

EVOLVE CAPP

Evolve Central Appalachia

DE-FE0032055

Open Session

Julian, WV

4 August 2023

Richard Bishop (PI)

ACKNOWLEDGEMENT

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AGENDA

1. Richard Bishop (VT) – Project Introduction & Opening Remarks
2. Scott Peterson (MM&A) - Basinal Resource Assessment
3. Parans Paranthaman (Oak Ridge National Lab) – Carbon Products
4. Danny Gray (Gray Energy Technologies) – Fly Ash Opportunities
5. Ralph Bandy (Advanced Resources Intl) – Produced Water
6. Deniz Talan (WVU) – Recovery from Wastes
7. Wencai Zhang (VT) – Separation Technologies
8. Brian Hill (CRI) – Infrastructure Assessment
9. Steve Schafrik (UKY) – Mining Technology Assessment
10. Matt Scheffel (Chmura Economics) – Economic Development
11. Vickie Ratliff (MECC) – Workforce & Economic Development
12. Closing remarks



RESEARCH TEAM

**West Virginia University
Mining Engineering**

**Virginia Tech
VCCER & Mining Engineering**

**University of Kentucky
Mining Engineering**

Marshall Miller & Associates

Gray Energy Technologies

Oak Ridge National Laboratory

Advanced Resources Intl.

Chmura Economics

U. S. Geological Survey

Crescent Resource Innov.

Southern States Energy Board

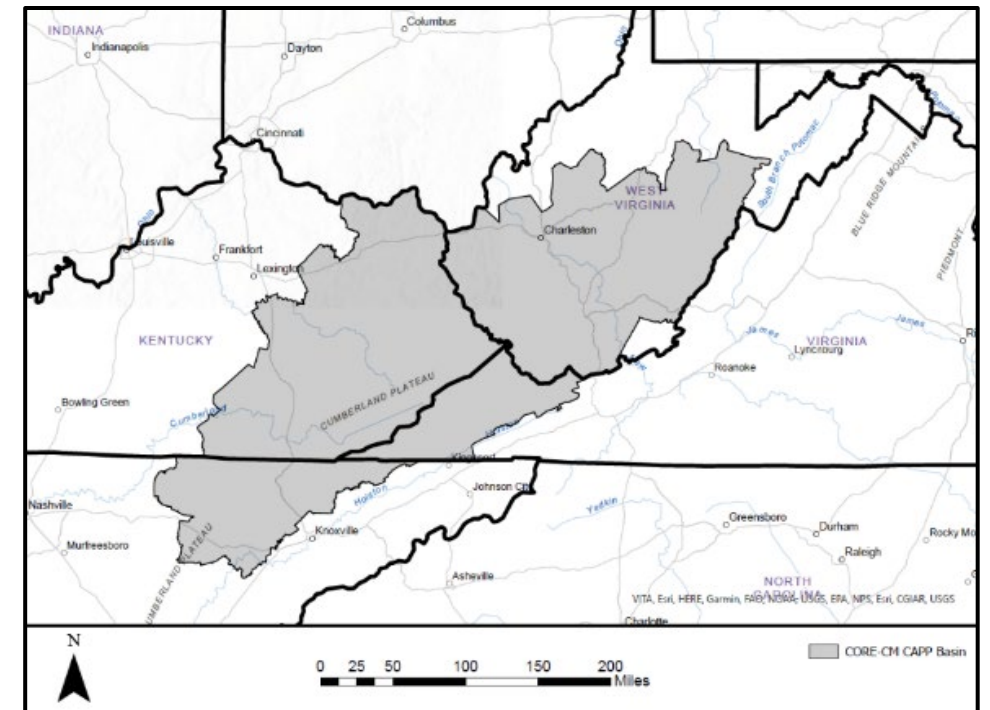
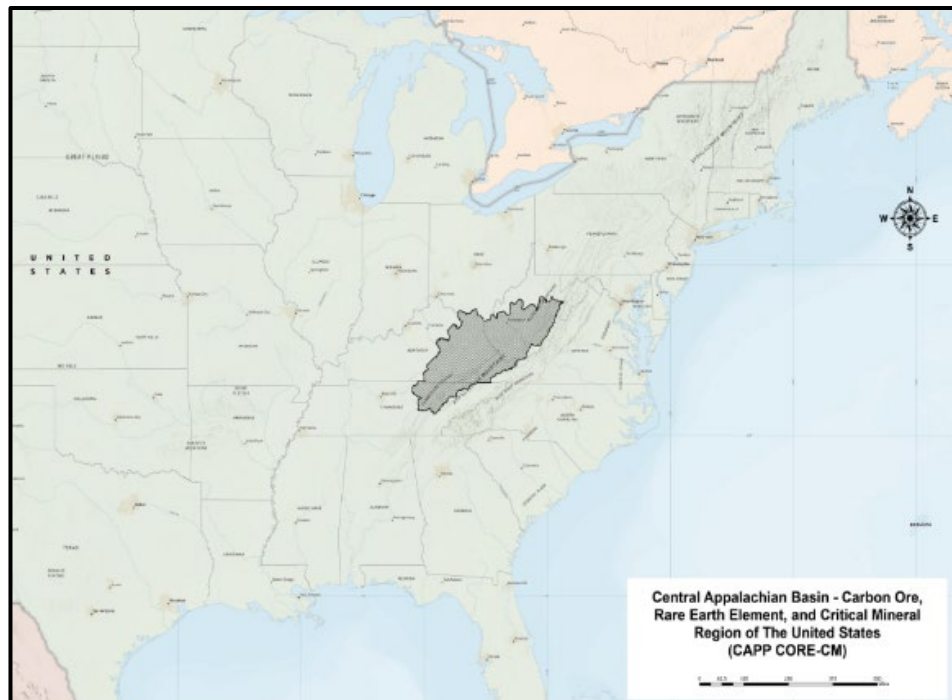
Virginia Dept of Energy

Mountain Empire Community College Coalition

- Mountain Empire Community College (MECC), VA
- Roane State Community College (RSCC), TN
- Southeast Kentucky Community & Tech. College (SKCTC)
- Southern West Virginia Comm. & Tech. College (SWVCTC)

PROJECT OVERVIEW

- Investigating the Rare Earth & Critical Minerals potential of the Central Appalachian (CAPP) basin
- Project Dates: October 1, 2021 – September 30, 2023; Funding: **\$1,58M DOE** + **\$526K cost share**
- Extension: October 1, 2023 – March 31, 2024; Add'l Funding **\$500K DOE** + **\$97K cost share**



EVOLVE CAPP PRIORITIES & PRINCIPLES

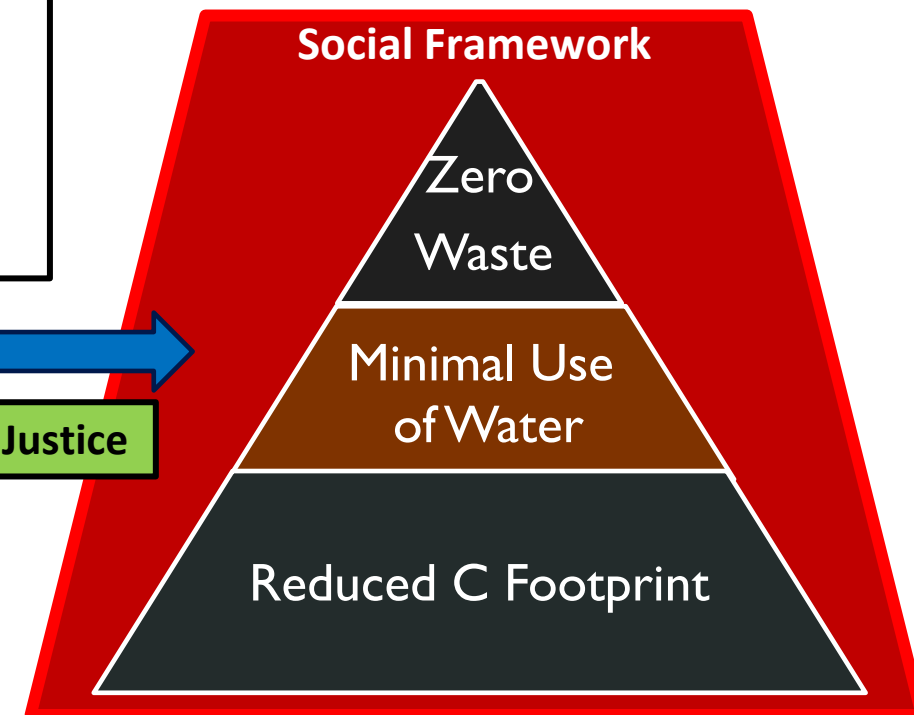
Evolve CAPP Priorities:

- ✓ Establish a CORE-CM Stakeholder **Community**
- ✓ Develop Vibrant CORE-CM Domestic Industries
- ✓ Supply Green & Digital Economy & Contribute to National Security
- ✓ Avoid Mineral Supply Risk, Potential Interruptions
- ✓ Create Downstream Value-Added Industries & Chains
- ✓ Stimulate Economic Growth in CAPP Region
- ✓ Foster New Job Creation & Upskilling of Local Workforce

Evolve CAPP Principles:

- Develop/Adopt Technologies, Processes & Best Practices that aim for “Zero Impacts” & can earn Social Acceptance
- **Sustainable/Responsible Sourcing**

Positive Environmental & Social Outcomes



ADDRESSING ISSUES, BARRIERS & INCENTIVES

Issues/Barriers:

- ✓ Technology is not meeting Responsible Sourcing Standards!
- ✓ Asserting Minerals Titles to both Geologic & Waste Stream resources
- ✓ Waste Stream Regulations & Permitting- Authorities & Regulatory jurisdiction in Collection, Processing & Marketing
- ✓ Companies' reluctance to allow access to reclaimed waste sites for sampling & testing purposes. A significantly robust safety net & financial interest may have to be devised for those owners
- ✓ Is CORE-CM the Primary Production or a Byproduct?-What Happens if Mine/Plant closes?
- ✓ Local Community Expectations
- ✓ Production costs & margins
- ✓ Dependence on Global Pricing, "Dumping" & Arbitrage Issues

Incentives:

- ✓ Experience with Tax Credits, Low Interest Loans, Government-Supported FEED Studies
- ✓ New ideas needed (from Long-Term Government Contracts to Robust Community Benefits)

PROJECT SCOPE

The general scope of the Evolve CAPP project is to:

- 1) Assess existing knowledge*
- 2) Perform a gap analysis*
- 3) Fill identified gaps with future projects*
- 4) Provide educational & public outreach*



ASSESSMENT OF CORE-CM RESOURCES

- **Initial Sampling:**

- CCR sampling commenced **September 2022 (25 samples)**
- ESUP drill core samples **September 2022 (19 samples)**
- Produced water sampling commenced **December 2022 (30 samples)**
- Mine sampling commenced **July 2023 (30 samples)**
- Received new drill core samples **today**



MAPPING & SAMPLING PROGRESS

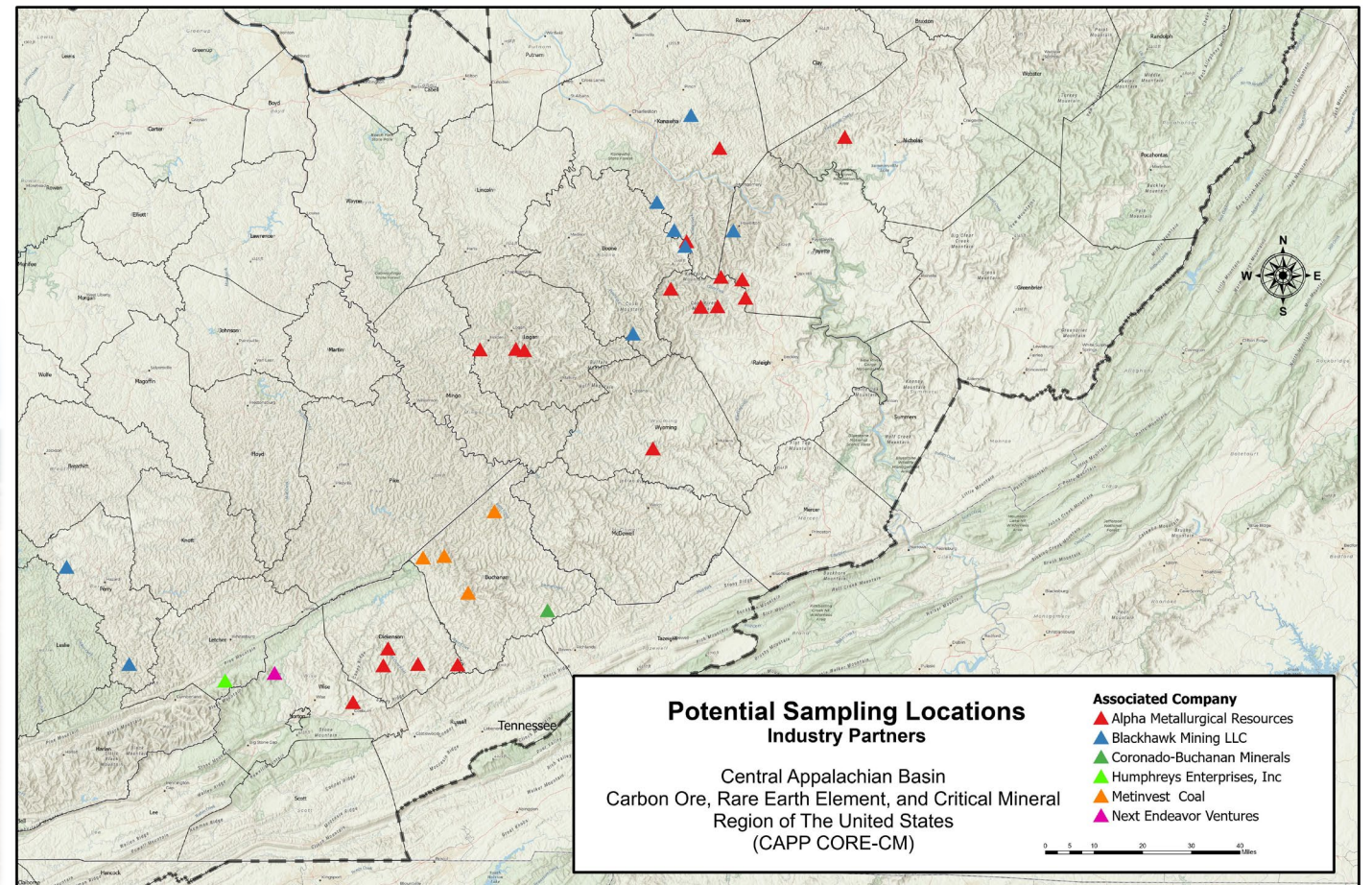
- Mapping complex area with numerous historic mining sites
- Significant advancements in mapping progress
- Multiple coal seams being evaluated
- Preliminary focus on sample frequency & concentration
- Methodology in place to form an initial resource assessment

	KENTUCKY					TENNESSEE			
	COUNT	MAX	MIN	AVERAGE		COUNT	MAX	MIN	AVERAGE
BLUE GEM	41	193.01	25.05	68.88	REX	2	46.75	32.10	39.43
UPPER ELKHORN NO 2	33	191.05	44.92	72.44	BLUE GEM	2	44.10	44.04	44.07
JELICO	42	170.06	44.07	91.84	MASON	3	61.66	34.78	45.64
UPPER ELKHORN NO 3	44	261.06	45.27	111.84	PEWEE	4	72.14	50.45	63.30
UNKNOWN-BITUMINOUS C	46	485.25	40.93	117.91	JELICO	3	99.63	43.62	79.90
PEACH ORCHARD	62	323.30	45.54	133.58	COAL CREEK	2	117.34	52.65	84.99
HAZARD NO 7	30	212.49	40.99	135.81	POPLAR LICK	3	140.83	34.94	100.11
HAZARD	59	420.31	50.79	140.85	BIG MARY	4	230.84	78.89	135.63
BROAS	31	661.07	65.72	148.87	WINDROCK	2	232.17	55.74	143.95
HINDMAN	30	413.30	71.79	164.93	WALNUT MOUNTAIN	2	186.24	141.95	164.10
FIRE CLAY	89	732.51	45.44	189.56					

	VIRGINIA					WEST VIRGINIA			
	COUNT	MAX	MIN	AVERAGE		COUNT	MAX	MIN	AVERAGE
LYONS	35	210.98	30.39	81.41	REDSTONE	42	453.77	43.67	104.65
BLAIR	18	149.24	47.06	82.07	BECKLEY	43	344.60	30.12	111.41
DORCHESTER	71	273.42	30.70	91.12	SEWELL	51	484.58	37.37	122.94
CLINTWOOD	67	394.08	30.41	93.18	POCAHONTAS NO 3	48	396.95	47.17	136.72
NORTON	18	159.34	39.39	94.20	NO 2 GAS	37	840.13	60.41	154.99
KENNEDY	18	278.48	37.57	96.70	EAGLE	54	833.07	52.64	156.91
UPPER BANNER	31	320.15	56.04	124.21	CAMPBELL CREEK	30	766.85	46.51	196.15
SPLASHDAM	24	498.31	48.20	124.30	COALBURG	39	846.04	52.16	203.98
LOWER BANNER	19	413.96	34.49	131.04	NO 5 BLOCK	38	1,389.71	51.44	245.11
JAWBONE	17	321.39	43.17	165.73	STOCKTON	27	712.13	70.17	247.86

POTENTIAL FUTURE SAMPLING LOCATIONS

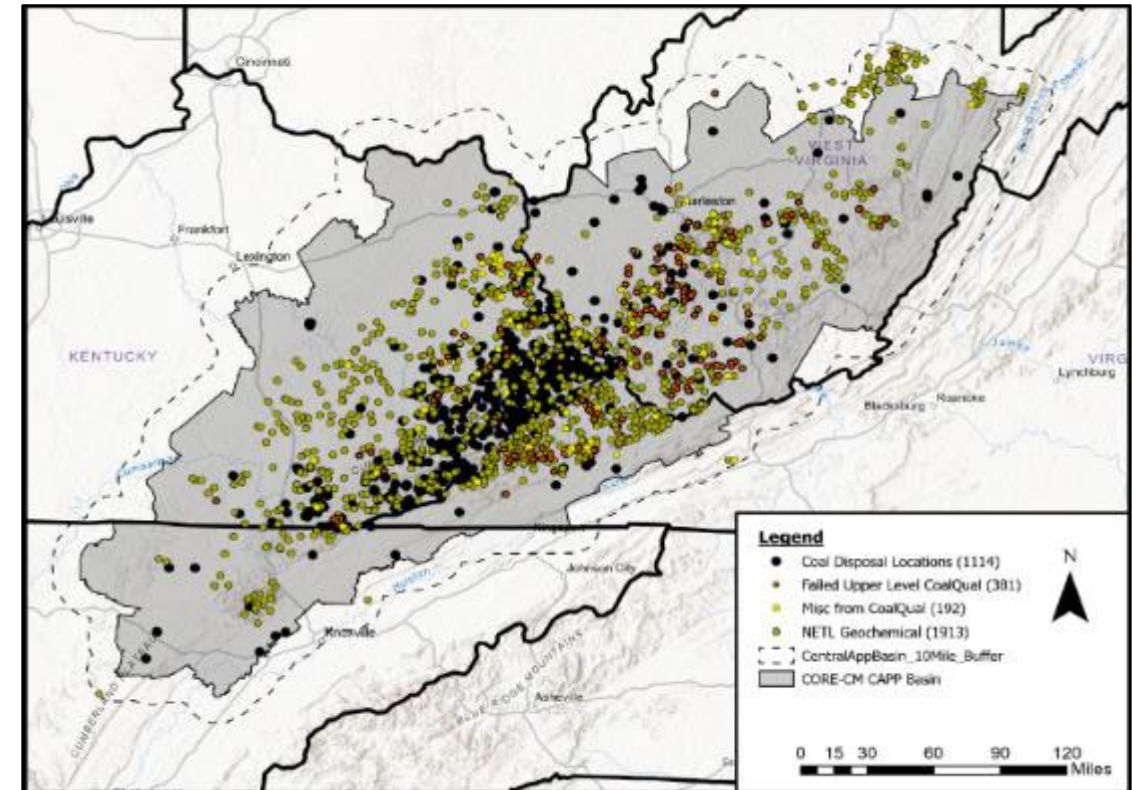
- Targeting resource gaps
- Confirming historical sampling



BASINAL STRATEGIES FOR REUSE OF WASTE STREAMS

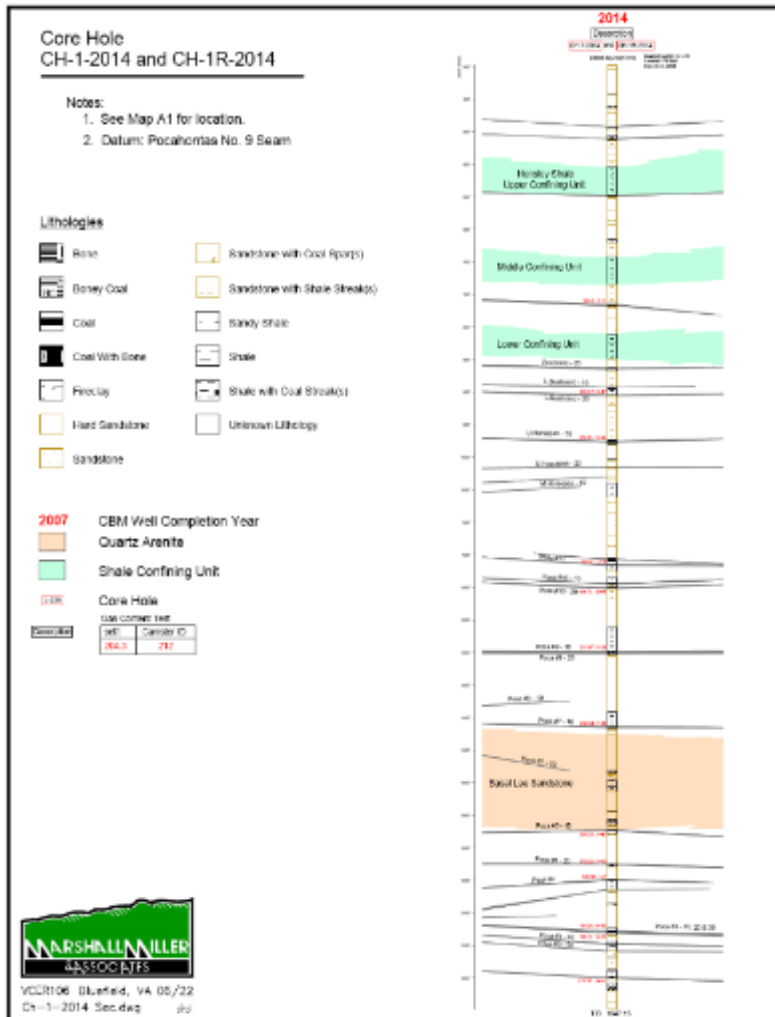
Assessment of Mine Refuse & CCR Waste Streams

- Identify “permitted” sites through State & Federal Regulatory Agencies
- Identify utility-known CCR landfills & impoundments based on EPA & State Solid Waste Database
- Contacting utilities & industry parties to identify CCR volumes, type of material stored & potential for REE-CMs
- Catalogue operational status in resource database



CAPP Basic Infrastructure
& Waste Stream Locations

P-XRF SCREENING & LAB ANALYSIS OF DRILL CORE

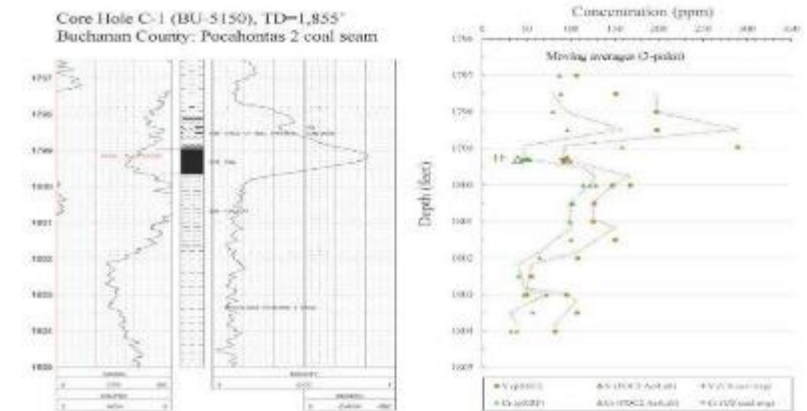


Plan:

- Analyze Core Hole for REE-CMs
- Compare pXRF to LIBS & ICP-MS

Status:

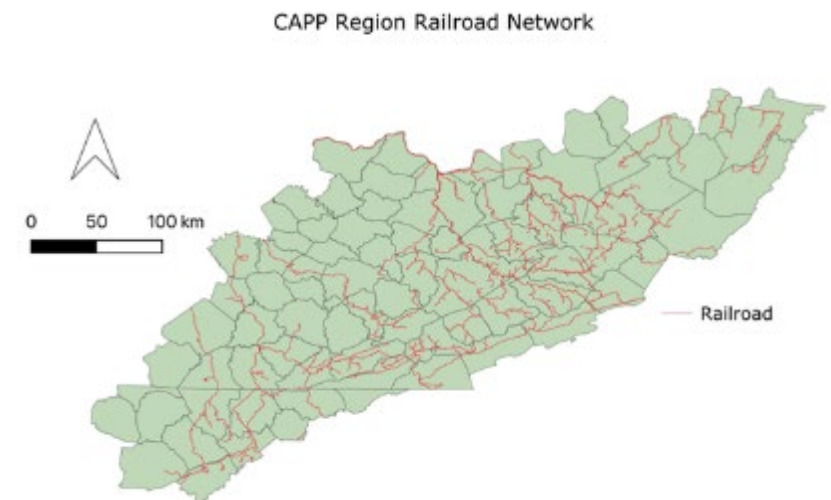
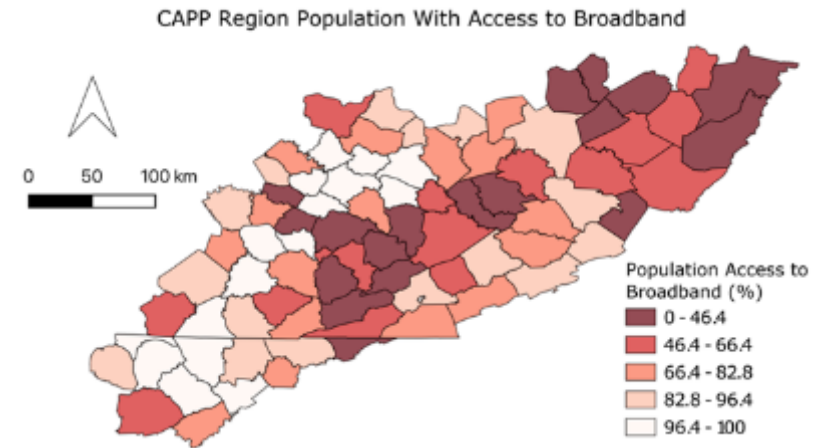
- ✓ pXRF complete
- ✓ **19** samples analyzed w/ ICP-MS



INITIAL INFRASTRUCTURE ASSESSMENT

Screening for various metrics, including:

- Cheapest source of electricity
- Primary & secondary roads
- Power generation
- Railroad networks
- Commercially navigable waterways
- Fly ash pond locations
- Population with access to broadband
- Educational opportunities
- Etc.



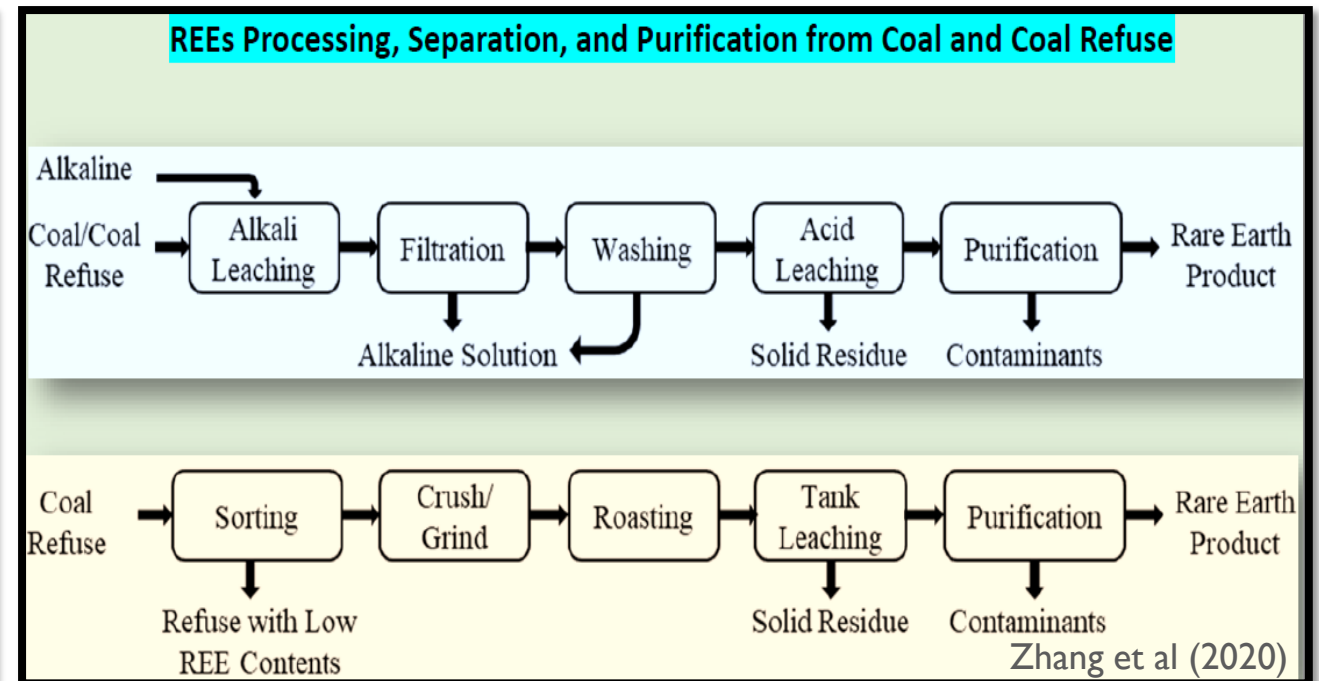
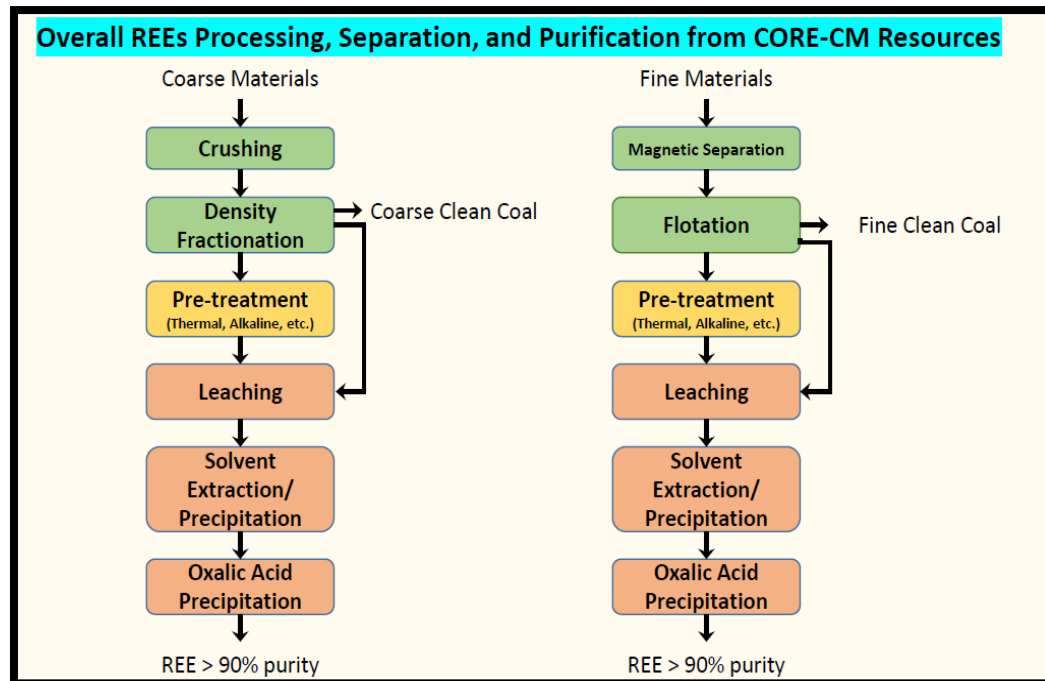
TECHNOLOGY ASSESSMENT, DEVELOPMENT & FIELD TESTING

- Mining (primary, co-products, re-mining)
- Separation Processes
- Carbon Products
- Technology Assessment
- Field-Testing
- Gap Analysis



TECHNOLOGY ASSESSMENT – SEPARATION PROCESSES

- Existing separation technologies being assessed & evaluated for best results under the geologic & waste stream conditions encountered in CAPP basin
- Technologies & processes screened based on **responsible extraction & processing** principles



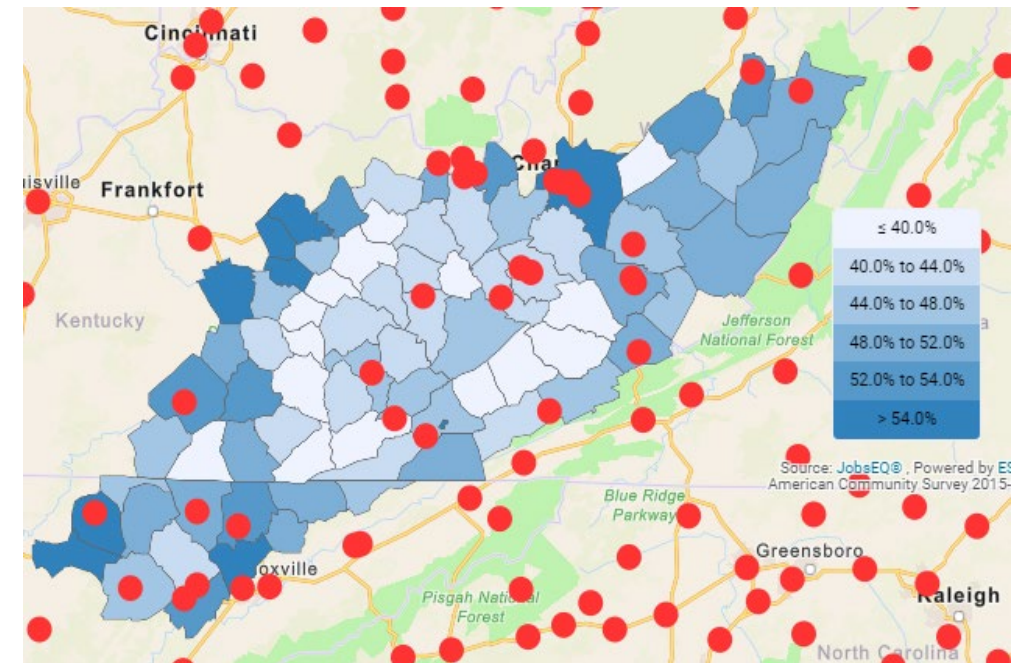
WORKFORCE READINESS & DEVELOPMENT

- Workforce Readiness Plan
- Workshops & Forums
 - Engage stakeholders/entrepreneurs, public, future workforce personnel
 - Identify & assess skillsets & employment opportunities
- Offer programs, certifications & skills training to match needs of projects in basin

Workforce Readiness Plan

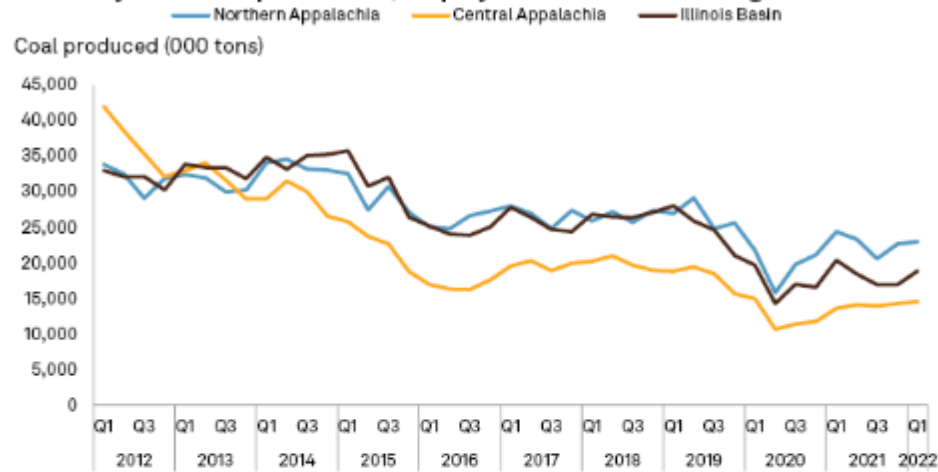


Labor Force Participation Rate with Locations of Public 2-year or Less Training Facilities

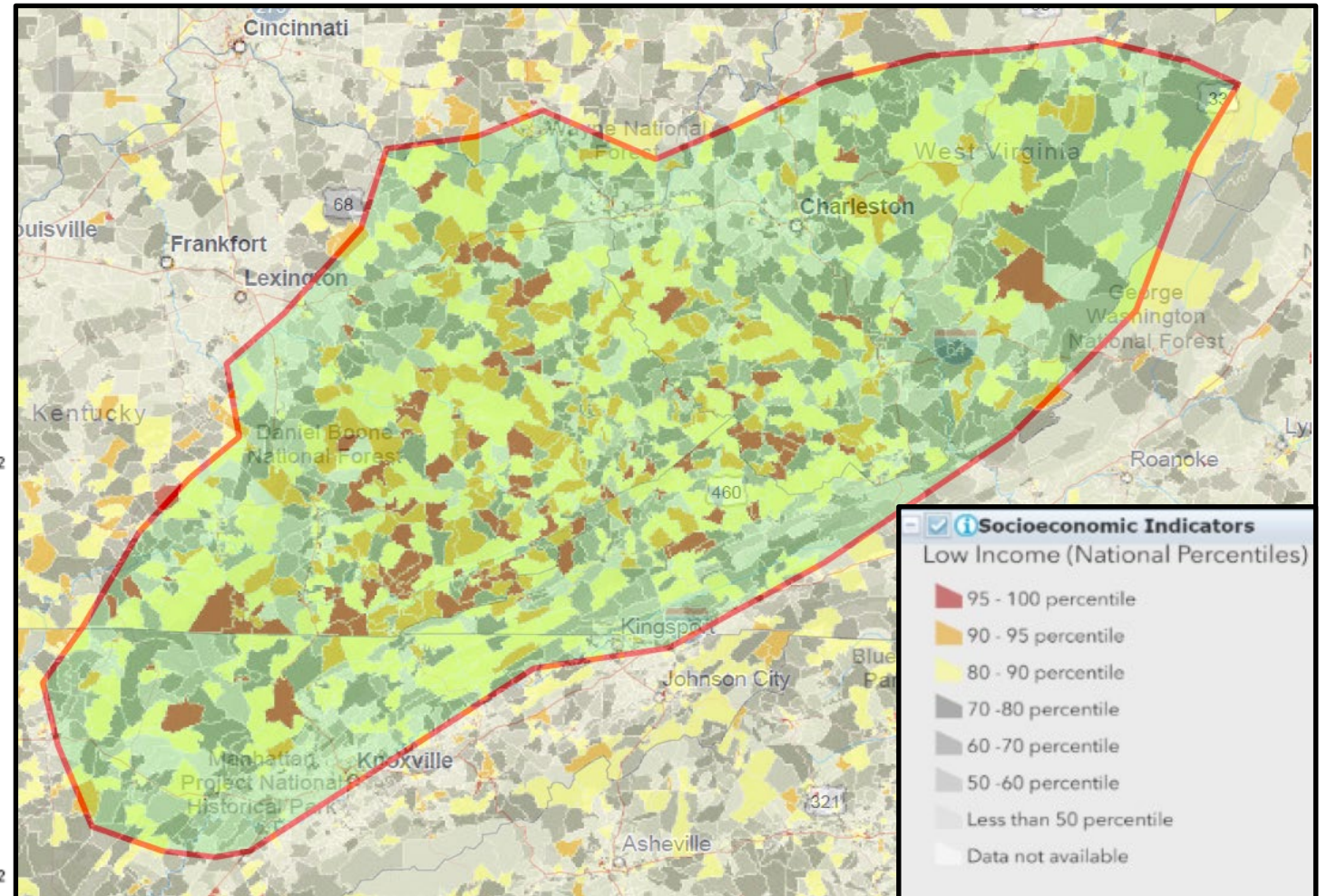
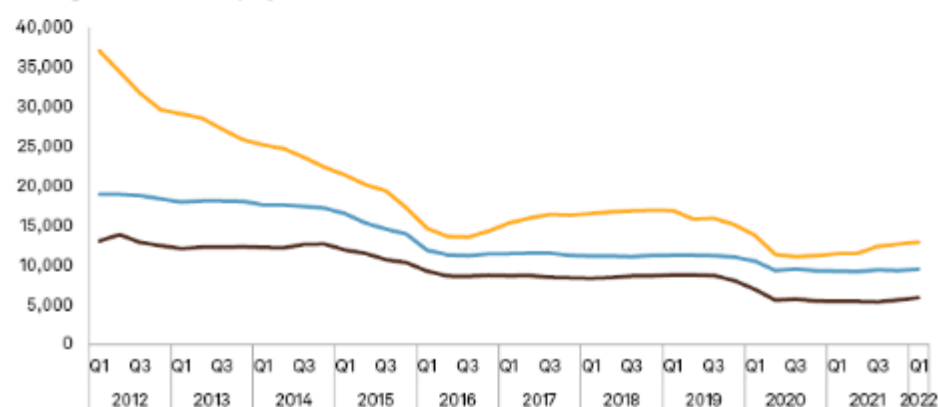


CAPP EMPLOYMENT TRENDS & SOCIOECONOMIC INDICATORS

Quarterly coal mine production, employee count for select regions



Average number of employees



Source: S&P Global Market Intelligence (May 2022)

STAKEHOLDER OUTREACH & EDUCATION

- Open Public Session, Stakeholders Advisory Committee: **March 2022** ✓
- Initial Stakeholder Outreach & Education Plan: **June 2022** ✓
- Public Outreach, Education & Engagement: **16 presentations..**
- **MCPA, USEA, SSEB, Open Session, SME-CAS, FL-SME, etc.**



EVOLVE CAPP
Evolve Central Appalachia

Research Team:

Central Appalachia Basin
Gordon Ore, Best Craft, Emission, and Critical Mineral
Map of the 2022 Study
CAPP CAPP-CAB

Sponsor:

Stakeholders Advisory Committee:

- Dominion Energy
- RMEF
- Coalfield Strategies
- Alpha Metallurgical Resources
- Mayor of Norton, Virginia
- Kentucky River Properties
- Coronado
- Blackhawk Mining