

West Virginia's Clean Hydrogen Pursuit & Appalachian Regional Clean Hydrogen Hub (ARCH2)

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GoWV Winter Meeting

January 18-19, 2022

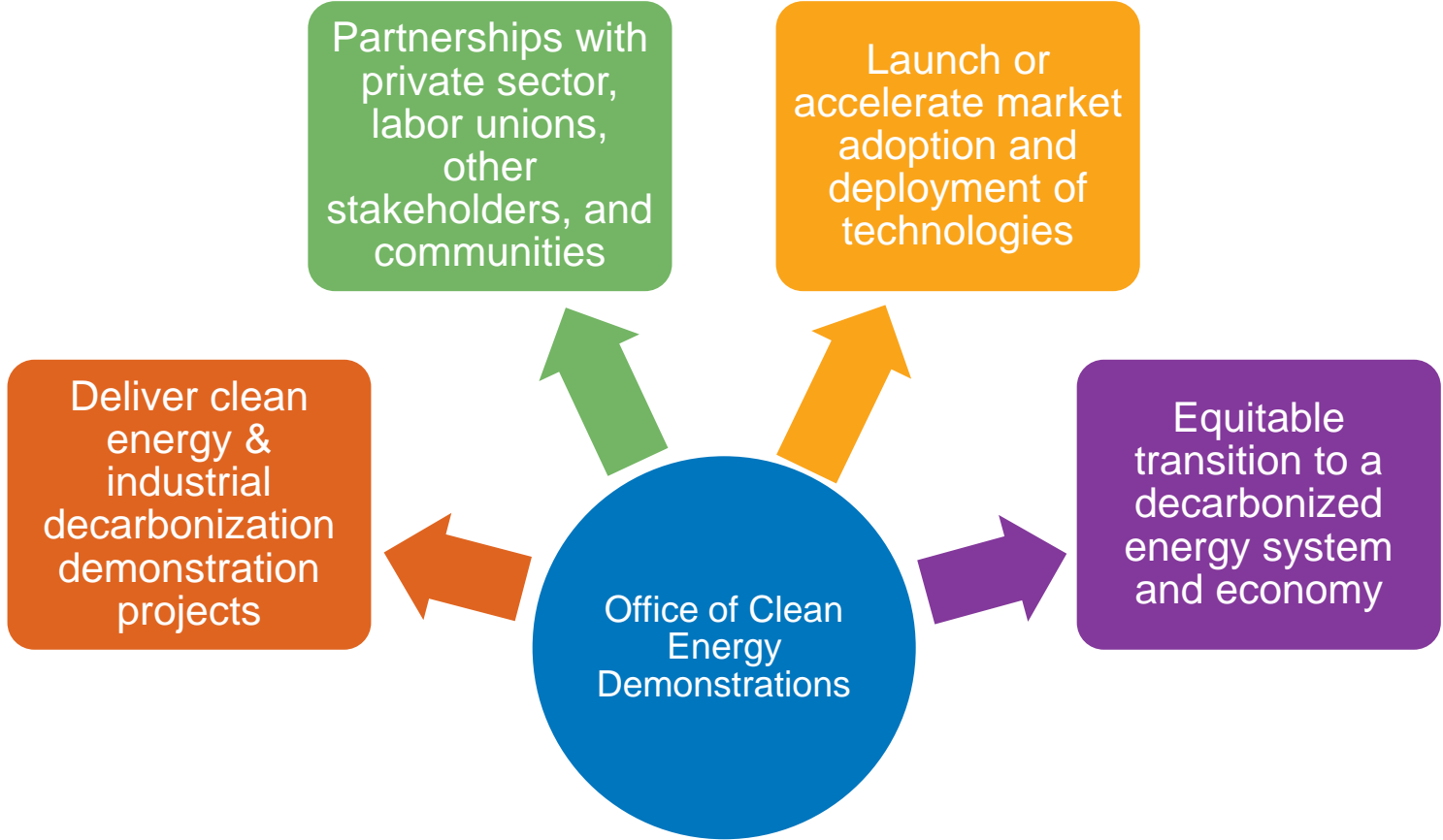


Agenda

- Why Hydrogen (H₂) now?
- Why the WV/Appalachian Region?
- Who is ARCH2?
- What are the Key Success Factors for H₂?
 - *IRA Amendments - Section 45Q Tax Credit*
 - *Monetization of the 45Q Tax Credits*
 - *Justice40*

Regional Clean Hydrogen Hub DOE Funding Opportunity Announcement (FOA)

- FOA was released September 22, 2022 by the DOE Office of Clean Energy Demonstrations (DE-FOA-0002779)
<https://oced-exchange.energy.gov/>
- Federal funding of \$8B as prescribed in the Bi-Partisan Infrastructure Law (BIL)
- H2Hubs defined... “a network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity.”
- The H2Hubs will accelerate the deployment of technologies, attract greater investments from the private sector, and promote substantial U.S. manufacturing of hydrogen-related technologies.



Hydrogen is widely regarded as the only alternative to de-carbonize hard-to-abate sectors, which is needed to achieve net-zero.

DOE's Implementation Approach

- Expected to award 6-10 H2Hubs at \$500M - \$1B each (minimum \$400M, maximum \$1.25B)
- Remaining \$1B-\$2B reserved for future launches or other supporting activities
- Minimum 50% cost share
- Executed over 8-12 years (or faster)
- Minimum of 50-100 metric tons per day H2 production to ensure regional impact & scale
- Key Factors:
 - *Demonstrably aid achievement of, but do not necessarily need to meet, the clean hydrogen production standard*
 - *Demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen*
 - *Can be developed into a national clean hydrogen network to facilitate a clean hydrogen economy*
 - *Evaluated by the degree to which emissions are reduced across the full life cycle*

Why WV?

ARCH2/WV Features	Benefit
<p>Centered in the nation’s second largest natural gas producing region; leverages existing infrastructure</p>	<p>Clean H2 production and transport via low-cost natural gas and existing pipelines maximizes the impact of funds while addressing a key Infrastructure Law provision concerning H2Hubs in natural gas regions</p>
<p>Abundant and diverse energy resources and vast industrial base across the region offers ample production capacity and demand</p>	<p>Estimated >1,000 metric tons per day (MT/d) of clean H2 production—far exceeding minimum 50–100 MT/d criteria—delivers H2 across multiple sectors</p>
<p>Substantial private sector interest with cost-share commitments exceeding the minimum 50% match required by DOE</p>	<p>Over \$3B in private sector investments — far exceeding minimum required — brings thousands of jobs, creates market liftoff, and ensures long-term viability and sustainment</p>
<p>Proactive engagement and support (e.g., labor organizations, educational institutions, environmental nonprofits, community groups)</p>	<p>Stakeholder acceptance and support generated — particularly in disadvantaged and underserved communities — minimizes program risks and delays</p>
<p>World-class research institutions, including the National Energy Technology Laboratory (NETL), and numerous colleges and universities</p>	<p>Significant H2 technology development capacity and access to a highly skilled workforce drives technology advancements and integrated solutions</p>
<p>Connected energy delivery infrastructure to Northeast, Midwest, and Southern regions</p>	<p>Opportunities for interconnectivity between ARCH2 and other H2Hubs accelerates scaling to a national H2 network</p>

ARCH2 Team

MOU Initial Parties

- ✓ Allegheny Science & Technology
- ✓ Battelle
- ✓ EQT
- ✓ GTI Energy
- ✓ Marshall University
- ✓ National Energy Technology Laboratory
- ✓ State of West Virginia
- ✓ WVU Research Corporation



Approximately 150 Interested Participants

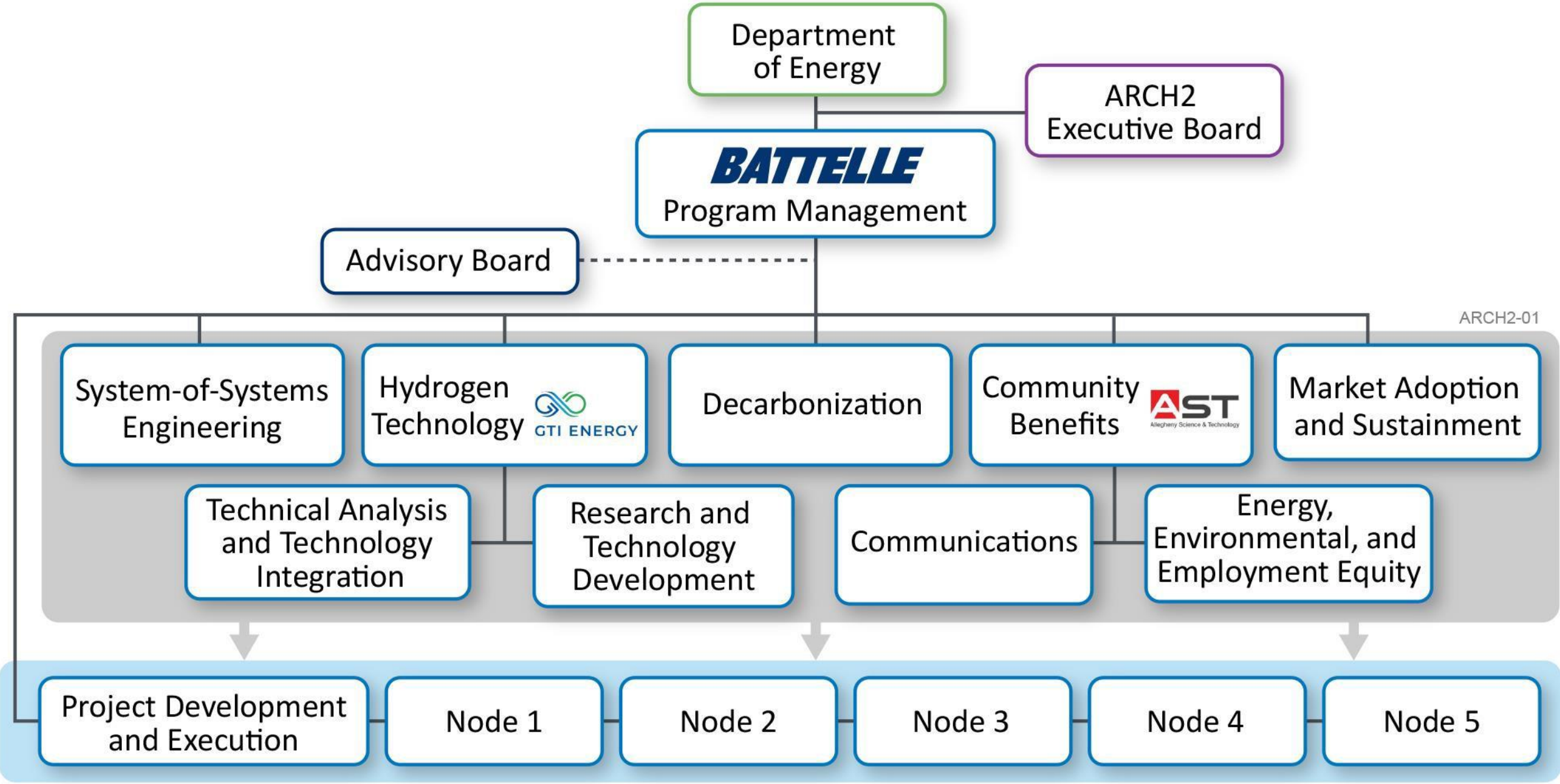
- ✓ NETL
- ✓ 3 Transit Authorities
- ✓ 20+ Foundations & Non-Profits
- ✓ 9 Community & Technical Colleges
- ✓ 5 Higher Educational Institutes
- ✓ Several Labor and Jobs Organizations



Over 50 MOUs and NDAs Signed by Industrial Partners Committed to a 50% Cost Share, including:

- ✓ H2 Production (Blue)
- ✓ H2 Production (Green)
- ✓ End Use
- ✓ Transport/Storage
- ✓ OEM
- ✓ Professional Services
- ✓ Transportation
- ✓ Power Generation (I/C)
- ✓ Industrial/Chemical
- ✓ Residential/Commercial

ARCH2 Structure



➔ 5 ARCH2 Program Domains (gray box) – Integrate requirements across all ARCH2 nodes

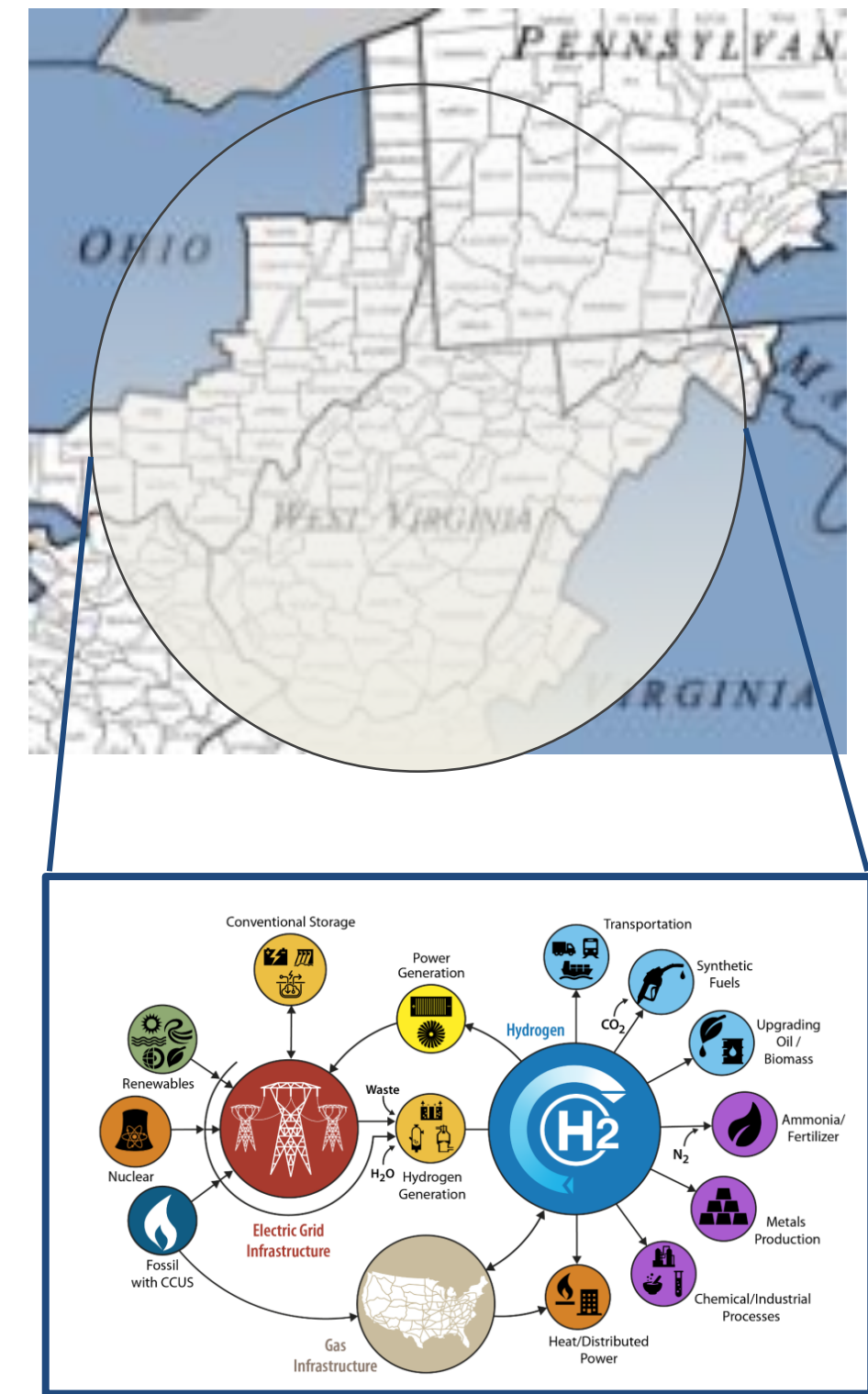
➔ Principal Group (blue box) - Lead industrial companies across the H2 value chain lead node development (EQT = PG Chair)

➔ Advisory Board – Representatives of State governments and community stakeholders provide recommendations on projects and assist with local support (WV Econ Dev Director is the Advisory Board “AB” Chair)

➔ Executive Board – Comprised of 5 representatives: PM, DPMs (2), AB Chair, and PG Chair; oversees ARCH2 strategic planning and decision-making activities

ARCH2 Unique Advantages

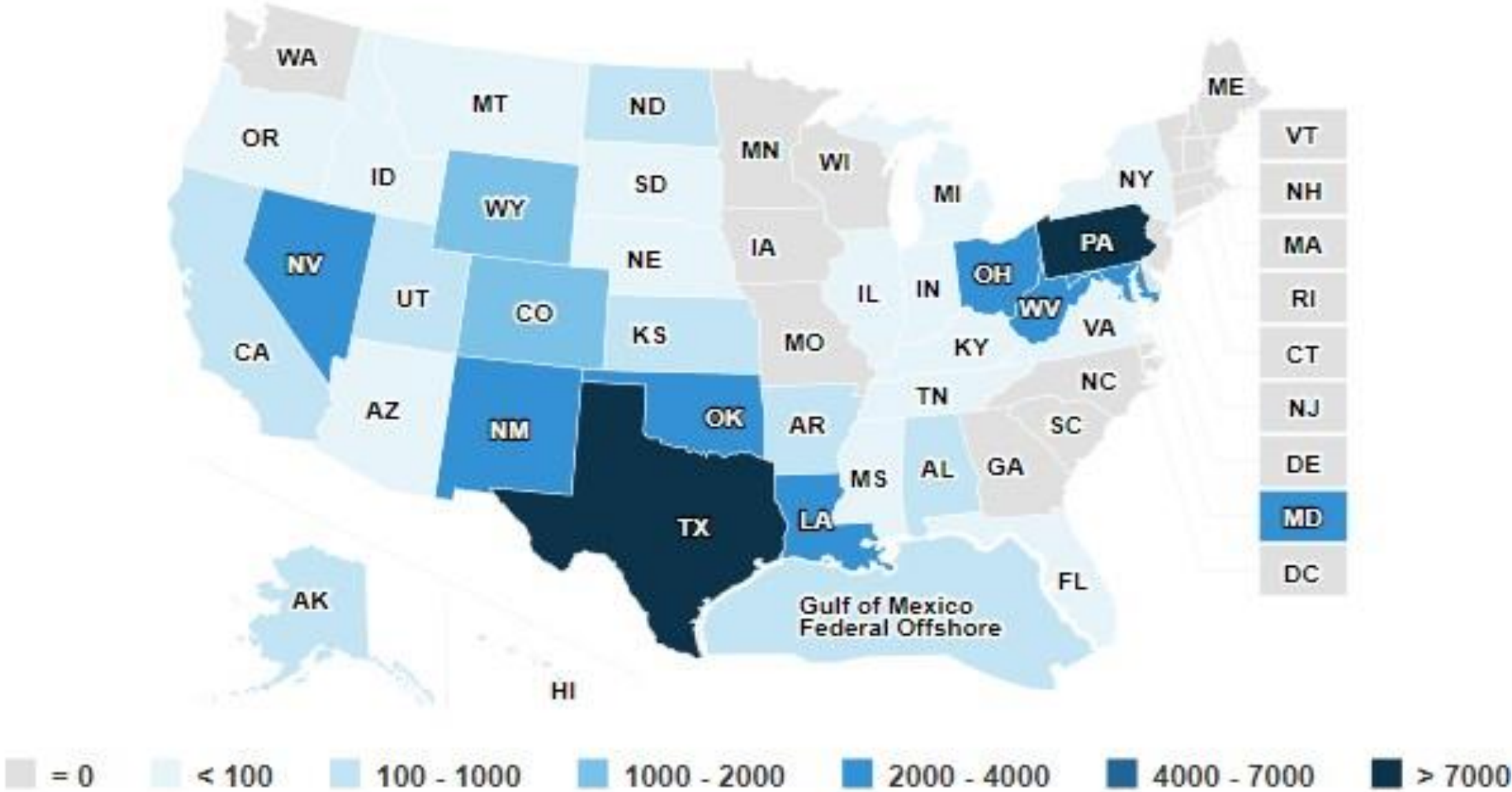
- Existing infrastructure for H2 production and transport via low-cost natural gas production and existing pipeline transportation networks
- Vast energy resources to easily expand to electrolysis-based production, creating the opportunity for H2 production through diverse feedstock in a single hub
- Uniquely situated in an industrial hub along the Ohio River, the region offers an abundance of end-use opportunities across multiple sectors, including power generation, industrial, commercial, residential, and transportation sectors
- Proximity to energy delivery highways and major end-use markets in the Midwest, Northeast, and Southeast
- Existing highly-skilled energy workforce
- Support from labor organizations, environmental non-profits, and community stakeholders
- Access to world-class academic and technology institutions
- Vast opportunities to positively impact disadvantaged and underserved communities via job creation, environment, and energy justice
- Substantial private sector interest will attract required capital to meet 50% cost-share match
- Northern Appalachia is the second largest natural gas producing region in the U.S. and the BIL requires at least two hydrogen hubs in natural gas producing regions



ARCH2 Unique Advantages

U.S. dry natural gas production by state in 2021

billion cubic feet



Data source: U.S. Energy Information Administration, *Natural Gas Annual*, September 2022



HB 4491: CO2 Sequestration Pilot Program

- Passed WV Legislature 3/1/22 with wide bipartisan support (90-9-1 vote in House; unanimous vote in the Senate (33-0-0); effective 5/30/22).
- Pore space ownership vested with surface owner and cannot be severed.
- Before a permit may be approved, it must be determined if proposed storage facility contains “commercially valuable minerals.”
- Must demonstrate that interests of mineral estate will not be adversely affected or have been addressed in written agreement.
- Mineral owners may drill through storage.
- Unitization: Owners of 75% of pore space acreage in the storage reservoir must consent.

WV Class 6 Primacy Rule

- 47CSR13: Represents a total revision of UIC regulations, including new section on Class 6.
- Last major update was in 1980s. Drafted with assistance from EPA.
- June 23, 2021: Draft rule filed; 30-day public comment period begins.
- July 23, 2021: Public Hearing (virtual meeting).
- July 30, 2021: Agency-approved rule filed; public comments addressed.
- Spring 2022: Rules packaged approved by WV Legislature; primacy application submitted to EPA.
- Still waiting on EPA determination.

<https://apps.sos.wv.gov/adlaw/csr/ruleview.aspx?document=17482&Keyword>

IRA Amendments - Section 45Q Tax Credit

- [https://uscode.house.gov/view.xhtml?req=\(title:26%20section:45Q%20edition:prelim\)](https://uscode.house.gov/view.xhtml?req=(title:26%20section:45Q%20edition:prelim))
- 45Q Credit Values
- Geologic Storage
- Industrial Facilities or EGUs: \$50 per ton for projects placed in service after 3/9/2018 and before 1/1/2023
 - *\$85 per ton for projects placed in service after 12/31/2022 (Bonus Amount)*
 - *\$17 per ton for projects placed in service after 12/31/2022 (Base Amount)*
- Direct Air Capture: \$50 per ton for projects placed in service after 3/9/2018 and before 1/1/2023
 - *\$180 per ton for projects placed in service after 12/31/2022 (Bonus Amount)*
 - *\$36 per ton for projects placed in service after 12/31/2022 (Base Amount)*

Monetization of the 45Q Tax Credits

- Many owners of energy development projects do not have tax liability to monetize the tax credits and need to enter into tax equity partnerships to create a revenue stream to the owner of the credit in return for tax equity investment in the partnership.
- Tax equity investors typically take on a significant portion of the tax credit value in return for equity investment.
- New election for direct pay mechanism will enhance monetization of the 45Q tax credits for CCUS project developers by allowing project owners to receive a cash payment from the Treasury instead of using tax equity investors.

Justice40 Initiative

“For the first time in our nation’s history, the Federal Government has made it a goal that 40 percent of the overall benefits of certain Federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution. President Biden made this historic commitment when he signed Executive Order 14008 within days of taking office.”

- Decrease energy burden in disadvantaged communities (DACs)
- Decrease environmental exposure and burdens for DACs
- Increase parity in clean energy technology (e.g., solar, storage) access and adoption in DACs
- Increase access to low-cost capital in DACs
- Increase clean energy enterprise creation and contracting (MBE/DBE) in DACs
- Increase clean energy jobs, job pipeline, and job training for individuals from DACs
- Increase energy resiliency in DACs
- Increase energy democracy in DACs

Challenges to H2Hub Success

- Policy framework – State level (e.g. PA H2 tax credit)
- Establishing Class VI Primacy in each state
- Land acquisition and pore space ownership
- Royalty expectations
- Geology and reservoir potential
- Infrastructure build-out
- Market dynamics



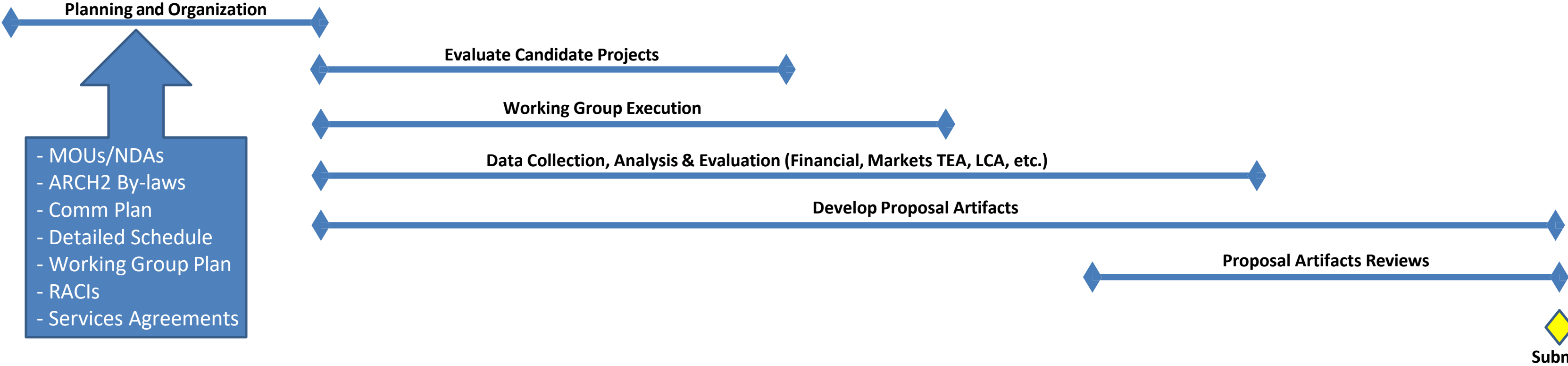
Path Forward

FOA Application Schedule

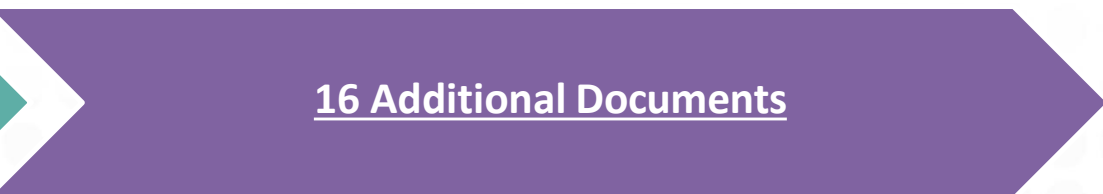
Concept Paper
(Nov 7, 2022)

DOE
Notification (Dec)

Full Application
(April 7, 2023)



- MOUs/NDAs
- ARCH2 By-laws
- Comm Plan
- Detailed Schedule
- Working Group Plan
- RACIs
- Services Agreements



- Business Dev & Management
- EPC & Operations
- Safety, Security, Regulatory

- Risk Analysis & Mitigation
- Technical Data & Analysis
- Work Plan

- Quality Jobs
- Environmental Justice
- Energy Equity

- TEA/LCA Projections
- Environmental Considerations
- Community Partnerships

- Budget Justification
- Letters of Commitment
- Resumes and more...



Questions?