

State of the U.S. Renewable Gas Markets



REM 2023

Presented by Sam Lehr

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About RNG Coalition

- Provide education and policy advocacy on behalf of renewable gas and adjacent industries in North America
- We advocate for the sustainable development, deployment and utilization of renewable gas so that present and future generations will have access to domestic, renewable, clean fuel and energy
- 370+ members including: RNG developers, marketers, financiers, technology providers, consultants, utilities and labor coming together
- 98%+ of the RNG supply in North America



Organic Waste-to-X



Thermal



Transportation



Electricity

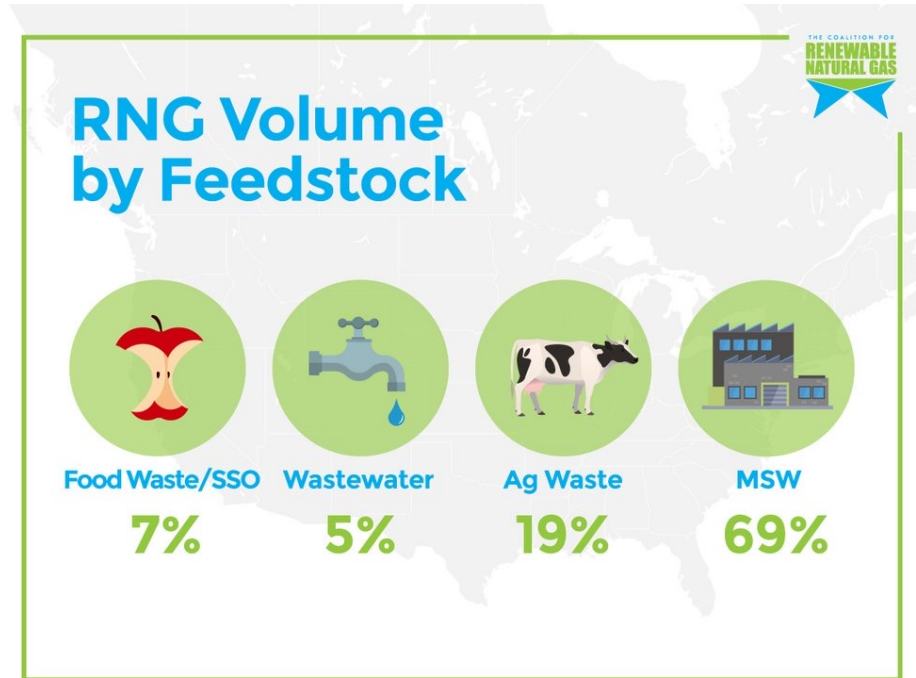


Hydrogen

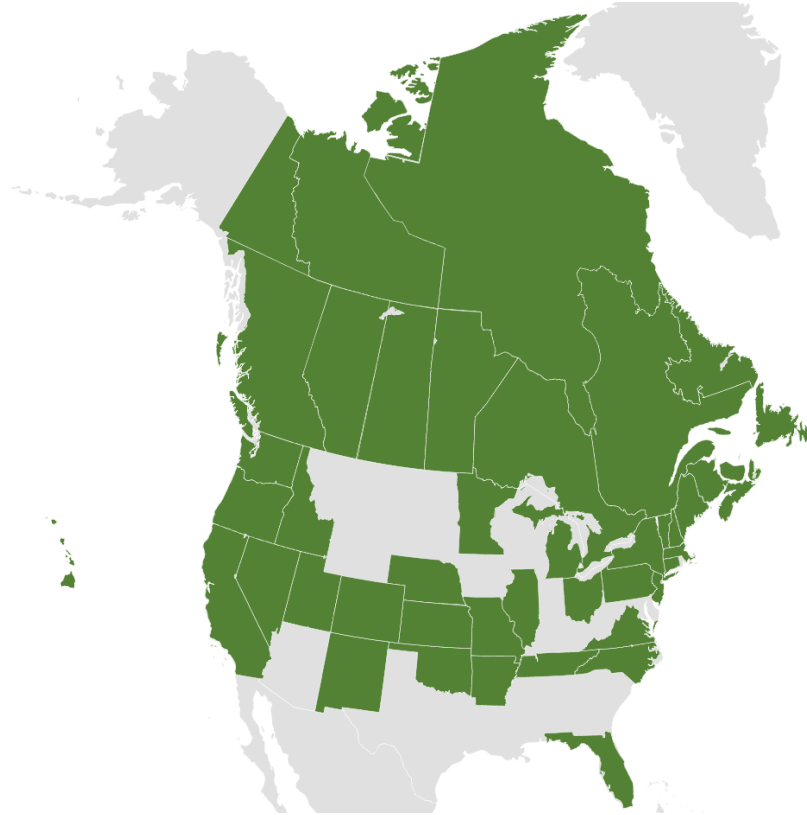


Bio-based Products

Where Does RNG Come From Today?



RNG Markets at a Glance

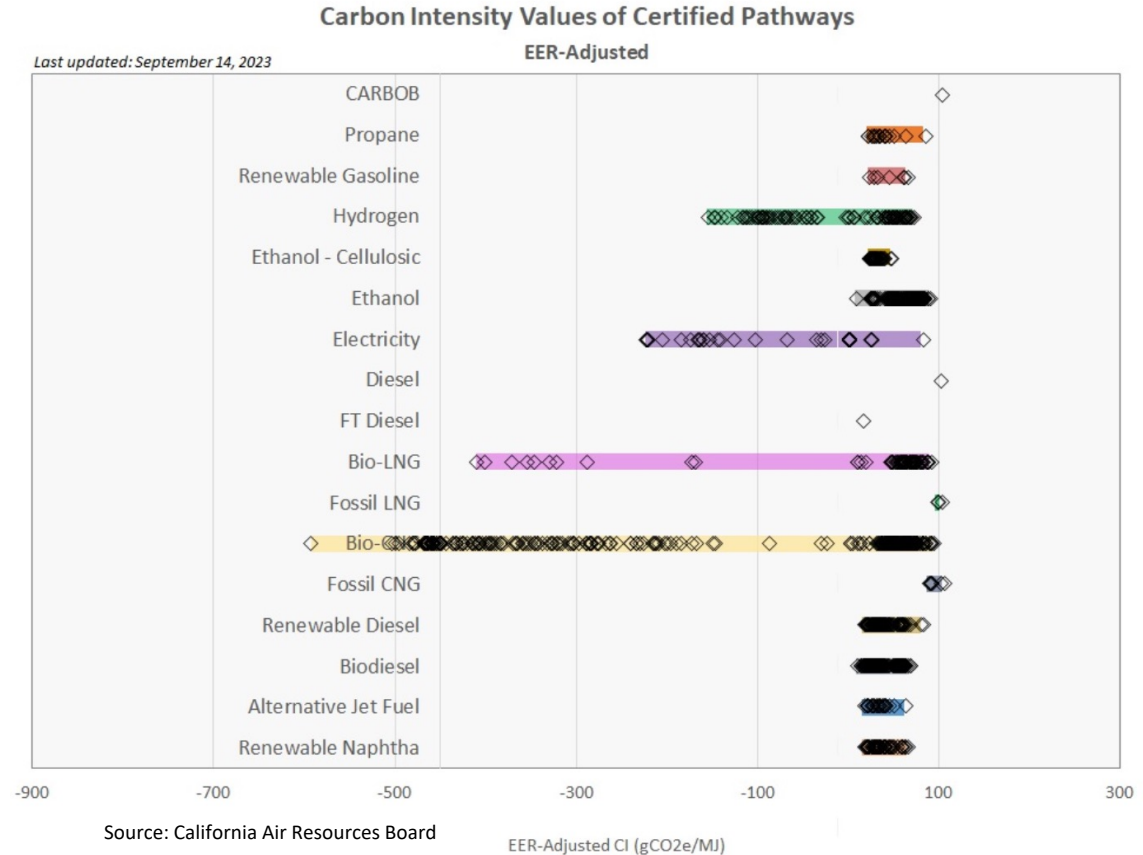


- Mandatory, voluntary, and other enabling policies in 44 states and provinces
- 116 tBtu/yr production capacity
- 178 tBtu/yr in progress
- Approaching 1%

Carbon Intensity



- Weighted average CI score across food waste, wastewater, ag waste, and landfill is -16.6 gCO₂e/MJ
- Lifecycle CI includes point of use, processing, transport, methane avoidance

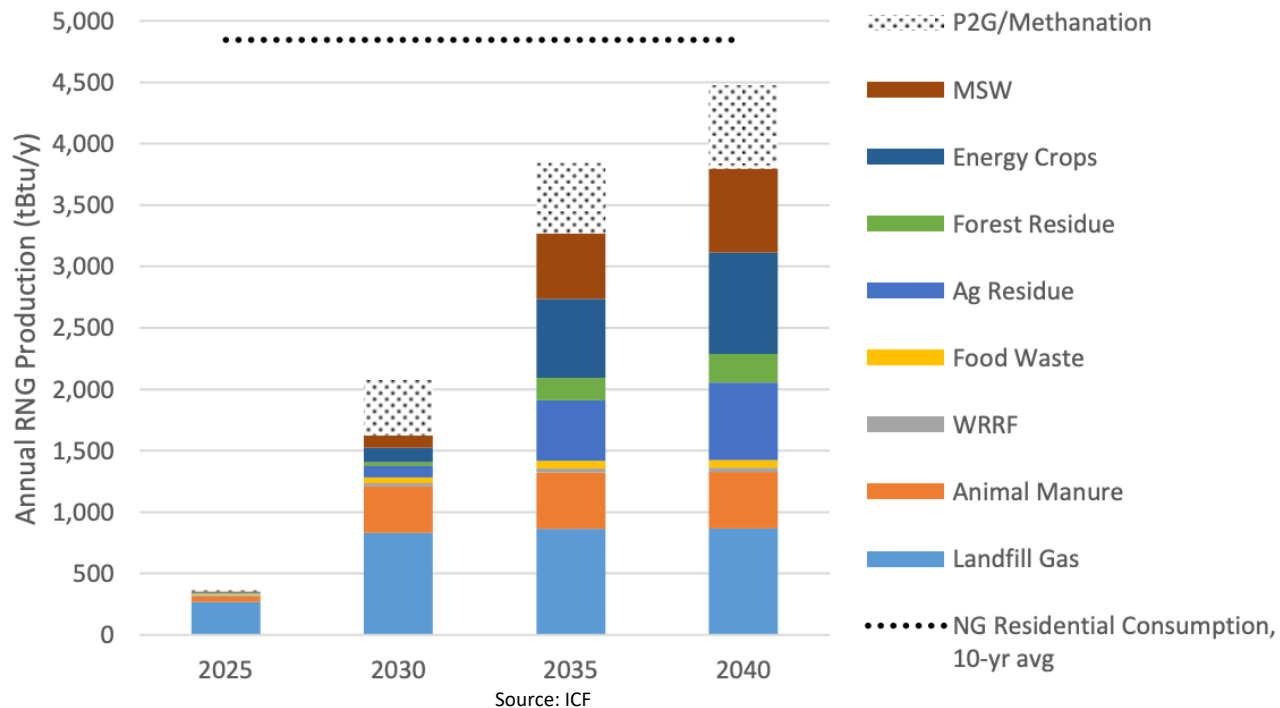


Projected Volumes for 2030, 2040



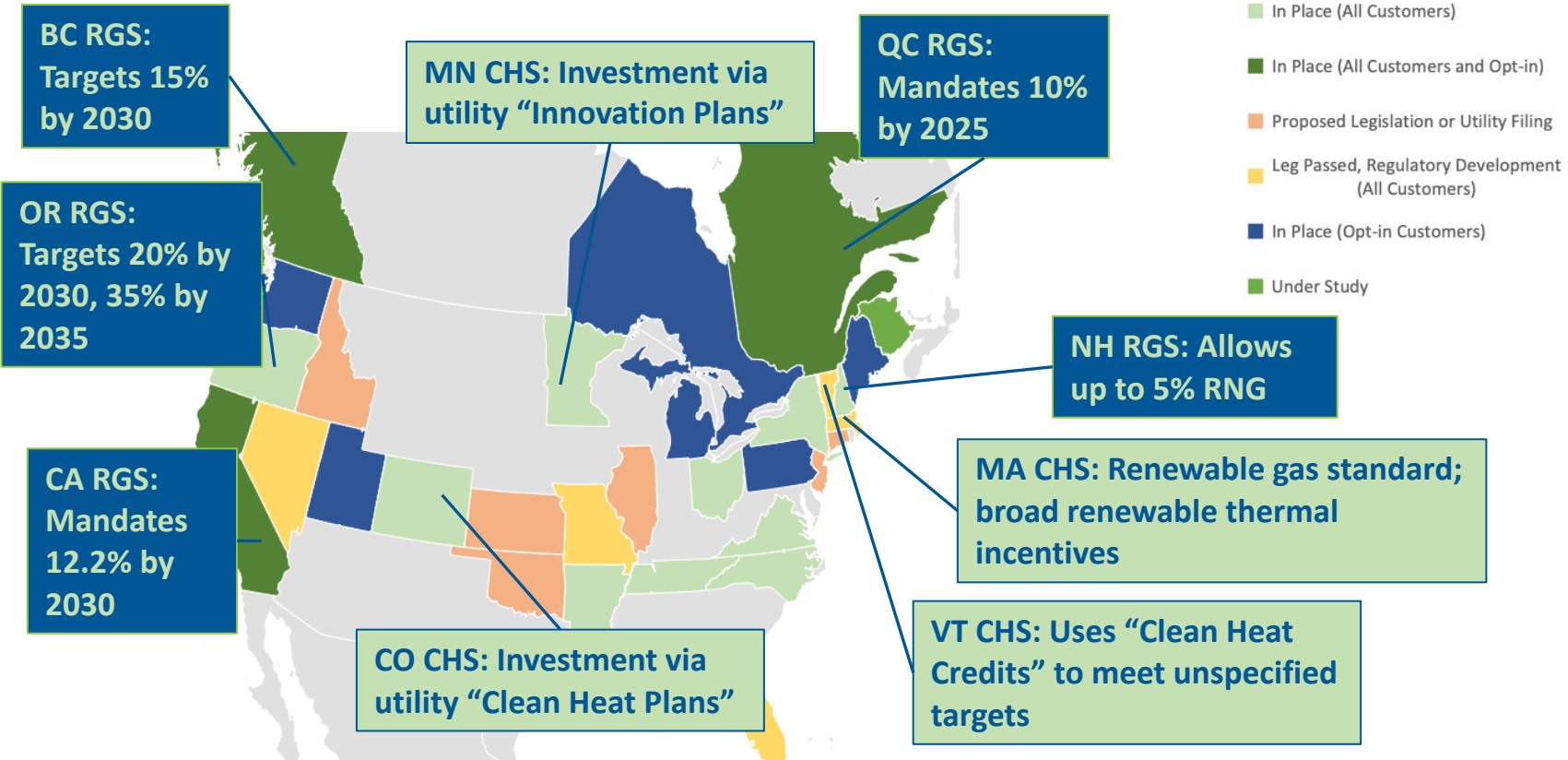
- 9-26% of combined 2021 residential, commercial, and industrial demand from anaerobic digestion feedstocks alone
- Most in 2030 timeframe
- Opportunities for non-AD feedstocks to achieve additional RNG or hydrogen production, carbon sequestration

Figure 6. Estimated Annual RNG Production, High Resource Potential Scenario, tBtu/y





Renewable Gas and Clean Heat Standards

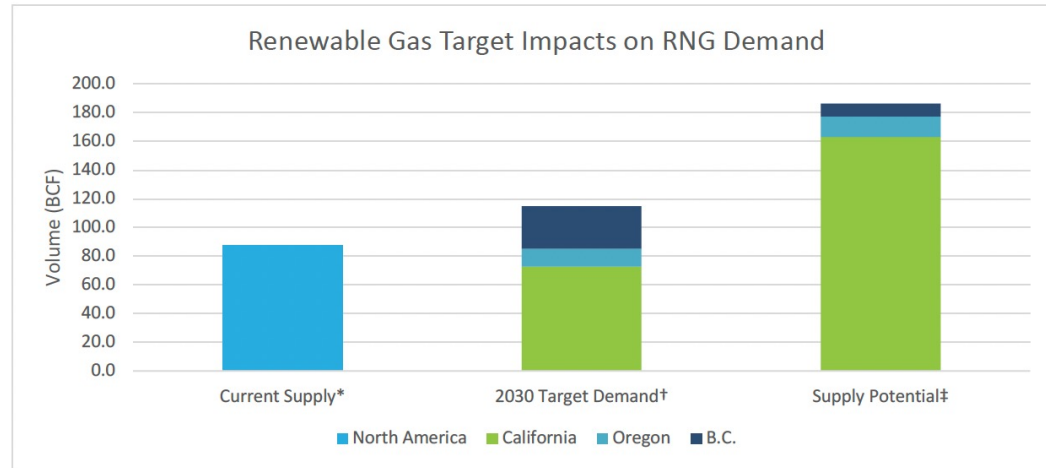




California's Renewable Gas Standard

CPUC's set the following mandatory RNG procurement targets for California's gas utilities:

- A short-term target of 17.6 BCF/year by 2025, sourced primarily from anaerobic digesters which utilize organic waste diverted from landfills
- A mid-term target of 72.8 BCF/year by 2030 and beyond—equal to approximately 12.2% of total annual statewide gas IOU core customer consumption in 2020



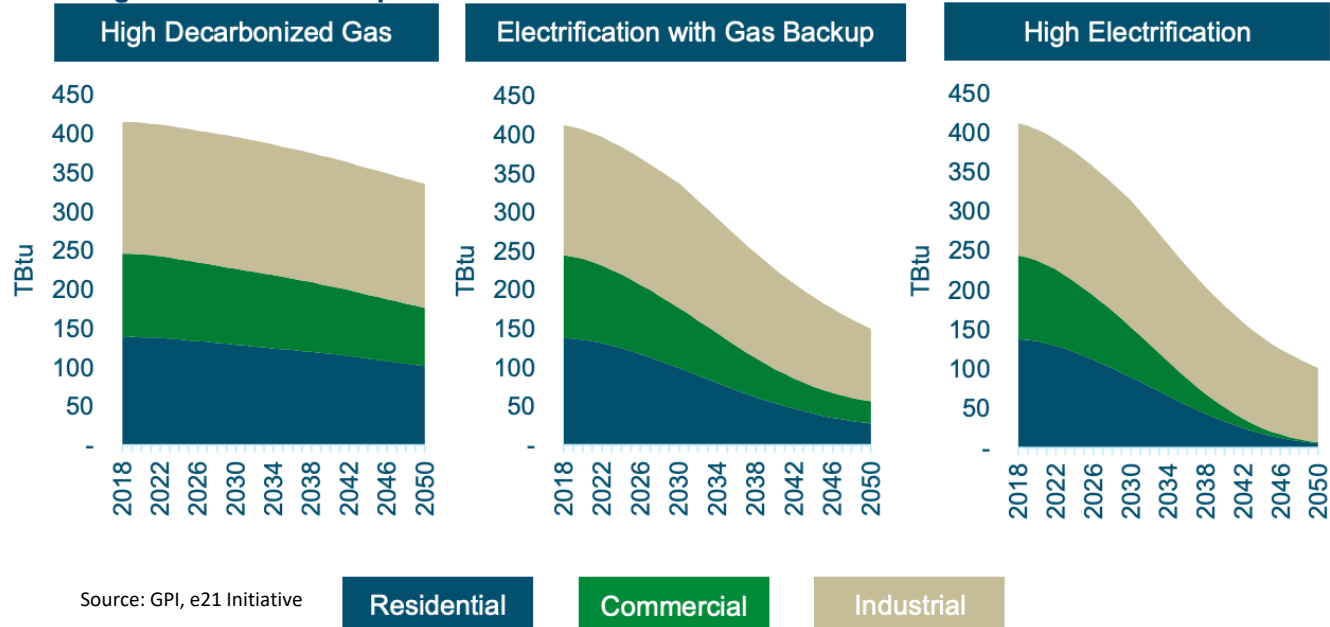
***California's RGS is designed to achieve broader environmental goals in the state's waste management, energy, forestry, and transportation sectors**

Minnesota's Natural Gas Innovation Act (Clean Heat Standard)



- Allows gas utilities to invest in “innovative resources”
- Includes RNG, hydrogen, electrification, geothermal, efficiency, etc.
- In pursuit of Minnesota’s decarbonization goals; but no set targets under program
- Minnesota-specific pathways show significant gas demand in 2050 regardless of pathway

Figure 6. Gas consumption in each scenario





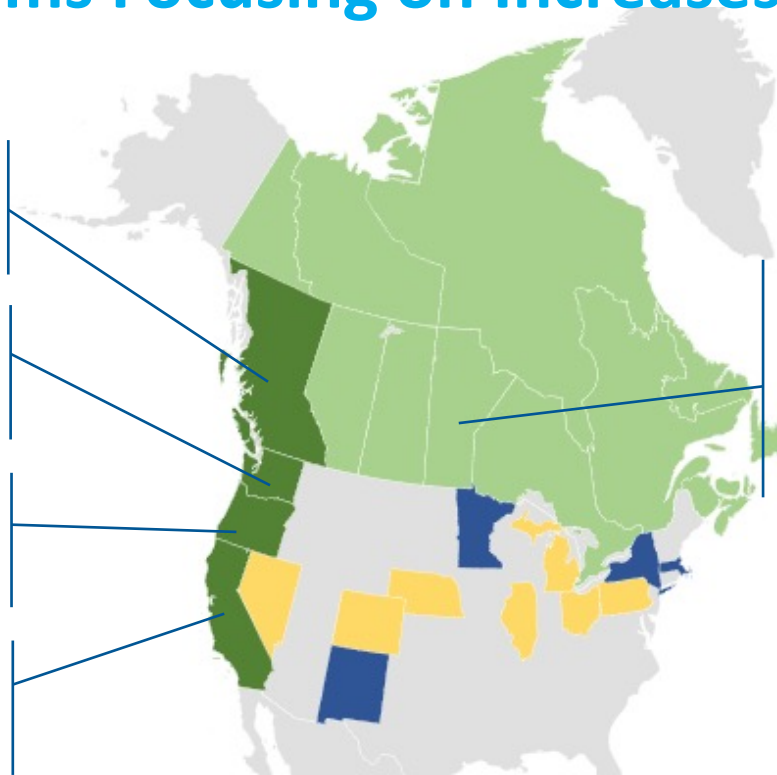
Low Carbon/Clean Fuel Standards Continue to Expand, Existing Programs Focusing on Increases in Ambition

BC: Committed 30% by 2030 (from 2010)

WA: Committed to 20% by 2034 (from 2017)

OR: Examining 20% by 2030, 37% by 2035 (from 2015)

CA: Examining at least 25% by 2030, 54% by 2035 (from 2010)



CAN: Examining 15% by 2030 (from 2016)

- Legislation Introduced
- Regulatory Development
- In Place
- Under Study



Renewable Fuel Standard

- Supports development and commercial-scale deployment of cellulosic biofuels
- Authorized by the Energy Independence and Security Act (EISA) of 2007
- RNG and biogas qualify as cellulosic biofuels
- Grew RNG transportation fuel from 142M gal (2015) to 665M gal (2022)
- e-RINs would pair biogas/RNG with EV charging



Inflation Reduction Act

Contains beneficial tax policies advocated for by RNG Coalition:

- Section 48 ITC to include biogas property, cleaning and conditioning equipment
- Extension of alternative fuel tax credit
 - Applicable to all transportation-quality fuels
- 45V hydrogen tax credit to allow for the use of RNG and other biologically-derived feedstocks
- 45Q carbon oxide sequestration credit
 - Important for carbon negative RNG and hydrogen pathways



Renewable Energy Tracking and Certification Underpins Procurement

M-RETS

- Primary RNG verification system
- Includes CI, feedstock, vintage, location, etc.
- Voluntary buyers
- Compliance markets including OR, WA CFS, etc.

Green-e (Center for Resources Solutions)

- Sustainability certification
- Analogous to Green-e renewable power
- Pairs with M-RETS (optional)



Green-e

Evolving Role of Renewable Gas



Near-Term: Reduce Methane Emissions

- Build biogas & RNG facilities immediately to reduce methane from organic waste streams
- Adopt Clean Fuel Standards, Renewable Gas Standards and/or Clean Heat Standards to incentivize project development and begin to decarbonize the gas system

Mid-Term: Begin to Prioritize RNG Use in Hard-to-Decarbonize Sectors

- RNG facilities that are pipeline injected offer a flexible resource which can be sent to sectors that most need it over time
- Proximity to RNG supply becomes a key consideration as RNG comprises larger share of gas supply

Long-Term: Include H2 with CCUS

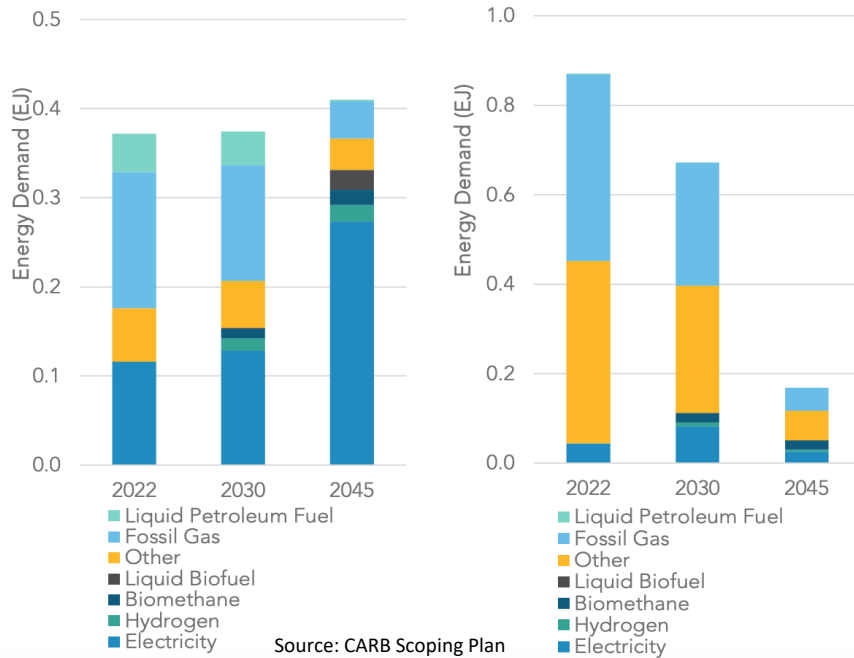
- When hydrogen transport infrastructure develops, consider transitioning bio feedstocks to the hydrogen molecule as the energy carrier (especially for non-AD feedstocks)
- Couple H2 production with carbon capture, utilization and storage to achieve carbon-negative outcomes

Leading Jurisdictions Predict Near- and Long-Term Roles for RNG and Hydrogen



Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario³⁸³

Example illustrates projected energy use in California industry:



- Focus on “reducing fossil fuels wherever they are currently used” including by scaling up renewable hydrogen and RNG
- Targets increased RNG and hydrogen blending in existing gas system
- Use of RNG to create renewable hydrogen
- Utilizes RNG in industry, transportation, and buildings through 2045 (end of report timeframe) to achieve carbon neutrality

Denmark's Green Gas Strategy Outlines Comprehensive Role for Renewable Gas



- Danish gas system current at 39.3% biomethane
- Expects to achieve 100% biomethane around 2035
- Plans to shut down fossil gas production in North Sea, ramp up biomethane production headed to 2050
- Denmark is currently around 5-6% landfill (note this also includes incineration for non-organic)

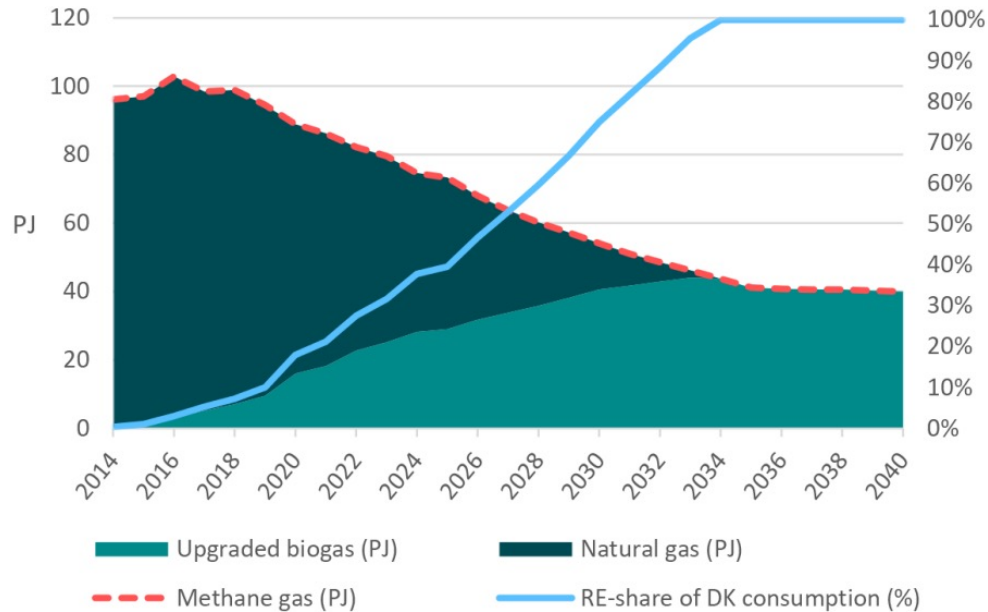


Figure 3: Consumption of methane gas by energy type and share of renewable energy in gas consumption. Source: The Danish Energy Agency's 2021 Analysis Assumptions for Energinet (AF21).

Denmark's Green Gas Strategy Outlines Comprehensive Role for Renewable Gas



- Long-term end-uses for the gas system (all renewable gas) include:
- Danish strategy discusses large potential for power-to-x, especially to create other bio-based fuels (in addition to pictured end-uses)

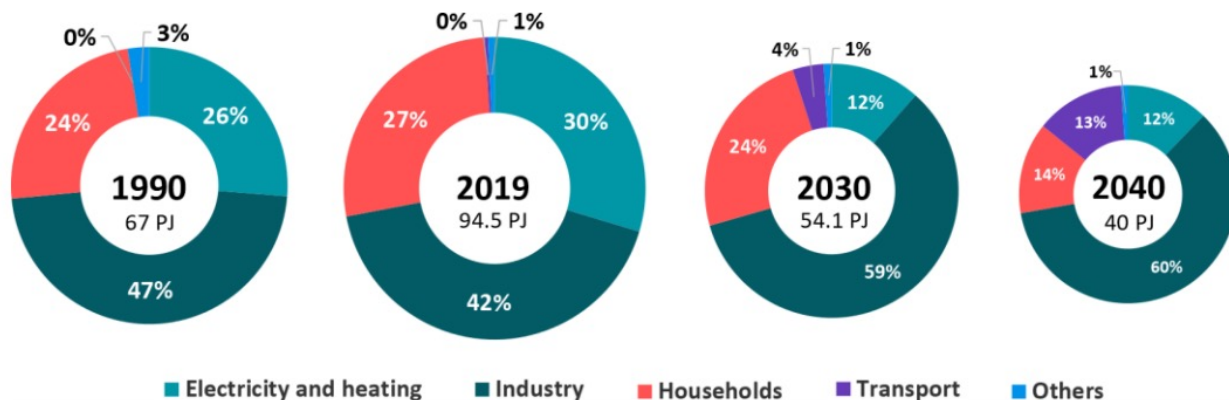


Figure 4: Distribution of Denmark's consumption of system gas by sector in 1990, 2019, 2030 and 2040. The distributions in 2030 and 2040 are based on AF21. The size of the circles represents the relative size of total system gas consumption, which was 67 PJ in 1990 and 94.5 PJ in 2019. According to AF21, the total system gas consumption is expected to decline to 54.1 PJ in 2030 and 40 PJ in 2040.

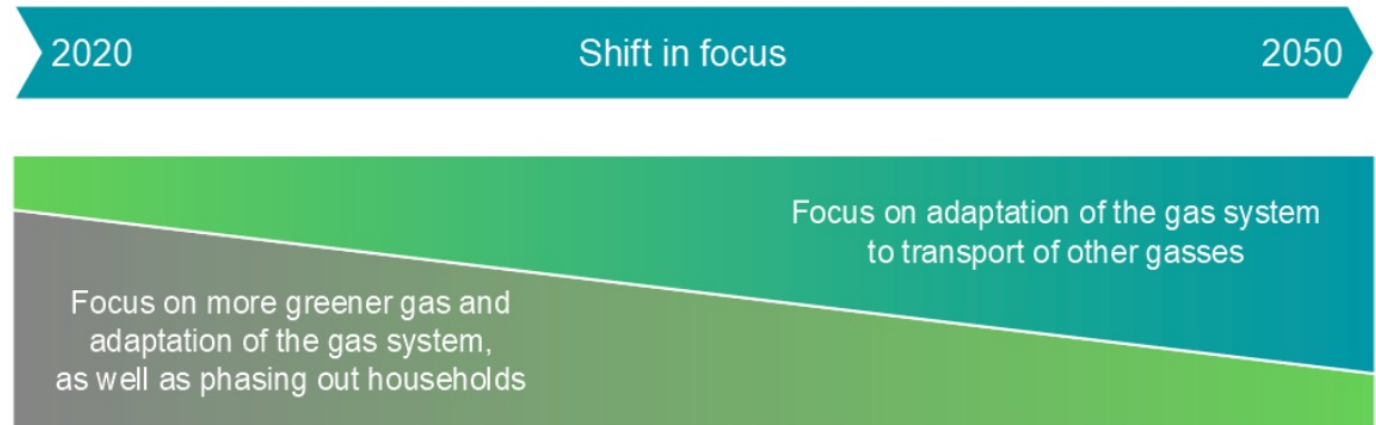
Source: AF21.

Source: Danish Green Gas Strategy

Denmark's Green Gas Strategy Outlines Comprehensive Role for Renewable Gas



- Switch from NG system to multi-gas system over time
- Recognizes role of biomethane, hydrogen, raw biogas, pyrolysis gas, e-methane (power-to-x), and CO₂ transport
- Includes dedicated pipelines for renewable methane, hydrogen, raw biogas, and CO₂

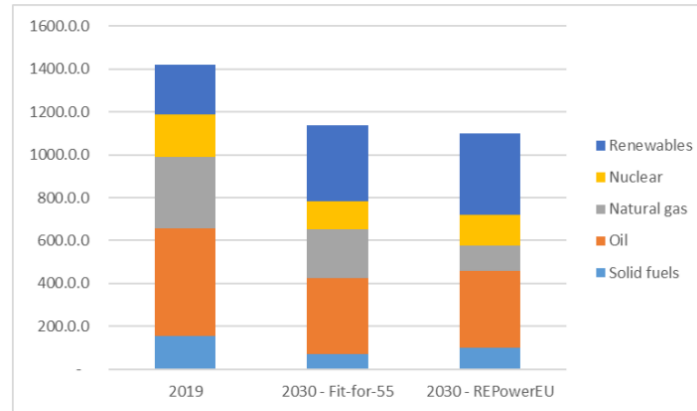


Source: Danish Green Gas Strategy

EU Targets Rapid Growth of Biomethane

- European Commission targeting 35 bcm (10x increase) of biomethane by 2030. Will create larger post-2030 targets
- Equal to 20% of lost Russian gas demand
- Ability to produce ~167 bcm, covering ~61% of total EU gas demand in 2050

Figure 1: Gross inland consumption by fuel in 2019 and in 2030 in the Fit-for-55 and REPowerEU scenarios (Mtoe)

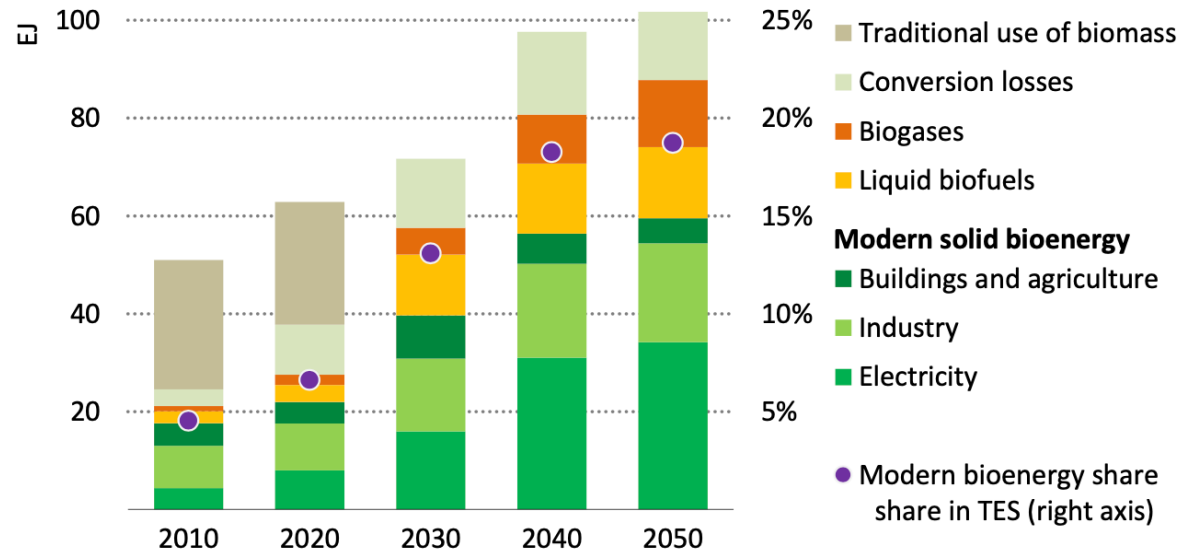


Source: European Commission Biomethane Action Plan

IEA Projects Need for 27X Increase



Figure 2.20 ▶ Total bioenergy supply in the NZE



Source: IEA Net Zero by 2050 Report

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IEA projects that RNG must increase 27X from 2021 levels in its Net Zero by 2050 report



Broad Considerations

- Circular Economy – Recycling resources to create a circular economy
- Sustainability – How can RNG production facilities be used to facilitate broader change?
- Carbon Neutrality/Negativity – Eye toward full carbon neutrality across production and use through 100% clean energy inputs, use of carbon capture and storage
 - See Argonne National Lab's GREET Model
- GHG Accounting Standards – Must align with existing programs and purchasing practices for renewable energy



Speaker Info

Sam Lehr

Manager of Sustainability and Markets Policy

RNG Coalition

sam.lehr@rngcoalition.com

(302) 757-0866

RNGCoalition.com