

U.S. DOE's Office of Fossil Energy Critical Minerals and Rare Earth Elements R&D Webinar

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Technology Manger**

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NETL – Pittsburgh, PA

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Courtesy of NETL REE-CM Website

REE-CM Program Portfolio – 2014 to Present



KEY PROGRAM DRIVERS

National Security & Economy
Environmental Impact
Economic Targets
Build U.S. Domestic Infrastructure
for On-Shore Production

PROGRAM GOAL

1-3 tonnes/day Production of $\geq 75\%$ Mixed
REO/RES from Coal and Coal-Based Resources

Program Portfolio Budget – \$118M

~40 Intramural/Extramural
Projects

KEY PROGRAM DRIVERS

National Security & Economy
Environmental Impact
Economic Targets

Build U.S. Domestic Infrastructure
for On-Shore Production

Modified Conventional Separation
RFP-89243329RFE000032

Small Pilot High Purity MREO
FOA-1627

Conventional & Transformational Separation
FOA-2003

Conventional & Transformational Separation
FOA-1202 & FOA-1718
NETL RIC FWP, LANL FWP, LLNL FWP

REE Separations; Metallization
SBIR 2018 & 2019

REE Industries, CM Markets/End-Use
UCFER

Field Prospecting
RFP-9067, RFP-10982

Sensors: SBIR 2017

NETL RIC FWP, LANL FWP, INL FWP

PROGRAM GOAL

1-3 tonnes/day Production of $\geq 75\%$ Mixed
REO/RES from Coal and Coal-Based Resources

– Nominally 300ppm REE –

*Run-of-Mine, Coal Prep Refuse, Over/Under-Burden
Clays/Shales, Power Generation Ash, Acid Mine Drainage*

DEMONSTRATION
&
COMMERCIALIZATION

PRODUCTION
PILOT-SCALE FACILITIES (TRL 5-7)

PROCESS DEVELOPMENT
LAB/BENCH-SCALE FACILITIES (TRL 3-5)

BASIC SCIENCE – CONCEPT DEVELOPMENT (TRL 1-3)

ENABLING TECHNOLOGIES

Resource Assessment – Sensors – Techno-Economic Analysis

Major Program Accomplishments

- 3 First-of-a-Kind Domestic Pilot-Scale Facilities Producing Small Quantities of MREO from Coal
- Critical Mineral Production from Coal-Based Resources
- Diverse Feedstock Resources & Multiple Processing Approaches to Produce MREO
- Complete REE Extraction from AMD
- High REE-Organic Association in Lignite
- Licensed REE-Sorbent Technology
- Separation/Extraction POC Validation
- U.S. REE Clay Association
- >4,000 Domestic Field Samples
- Coal HREE/LREE >1
- Fiber Optic & LIBS Prototype Sensors Detect ppm REE Concentrations in Fluids

University of Kentucky – Coal Refuse –



*Courtesy of Rick Honaker, University of Kentucky
Roe-Hoan Yoon & Aaron Noble, Virginia Tech*

Physical Science Inc. & Winner Water Services – Power Generation Ash –



*Courtesy of Prakash Joshi, Dorin Preda, & David Gamliel, PSI
Todd Beers, Winner Water Services*

West Virginia University – Acid Mine Drainage –



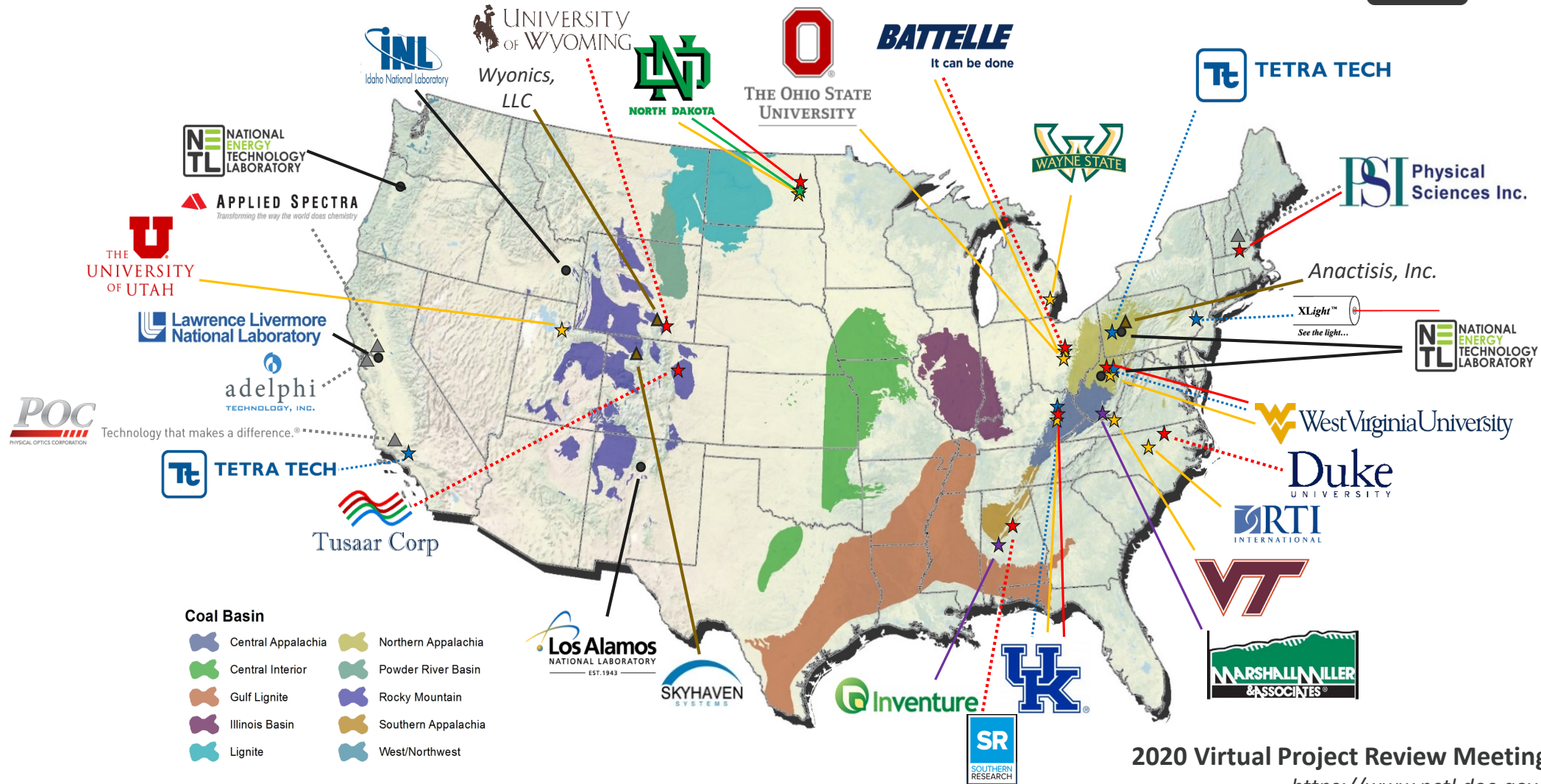
Courtesy of Paul Ziemkiewicz, WVU

University of North Dakota – Lignite –



Courtesy of Nolan Theaker, UND

REE-CM Program – Acknowledgments



2020 Virtual Project Review Meeting – Sept 15-16

<https://www.netl.doe.gov>