



RG 360

HYDROGEN BLENDING IN NATURAL GAS PIPELINES

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SoCalGas



A Semptra Energy utility®

SoCalGas Vision



- » Build the cleanest, safest, most innovative energy company in America
- » Harness the potential of H2 to decarbonize the energy system and help California achieve its climate goals

Hydrogen Blending Policy

- Emphasize SoCalGas' commitment to conducting the necessary work to safely introduce hydrogen into the Utility pipeline
- SoCalGas has presented and a filed a plan to identify hydrogen injection standard in near future as critical research is conducted and additional information is gathered to ensure safety and reliability

In Progress

- Ongoing research to inform development of hydrogen injection standard

Near Term (1-3 years*)

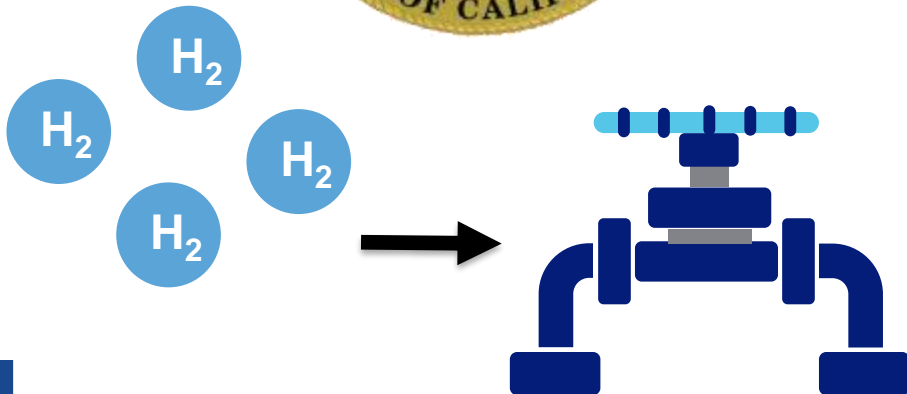
- Develop preliminary hydrogen injection standard, based on:
- Demonstration program
 - Data collected from ongoing research
 - Info from int'l pilots/ research/collaboration

Long Term (3+ years*)

- Identify final hydrogen injection standard
- Submit regulatory filings for approval

*As of 11/20/20 Application filing date

H2 Policy Considerations



- » Narrow H2 definition in CPUC filing
- » SoCalGas open to working with H2 stakeholders on a broader definition
- » Utility procurement programs should include Green H2

H2 Blending Focus Areas

Hydrogen Blending Safety

- Leakage Rates and Leak Detection
- No concrete evidence of increased leak rate
- Current natural gas odorant still suitable when hydrogen is present
- Electrical equipment compatibility

System Integrity

- Plastic and Steel compatibility
- AGS/UGS Assessment
- End User Considerations
- Feedstock Customers & Gas Quality
- NGVs

System Reliability

- Operations and system impacts (e.g. in-service welding)
- Facilities (Regulator, Pressure Limiting, and Measurement Stations)
- Compressors, turbines, engines
- Backbone System Supply

Progression, Additional Research on:

- Steel compatibility
- Underground Storage
- Measurement (e.g. gas chromatograph assessments are in progress)
- Expanded appliance testing (working directly with GTI on cooking equipment)

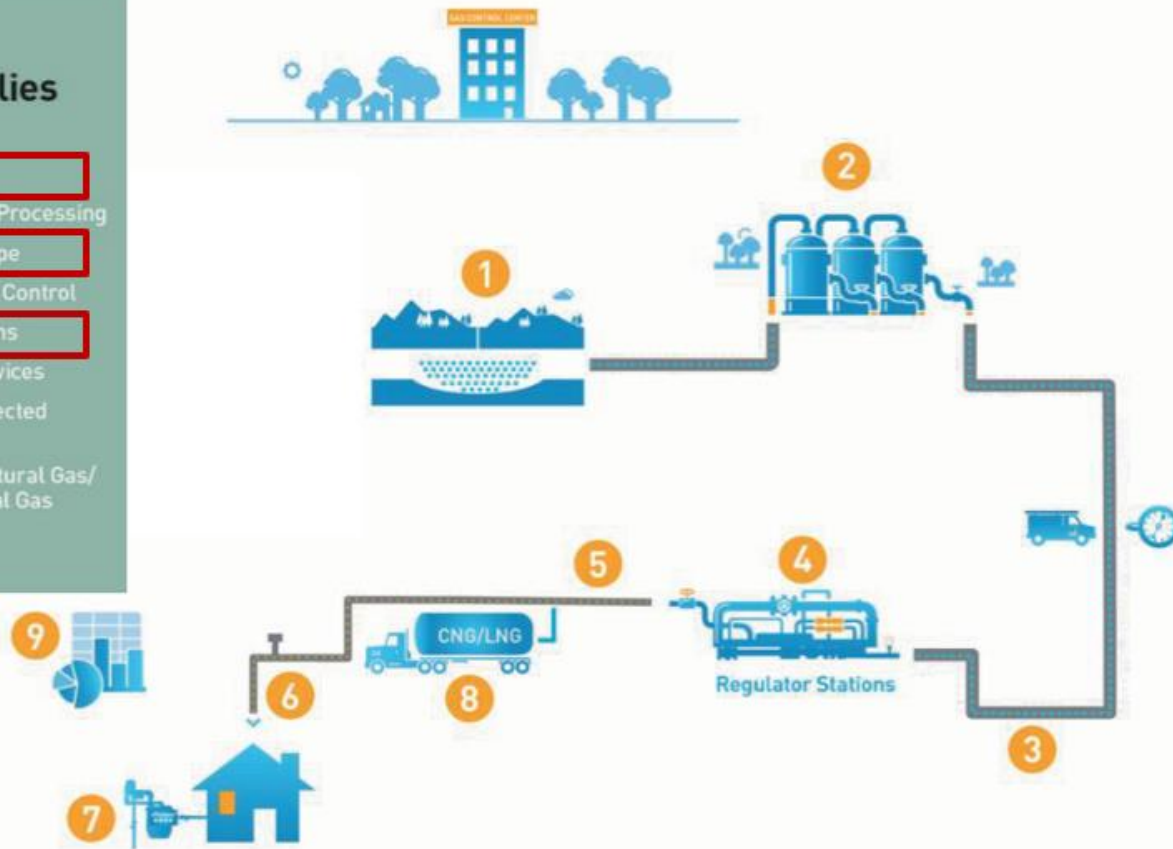
Research Action Plan Matrix

- » Developed by SoCalGas, SDG&E, PG&E, and Southwest Gas to help identify, prioritize, and track knowledge gaps for hydrogen blending
- » Plan is built upon four categories:
 - System integrity
 - System and industrial equipment
 - Residential and commercial end use equipment
 - General

Research Action Plan Matrix

Asset Families

- 1 Gas Storage
- 2 Compression & Processing
- 3 Transmission Pipe
- 4 Measurement & Control
- 5 Distribution Mains
- 6 Distribution Services
- 7 Customer-connected Equipment
- 8 Compressed Natural Gas/ Liquefied Natural Gas
- 9 Data

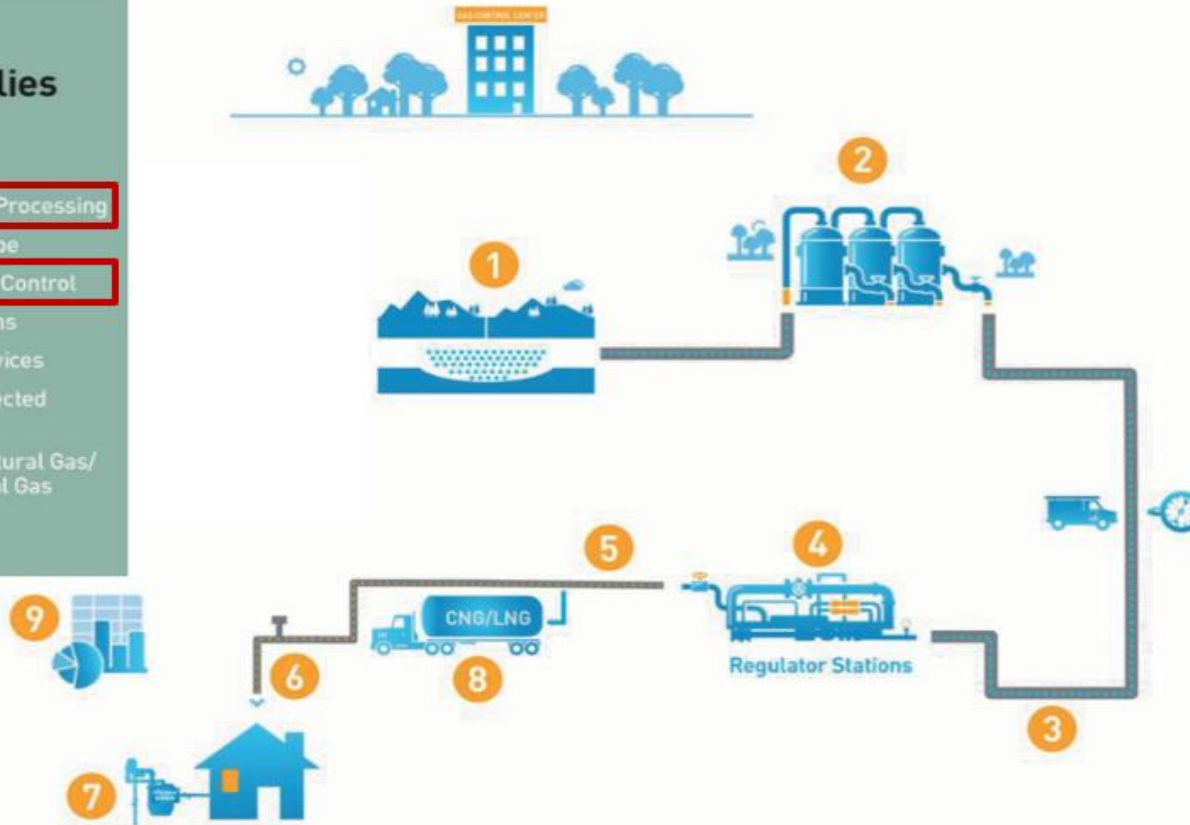


- » Hydrogen embrittlement
- » In-service welding
- » Underground storage
- » Cathodic Protection
- » Hot Tie-Ins and gas handling procedures

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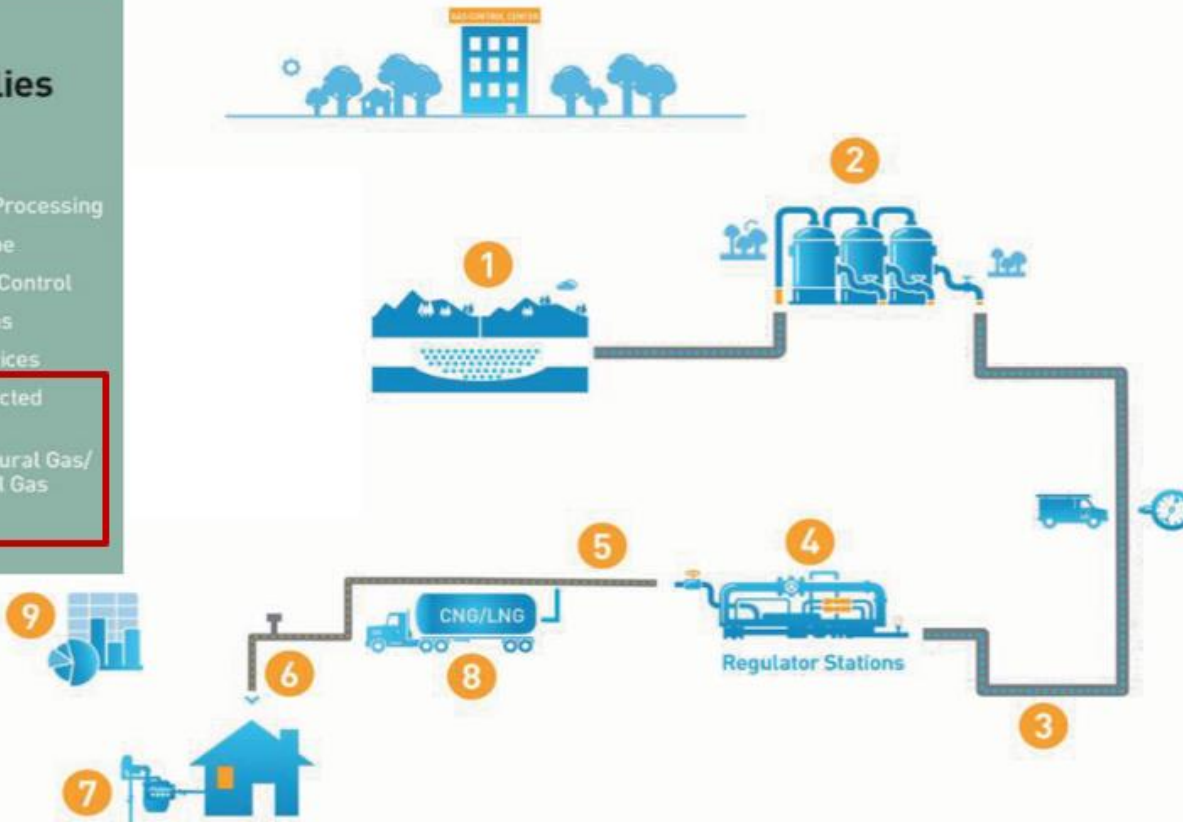


- » Compressors, engines, and turbines
- » Measurement and control
- » Sealants, gaskets, elastomers
- » Valves, flanges, fittings

Research Action Plan Matrix

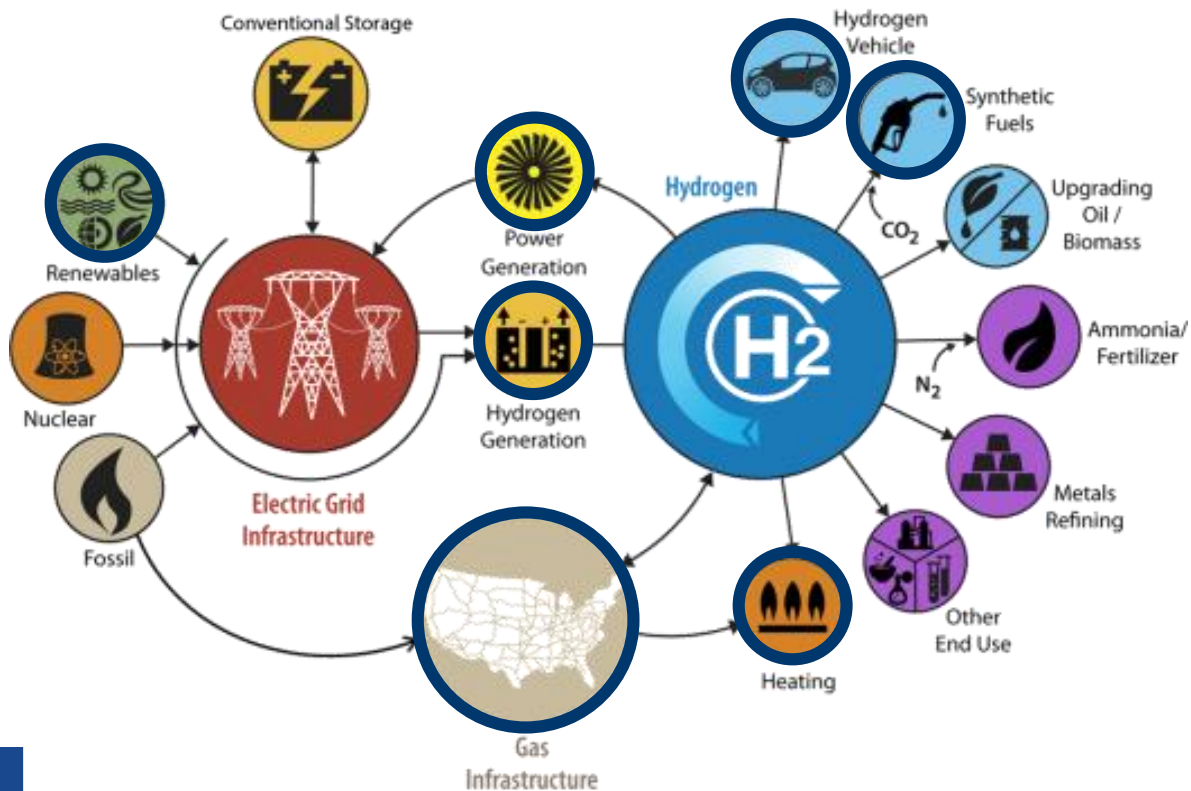
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- » End-use: appliances, feedstock
- » NGVs
- » Hydrogen separation technology
- » Impacts to emissions
- » Combustion stability

Research Areas



- » Renewables
- » H2 generation
- » Gas infrastructure
- » H2 vehicles
- » Synthetic fuel
- » Heating
- » Power generation

RD&D Efforts



- » UCI - injects P2G green hydrogen into campus power supply
- » JPL methane reforming technology development & commercialization
- » Fluor Honor Rancho P2G FEED Study
- » Brimstone Energy cogeneration project supporting low-cost/low-energy hydrogen production
- » Hydrogen home

H2 Blending Safety

» Leakage rates

- Preliminary testing with UCI on low pressure steel distribution system with blends up to 10% showed no significant increase; further testing warranted

» Leak detection

- Evaluating currently deployed technologies with hydrogen blends of up to 20%

» Odorant

- Vendors advise that hydrogen will not affect the stability of currently used NG odorant

» Compatibility with electrical equipment

- Hydrogen and NG fall under different hazardous groups; past research suggests hydrogen blends of up to 14% do not lead to a hazardous group reclassification

H2 Blending Reliability

» In-service welding & hot tie-ins

- Supporting a Joint Industry Project to determine if hydrogen will increase risk of cracking in welds and if so, develop mitigative measures

» Regulator, pressure limiting, and measurement stations

- Evaluating gas chromatographs able to detect hydrogen

» Compressors, turbines, engines

- Partnering with UCI and Capstone Turbine to demonstrate a hydrogen-tolerant microturbine-based CHP system

» Backbone system supply

- Hydrogen energy density is one-third of natural gas; energy delivery capacity of the pipeline system will be reduced with hydrogen

H2 Blending Integrity

- » Polyethylene piping is generally compatible with hydrogen blends
- » Steel pipelines and components are susceptible to hydrogen embrittlement
 - DNV GL hydrogen embrittlement testing
- » Further study on impact of hydrogen on fittings and components constructed of various polymers, metals, and elastomeric seals
 - NYSEARCH elastomers evaluation
- » Need to investigate compatibility of wellbore materials and chemical/biological reactions in storage facilities
- » End user considerations: testing appliances; planning meter, NGV engine and hydrogen separation technology evaluations; initiate feedstock customer outreach

Hydrogen Blending Demonstration Program

	Project 1 (2021)	Project 2 (2022)	Project 3 (2022)
Project	Blend hydrogen in polyethylene plastic , isolated pressure district in SoCalGas Territory	Blend hydrogen into mixed material isolated distribution network	Blend hydrogen in dedicated steel line to commercial/industrial end user
Blend Target	Start at 1% and go up to 20% blend of Hydrogen	1-5% to start, consider 20%, or conversion to 100% long term	Determine with End User
Technology	Hydrogen injection skid, residential appliances, leak detection equipment (Solar panels, electrolyzer)	Same as PE Plastic Demonstration, Plus Assessment of Mixed Material Network	Same as PE Demonstration, Plus Assessment of Steel and of Transmission System
Goal	Establish Hydrogen Blending Demonstration workflow including data acquisition to set Integrity Management approach; Set standard for PE Plastic Sections of Distribution Network	Set Standard For Mixed Material Distribution Network	Data acquisition on steel will feed into Integrity Management Analysis to set Standard for Transmission Network

Biomethane OIR & Phase IV Ruling

Phase 1:

Development of biomethane injection standards

0.1 % hydrogen trigger limit

Phase 2:

Biomethane pipeline interconnection incentives (\$40 million)

Phase 3:

RG Interconnection Rule submitted November 2019

Interconnection Agreements filed May 2020

Phase 4:

Standards for injecting renewable hydrogen into gas pipelines

Implementation of SB1440



Thank You

