

A Natural Gas Distribution Perspective on RNG

Panel 2: RNG Policy and Market Forces

September 26, 2017

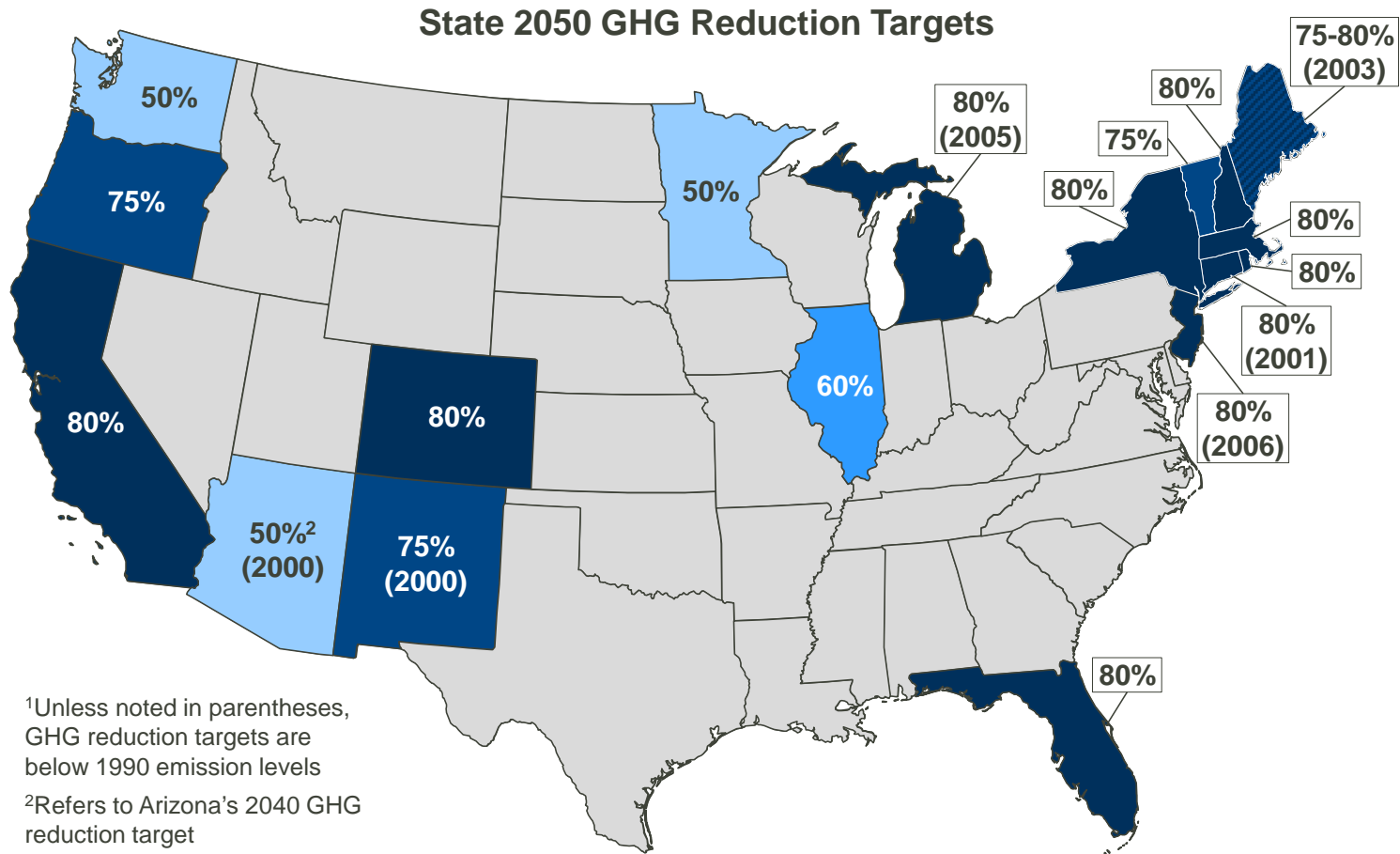
Brian Jones
Senior Vice President
M.J. Bradley & Associates
bjones@mjbradley.com

Pye Russell
Policy Analyst
M.J. Bradley & associates
prussell@mjbradley.com

MJB & A

Economy-Wide State GHG Reduction Goals

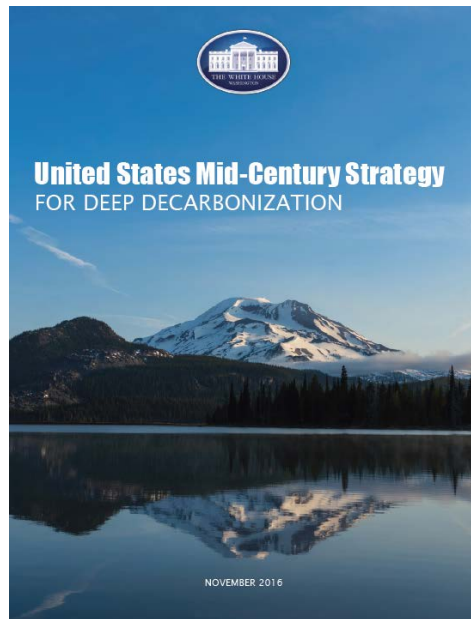
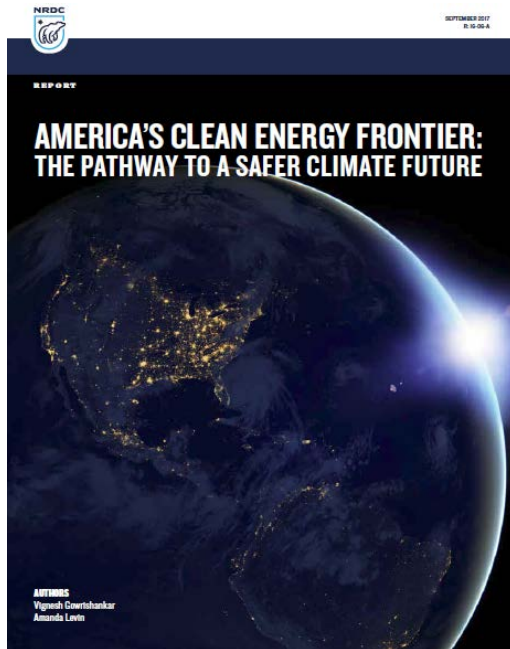
Achieving deep decarbonization goals will require reductions from end use combustion associated with delivered fuels and natural gas supplied by utilities.



Decarbonization Analyses

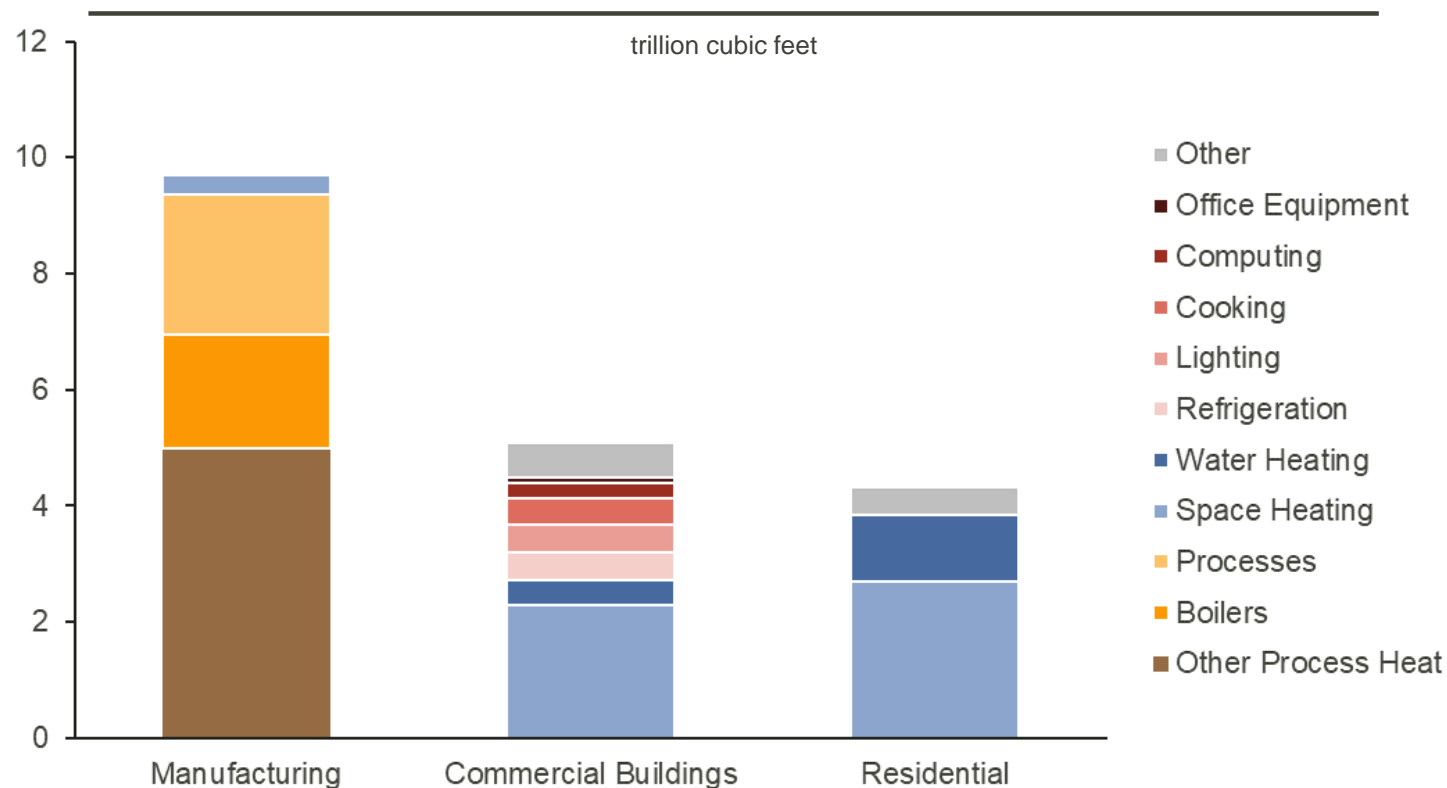
Several state and national studies identify the key strategies for economy-wide decarbonization:

- **Energy Efficiency** - Energy intensity of GDP must decline by 70% to 2050 (Nationally)
- **Decarbonized electricity** - Near complete decarbonization of electricity
- **Fuel switching** – Electrification where possible
- **Decarbonize fuels** – Liquid and gas



Share of Natural Gas End Use by Sector

2016 Natural Gas Consumption by Sector & End Use



Source: U.S. EIA, Annual Energy Review (May 2017), U.S. Natural Gas Consumption by End Use, MJB&A analysis to apportion shares by end use based on available data (2010 RECs for Residential, 2010 MECS for Industrial, and 2012 CBECs for Commercial Buildings)

LDC Challenges and Opportunities

RNG allows LDCs to use existing natural gas distribution system to deliver a renewable fuel and decarbonize the fuel supplied to customers

Challenges	Potential Solutions
<ul style="list-style-type: none">• Upfront capital costs: gas processing, interconnection, pipeline laterals• Utilities subject to least-cost requirements• Lack of gas quality standards creates uncertainty for both developers and utilities• Availability of RNG supply in a given state or region	<ul style="list-style-type: none">• Voluntary RNG customer offerings<ul style="list-style-type: none">• FortisBC, DTE Energy, Vermont Gas• Direct contracting to large end users<ul style="list-style-type: none">• Corporations and institutions with sustainability goals• Renewable Thermal Collaborative• Renewable Gas Standards – following Renewable Portfolio Standards• State policy action<ul style="list-style-type: none">• Interconnection/gas quality standards• Funding mechanisms• Regulator consideration of climate/economic benefit of RNG investment



M.J. Bradley & Associates, LLC

Concord, MA

Headquarters

47 Junction Square Drive
Concord, MA 02145
USA

T: +1 978 369 5533
F: +1 978 369 7712

Washington, DC

1225 Eye Street, NW, Suite 200
Washington, DC 20005
USA

T: +1 202 525 5770

For more information, visit www.mjbradley.com

About Us

M.J. Bradley & Associates (“MJB&A”) is an internationally recognized consulting firm with an 21-year track record advising industry, NGOs, and government agencies on environmental and energy policy, technology, and implementation.

Our staff has professional experience from public, private sector, and non-governmental organizations, and advanced degrees in law, engineering, finance, policy, and environmental science.

Key areas of focus and expertise:

- Power Sector
- Oil and Gas Industry
- Transportation and Electric Vehicle Technology and Policy
- Engineering and Technical Services

We apply our skills to help clients with issues including:

- Market implications of emerging laws and regulations
- Market entry strategies for emerging technologies
- Investment strategies for environmental markets
- Investment due diligence
- Stakeholder coalitions on long-term energy sector strategy
- Tracking state, regional, and federal energy and environmental initiatives

Representative Clients

Our clients are multi-national in scope and include energy and clean technology firms, environmental groups, transportation companies, and government agencies.

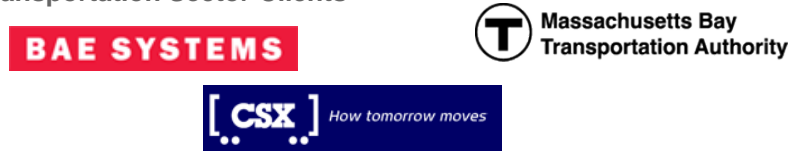
Energy Sector Clients



Municipal and Government Clients



Transportation Sector Clients



Think Tanks, Policy Institutes & Advocacy Group Clients

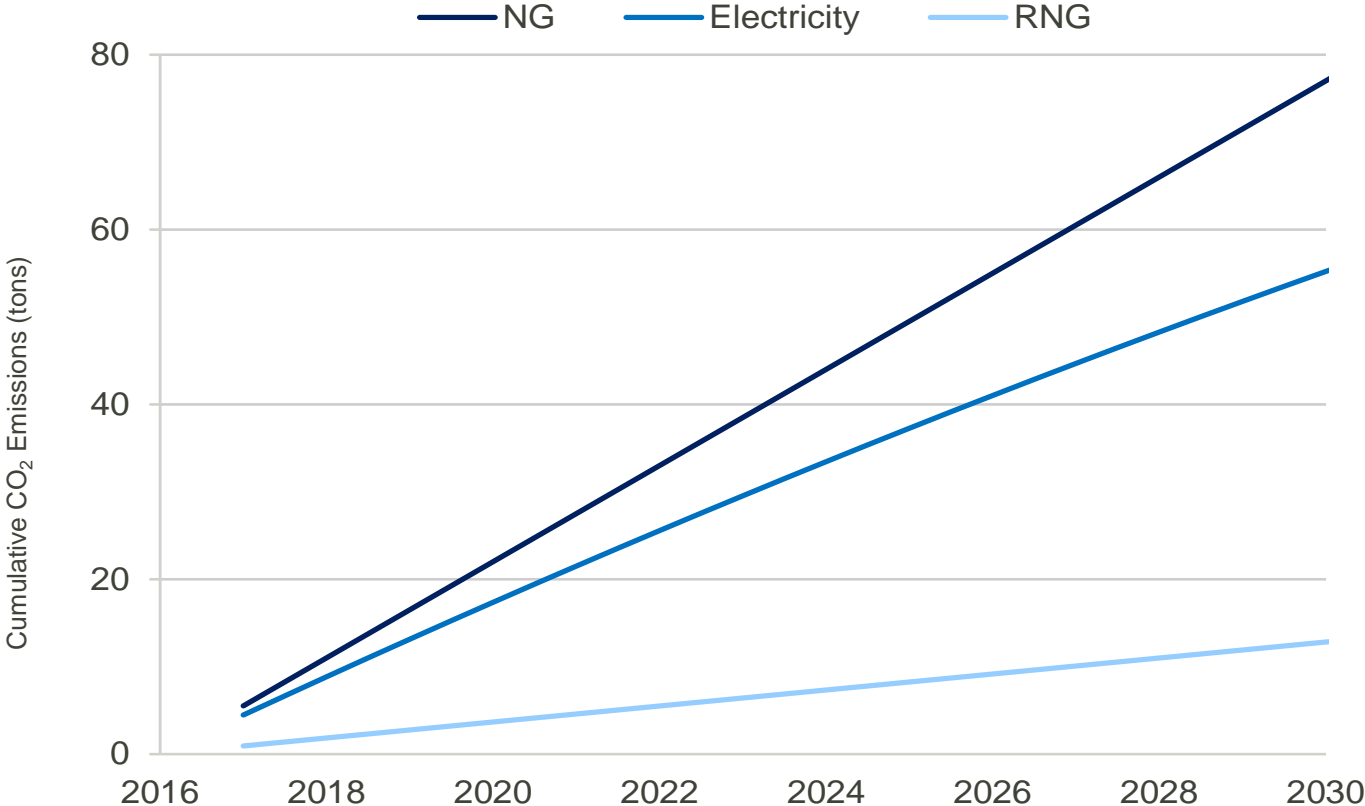


Foundations



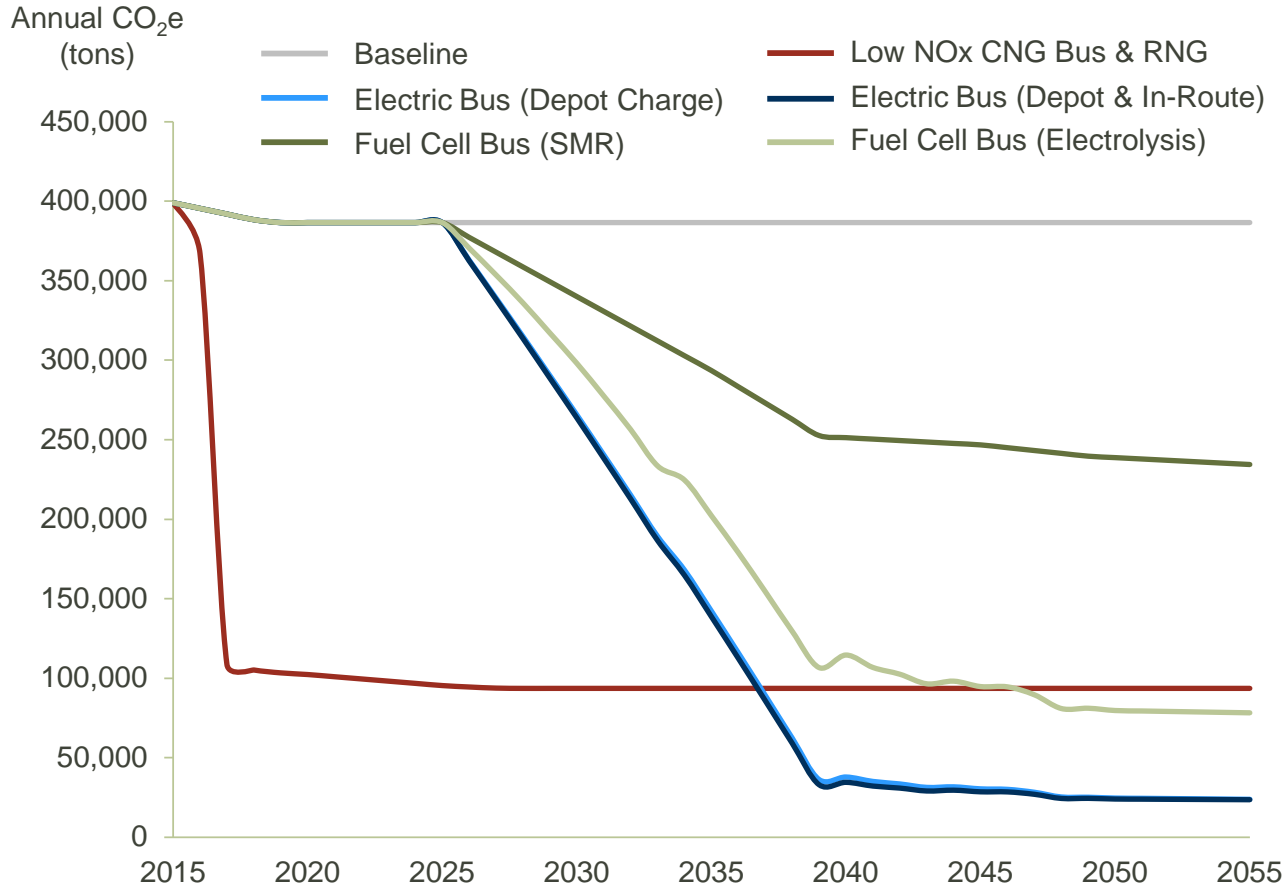
Cumulative Household GHG Emissions with RNG

A home using RNG would generate roughly one quarter the CO2 emissions of a home using electricity



Comparison of Bus Fleet GHG Emissions

Projected Annual Fleet GHG Emissions Using Different Fuels



Source: Ramboll Environ U.S. Corporation, MJB&A

Note: The analysis assumed that GHG emissions from electricity generation in California would be 262 g/kWh in 2015, falling to 109 g/kWh in 2050. 2015 emissions are actual average values, based on EIA data. Projected future emissions are based on zero-carbon electricity generation in California increasing from 46% today to 78% in 2050, in accordance with state goals. Fleet-wide deployment of electric buses is assumed to be uneconomical until 2025.