



**AMERICAN  
BIOGAS  
COUNCIL**

# Technological Developments, Future Scalability, and Innovations in Biomethane & Bio-LNG in the U.S.

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# About the American Biogas Council



- **ABC IS:** A national trade association founded in 2010 and headquartered in Washington, DC representing the entire U.S. biogas and renewable natural gas (biomethane) industry
- **WHO WE REPRESENT:** 400+ organizations and 6,500 individuals from across the world
- **OUR MISSION:** Maximize the economic and environmental benefits of biogas while advancing sustainable solutions for energy, agriculture, and waste management
- **FOUNDING MEMBERS OF:** American Biofuels Maritime Initiative (AMBI), Bio-LNG Maritime Coalition (BLMC), United Biogas Association (UBA) and coordinates closely with national/regional/global biogas associations from across the world (WBA, UK, Europe, Brazil, Canada)
- **INDUSTRY PARTNERS/MEMBERS OF:** International Energy Agency (IEA), Society for Gas as a Marine Fuel (SGMF) and works closely with the Global Methane Hub, IPCC, UN, COP, GHG-Protocol, SBTi, Molecule Group, Future Fuels for Maritime, API, IPIECA, and more

# ABC Members and Partners

maritime at-a-glance



American Biofuels  
Maritime Initiative

**ExxonMobil**

**anew** climate



# Global Biomethane Picture, 2010-2024

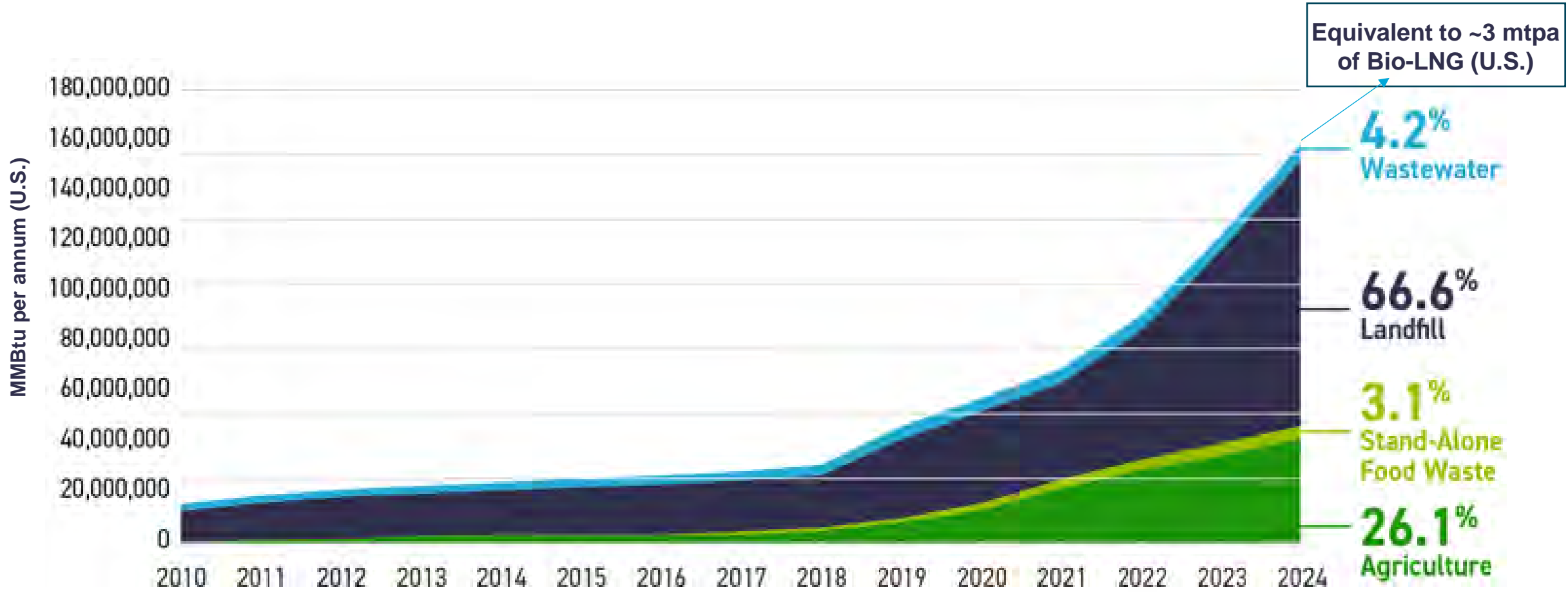


Evolution of global RNG production (2010-2024)

# U.S. Biomethane Picture, 2010-2024



U.S. Production Capacity = ~35% of global supply, 400+ operational projects (2024)<sup>1</sup>

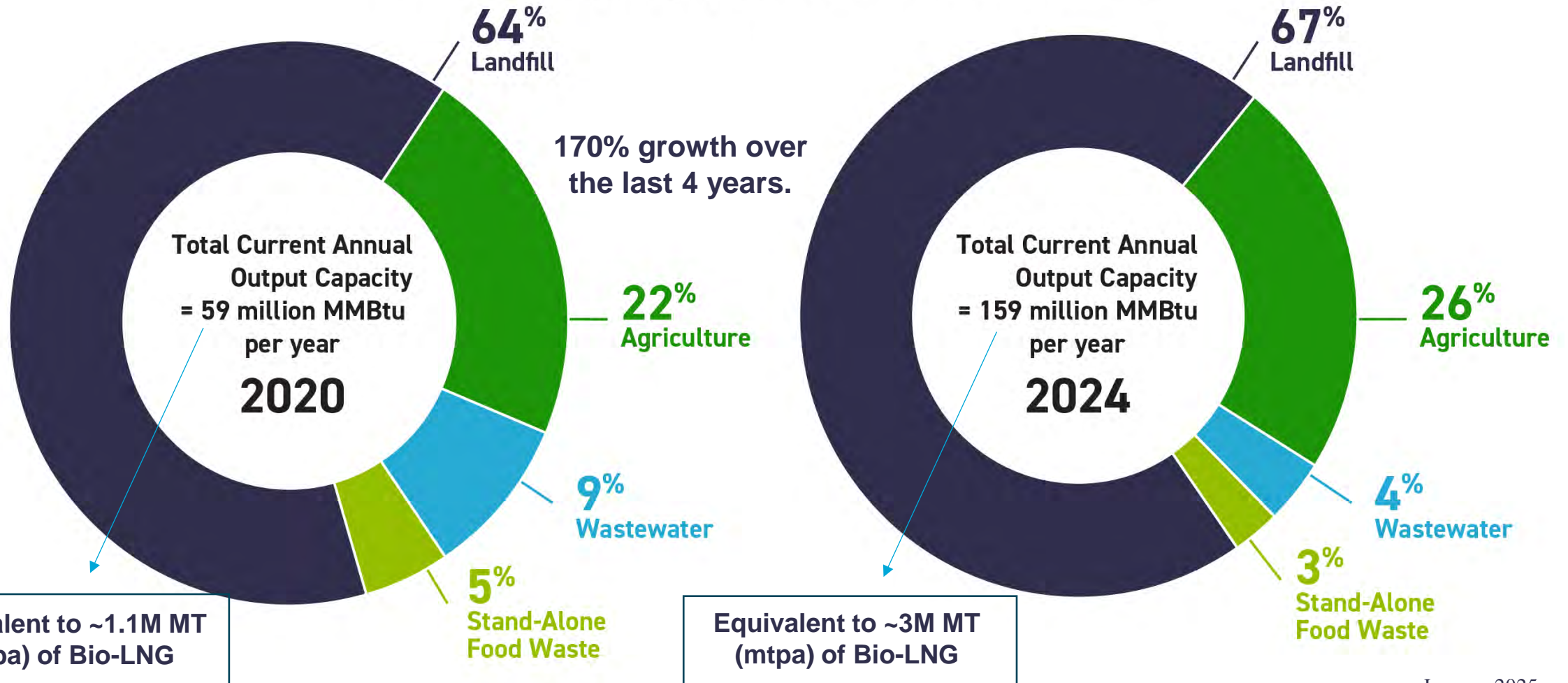


Source: <sup>1</sup>More than 600 biomethane projects operational today in U.S. (2026) - American Biogas Council

# U.S. Biomethane Picture, 2020 & 2024



## Biomethane Output Capacity by Sector, 2020 & 2024 (MMBtu)



# Technological Developments Driving Biomethane Growth



## Efficiency & Optimization

- Improved membrane upgrading → Higher methane recovery (>99%)
- Advanced separation media → Nitrogen recovery efficiency gains
- Improved biological monitoring → Higher biogas yields & capture
- Enhanced feedstock pre-treatment → Increased performance / uptime

## System Design & Operations

- Increased efficiency through smaller modular systems
- Standardized designs and approaches vs. purely custom
- Improved fugitive emissions detection enabling better sealing and reduced methane losses

## Emerging Innovations

- CO<sub>2</sub> recovery enabling sequestration & utilization of carbon dioxide for beneficial use
- Nutrient recovery systems that create organic fertilizers from digestate to displace synthetics
- CNG engine technology advancements that allows for more versatility and power in on-road transportation applications

# Why methane capture is vital for overall GHG reductions



## Methane = Fastest & Most Impactful Near-term Climate Lever

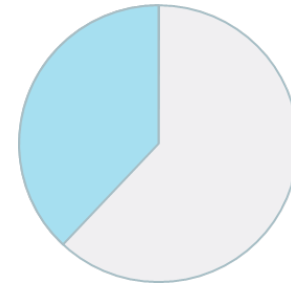


**2018 – 2023**

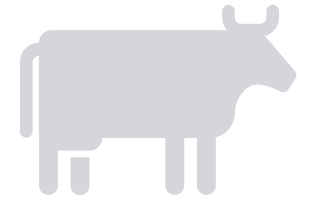
Methane emissions rose **FASTER** than any time in recorded history<sup>1</sup>

**80x**

Methane has a GWP **80x HIGHER** than CO<sub>2</sub> over 20 years<sup>2</sup>



Manure & enteric fermentation together account for **32%** of Global agricultural methane emissions<sup>3</sup>



Manure management contributes approx. **237M MT** CO<sub>2</sub>e per year<sup>4</sup>

### VALUE RECOGNITION

Methane abatement benefits already credited in major frameworks (EU's RED, U.S. RFS & LCFS programs, Canada CFR, etc.)

**Sources:** <sup>1</sup> Global Methane Pledge Ministerial Factsheet 2024. Global Methane Pledge; <sup>2</sup> Raymond, Peter and Steven Hamburg. *Yale Experts Explain Methane Emissions*. Yale Sustainability, 2024; <sup>3</sup> Food and Agriculture Pathway. Global Methane Pledge, 2022; <sup>4</sup> Agricultural Sources and Mitigation Options. Global Methane Initiative

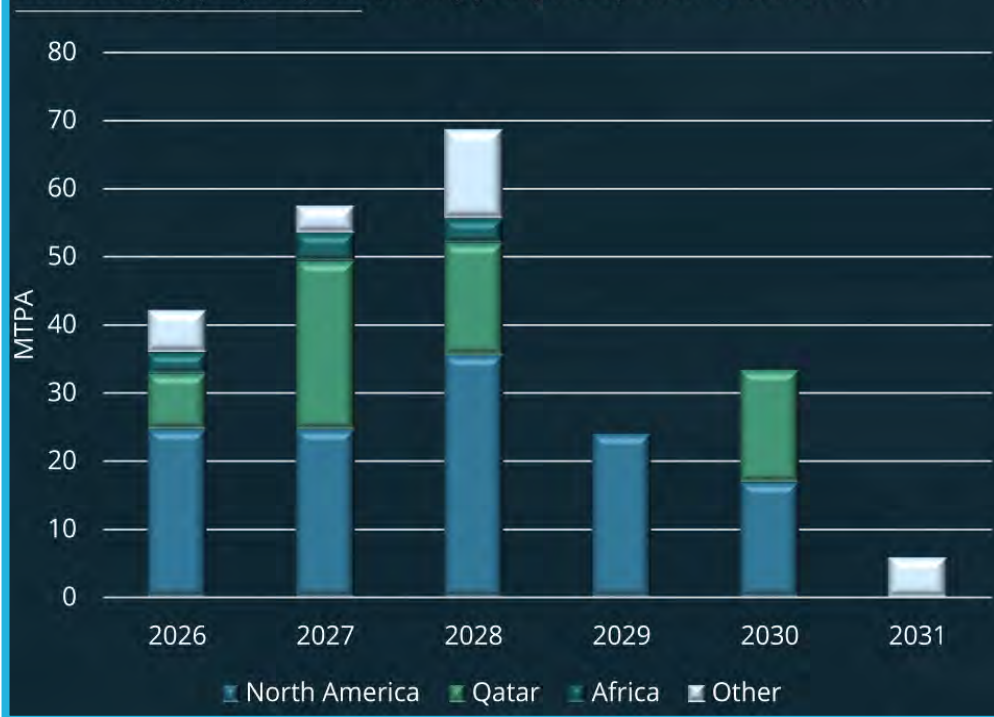
# LNG & Bio-LNG: A critical bridge in the Energy Transition



LNG utilization has grown consistently YOY across ship types reaching 6.7% of reported marine fuels in 2024

(latest data GISIS (MEPC 84/6/1))

New LNG supply capacity additions by year (already under construction)\*



Source: Fearnleys SSLNG Q4 2025 Report



Allows fleet owners to forgo major vessel retrofits, enabling faster and less capital-intensive adoption



Improves the intensity and strengthens the energy security potential of the LNG fuel pathway



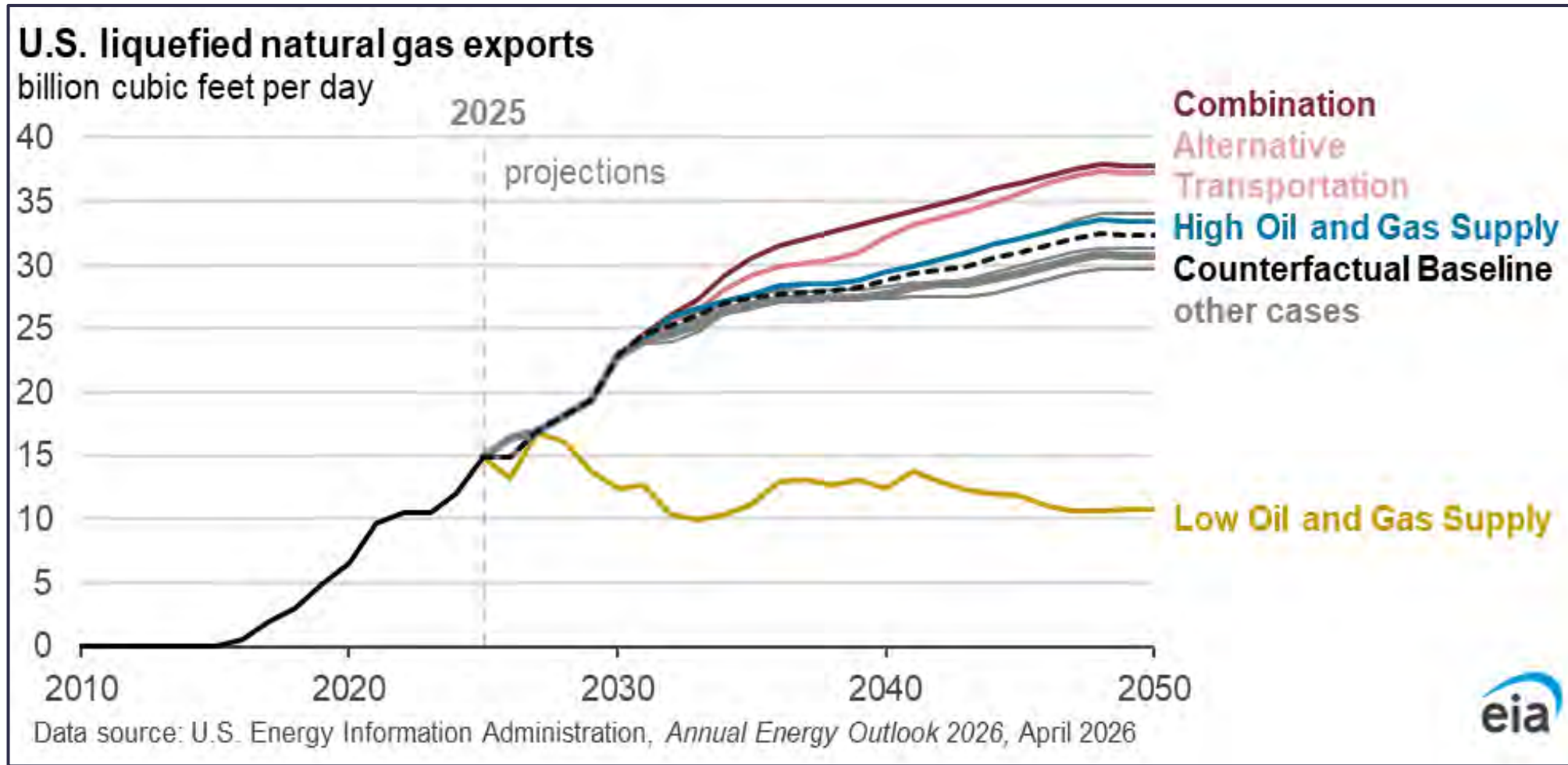
Leverages existing and growing LNG investment



Offers competitive cost trajectories relative to other alternative fuels

>200 mtpa of LNG capacity under construction – reaching commercial operations by 2030

# U.S. LNG Export Outlook



U.S. LNG exports are projected to increase from ~150 to ~300 bcm by 2030 according to U.S. EIA data.

(Equivalent to 200+ mtpa)

By 2050, U.S. LNG exports projected to reach 400 bcm

# Estimated Demand for LNG Bunker Fuel



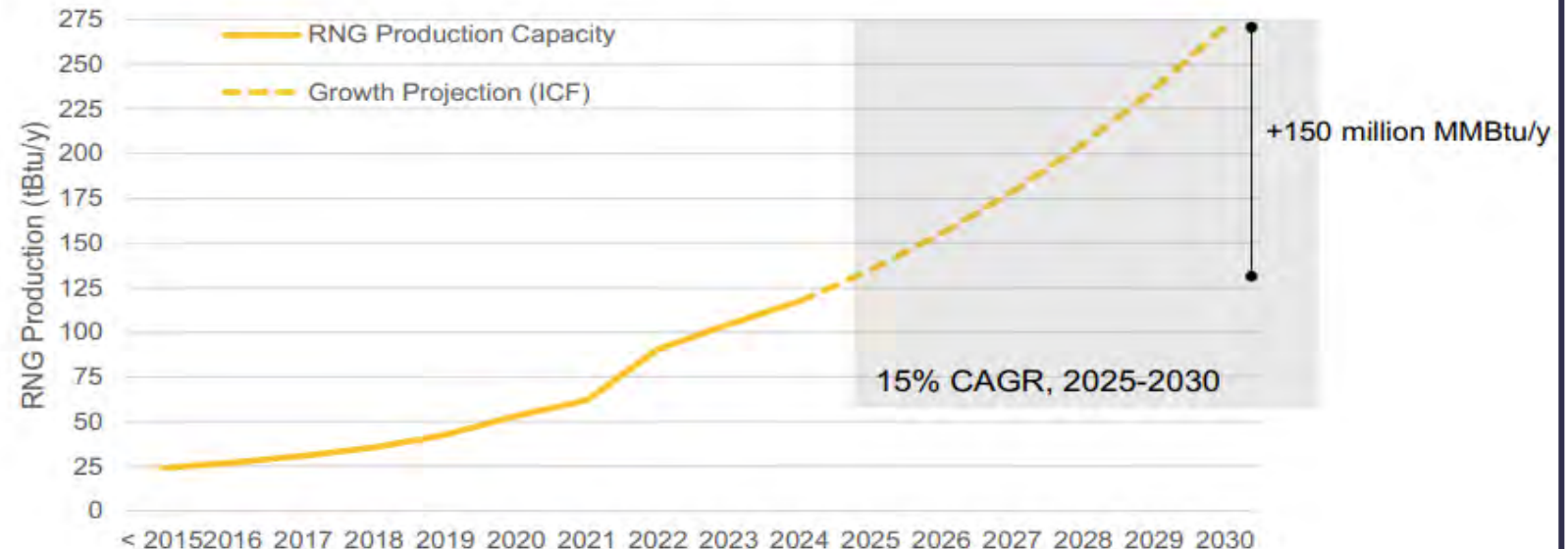
LNG bunker fuel demand is projected to grow from 3.8 mtpa (2025)<sup>1</sup> to 17+ mtpa (2030)<sup>2</sup>

- If Bio-LNG supplies 20% of demand → **3.4 mtpa required of Bio-LNG by 2030** (bunker fuel only)<sup>3</sup>
- Estimated global production will be 14-16 mtpa by 2030 → 21% - 24% of biomethane to maritime
- Estimated U.S. production will be 5-6 mtpa by 2030

## Bio-LNG Forecasted New Capacity (by 2030)

- U.S. production growth at 15% CAGR
- = 3 mtpa of Bio-LNG capacity increase**

Figure 5. Forecasted RNG Supply, 2025-2030

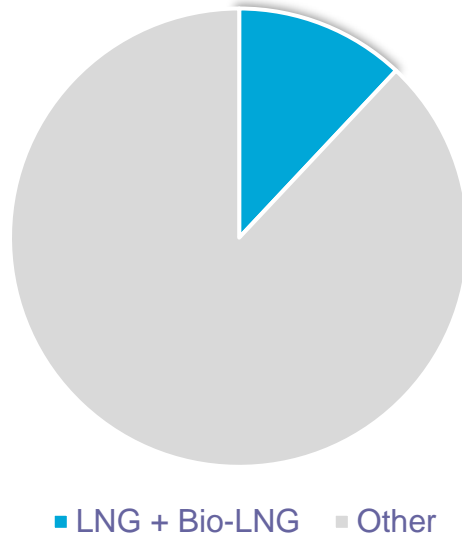


# LNG bunker fuel demand & supply relatively balanced



## Market Potential

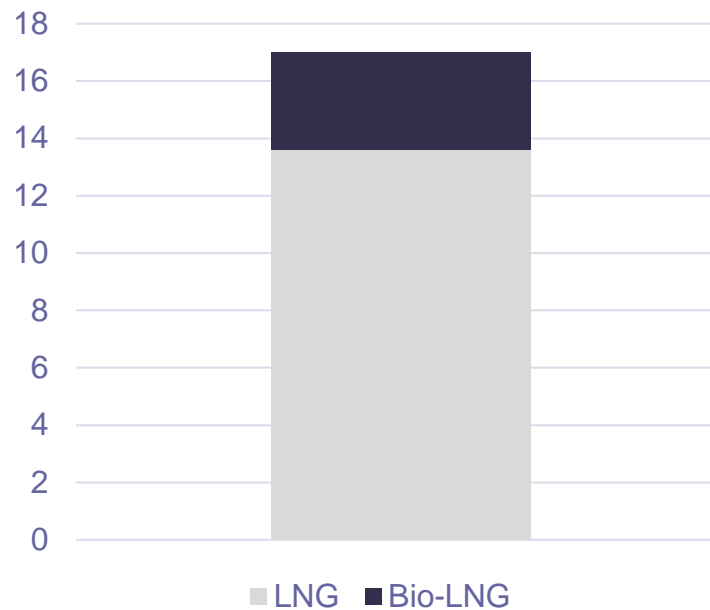
2030 Global Marine Fuel Mix



**LNG/Bio-LNG gaining traction globally  
~10-12% of marine fuel by 2030**

## Bunker Fuel Demand

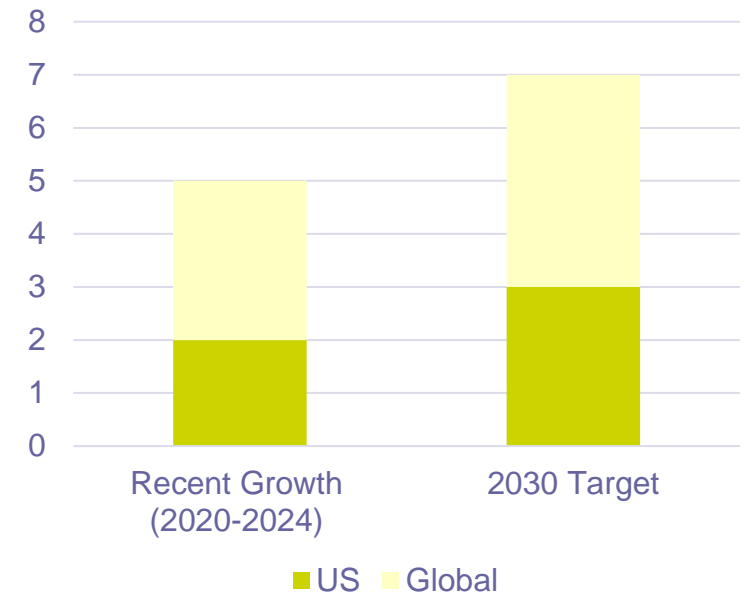
LNG/Bio-LNG Demand (mtpa)



**3.4 – 4.0 mtpa Bio-LNG needed  
by 2030 at 20% Bio-LNG Blend**

## Supply Reality

New Bio-LNG Capacity



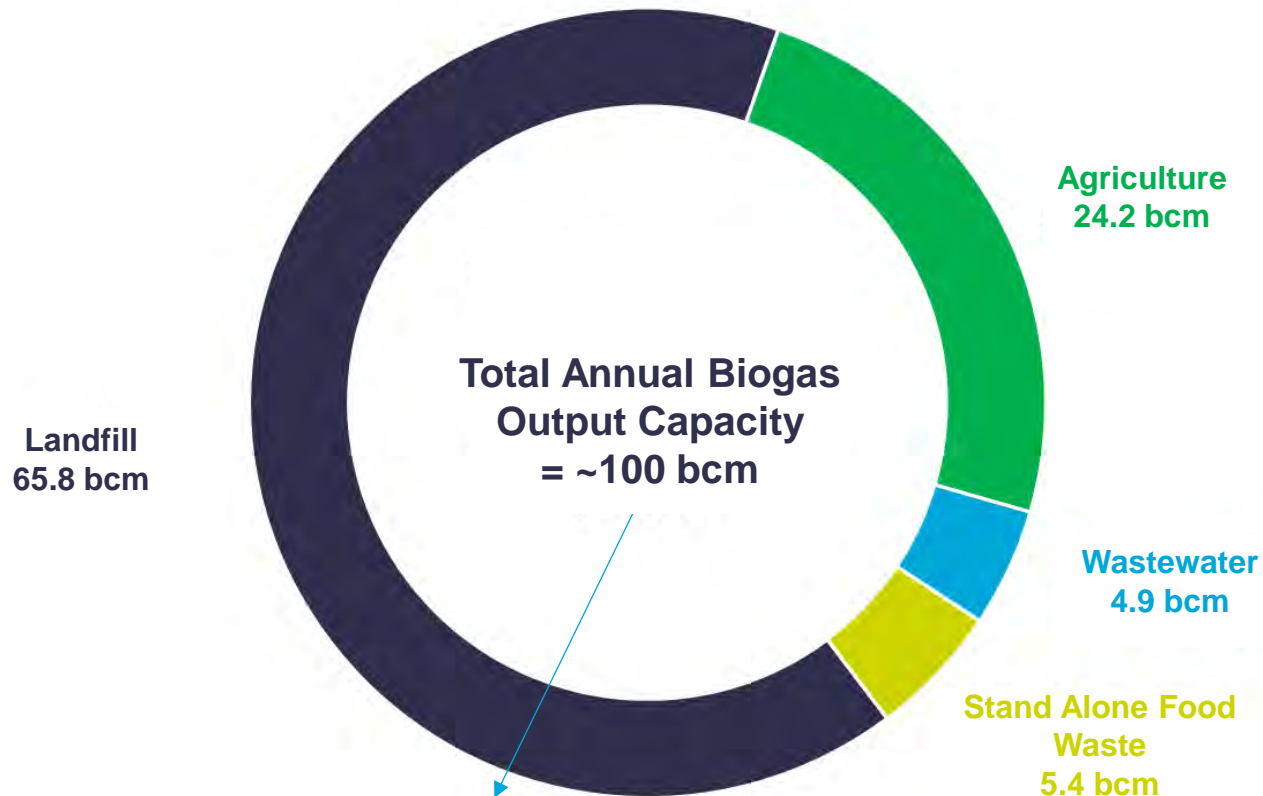
**Recent growth proves  
scalability**

***The right policy signal unlocks immediate, scalable opportunity for the US and Global Supply***

# Remaining Potential of U.S. Biomethane Capture Capacity



Using only the four current primary feedstock categories in U.S.



Remaining Potential = 79%	
Landfill	78%
Agriculture	89%
Wastewater	48%
Food Waste	88%

- Note: Doesn't include**
- Cover crops (sequence crops)
  - Agriculture residuals
  - Energy crops

**Additional 8.4 mtpa of Bio-LNG capacity**

Assuming only 20% of the 100 bcm biogas capacity is upgraded to biomethane, and methane content between 55-60%

# Pricing: Key factors impacting uptake and pricing



## Recognize high-impact pathways to reduce emissions

- Manure-based fuels ≠ standard fuel switching
- Established frameworks already credit avoided methane with verified integrity
- Explicit inclusion of avoided methane crediting

## Create a strong demand signal

- Set ambitious GFI targets
- Account for availability, scalability, & affordability of fuels
- Enable overcompliance + credit trading,

## Enable Practical Implementation

- Flexible blending
- Pragmatic mass-balancing – Any tracking and certification framework should enable and facilitate mass balance-based delivery through pipeline grid.

**IMO framework design choices will determine whether high-impact fuels are fully valued and set up to scale**



# Pricing at a glance (2030 estimates)

**100% LNG Delivered: Est. average range of \$11.00 - \$14.50/MMBtu<sup>1</sup>**

**80/20 Bio-LNG Blend Delivered: Est. average range of \$16.00 - \$26.50/MMBtu<sup>2</sup>**

- Emissions reductions from Bio-LNG Blends can be substantial by recognizing avoided emissions
- Result can be significant emissions reductions for fleets at affordable costs and a very minimal cost to the consumer

**Notes:** <sup>1</sup> Est. range for LNG bunker fuel pricing based on 2025 prices and new global LNG export capacity coming online through 2030;

<sup>2</sup> Est. range for Bio-LNG bunker fuel pricing based on 2025 prices for PoS certificates in EU markets, credit pricing in US road transportation markets, plus other markets

# Conclusions



- Methane is already a mainstream bunker fuel today. Careful consideration of its decarbonization options is warranted and key decisions will greatly advance cost efficiency of the program
- LNG and Bio-LNG are mature, scalable solutions that achieve immediate impact by reducing GHGs compared to conventional fuels into abundant energy while benefiting rural economies
- US Bio-LNG is scaling at 15% per year, ready to meet demand under an approved IMO framework
- Current waste-based feedstocks within U.S. can supply maritime with up to 3 mtpa by 2030, 8+ mtpa by 2040, with potential for additional production based on new pathways
- Methane avoidance crediting, flexibility mechanisms, and mass balance-based delivery through the pipeline grid must be firmly recognized by the IMO to reduce compliance costs. Such crediting and flexibility can be implemented with environmental integrity
- Meaningful GFI targets, embedded into a flexible and pragmatic framework that recognizes a mix of solutions would enable development of cost-efficient global value chains and avoid a burdensome and costly alternative of regional frameworks

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