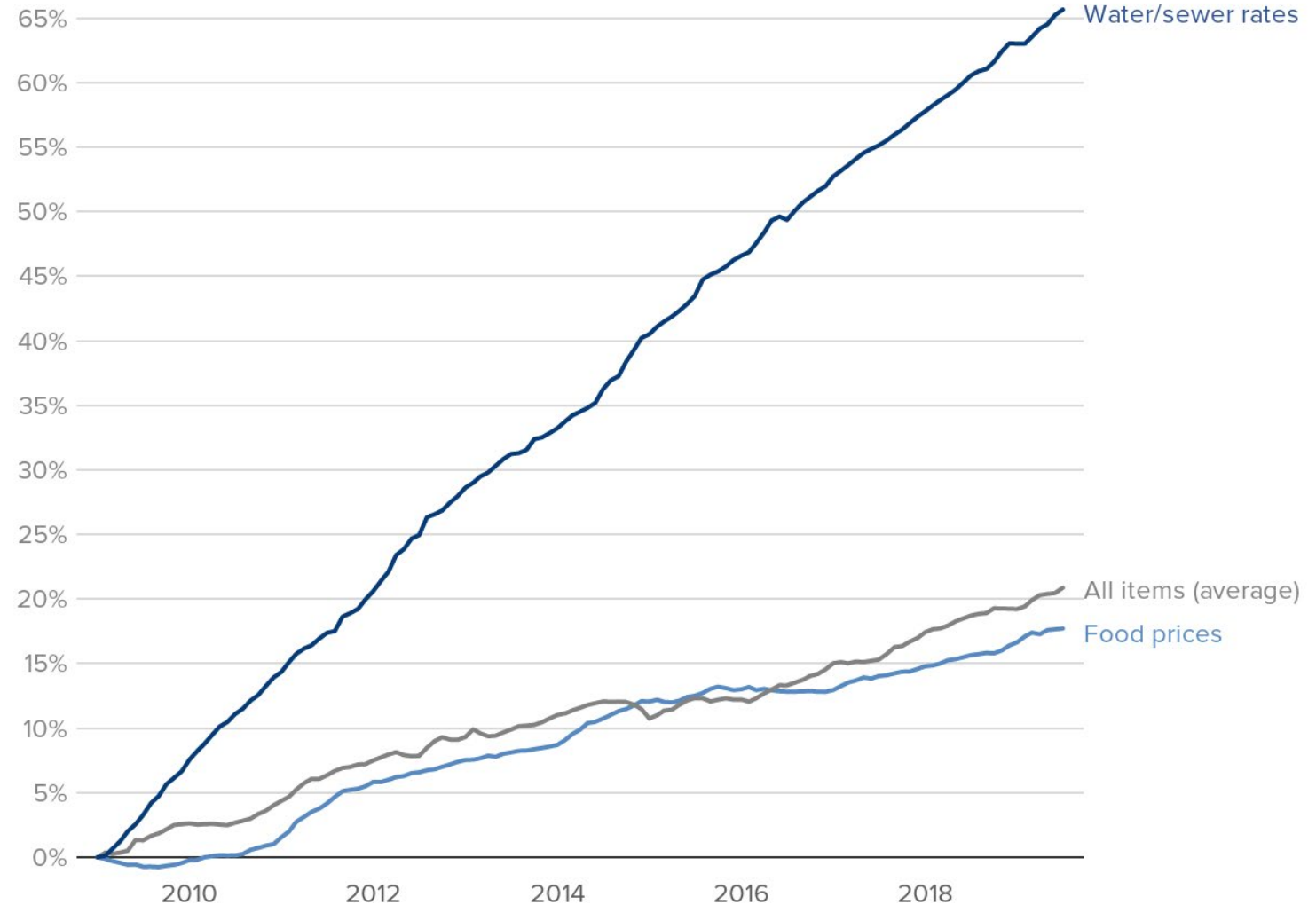
# What's the Price of Water?

California has a market for Fresh Water



# Water Utility Bills are Rising Nation-wide

- Water bills are increasing well above inflation
- Water services are becoming an increasing cost both for:
  - Residential &
  - Industrial Uses



# 30% of the Water Workforce will be retiring



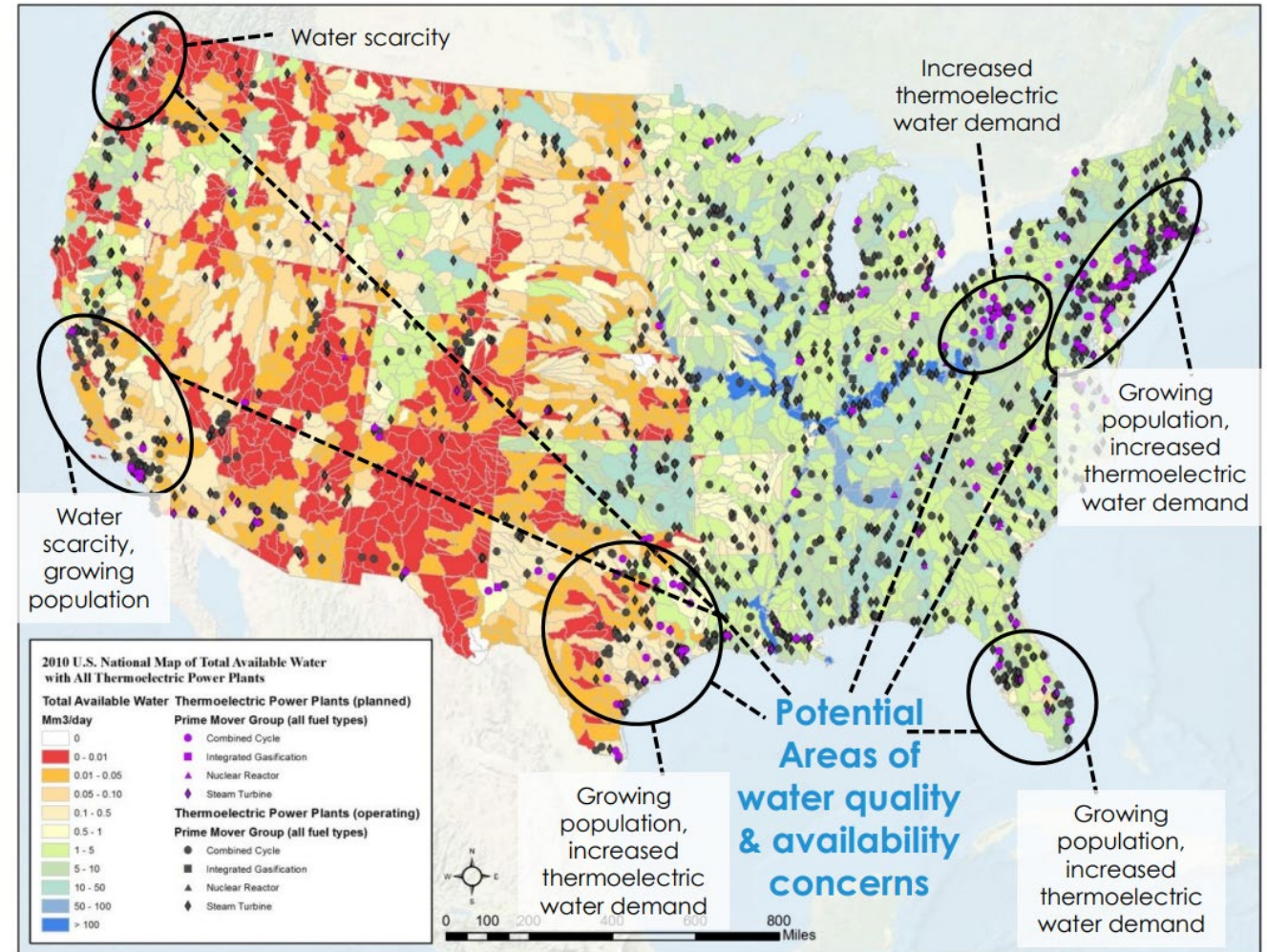
- Like many STEM areas, there are work force development issues due to eligible retirees
- Water conference, like the International Water Conference and the American Water Works Association, have active mentorship programs to help train the next generation and get them excited about water treatment
- NETL is a part of the [Mickey Leland Energy Fellowship Program](#) (Application for Summer 2021 due Jan 8<sup>th</sup>)
- An aside: Water conferences are the most engaging and interactive of any conferences I've attended in the 18 years since graduating college





# Energy-Water Issues are Highly Regional

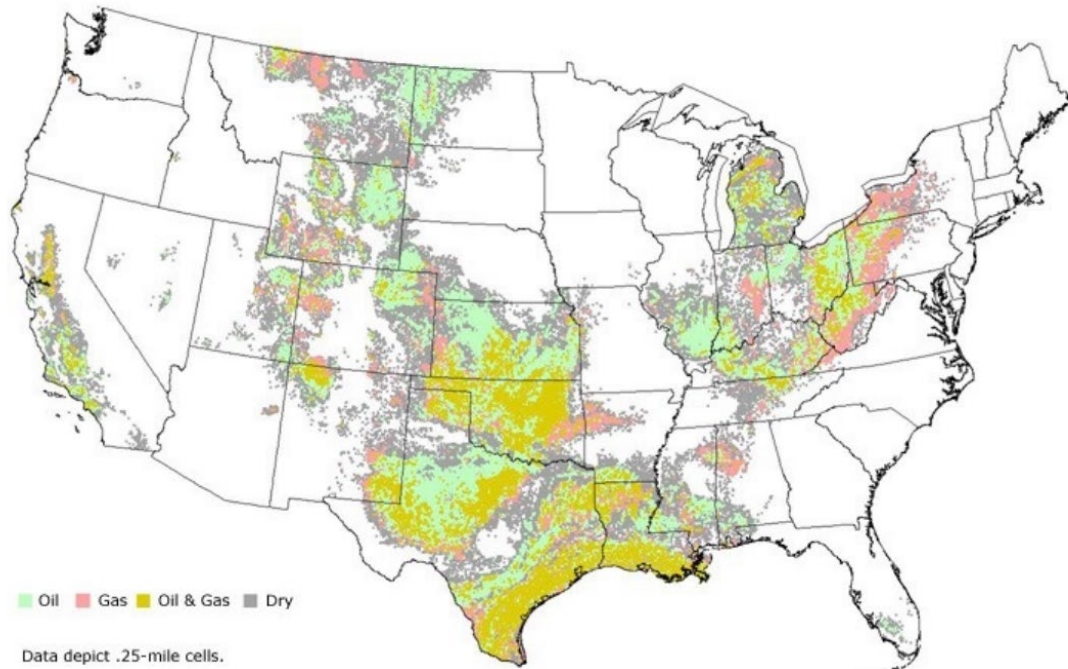
- Each region of the U.S. is facing unique water challenges
- There is no unique solution
- West: Water Scarcity
- East: Water Quality



# Potential Synergies between Fossil Assets

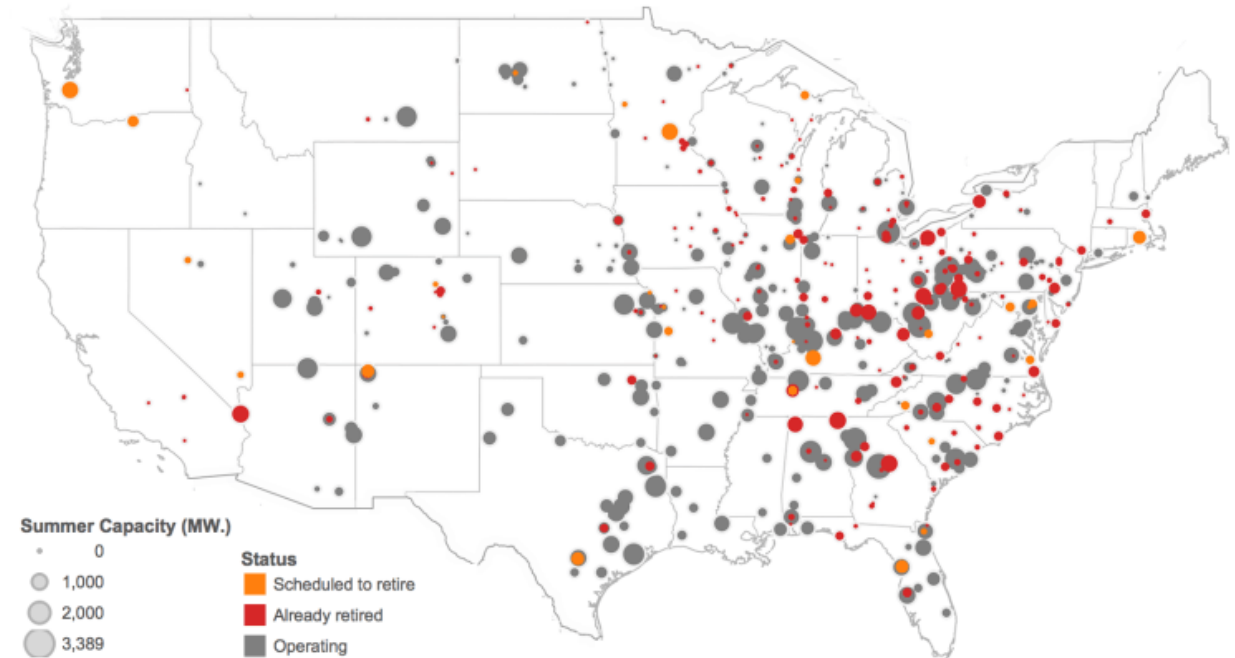
Potential for Produced Water from Oil&Gas Wells to be Treated at Coal Power Plants

## Distribution of Oil & Gas Wells



Up to 1 trillion gallons of fresh water

## Capacity of Existing & Recently Retired Coal Plants



>60 million tons per year of salt



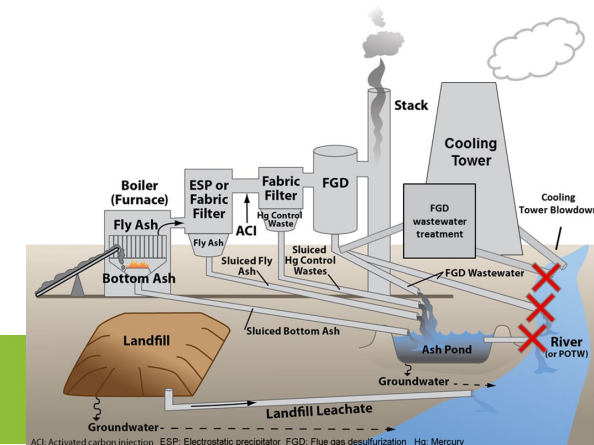
# EPA Limits on Effluent & Example FGD Effluent Compositions

## 2020 New Final Ruling

Pollutant	Unit	Avg	Monthly Avg Lim
Arsenic, total	(ug/L)	5	9
Mercury, total	(ng/L)	13	34
Selenium, total	(ug/L)	16	29
Nitrate/nitrite as N	(mg/L)	2	3

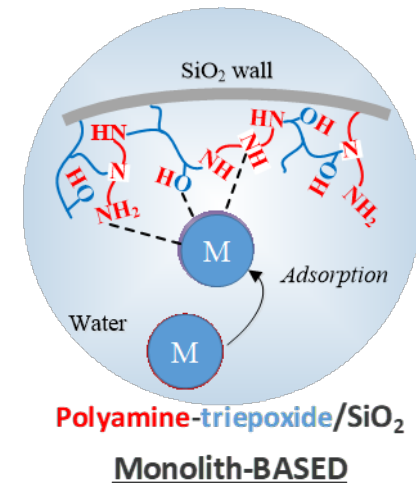
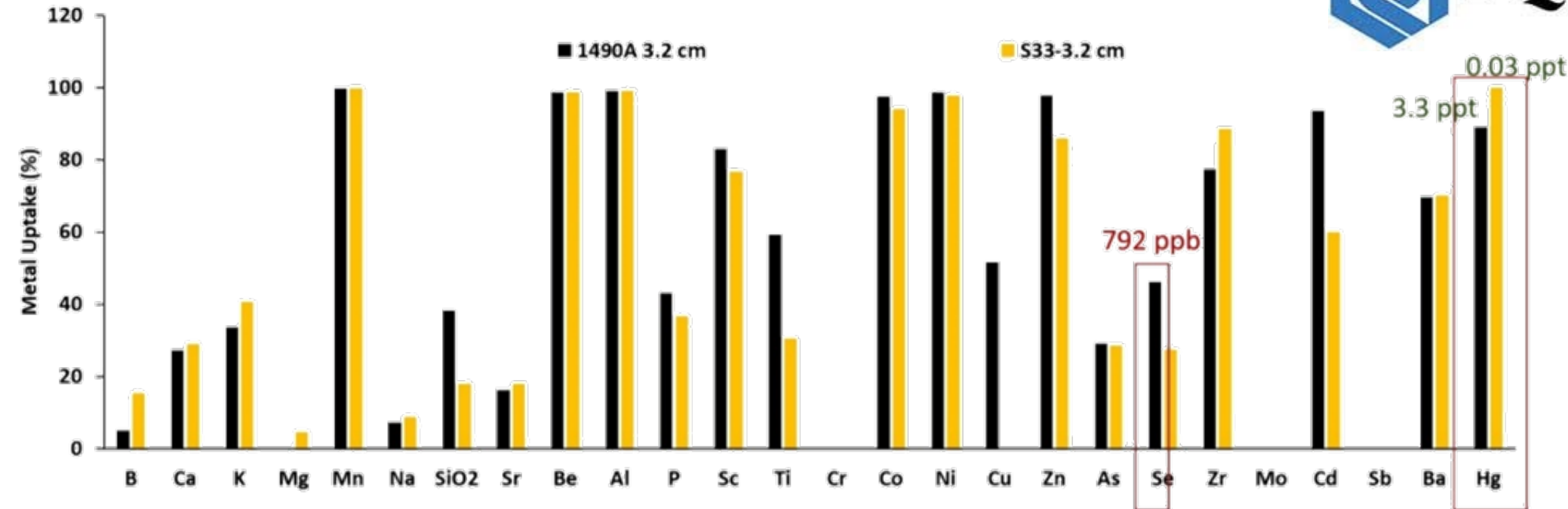
## EPA Data Collected during Initial Rule Making

Pollutant	Unit	PP June 22 2010	MF July 12 2010	A Aug 2 2010	BC June 2010
Arsenic, total	(ug/L)	160	937	120	240
Mercury, total	(ng/L)	2,080,000	166,000	50,300	291,000
Selenium, total	(ug/L)	15,000	3,400	1,500	6,600
Nitrate/nitrite as N	(mg/L)	160	72	14	16



# Selective Removal of Heavy Metals for Effluent Streams

Percentage uptake of elements into NETL sorbents from Longview FGD water



## Patent Applications:

- M. L. Gray, B. W. Kail, W. C. Wilfong, Q. Wang, Stable Immobilized Amine Sorbents for REE and Heavy Metal Recovery from Liquid Sources. Published April 2018, WO2018071730A1 (Licensed to PQ cooperation)
- M. L. Gray, B. W. Kail, W. C. Wilfong, Q. Wang, F. Shi, Metal-loaded Basic Immobilized Amine Sorbents for the Removal of Metal Contaminants from Wastewater. Filed Jul. 17, 2019, US 62875364 (Licensing in process and projected 2-ton test proposed by Somerset Environmental Solutions, Inc.)
- M. L. Gray, B. W. Kail, W. C. Wilfong, Q. Wang, F. Shi. Multi-Functionalized Basic Immobilized Amine Sorbents for Removal of Metal Contaminants from Wastewater. Filed Jul. 18, 2019, US 62875829 (Licensing in process and projected 2-ton test proposed by Somerset Environmental Solutions, Inc.)

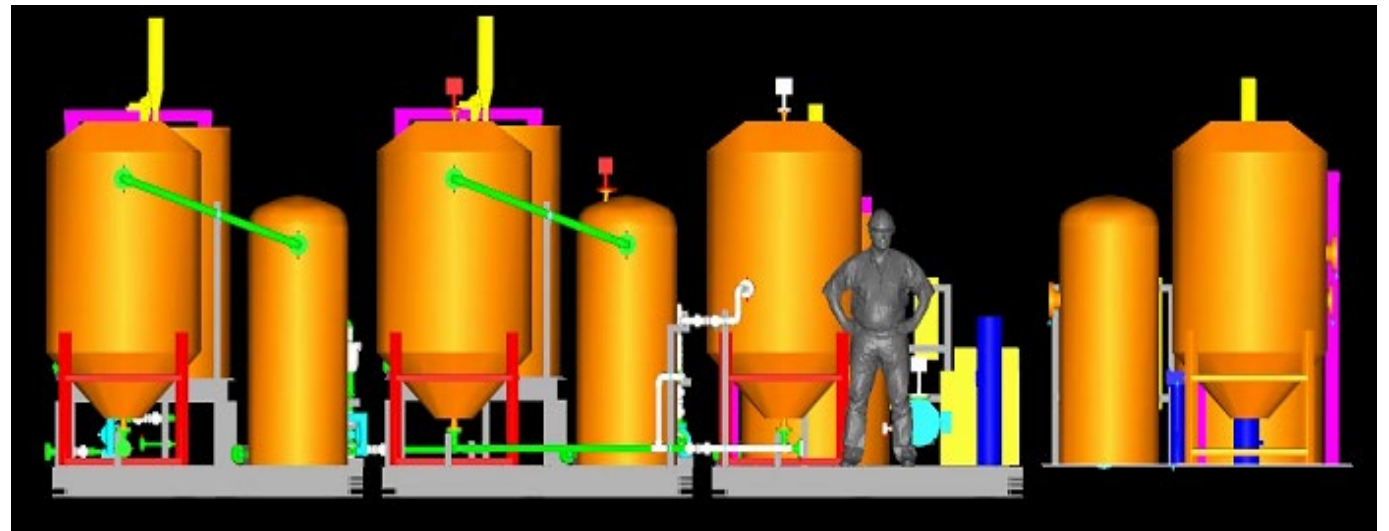


# Zero Liquid Discharge & Resource Recovery



NETL/RIC is designing a UF/NF/RO skid to add in front of an existing brine concentrator to demonstrate Zero Liquid Discharge and Resource Recovery

Goal: To Operate at Longview Power Plant near Morgantown, WV



# Local Business & Power Plants

- Interphase Materials is a local Pittsburgh, testing at Longview Power Plant
- WVU will be testing ZLD technologies at Longview Power Plant

## Produced Water-Aided Treatment of Blowdown Water for Value Creation

Lance Lin (PI)

Harry Finklea

Hailin Li

Fernando Lima

Paul Ziemkiewicz



Application of Heat Transfer Enhancement (HTE) System for Improved Efficiency of Power Plant Condensers

FE R&D Virtual Project Review | 10.01.2020



Projects funded  
through  
NETL/TD&IC

[https://netl.doe.gov/sites/default/files/netl-file/20WTVPR\\_Lin.pdf](https://netl.doe.gov/sites/default/files/netl-file/20WTVPR_Lin.pdf)

[https://netl.doe.gov/sites/default/files/netl-file/20WTVPR\\_Snyder.pdf](https://netl.doe.gov/sites/default/files/netl-file/20WTVPR_Snyder.pdf)

# Water Management for Power Systems



DOE/HQ Program Lead: Regis Conrad  
Technology Manager: Briggs White

TD&IC Project Managers: Jessica Mullen & Barbara Carney

RIC Technical Portfolio Lead: Nicholas Siefert  
RIC Principal Investigators:

- |  |                  |
|--|------------------|
| • Task#2: Guiding R&D for Treatment of Coal Power Plant Effluent Streams | Eric Grol        |
| • Task#3: <u>Selective Removal of Heavy Metals for Effluent Streams</u>  | McMahon Gray     |
| • Task#4: <u>Concentrating Wastewater Effluent Streams</u>               | Nicholas Siefert |
| • Task#5: Impact of Water Use of Power Systems                           | Erik Shuster     |
| • Task#6: <u>Biological Treatment of FGD Effluent Streams</u>            | Djuna Gulliver   |
| • Task#7: <u>Characterization of FGD Effluent Streams</u>                | Dustin McIntyre  |
| • Task#8: Water Management for Fossil-Based Hydrogen Production          | Timothy Skone    |