Project ThermH_2:
Hydrogen Blending in Natural Gas Pipelines

Dominion Energy – At A Glance

We are striving to be "the most sustainable energy company in the country"

- ✓ **Fortune 200** company with 17,000 employees
- ✓ **$65 billion** market capitalization
- ✓ **7 million** electric and gas utility customers over 16 states
- ✓ **24 gigawatts** of zero-carbon power generation by 2036
- ✓ **$32 billion** of investments in clean energy over next 5 years
- ✓ Pursuing **Net Zero 2050** as an enterprise-wide goal

Dominion Energy Is Pursuing “Net Zero 2050”

Capturing Methane Emissions

- 65% reduction from existing gas infrastructure by 2030 vs 2010 levels
- 80% reduction from existing gas infrastructure by 2040 vs 2010 levels

Developing Renewable Natural Gas Projects

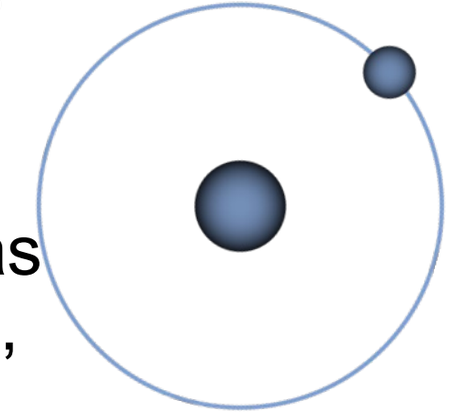
- Partnerships with Smithfield Foods & Vanguard Renewables
- Designing, building and operating RNG plants at swine and dairy farms

Incorporating Hydrogen Into The System

- Prepare gas system to receive 5% hydrogen by 2030
- ThermH_2 is a muti-phase leading hydrogen blending initiative in US

Why H2? “The ABCD’s of Hydrogen”

- Abundant: Hydrogen is the most abundant element in the universe, found in water and in all hydrocarbons.
- Broad: Hydrogen’s use is broad, serving the same markets as natural gas–heating, power generation, transportation.
- Compatible: Hydrogen is largely compatible with natural gas infrastructure – pipelines, valves, leak monitoring detection, combustion turbines.
- Decarbonize: Hydrogen helps decarbonize the global economy, especially hard-to-decarbonize sectors such as cement and steel.



Comparing Natural Gas to Hydrogen

Category	Natural Gas (methane)	Hydrogen
Chemical Symbol	CH4	H2
Molecular Weight (g/mol)	16	2
Molecular Diameter (pm, 10-12m)	380	289
Heat Content (Btu/scf)	912	275
Heat Content (Btu/lb)	21,515	51,593
CO2 Intensity (g/Kwh)	198	0
Boiling Point (°F)	-306	-423
Flame Temperature (oF)	3586	3895
Flammability Range	5-15%	4-78%
Specific Gravity	0.55	0.069
Vapor Density (lb/ft3)	0.0406	0.0052

Hydrogen is 8x lighter than methane and 14x lighter than air

Hydrogen has less than 1/3 the volumetric heat content of methane.

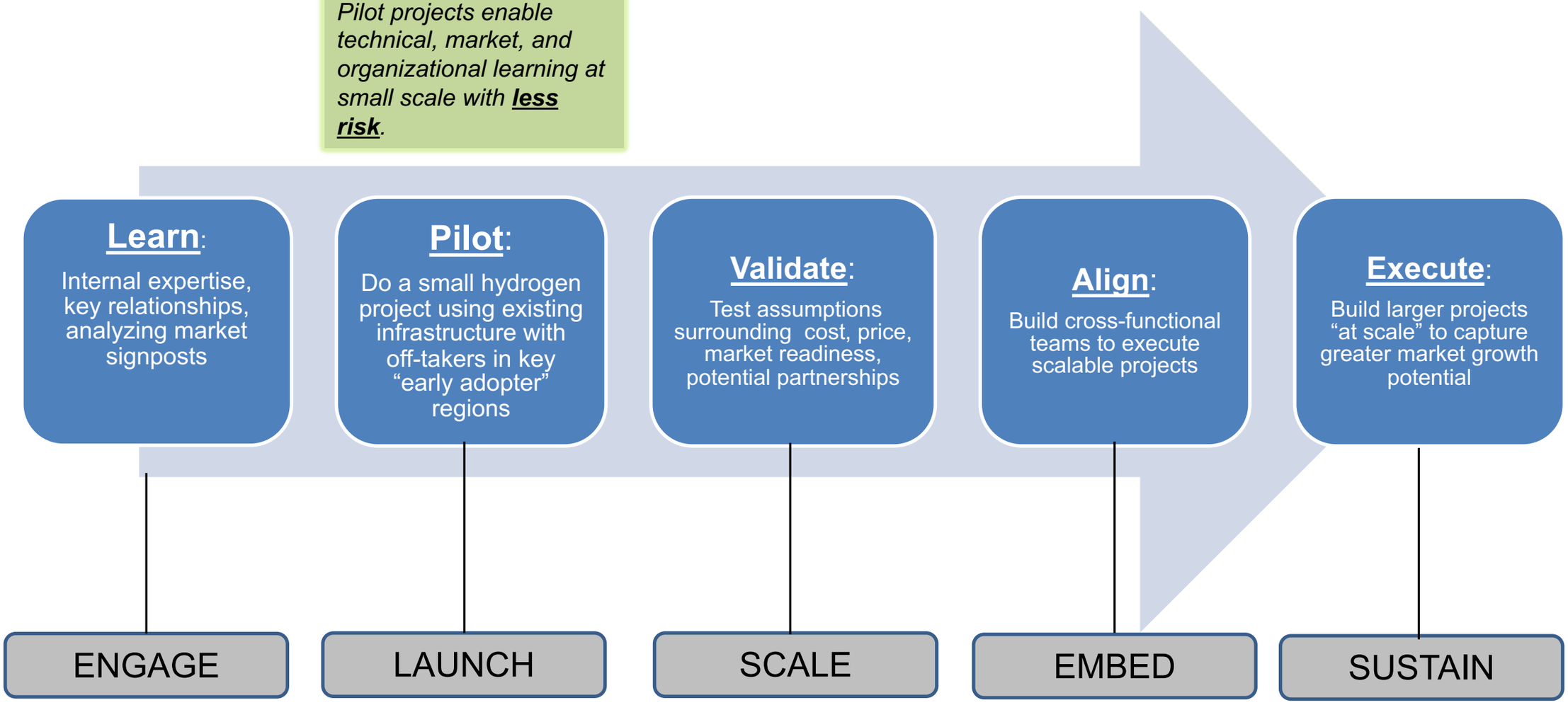
Hydrogen burns hotter (i.e. higher flame temperature) than methane.

Hydrogen has a wider flammability limit than methane.

Why Hydrogen Pilots?

"Hitting Singles": Micro-Learn Now to Mass-Produce Later

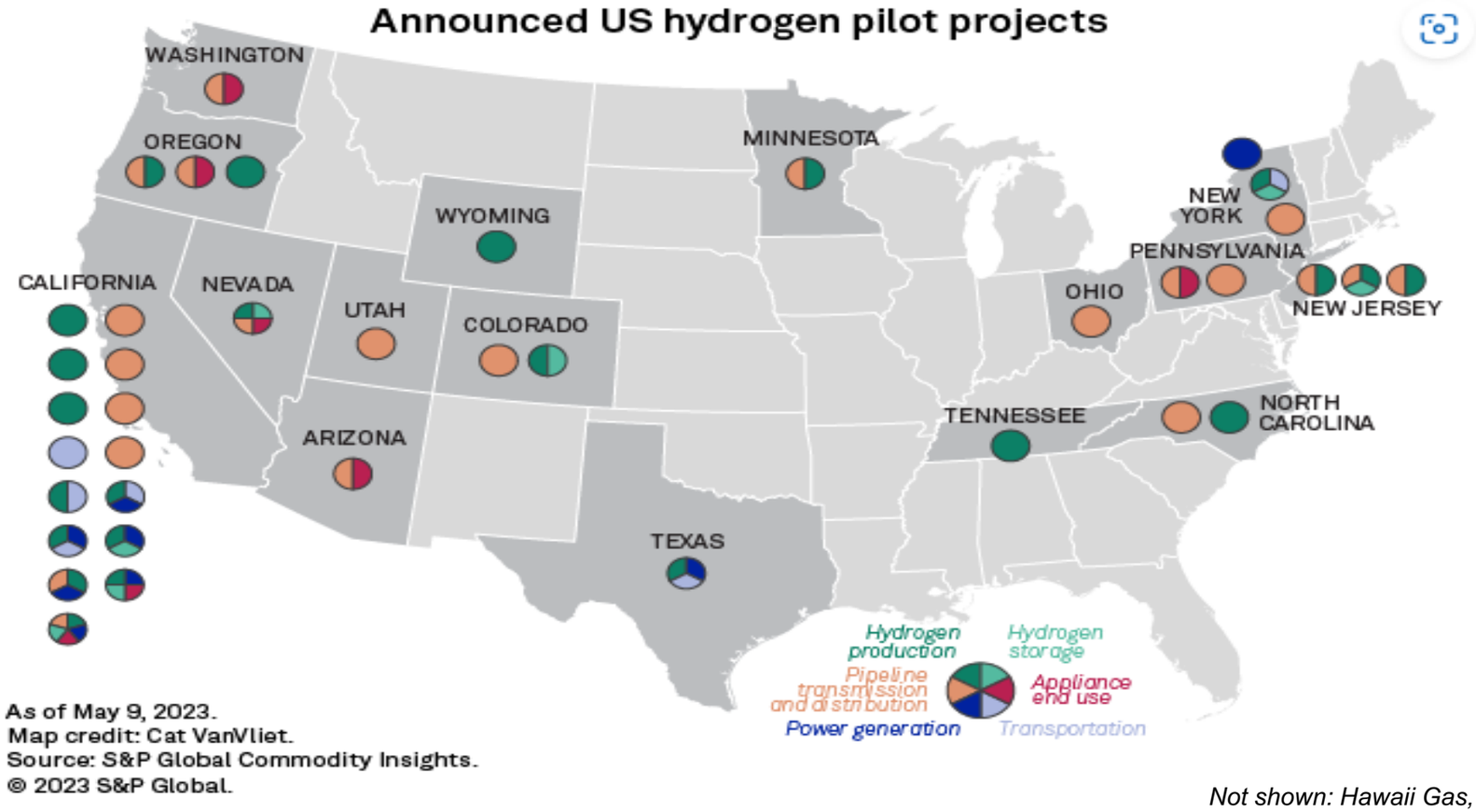
*Pilot projects enable technical, market, and organizational learning at small scale with **less risk**.*



Industry-Wide Hydrogen Pilots

- Gas and Electric Utilities in 17 states are in various stages of development of their hydrogen pilots in transportation, power generation, transportation and industrial feedstock sectors

- 14 out of 36 (39%) of Dominion Energy's gas & electric utility peer group have announced or active hydrogen pilots



Not shown: Hawaii Gas, standard operations

Dominion Energy: Hydrogen Blending Pilot Comparison

Ohio: Hydrogen Heights – Phase 1

Hydrogen Provider: Linde Gas
End user appliances:
- 14 Houses
- 9 Types of appliances
  - Example: Dryer, Furnace
- 26 Total Quantity of appliances
- 40,558 Btu/Hr Average Energy

Technical Components:
- 12 cylinders storage (7.35 kg)
- In-line static mixer
- Chromatograph system
- Hydrogen storage tanks

Facility Specifications:
- 6” gas main HD plastic (MP – 99 lb)
- No blast wall

Testing Scope:
- Gas Control
- Gas Planning
- Field maintenance
- Field operations

Similarities

Hydrogen Capacity:
Ohio 3,120 scf (7.35 kg)
Utah 3,000 scf (7.24kg)

Technical Component:
GC system to confirm blending of hydrogen and fuel gas.

Testing Scope:
Leak Survey
Safety
Gas Quality
Heat Content

Utah: ThermH2 – Phase 1

Hydrogen Provider: Airgas
End user appliances:
- 16 Houses
- 11 Types of appliances (Ex. Oven, Range)
- 73 Total Quantity of appliances
- 46,476 Btu/Hr Average Energy

Technical Components:
- 16 cylinders storage (7.24 kg)
- No mixer
- Welker “odor-eyes” system
- Alicat flowmeter

Facility Specifications:
- 2” gas main MDPE plastic (MP – 45 lb)
- Blast wall

Testing Scope:
- Odorization
- NOx Emissions
- Material Compatibility
- End-user appliances

Project ThermH_2 Scope – Phased Approach, Incremental Learning

Phase 1
- 5% blend at DEU Training Academy confirms existing research
- Status: Completed December 2021.

Phase 2
- 5% H_2 blending in Delta, UT's IHP system, started 3/23/23
- Status: In Process - PEM electrolyzer expected in Q4 2023

Phase 3
- 5% H_2 blending in rural HP system: 2028 timeframe
- Status: indicative budget and schedule created

Phase 4
- Produce synthetic natural gas (biomethane) from industrial CO_2 and green H_2 via biomethanation in HP system: 2030 timeframe
- Status: indicative budget and schedule created

ThermH_2 – Phase 1 Facility, DEU Training Academy.

Phases 3-4: Included in Western Interstate Hydrogen Hub (WISHH) application for ~50% funding match from DOE.

Phase 1: Test Findings

TEST RESULTS

- Appliance Safety: PASSED
- Leak Detection: PASSED
- Pipeline Material: PASSED
- Gas Quality: PASSED

Water heater with NOx detection equipment.

Visual flashback and flame characterization testing.

Testing for hydrogen leaks.

Extensive testing and analysis of 5% hydrogen blending over a variety of applications confirmed our top research priority:

Hydrogen Blending Is Safe and Reliable

Phase 2: Why Delta?

Delta, Utah will be a leader in this emerging area of energy innovation

- Customer base and system size allows for a controlled environment
- Modern infrastructure system
- Proximity to a variety of renewable and traditional energy sources
- Proximity to massive amounts of potential storage – Salt Caverns

- Nearly 2,000 customers in the Delta area will receive a blend of up to 5% hydrogen
- All hydrogen will eventually be created on-site using a process called electrolysis
- Community will continue to enjoy the safe, affordable and reliable natural gas service they receive today with added sustainability
- As we blend hydrogen and natural gas, safety and reliability will continue to be our first priority

Phase 2: Delta, UT Regulator Station Site Overview

- Project will be built at the Delta Regulator Station, Dominion Energy-owned property
- Adequate space for hydrogen production, storage, blending, and construction laydown
- Access to water
  - Expected water consumption is 270 gallons per day or 100,000 gallons per year
- Access to renewable electricity for green hydrogen production
- Will remove 110 tons of CO2 from the atmosphere per year, the equivalent of planting 5000 trees or removing 25 cars from the roads

Project ThermH$_2$: Phase 1-2 Test Protocols

Test Type	Test Procedures	Comments
Leak Detection	Use handheld devices	Already identified in Phase 1
Appliance Compatibility	Use different appliances:stoves, dryers, furnaces, water heaters, fireplaces	Consider business district or school district; utilized GTI support.
Materials	Embrittlement tests	Utilized GTI support
Electrolyzer Performance	Conversion ratio tested	Conversion ratio = proxy for efficiency
Odorant	Sniff test	Mercaptan detection
Gas Homogeneity Tests	Ensure 5% at start and end of tested area	Consider business district or school district

Project ThermH_2 Expected Customer Impact - None!

What can Delta customers expect from 5% hydrogen blending during Phase 2?

NO CHANGE to existing residential natural gas appliance performance and no residential appliance adjustments needed

NO CHANGE to bills or rates

NO CHANGE to system safety

NO CHANGE to carbon footprint increases – it actually decreases!

For more information, please contact:

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OPEN DISCUSSION

THANK YOU FOR YOUR TIME!