



Ohio Clean Hydrogen Hub Alliance

AIChE Cleveland & Akron Sections

Joint Meeting March 1, 2023

Kirt Conrad, CEO SARTA

H2 Hub Defined



OHIO CLEAN HYDROGEN HUB ALLIANCE

The Energy of Tomorrow driving economic growth and innovation Today

The Ohio Clean Hydrogen Hub Alliance is a powerful broad-based coalition formed to wage an aggressive, multi-faceted campaign to convince the federal government to site a Clean Hydrogen Hub in the state.

Founding Partners



HYDROGEN
**Dominion
Energy**[®]

**THE MIDWEST HYDROGEN
CENTER OF EXCELLENCE**

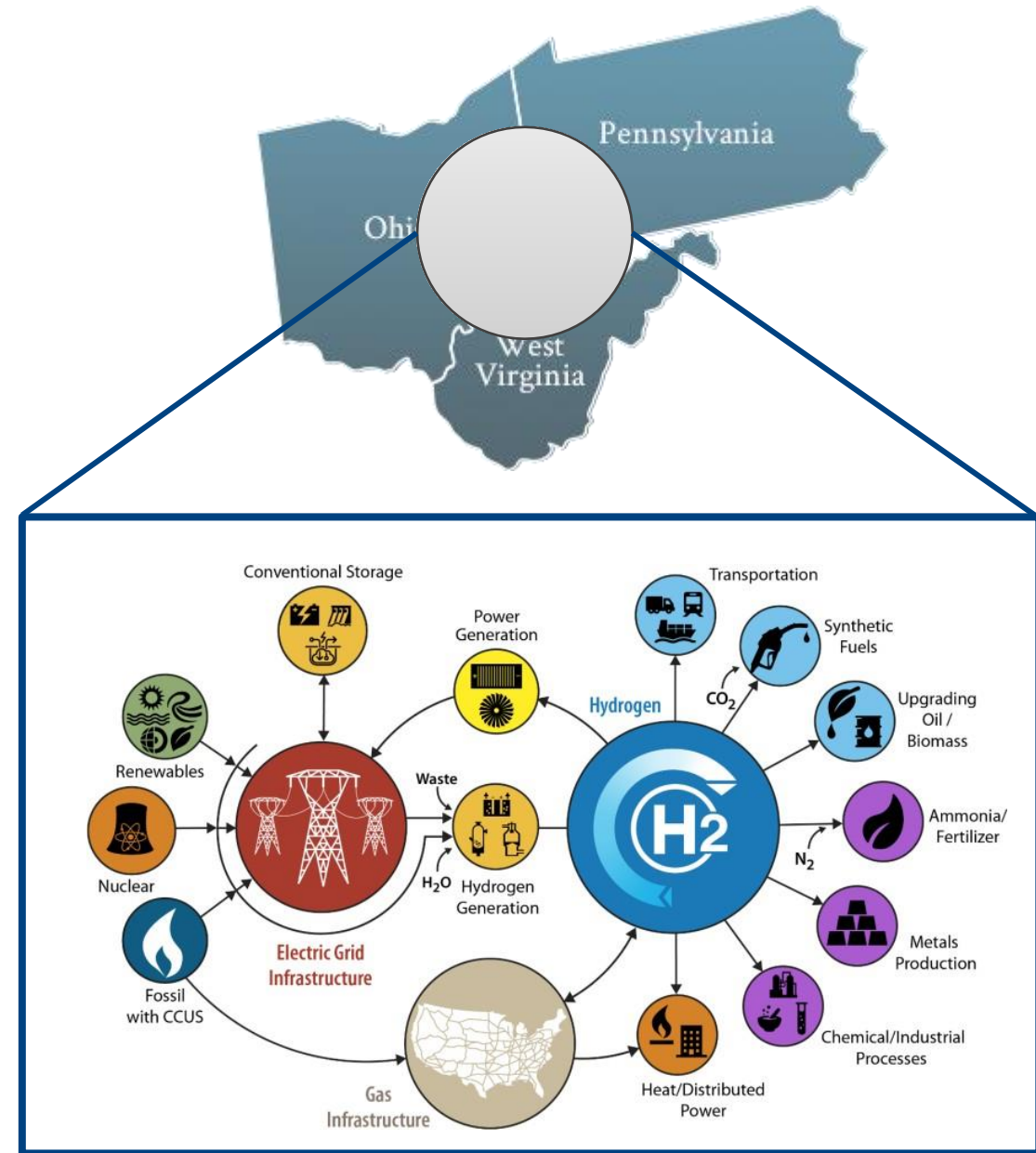
A Key Initiative of the Renewable Hydrogen Fuel Cell Collaborative



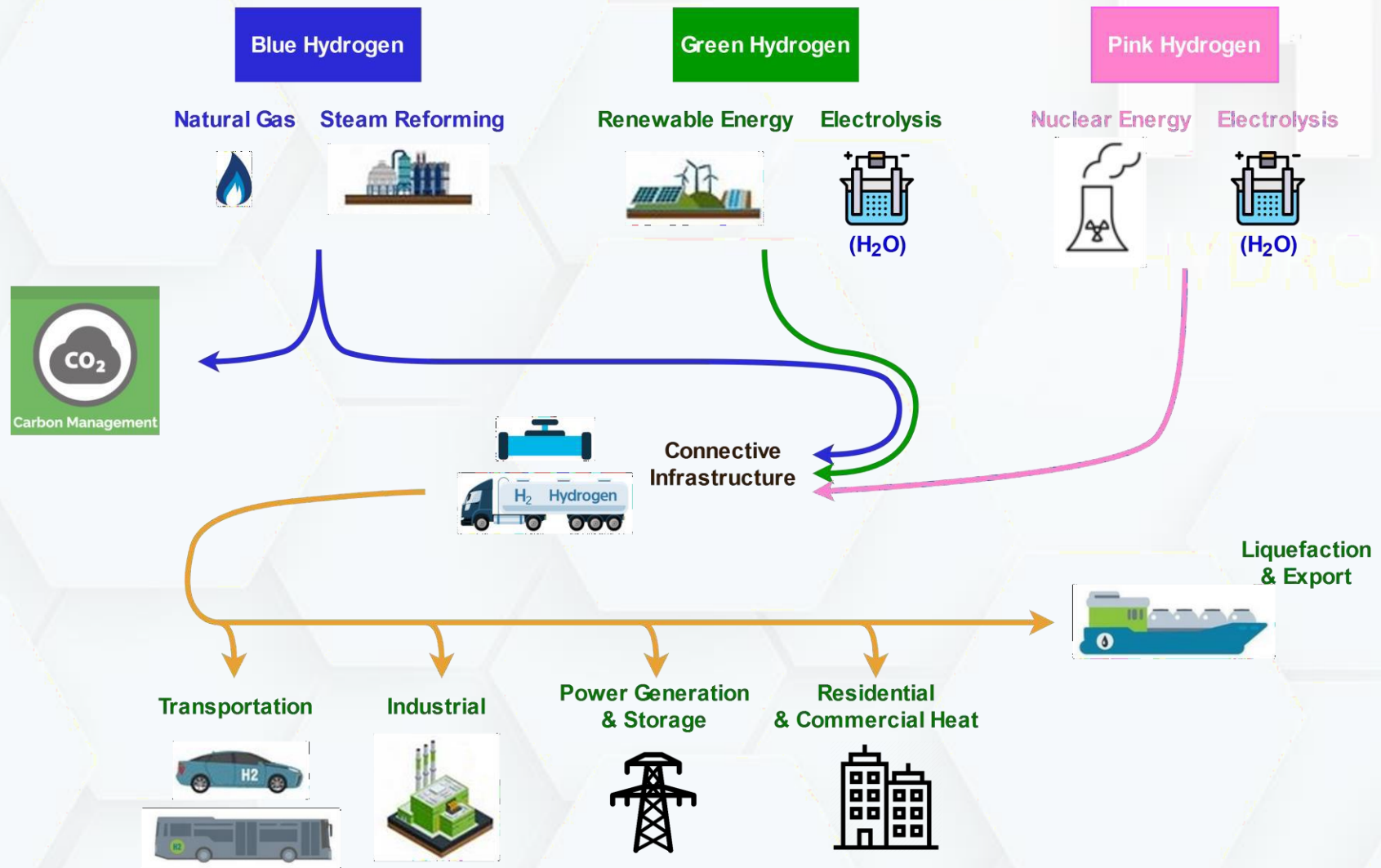
Levin.
THE MAXINE GOODMAN LEVIN
COLLEGE OF URBAN AFFAIRS

H2 Hub Defined

- The Bi-Partisan Infrastructure Law defines a “regional clean hydrogen hub” as “a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity.”
- To support:
 - The Biden Administration’s goal to achieve a carbon-free electric grid by 2035 and a net zero emissions economy by 2050.
 - The creation of good-paying jobs with the free and fair choice to join a union, the incorporation of strong labor standards, and training and placement programs, especially registered apprenticeship.
- H2 Hubs shall:
 - Demonstrably aid the achievement of the clean hydrogen production standard
 - Demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen, and
 - Can be developed into a national clean hydrogen network to facilitate a clean hydrogen economy.



Clean hydrogen will supercharge Ohio's economy in the 21st Century...



H2 Hub Defined

BIL authorizes appropriations of \$8 billion over 5 years (2022-2026) for the development of H2Hubs.

Feedstock Diversity

Produce clean hydrogen from:

1. fossil fuels
2. renewable energy
3. nuclear energy.

End-Use Diversity

End-use of clean hydrogen in:

1. Electrical power generation
2. Industrial sector
3. Residential/Comm heating
4. Transportation sector

Geographic Diversity

- Located in different U.S. regions
- Use energy resources abundant in the region

Additional Criteria

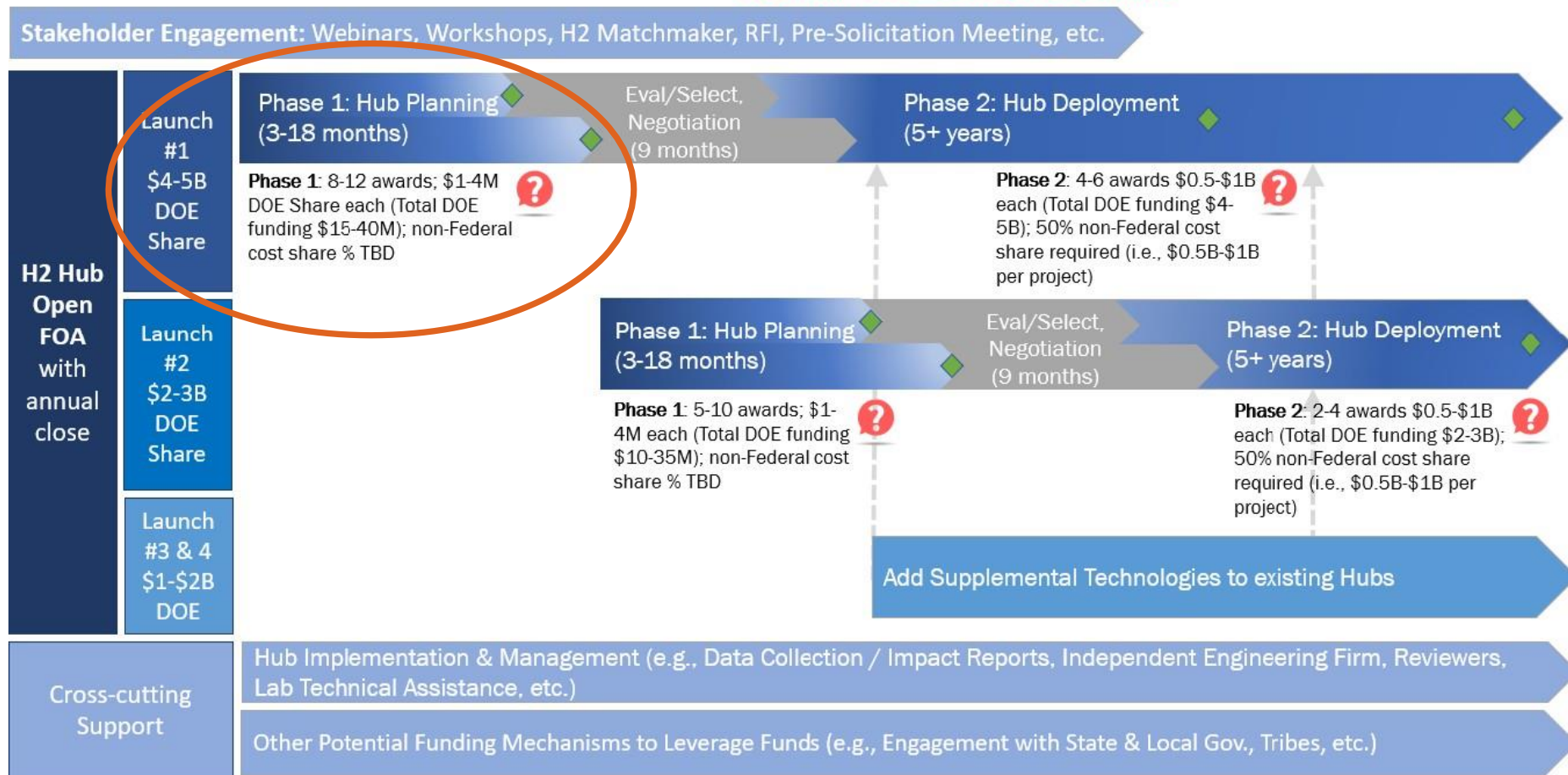
- At least 2 hubs in regions with greatest natural gas resources
- Priority to hubs likely to create long term employment to greatest number of residents

DOE must solicit proposals within 180 days of the BIL enactment and make at least four selections within a year of proposal receipt.

Draft FOA Strategy

Potential H2 Hub FOA Strategy (DRAFT) ****All funding amounts are approximate and subject to change**

◆ "Go/No-Go" Decision Points

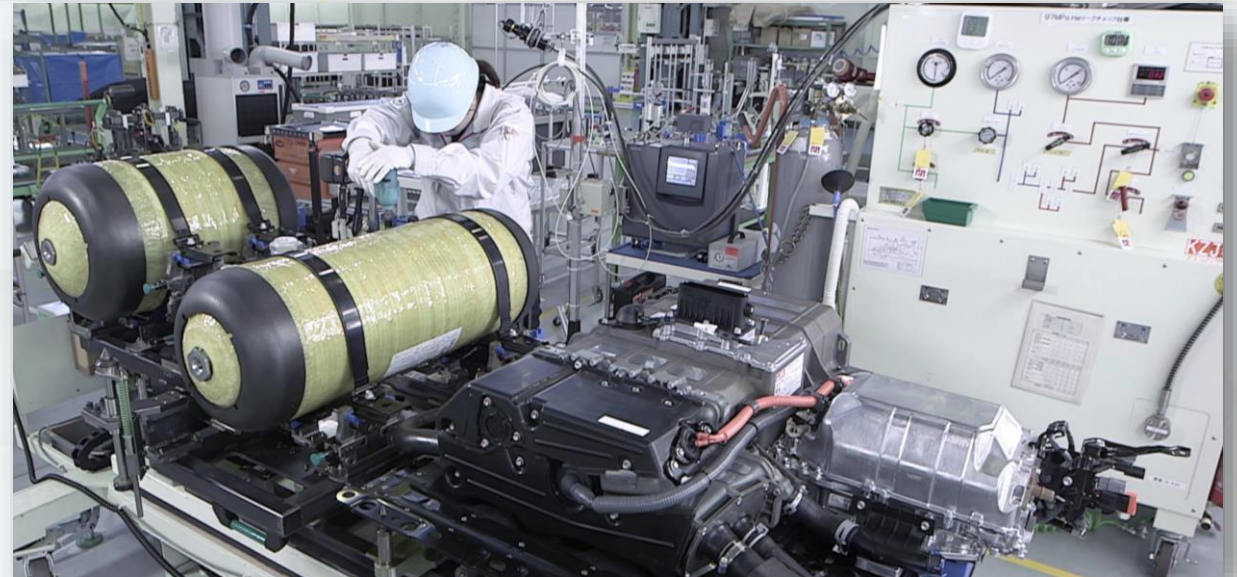


H2Hubs solicitation could be structured as a single, multi-year FOA with annual open and close dates for different “launches” over the FY 2022 – 2025 timeframe

Potential Economic Impact of Transition to H₂ Economy

Year	U.S. Jobs	Ohio's Projected Share*
2030	700,00	35,000
2050	3,400,000	170,000

Source: <https://www.fccea.org/us-hydrogen-study>



*Based on Ohio's approximate 5% national manufacturing share.
McKinsey & Co. Report on H₂ Economy Job Creation/Retention January 2021

Phase 1 – Hub Planning

- \$1 to \$4M DOE share for each potential H2Hub, plus required cost share (% cost share TBD)
- Approximately 3-18 months
- Goal at the end of Phase 1 - full plan ready for the roll-out of the hub in Phase 2 to Include:
 - Analysis of key metrics such as the *decarbonization* potential and *energy resources/infrastructure/workforce* in the proposed region.
 - Preliminary engineering, construction and deployment designs. – (Pre-FEED or Project Definition?)
 - Potential critical reviews, approvals, or negotiations such as *NEPA, financing, permitting, safety, partnering agreements, power purchase agreements, long-term hub sustainability* have been evaluated and addressed as much as practical.
- Phase 2 would be Hub Construction and Deployment.
 - Anticipate awarding *4-6 Phase 2 projects in Launch 1 and an additional 2-4 Phase 2 projects in Launch 2* (total goal of 6-10 phase 2 projects)
 - Awards from \$500M to \$1B to allow for a range of regional hub sizes and complexities

MHCoE Projections for Ohio Hydrogen Markets 2030-2050

		2030	2040	2050
Hydrogen Consumption	Power generation	31,100	88,400	251,200
	FCEVs	2,900	35,400	430,600
	Forklifts	4,700	8,400	12,700
	Oil refining	188,700	202,400	217,000
	Metal refining	23,900	96,600	391,000
	Ammonia production	114,200	119,600	125,400
	Biofuels	400	7,900	148,000
	Synthetic hydrocarbons	63,600	85,800	397,700
	Other Mfg. markets	8,100	9,100	10,300
	Total Consumption	437,600	653,600	1,983,900
Hydrogen Production	Electrolysis via Nuclear Power	9,300	50,700	59,600
	Electrolysis via Renewable Sources	65,310	78,980	94,334
	Natural Gas (SMR)	362,990	523,920	1,829,966

*Assumes Ohio will not be a zero-emission vehicle state.
Assumes repurposing 15% of nuclear and renewable power for hydrogen.*



RFI Categories

- **Category 1: Regional Clean Hydrogen Hub Provisions and Requirements**
 - Further breakdown the definition of Clean Hydrogen Hub such as providing a definition of close proximity, describing types of infrastructure and activities for sustainability.
 - Specify CO₂e/kg H₂ anticipated at the point of production. Develop metrics of success in achieving emission reductions. Describe challenges of measuring CO₂ emissions as well as policy/infrastructure roadblocks . Describe pros and cons of having 4 hubs vs. 6-10 hubs of varying sizes.
 - Feedstock Diversity: Discuss if a minimum level of hydrogen production per hub should be established. Should DOE prioritize historic fossil fuel regions? How would production be constrained by the availability of clean electricity or natural gas supply and distribution?
 - End Use: Provide approaches to off-taker commitments and define how to assess climate benefits of different hydrogen end uses.
 - Describe if DOE should define regions and, if so, how. Provide requirements on what qualifies as a region with the “greatest natural gas resources”. Describe how can H₂Hubs meet employment goals.

RFI Categories

- **Category 2: Solicitation Process, FOA Structure, and H2Hubs Implementation Strategy**
 - Provide input on funding mechanisms, review criteria, implementation strategy (such as the multiple launch approach, requirements of Phase 1 v. Phase 2) , and funding levels.
 - Describe manufacturing, safety, community engagement needs.
- **Category 3: Equity, Environmental and Energy Justice (EEEJ) Priorities**
 - Address how strategies, policies, practices on H2Hubs can support EEEJ goals.
 - Develop metrics and evaluation criteria to track EEEJ progress.
 - Describe EEEJ concerns or priorities most relevant for the H2Hubs.
- **Category 4: Market Adoption and Sustainability of Hubs**
 - Describe mechanisms that could incentivize market-based supply and demand.
 - Provide input on how to demonstrate a path to economic viability for H2Hubs after funded phases.
- **Category 5: Other**

RFI High Level Talking Points -

- Northern Appalachian/Upper Ohio Valley Corridor - parts of three states (E. Ohio, W. PA, N. WV as core area). A region connecting multiple projects under one umbrella hub
- Blue Hydrogen – largest natural gas producing area with Marcellus and Utica Shales. Possible use of coal, waste coal, biomass co-firing. Extensive subsurface and surface infrastructure as a foundation
- Full value chain for blue H₂ possible – production, transport, multiple end uses
- Proximity – determined by fossil infrastructure in the region – can't be just one plant and one user.
- Scalability to national network – possible in this region, connection to east coast, Midwest, and S. Appalachian regions
- Fully engaged industry with net-zero commitments and willingness to lead the energy transition
- Needs to be industry driven, community accepted, and policy enabled
- Need to show strong/direct connection to job creation, EJ, engagement – local colleges, training centers, trade unions, and community leaders.
- We strongly encourage coordinated response, with core messages and selected inputs based on respondent areas of expertise/interest. We also need input from stakeholders and subject matter experts.

Path Forward

Path Forward

- Coordinated RFI response ⑦ Due March 8
- Administer survey ⑦ Immediately after this meeting
- Hold workshops ⑦ Starting mid-March

