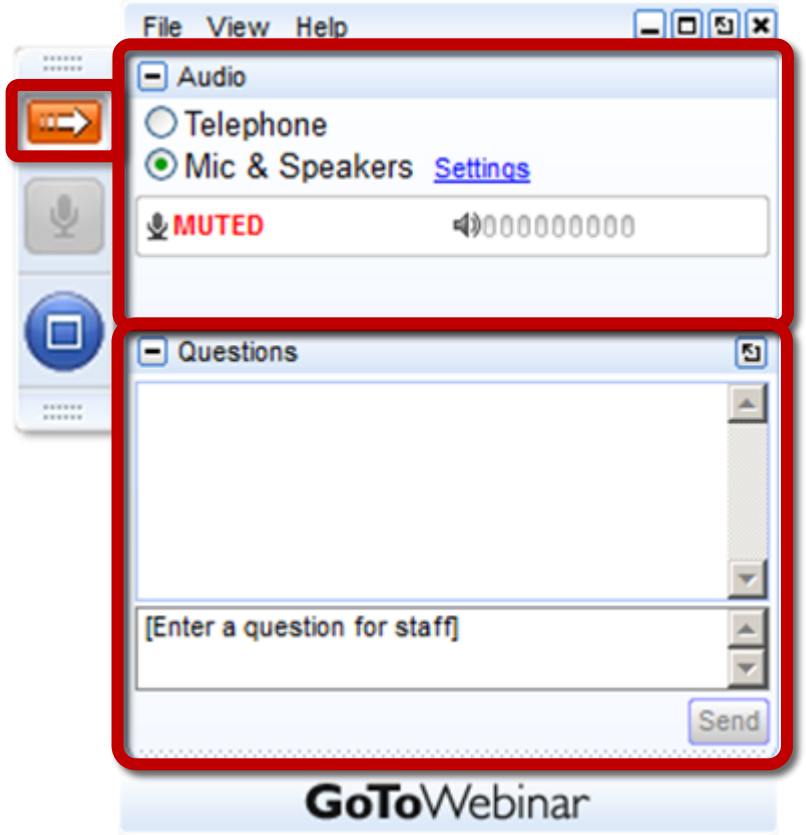
Environmental Justice Strategies for Hydrogen Opposition

December 15, 2022

WEBINAR LOGISTICS



Join audio:

- Choose Mic & Speakers to use VoIP
- Choose Telephone and dial using the information provided

Use the orange arrow to open and close your control panel

Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. CEG's webinars are archived at www.cleanegroup.org/webinars

Clean Energy Group (CEG) works at the forefront of clean energy innovation to accelerate an equitable and inclusive transition to a resilient, sustainable, clean energy future.

Visit www.cleanegroup.org to learn more about our current initiatives, recent publications, and upcoming events.

Hydrogen Information and Public Education (HIPE) Project

- Started in 2021 to combat fossil fuel industry hype regarding hydrogen fuel
- Provides unbiased information regarding hydrogen's uses, drawbacks, and ramifications
- Focused on equipping frontline organizations and communities with the tools they need to critically evaluate proposals
- For fact sheets, articles, and research, visit: cleanegroup.org/hydrogen

WEBINAR SPEAKERS

Erik Schlenker-Goodrich
Executive Director, Western Environmental Law Center

Sean O'Leary
Senior Researcher, Ohio River Valley Institute

Marriele Mango
Project Director,
Clean Energy Group

Abbe Ramanan
Project Director,
Clean Energy Group

Western Environmental Law Center

Ohio River Valley Institute

Clean Energy Group

Hydrogen & Environmental Justice: Greenwashing vs Reality

Abbe Ramanan

Why the hype now?

TRANSPORTATION • DAILY COVER

Is Green Hydrogen The Fuel Of The Future? This CEO Is Betting On It

Hydrogen

Siemens Energy Seals Deal for Hydrogen-Ready Coal-

Clean Energy

Massachusetts Utilities Hope Hydr
ane Can Keep the State Co
as

lectric utilities to plan how to
ower they supply, but environmentalists say the
ting false solutions to lock in natural gas as a fue
s.

GTI ADVANCES GUL
HYDROGEN HUB PR

Nov 10, 2022 5:32:pm

SUMMARY

Hub proposes mix of 60% blue hydrogen and 40% green hydroge

BY DALE LUNAN

POSTED IN:

AMERICAS UNITED STATES COMMERCIAL INNOVATION SOCIAL INNOVAT

GTI Energy said November 10 it is leading a multi-partner consorti
Energy's Regional Clean Hydrogen Hub financing program.

How the Hydrogen Revolution Can Help Save the Planet—And How It Can't

Many researchers see a huge role for hydrogen in decarbonizing economies

“Clean” Hydrogen

Green Hydrogen	Hydrogen produced with renewable energy via electrolysis.
Blue Hydrogen	Hydrogen produced through natural gas steam methane reformation (SMR), with carbon capture employed
Grey Hydrogen	Hydrogen produced through SMR without carbon capture. 95% of hydrogen produced today is grey hydrogen
Pink Hydrogen	Hydrogen produced with nuclear energy via electrolysis

Hydrogen End-Uses

- **Power Generation:** Hydrogen is blended with natural gas to be combusted in existing turbines
- **Industrial Use:** Hydrogen is used to fuel high-heat industrial processes or for as a feedstock for its chemical properties
- **Fuel Cells:** Hydrogen is run through a fuel cell to produce electricity

Least-Regret Uses and Fossil Fuel Greenwashing

- Environmental justice advocates have pushed for a least-regret framework to evaluate hydrogen proposals:
- *Hydrogen should only be considered a potentially viable option if:*
    - *There are no other low-cost decarbonization strategies available;*
    - *There are no electric technologies being developed that could take advantage of zero-emission technology directly;*
    - *The logistics and costs of infrastructure for hydrogen transportation and storage can be contained;*
    - *Technologies for using hydrogen fuel in the sector are or will be available; and*
    - *Transitioning to hydrogen could measurably reduce air pollution.*
- However, these least-regret uses (green hydrogen for decarbonizing industry, heavy-duty trucking) are often used to greenwash MOST regret uses (blue hydrogen for combustion/power generation, blending with fossil fuels)

Myth: “Clean” Hydrogen is Emissions Free

- **Fact:** When combusted, hydrogen produces 6x the amount of nitrogen oxide (NOx) emissions as natural gas
- **Fact:** Existing NOx emissions controls are not formulated to work on hydrogen blends above 30%
- **Fact:** In new flexible fuel turbines NOx emissions are about the same as a natural gas plant. NOx at that level already causes adverse health impacts

Myth: “Clean” Hydrogen Can Help Meet Decarbonization Goals

- **Fact:** “Excess capacity” of current renewable assets is limited
- **Fact:** Combusted green hydrogen’s lifecycle efficiency is 30%, meaning 70% of the energy input is lost
- **Fact:** Electrolyzers need to be run continuously, which is nearly impossible to do with 100% renewable electricity.
- **Fact:** Emissions from grid-connected electrolyzers could be 2x worse than conventional grey hydrogen
- **Fact:** Because of additional power needed for CCS and upstream methane emissions, lifecycle GHG emissions for blue hydrogen 20% *worse* than burning coal for heat
- **Fact:** A blend of 35% hydrogen to natural gas results in only a 14% reduction in carbon emissions

Myth: Hydrogen Can be Safely Blended in Existing Pipelines

- **Fact:** Hydrogen can crack steel pipelines in a process called embrittlement
- **Fact:** Even at low levels of blending, hydrogen injected into natural gas pipelines can increase metal fatigue by >10x and reduce resistance to fracture by >50%
- **Fact:** If hydrogen is being pumped AT ANY LEVEL in a steel pipeline, it is not a matter of if, but when rupture events will occur
- **Fact:** Technology to capture hydrogen leaks *before* rupture does not exist – can only estimate that it's about double fracked gas

Myth: Hydrogen Will Save Money

- **Fact:** Green and blue hydrogen is incredibly expensive. Even a 20 percent blend of hydrogen to natural gas could raise fuel prices 2 to 4 times that of natural gas alone
- **Fact:** Blending would require retrofitting the over 3 million miles of natural gas pipelines in the U.S.
- **Fact:** Existing dedicated hydrogen pipelines are spoken for - 1,600 miles of existing (grey) hydrogen gas pipelines in the U.S., owned by merchant hydrogen producers near large hydrogen users (chemical plants, petroleum plants) – NOT for power generation
- **Fact:** Since there is no “glide path” to 100% hydrogen pipelines, they are still stranded assets

Myth: Hydrogen Does Not Contribute to Global Warming

- **Fact:** Due to size, hydrogen is extremely prone to leakage
- **Fact:** Columbia study predicts global leakage rates of 6.5 % by 2050 – equivalent to 100 million to 200 million tons of CO2
- **Fact:** Leaks of hydrogen could have an impact on warming by extending the lifetime of methane in the atmosphere
- **Fact:** Blue hydrogen: increased hydrogen *and* methane leaks, could yield up to 60% more warming over the first 10 years of usage vs fossil fuel technologies

Federal Funding: BIL

- The Bipartisan Infrastructure Law (BIL) includes $9.5 billion in funding for hydrogen, including $8 billion for 4 regional hydrogen hubs
- Law specifies that the hubs *"To the maximum extent practicable….demonstrate the production of clean hydrogen from fossil fuels….from renewable energy; and…hydrogen from nuclear energy."*
- Definition of "clean hydrogen": produced with lifecycle emissions of 2kg of CO2e/1kg of hydrogen
- Several hubs proposed around the country

Federal Funding: IRA

- Indefinite “clean” hydrogen production tax credit with laddered incentives starting at 4kg CO2e/1kg of hydrogen
- Additional tax credit that provides a monetary value per metric ton of carbon dioxide that’s captured and stored, only at point of capture
- Calculation of lifecycle emissions is important – implementation of tax credit could incentivize grid-connected electrolysis, which would increase CO2 emissions
- GREET model does not go far enough to account for lifecycle emissions of hydrogen

Environmental Justice Implications

- Hydrogen that extends the life of fossil fuel assets is an EJ issue
- Hydrogen that contributes to harmful air pollution is an EJ issue
- Hydrogen that increases energy burden in an EJ issue
- Development that occurs without environmental and community review is an EJ issue
- Public health and other harms should not be perpetuated in exchange for jobs and economic development

Thank You!

Abbe Ramanan

abbe@cleanegroup.org

https://www.cleanegroup.org/ceg-projects/hydrogen/

Western Environmental Law Center

ENVIRONMENTAL JUSTICE STRATEGIES FOR HYDROGEN OPPOSITION:

Lessons From the Land of Enchantment

Erik Schlenker-Goodrich, Executive Director

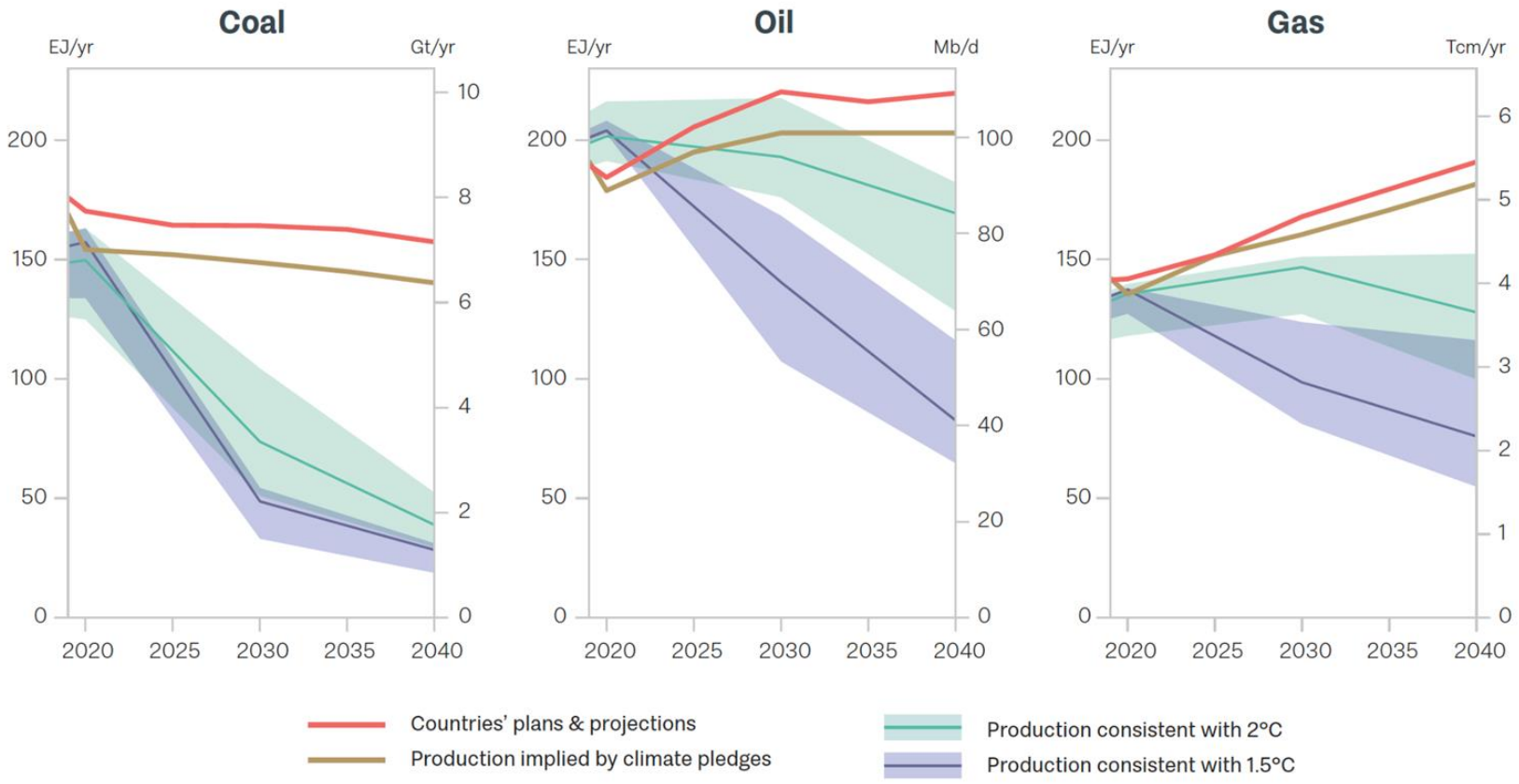
December 15, 2022

CLIMATE WEAVES EVERYTHING TOGETHER

Fourth National Climate Assessment, November 2018

"Climate change creates new risks and exacerbates existing vulnerabilities in communities across the United States, presenting **growing challenges to human health and safety, quality of life, and the rate of economic growth**."

"Climate change affects the natural, built, and social systems we rely on individually and through their connections to one another. These **interconnected systems are increasingly vulnerable** to cascading impacts that are often difficult to predict, threatening essential services within and beyond the Nation's borders."



Source: Production Gap Report 2021

SEVEN HYDROGEN PRINCIPLES FOR NEW MEXICO

350 NEW MEXICO ✦ AMIGOS BRAVOS ✦ CENTER FOR BIOLOGICAL DIVERSITY ✦ CENTER FOR CIVIC POLICY ✦ CITIZENS CARING FOR THE FUTURE ✦ CLIMATE ADVOCATES VOCES UNIDAS ✦ COALITION FOR CLEAN AFFORDABLE ENERGY ✦ CONSERVATION VOTERS NEW MEXICO ✦ DINÉ CITIZENS AGAINST RUINING OUR ENVIRONMENT ✦ DREAMS IN ACTION ✦ HEALTH ACTION NEW MEXICO ✦ NATURAL RESOURCES DEFENSE COUNCIL ✦ NAEVA ✦ NEW MEXICO ENVIRONMENTAL LAW CENTER ✦ NEW MEXICO NATIVE VOTE ✦ NEW MEXICO SPORTSMEN ✦ OLÉ – ORGANIZERS IN THE LAND OF ENCHANTMENT ✦ NEW MEXICO VOICES FOR CHILDREN ✦ PARTNERSHIP FOR RESPONSIBLE BUSINESS ✦ PROGRESSNOW NEW MEXICO ✦ RIO GRANDE INDIVISIBLE NEW MEXICO ✦ ROCKY MOUNTAIN FARMERS UNION ✦ SAN JUAN CITIZENS ALLIANCE ✦ SANTA FE GREEN CHAMBER OF COMMERCE ✦ SIERRA CLUB – RIO GRANDE CHAPTER ✦ SOUTHWEST ENERGY EFFICIENCY PROJECT ✦ TÓ NIZHÓNÍ ÁNÍ ✦ WESTERN ENVIRONMENTAL LAW CENTER ✦ WESTERN LEADERS NETWORK ✦ WILDEARTH GUARDIANS

PRINCIPLE 1:

New Mexico Must First Put In Place A Comprehensive, Durable, And Enforceable Climate Policy Framework.

- Are we putting in place a durable and enforceable framework for future action?
- Is New Mexico doing its fair share to reduce greenhouse gas (GHG) emissions, i.e., at least a statewide reduction in GHGs of at least 45% by 2030 as compared to 2005?
- Are we accelerating action to cut GHG emissions from all sectors of our economy, sparking new markets for economic growth and innovation that position New Mexico to benefit from a global energy economy that prioritizes decarbonization?
- Are we supporting working families, the backbone of New Mexico's economy, to participate in and benefit from the transition to a 100% emissions-free, renewable energy economy?

PRINCIPLE 2:

Equity and justice Must Shape Hydrogen Policy Decisions And Implementation.

- Have agencies provided for the fair treatment and meaningful involvement of impacted and overburdened communities?
- Has New Mexico consulted with Tribal governments?
- Does hydrogen policy center equity and justice or is equity and justice assumed via suspect “trickle down” logic?

PRINCIPLE 3:

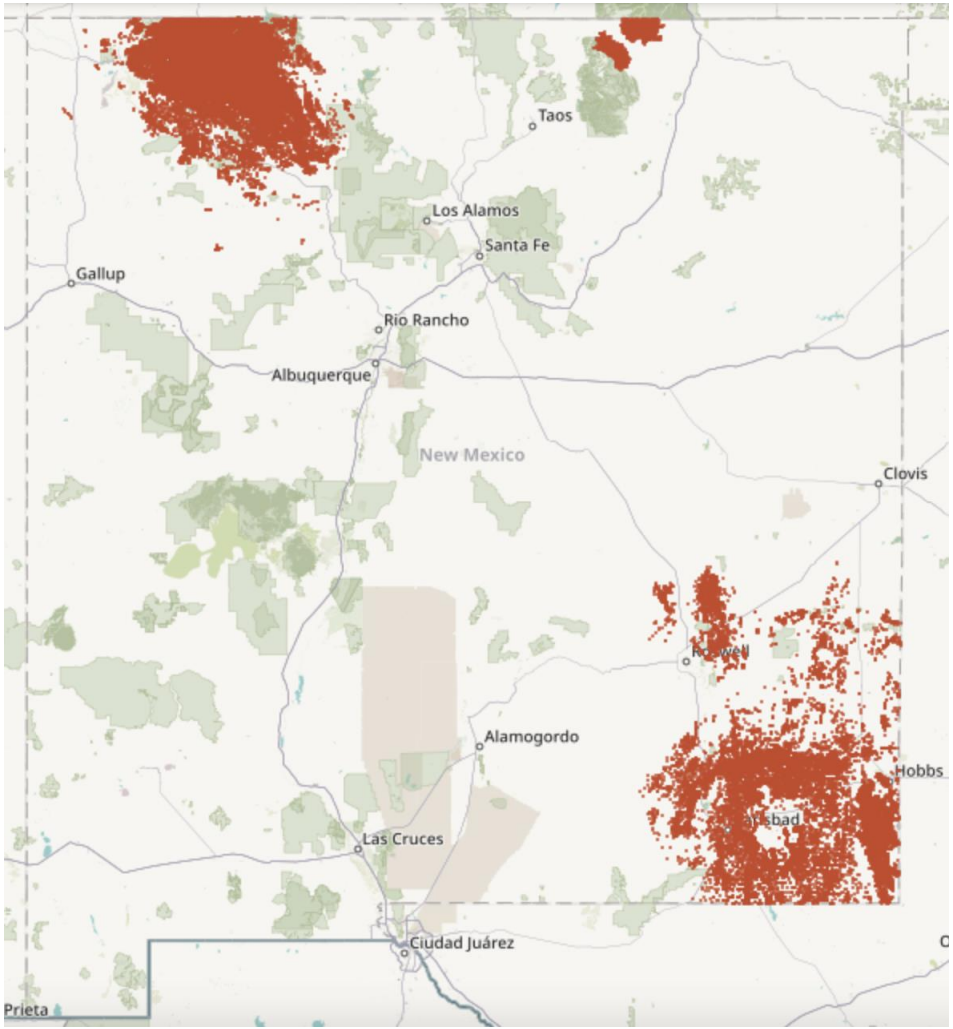
Hydrogen Must Neither Divert From Nor Delay New Mexico's Transition To A Renewable Energy Future.

- Could we make deeper and quicker emissions cuts and promote economic opportunity by instead strengthening our transition to renewable energy?
- Does fossil gas hydrogen further anchor New Mexico to volatile boom-bust oil and gas cycles or the prospect of a structural decline in fossil fuel markets to the detriment of state financial stability and diversification?
- Is fossil gas hydrogen industry propaganda designed to entrench fossil fuel interests and take advantage of government subsidies?

PRINCIPLE 4:

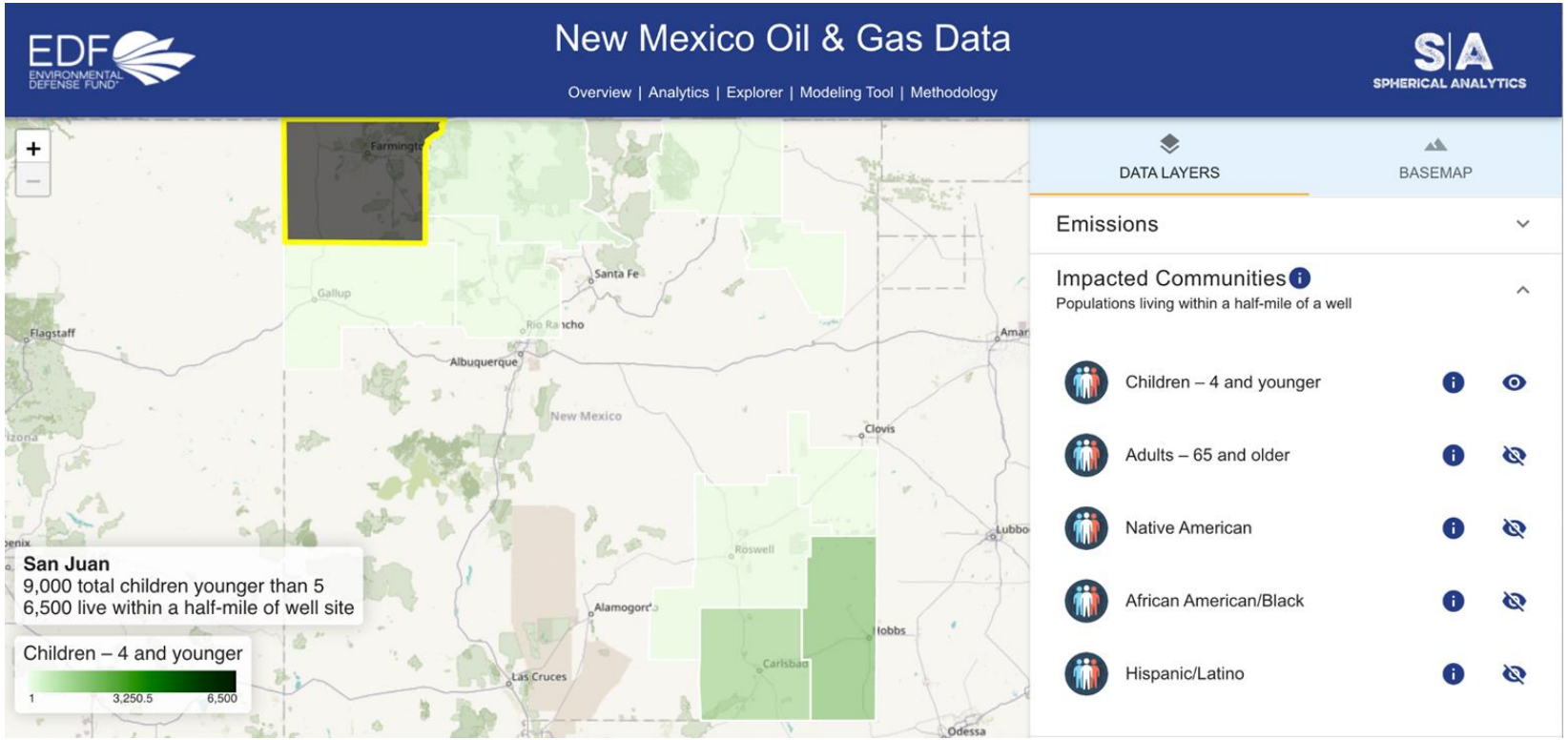
Hydrogen Must Avoid Adverse Climate, Environmental, Public Health, And Community Impacts.

- Has New Mexico avoided, minimized, and compensated for hydrogen infrastructure impacts to the climate, environment, public health, and communities?
- Would emissions reductions prove elusive or marginal, compromising real progress to constrain warming well below 2℃/3.6℉.?
- What are the implications of a build-out of hydrogen infrastructure to sacred, beloved, and living New Mexico landscapes and regions, such as Greater Chaco?
- Will hydrogen incentivize the development of new oil and gas fields or perpetuate aging and emissions-intensive existing oil and gas fields in New Mexico?
- Can new methane rules and carbon capture technology support the claim that fossil gas hydrogen can be “clean”?



Credit: https://www.edf.org/nm-oil-gas/map/

6,500 New Mexico Children Under The Age Of 5 In San Juan County Live Within 0.5 Miles Of An O&G Well



PRINCIPLE 5:

New Mexico Must Rigorously Scrutinize The Financial And Economic Prospects Of Hydrogen As A Climate And Energy Transition Tool.

- Is New Mexico chasing federal money for short-term gain for subsidy-dependent projects or are we creating the conditions for the state to generate durable, long-term economic opportunity for the benefit of all New Mexicans?
- What is the risk that investments in fossil gas hydrogen will fail within the next decade, wasting public taxpayer resources and stranding capital and infrastructure?
- Is New Mexico creating a framework that will inure to the long-term benefit and stability of frontline and energy-producing communities and working families?
- What are the realistic end-use hydrogen markets and opportunities for New Mexico?

‘Green’ Hydrogen to Outcompete ‘Blue’ Everywhere by 2030

May 5, 2021

This article first appeared on the BNEF mobile app and the Bloomberg Terminal.

- Fossil hydrogen with CCS currently cheaper than ‘green
- The opposite should be true by 2030 in all major markets

Clean Hydrogen Ladder: Competing technologies

Liebreich Associates

Unavoidable

Key: No real alternative | Electricity/batteries | Biomass/biogas | Other

A	Fertiliser, Hydrogenation, Methanol, Hydrocracking, Desulphurisation
B	Shipping*, Off-road vehicles, Steel, Chemical feedstock, Long-term storage
C	Long-haul aviation*, Remote trains, Coastal and river vessels, Vintage vehicles*, Local CO2 remediation
D	Medium-haul aviation*, Long distance trucks and coaches, High-temperature industrial heat
E	Short-haul aviation, Local ferries, Commercial heating, Island grids, Clean power imports, UPS
F	Light aviation, Rural trains, Regional trucks, Mid/Low-temperature industrial heat, Domestic heating
G	Metro trains and buses, H2FC cars, Urban delivery, 2 and 3-wheelers, Bulk e-fuels, Power system balancing

Uncompetitive

** Via ammonia or e-fuel rather than H2 gas or liquid*

Source: Liebreich Associates (concept credits: Adrian Hiel/Energy Cities & Paul Martin)

PRINCIPLE 6:

New Mexico Must Provide A Clear-Eyed Assessment Of Water Availability, Efficiency Challenges, And End-use Markets For Green Hydrogen.

- Where’s the water coming from?
- Would industry use freshwater resources that should be conserved and used for the long-term benefit and need of communities?
- If industry uses brackish or produced water resources, what are the resources? Would that improve the economics of oil & gas production, perpetuating fossil fuel infrastructure?
- What are realistic prospects for green hydrogen at scale, including relative to end-use green hydrogen markets?

PRINCIPLE 7:

New Mexico Must Carefully Consider Hydrogen Infrastructure Concerns.

.

- Given that hydrogen is corrosive and can embrittle pipelines, what are the leakage, health and safety risks of blending hydrogen into existing natural gas pipeline systems and how will these risks be prevented?
- Where hydrogen is not blended, what is the contemplated scale of new, dedicated, and capital-intensive infrastructure (including for carbon capture) to produce, transport, and store hydrogen?
- What voice will communities have in the infrastructure siting process, especially communities already overburdened with a legacy of fossil fuel production?
- What cumulative impacts would hydrogen infrastructure cause to land, air, water, and communities?

KEY TAKEAWAYS FROM NEW MEXICO

1. We can’t just reduce greenhouse gas emissions. We need to reduce GHGs to meet science-based targets to limit warming to well below 2℃/3.6℉.
2. It is essential to consider the prospect of hydrogen in two contexts:
    a. Action to decarbonize the economy; and
    b. Action to transition state revenue and economic base from fossil fuels.
3. There are a variety of environmental, public health, land and water, and financial and economic risks associated with hydrogen that require a clear-eyed and candid assessment as well as action that avoids those risks.
4. If hydrogen, especially fossil gas hydrogen, fails, it would be yet another unmet promise to communities and working families who seek long-term stability and security.

FOR FURTHER READING

- New Mexico NGO hydrogen policy letter: https://westernlaw.org/nm-groups-lawmakers-fossil-fueled-hydrogen-climate-threat-not-solution/
- Fourth National Climate Assessment: https://www.globalchange.gov/nca4
- IPCC Assessment Report 6 WG1 Report: https://www.ipcc.ch/report/ar6/wg1/
- Limits of national climate pledges: https://www.washingtonpost.com/climate-environment/interactive/2021/climate-pledges-cop26/
- 2021 Fossil Fuels Production Gap Report: https://productiongap.org/2021report/
- An overview of fossil gas hydrogen risks: https://time.com/6098910/blue-hydrogen-emissions/
- Michael Liebreich, The Unbearable Lightness of Hydrogen: https://about.bnef.com/blog/liebreich-the-unbearable-lightness-of-hydrogen/

FOR FURTHER READING (Cont.)

- The role of hydrogen in a clean energy transition: https://blog.ucsusa.org/julie-mcnamara/whats-the-role-of-hydrogen-in-the-clean-energy-transition/
- Hydrogen climate emission concerns: https://www.nytimes.com/2021/08/12/climate/hydrogen-fuel-natural-gas-pollution.html
- Reclaiming hydrogen for a renewable energy future: https://earthjustice.org/features/green-hydrogen-renewable-zero-emission
- Green hydrogen to outcompete fossil gas hydrogen by 2030: https://about.bnef.com/blog/green-hydrogen-to-outcompete-blue-everywhere-by-2030/
- Economic prospects of green hydrogen: https://www.irena.org/newsroom/pressreleases/2020/Dec/Making-Green-Hydrogen-a-Cost-Competitive-Climate-Solution

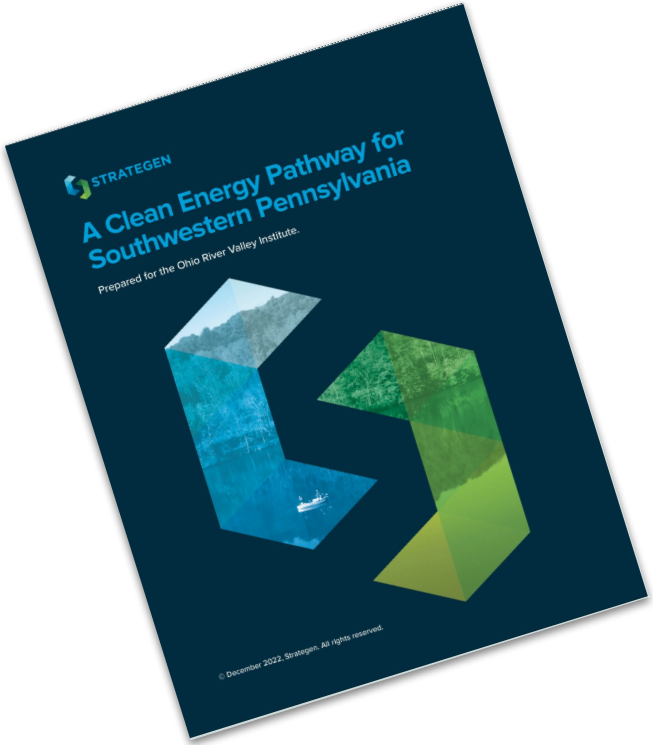
Ohio River Valley Institute

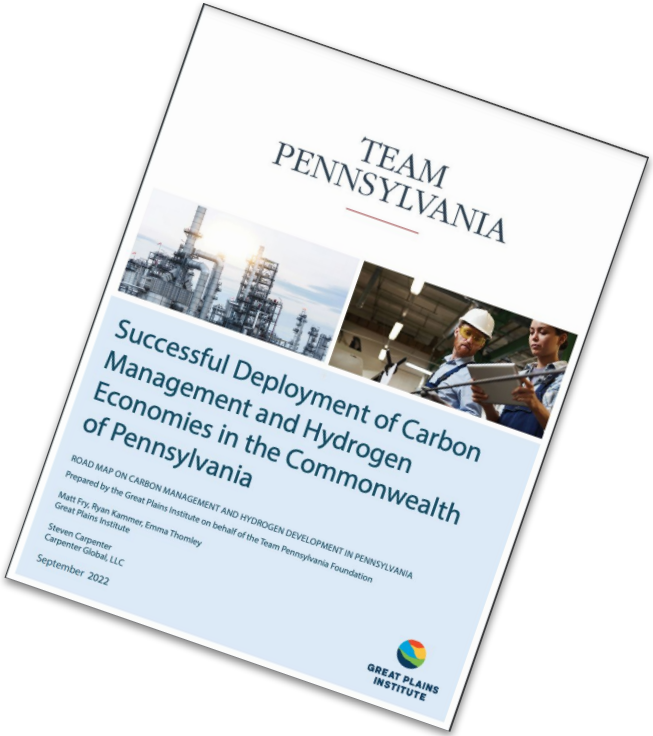
Blue Hydrogen & Carbon Capture Hubs in the Age of The Inflation Reduction Act

December 15, 2022

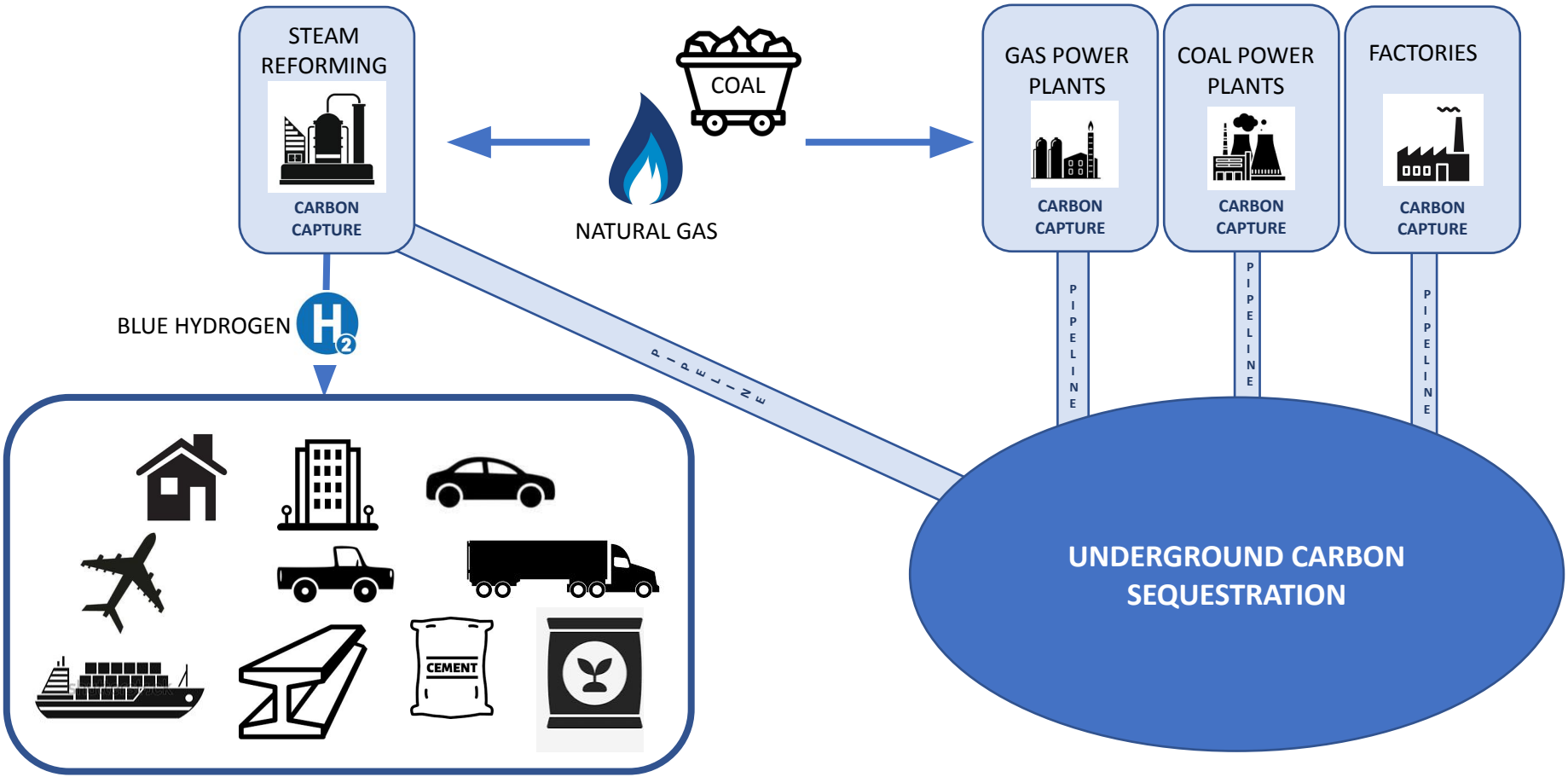
THE QUESTION ISN'T WHETHER APPALACHIA WILL DECARBONIZE, BUT HOW?

The choices are clean energy transition based on renewable resources or fossil fuel transition enabled by blue hydrogen and carbon capture and sequestration (CCS)





A BLUE HYDROGEN & CO2 HUB LOGICAL VIEW



THE TEAM PENNSYLVANIA CARBON CAPTURE & HYDROGEN HUB ROADMAP

Team Pennsylvania, a public/private partnership, has given us the most completely sketched out vision of what a Pennsylvania hub might look like.

It features 1,400 miles of pipelines that would capture and transport 62 million tons of CO2 annually, about 2/3s of industrial emissions.

89% of the captured CO2 would come from coal and gas-fired power plants.

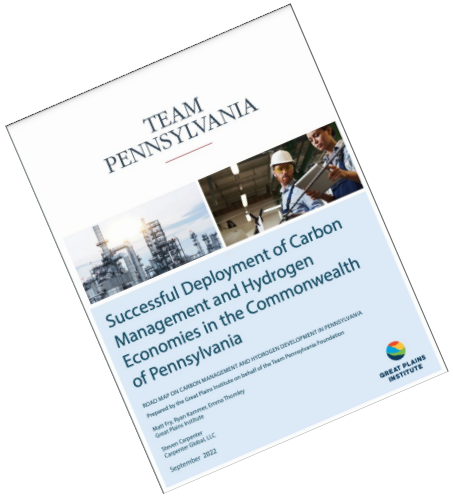
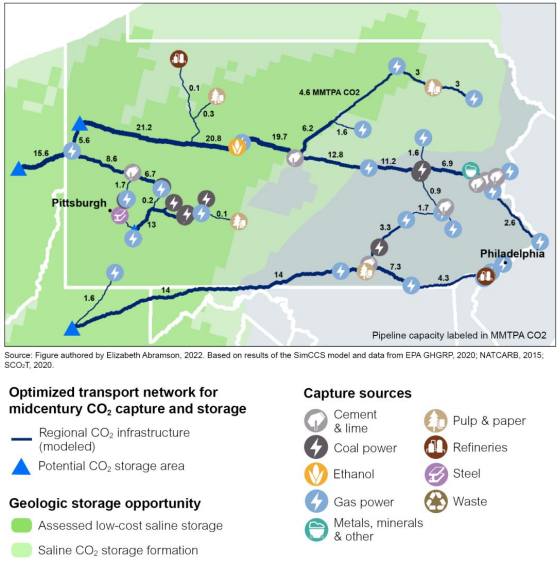


Figure 3. Midcentury carbon capture opportunities infrastructure scenario



Source: Figure authored by Elizabeth Abramson, 2022. Based on results of the SimCCS model and data from EPA GHGRP, 2020; NATCARB, 2015; SCO_2T, 2020.

Carbon captured from H2 would probably amount to less than 15% of the amount captured and sequestered.

Table 1. Pennsylvania industrial and power sector emissions

Sector	Number of facilities	CO_2 emissions MMTPA CO_2
Cement	8	3.7
Chemicals	15	0.6
Coal power plants	15	24.5
Ethanol	1	0.2
Gas power plants	48	47.3
Gas processing	44	2.0
Metals, minerals & other	50	2.9
Other power plants	2	0.04
Petrochemicals	2	0.2
Pulp & paper	10	3.1
Refineries	6	2.1
Steel	27	5.9
Waste	51	2.8
Total	**279**	**95.3**

Source: EPA GHGRP 2020.

Table 2. 45Q-eligible facilities in Pennsylvania

Sector	Number of facilities	CO_2 emissions MMTPA CO_2	Potential capture quantity MMTPA CO_2
Cement	8	3.9	3.3
Coal power plants	9	24.4	20.8
Ethanol	1	0.2	0.4
Gas power plants	23	44.4	34.7
Metals, minerals & other	1	0.9	0.1
Pulp & paper	4	2.7	1.0
Refineries	2	1.8	0.4
Steel	1	3.5	1.0
Waste	1	0.9	0.8
Total	**50**	**81.8**	**62.4**

Source: EPA GHGRP 2020.

THE INFLATION REDUCTION ACT PROVIDES GENEROUS SUBSIDIES FOR CARBON CAPTURE & HYDROGEN

DOE is offering over $8 billion in grants plus billions more in loan guarantees to promote the creation of hydrogen hubs. In addition, the IRA provides immense subsidies for CCS and H2.

Carbon capture & Sequestration

- Carbon from qualifying facilities that is captured and sequestered is eligible for a subsidy of $85/metric ton for up to twelve years.
- Additional assistance in the form of grants and loan guarantees is also available.

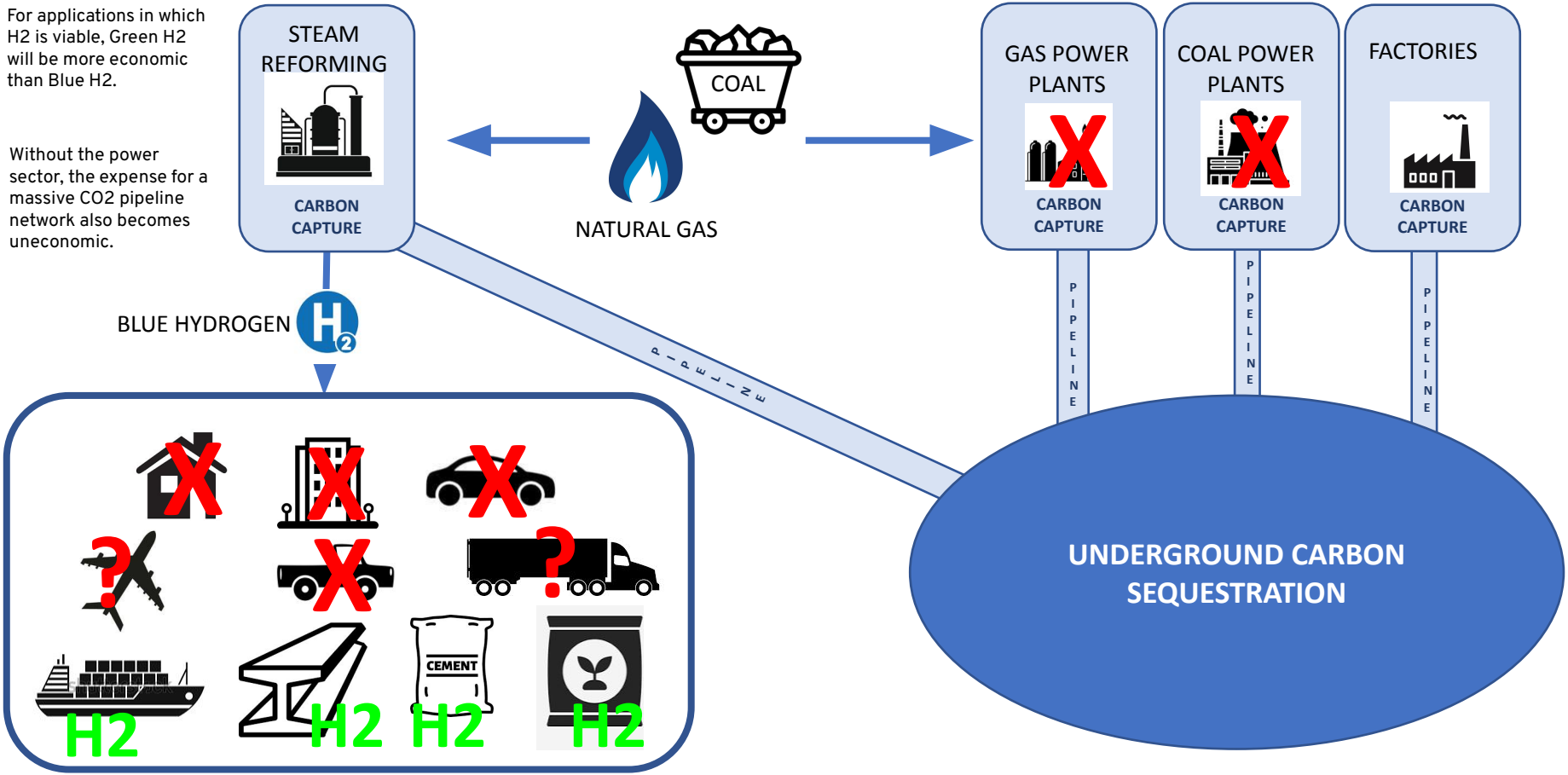
Hydrogen

- The H2 subsidy is variable based on the amount of emissions that are avoided and facility location and employee pay.
- Blue H2 can plausibly earn a subsidy of $.60 - $.75 per kilogram (kg)
- Green H2 can plausibly earn a subsidy of $3.00/kg.
- Some of green H2's advantage could be eroded in rulemaking and by reliance on self-regulation by an industry notorious for its dishonesty.

BUT ON EXAMINATION THE ECONOMIC CASE FOR BLUE H2 & CCS FALLS APART

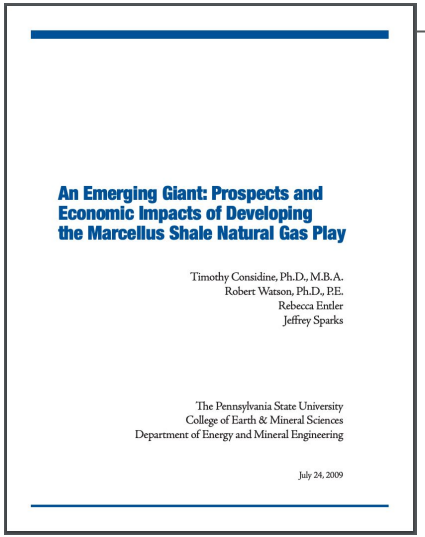
For applications in which H2 is viable, Green H2 will be more economic than Blue H2.

Without the power sector, the expense for a massive CO2 pipeline network also becomes uneconomic.

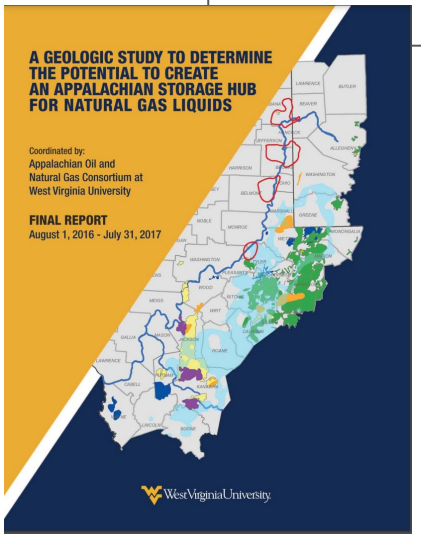


THE QUESTION IS HOW MUCH EFFORT AND RESOURCES WILL BE SQUANDERED ON A FALSE PROMISE?

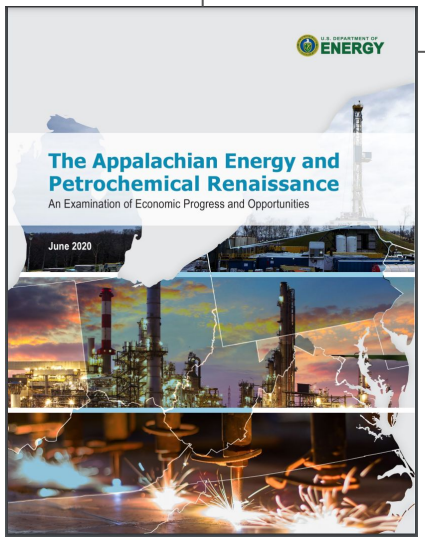
Appalachia's record isn't a good one.



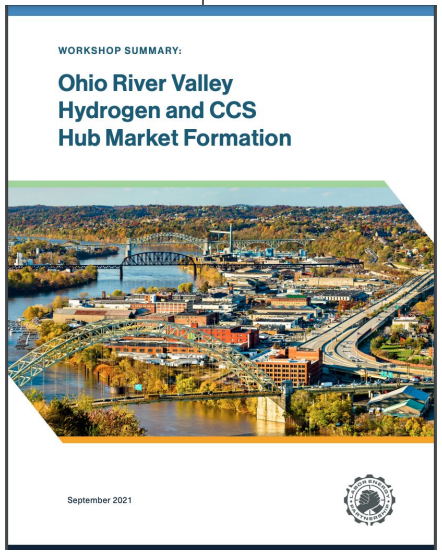
The Natural Gas Jobs Boom



The Appalachian Storage Hub



The Petrochemical Renaissance



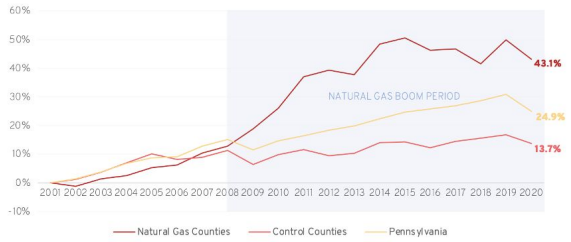
The H2 and Carbon Capture Hub

AND WE'VE PAID A STEEP PRICE

Pennsylvania's rural counties provide a natural experiment – an apples-to-apples comparison – with which to quantify the economic impacts of Appalachian natural gas development.

- GDP skyrocketed in the gas counties but not in the non-gas counties
- Despite GDP growth, jobs declined and did so a rate comparable to the decline in non-gas counties
- Population plunged even more deeply in gas counties than it did in non-gas counties.

Figure 3: Change in Real GDP, 2001-2020



Source: Author's calculations using Bureau of Economic Analysis data

Figure 4: Change in Total Employment, 2001-2020

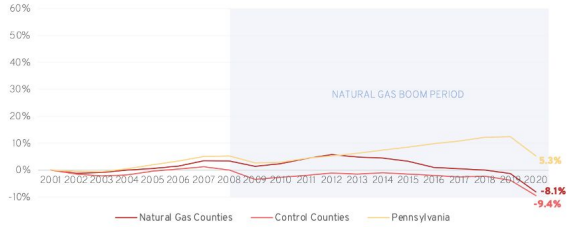
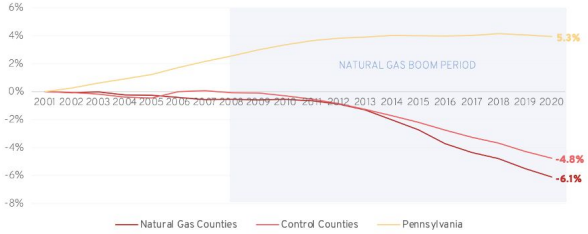


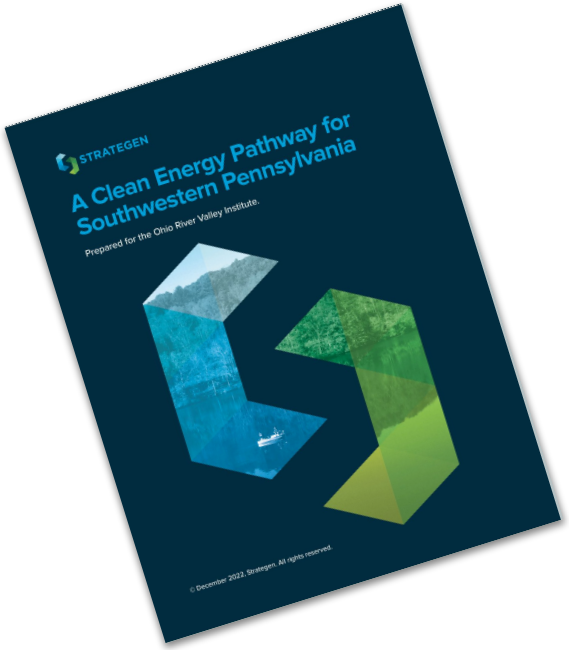
Figure 5: Change in Population, 2001-2020



Source: Author's calculations using Bureau of Economic Analysis data

THERE IS A BETTER ALTERNATIVE

- More effective at reducing emissions and local pollutants as well
- Less expensive
- Far better for job growth and prosperity



Please visit ohiorivervalleyinstitute.org to see the clean energy transition pathway for southwestern Pennsylvania and Appalachia.

Thank you!

Sean O'Leary
sean@ohiorivervalleyinstitute.org
603-661-3586

Thank you for attending our webinar

Marriele Mango
Project Director
Clean Energy Group
marriele@cleanegroup.org

Abbe Ramanan
Project Director
Clean Energy Group
abbe@cleanegroup.org

Find us online:
www.resilient-power.org
www.cleanegroup.org
www.facebook.com/clean.energy.group
@cleanenergygrp on Twitter

Clean Energy Group

RESILIENT POWER
A Project of Clean Energy Group

Upcoming Webinars

- New Federal Money for Energy Storage: The Inflation Reduction Act (12/16)
- State of the U.S. Energy Storage Industry: 2022 Year in Review (1/10)
- Bringing Community Perspectives to Community Solar (1/23)
- Assessing the Value of Energy Storage: A Framework for States (1/31)

Read more and register at www.cleanegroup.org/webinars