

# Renewable Natural Gas Potential as a Transportation Fuel

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Joint IEPR-Transportation  
Lead Commissioner Workshop  
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Johannes Escudero, Executive Director  
**Coalition For Renewable Natural Gas, Inc.**

# The Coalition for Renewable Natural Gas

- \* International Non-Profit
- \* Industry Association
- \* Dedicated to Advancement of RNG
- \* Membership Based
- \* Public Policy Focused
- \* Relationship Driven

[www.RNGCoalition.com](http://www.RNGCoalition.com)



# Presentation Overview

- \* **Introduction to RNG:** Definitions, Comparisons & End Uses
- \* **Potential:** Drivers behind Growth & increased use of RNG in California as a Transportation Fuel
- \* **Estimated Volumes of RNG Available for Transportation Fuel by 2020:** Idealistic vs. Realistic
- \* **RNG:** Industry Insights – Challenges Faced & Recommendations for Government Actions



# Definitions: Biogas

- \* **Biogas** – a mixture of hydrocarbons that is a gas at 60 degrees Fahrenheit and 1 atmosphere of pressure that is produced through the conversion of organic matter.
- \* Biogas includes landfill gas, gas from waste digesters, and gas from waste treatment plants.
- \* Waste digesters include digesters processing animal wastes, biogenic waste fats/oils/greases (FOG), separated food and yard wastes, and crop residues.
- \* Waste treatment plants include wastewater treatment facilities and publicly owned treatment works (EPA, RFS2 Proposed)

# Definitions: R-CNG

- \* **Renewable Compressed Natural Gas** – biogas that is processed to the standards of pipeline natural gas (biomethane) as defined in 40 CFR 72.2 and that is compressed to pressures up to 3600 psi. (EPA, RFS2 Proposed)
- \* Only Renewable CNG that qualifies as renewable fuel and is used for transportation fuel can generate RINs.

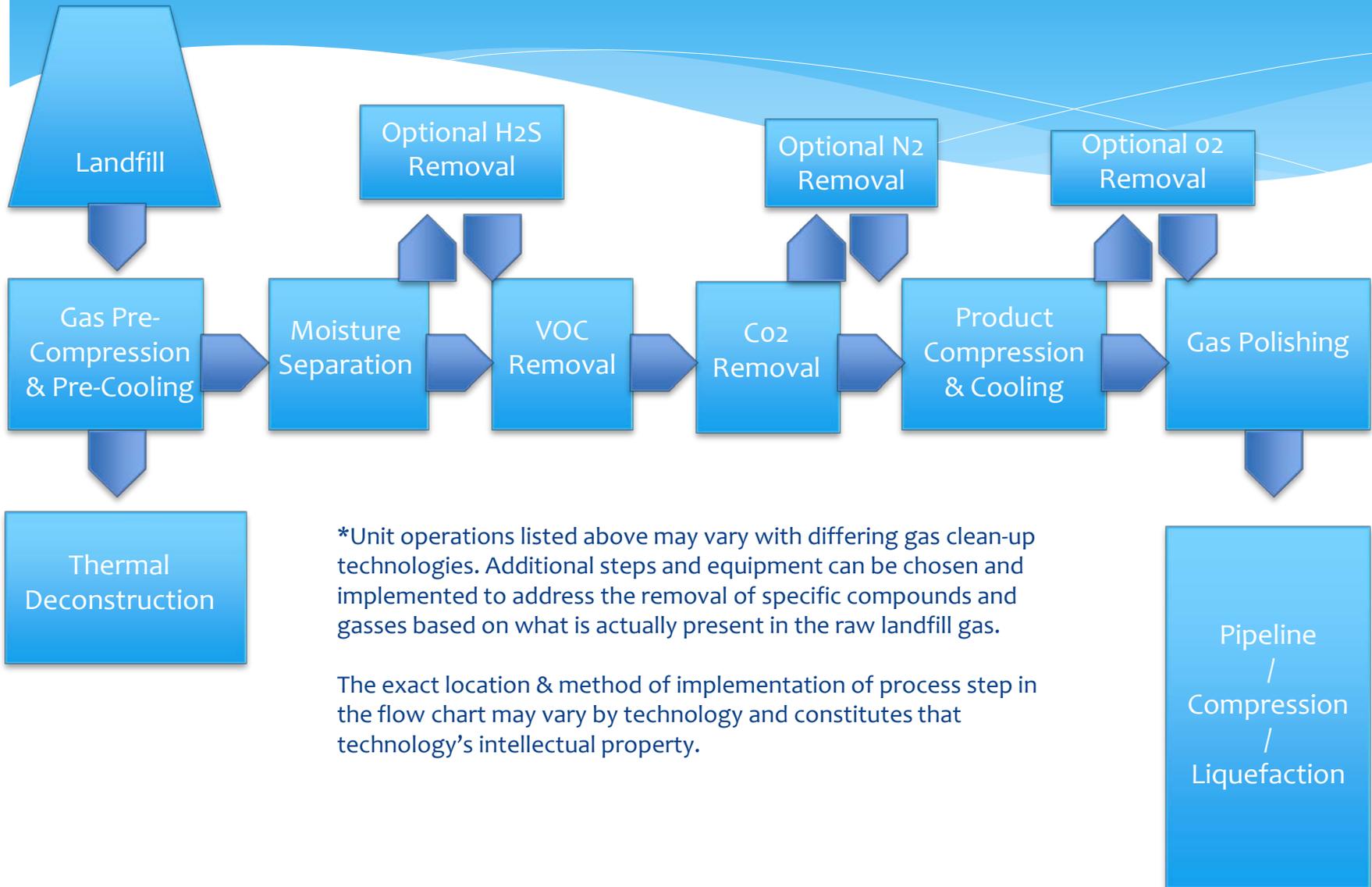


# Definitions: R-LNG

- \* **Renewable Liquefied Natural Gas** - biogas that is processed to the standards of pipeline natural gas as defined in 40 CFR 72.2 and that goes through the process of liquefaction in which the biogas is cooled below its boiling point and weighs less than half the weight of water so it will float if spilled on water. (EPA, RFS2 Proposed)
- \* Only renewable LNG that qualifies as renewable fuel and is used for transportation fuel can generate RINs.



# Landfill Gas Cleanup Process

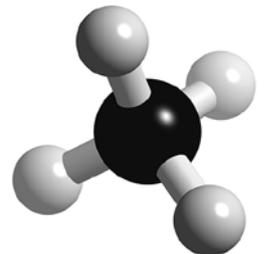


\*Unit operations listed above may vary with differing gas clean-up technologies. Additional steps and equipment can be chosen and implemented to address the removal of specific compounds and gasses based on what is actually present in the raw landfill gas.

The exact location & method of implementation of process step in the flow chart may vary by technology and constitutes that technology's intellectual property.

# Biomethane vs. Natural Gas

- \* Renewable Natural Gas or Biomethane is primarily methane (95%+ CH<sub>4</sub>)
- \* Fossil Fuel Natural Gas is primarily methane (80%+ CH<sub>4</sub>)
- \* Both include Carbon Dioxide (CO<sub>2</sub>), Water (H<sub>2</sub>O), Nitrogen (N), Oxygen (O) and Hydrogen Sulfide (H<sub>2</sub>S)
- \* Major Difference: Source of Decay  
(*T-Rex or last night's Tuna Sandwich?*)



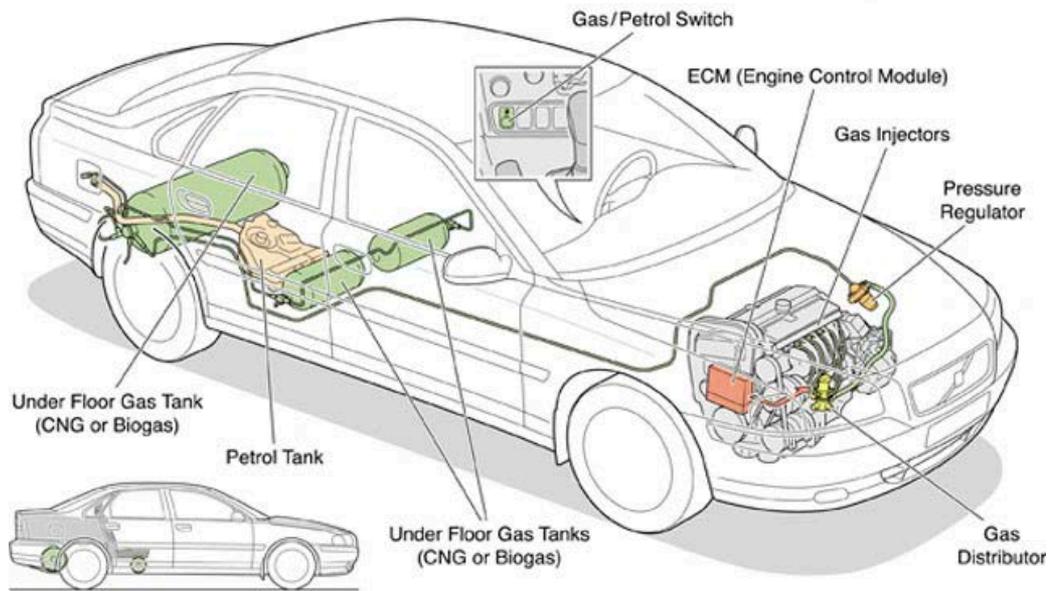
# Potential End Uses for RNG

- \* Electricity Generation (RPS)
- \* Thermal Heating (RPS, APS)
- \* **Transportation Fuels (RFS<sub>2</sub>, LCFS)**



# Transportation Fuel

## Bi-Fuel System (CNG, Biogas)



Volvo S80

- \* 16.4 million natural gas vehicles worldwide (2012)
- \* 250,000 natural gas vehicles in the U.S. (2012)
- \* Growing every day

# Potential: Growth of RNG in CA as a Transportation Fuel

## What Drives Growth?

Backseat Driver: *Technical Data*

- \* Technical Engineering (Volumetric Ratio)
- \* Financial Engineering (Secret Formula)

Designated Driver: *Public Policy*

- \* RFS
- \* LCFS



# Drivers: Technical Data

## Technical Engineering

Generally, the MMBtu of gas produced per day factors into how and for what end-use purpose an eligible landfill project may be developed

Smaller landfills are usually developed for on-site electric power purposes, for thermal heat and or to fuel fleets with access to the on-site fueling station

Raw biogas (depending on source) has approx. 50-55% methane & approx. 40% CC

On-site Vehicle Fueling Station: 90%+ methane, very low water, some impurities

Larger landfills are usually developed to deliver pipeline quality biomethane for off-site generation of electric power, thermal heat or utilization as a transportation fuel

To deliver for off-Site Transportation Fuel in large quantities, RNG must meet Pipeline Specifications; 97%+ methane, ultra low impurities & high Btu heating value (970 MMBtu for example; varies depending on the utility)

**Volumetric Ratio** = MMBtu: diesel gallon equivalent (DGE)... *more on this later.*



# Drivers: Technical Data

## Financial Engineering

Secret Formula = Revenues > Expenses Predictably

- \* Due to investment (tens of millions) required and limitation on access to markets, **only 39 out of 594 operational landfills in the United States have been developed into High Btu projects;**
- \* 0 LFG in CA; 1 WWTF (\$30 million grants)



# Costs: LFG to Pipeline Quality Renewable Natural Gas Project

Gas Processing Cost For 2 million Feet/Day Inlet in \$/MMBtu	
\$1.80	Plant Capital Amortization
\$2.20	O&M for Processing Plant
\$0.38	Collection System Expansion Per Year
\$0.61	Collection System O&M Per Year
\$0.49	Initial Collection System and Flare Capital Amortization
\$0.78	12.5% Royalty
<b><u>\$5.48</u></b>	<b>Total Cost Per MMBtu</b>

# Revenue: LFG to Pipeline Quality Renewable Natural Gas Project

**Henry Hub Pricing (May, 2013) = \$4.23**

**PROBLEM:** compared to the costs to develop a High Btu RNG project (\$5.48 per MMBtu) the commodity price for the energy content in RNG does NOT meet the Secret Formula (**-\$1.25 per MMBtu**)

# Predictable ROI: LFG to Pipeline Quality Renewable Natural Gas Project



- \* Financing – Investors like to know they are getting their money back, and expect a return on investment
- \* Owners/Developers also want to make a profit
- \* Taxpayers like to know that their money is not being flushed down the drain or thrown in the trash

# Drivers: Public Policy

## Good News –

Policy drives demand, demand drives value;  
with good public policy in place the financing can and does work,  
even with low current commodity pricing

- \* RFS2 creates the RIN market [when you produce renewable fuel and dedicate that fuel for transportation use you generate a commodity that can be traded (sold) in the market.]
- \* 11.2 RINs per MMBtu
- \* \$0.30 - \$1.29 per RIN (as of July 16, 2013)
- \* Commodity/RIN/LCFS Value (basics):

Natural Gas Price (\$4.23 MMBtu) + RIN Value (\$3.36 - \$14.45 per MMBtu) =  
\$7.59 - \$18.68 MMBtu + LCFS Credits (valued at approx. \$5 per MMBtu) =  
\$12.59 – 23.68 MMBtu



**Growth of Available RNG Volume for Transportation Fuel by 2020** is dependent upon the continuation of and certainty provided by good public policy programs like the Federal RFS2 and California's Low Carbon Fuel Standard (LCFS)

# Estimated Volume of RNG Available by 2020: Idealistic

## Idealistic RNG Volume Estimates (Volumetric Ratio)

**RATIO:** For every 1000 mmbtu / 1 Billion Btus of biomethane produced per day = 7,752 diesel gallon equivalents are produced per day.

Based on a diesel truck driving an average 150 miles per day (6 mpg) = 25 gallons per day, every 1 Billion Btus of biomethane can supply enough fuel each day for 310 trucks.

There are nearly 1,000,000 (1 million) diesel vehicles operated on California's roadways each year.

If ALL 80 Operating/Candidate landfills in California identified by the LMOP were developed to capture and process methane exclusively for transportation fuel purposes, within 18 months these 80 landfills could produce approximately **31,008,000 diesel gallon equivalents.**

**That is enough RNG volume estimated to fuel at least 99,200 trucks per day between now and 2020** (nearly 10% of all diesel vehicles operated in CA).



# Estimated Volume of RNG Available by 2020: Realistic

## Realistic RNG Volume Estimates (Volumetric Ratio)

Considering that there are only 39 High Btu Landfill gas to energy projects in the entire United States (and only 4 in Canada), it has been estimated by developer members of the Coalition For Renewable Natural Gas that realistically, it is likely only 20 of the Operating or Candidate landfills in California identified by the LMOP will be developed to capture and process methane exclusively for transportation fuel purposes between now and 2020.

As such, within 18 months these 20 landfills could realistically produce approximately **46,5120 diesel gallon equiv. of RNG.**

Based on a diesel truck driving an average 150 miles per day (6 mpg) = 25 gallons per day, every 1,000 MMBtu produces approximately 7,752 diesel gallon equivalents, = 1 Billion Btus of RNG can supply enough fuel each day for 310 trucks.

**That is enough RNG volume estimated to fuel 18,600 trucks per day between now and 2020**  
(just 1% of all diesel vehicles operated in CA).

*NOTE:* This assumes 100% RNG fuel, which can be blended with fossil fuel natural gas to improve the environmental attributes of the gas while furthering the realistic in-State supply of estimated RNG available for transportation fuel purposes between now and 2020.



# RNG: Industry Insight

## Key Factors Substantiating Growth in California

- \* Good Public Policy
- \* Policy Drives Demand
- \* Demand Drives Value
- \* Value Drives Investment
- \* Investment Enables Development



# RNG: Industry Insight

## Challenges Faced in California

### Legislative & Regulatory

- \* Unintended Consequences (*Hayden, 1988; Rules 30/21; AB 1900, 2012*)
- \* Policy Incongruence (*Clean Air vs. Renewable Energy*)
- \* Policy Uncertainty & Unpredictability (*RFS<sub>2</sub>, LCFS*)

### Physical Limitations

- \* Volumetric Considerations
- \* Proximity of Landfills to Pipelines

### Technical & Financial

- \* Financing: Development, O&M, Interconnection Costs
- \* Energy, Sales and Property Taxes
- \* **Zero (o)** Federal or State Tax Credits, Grants or Subsidies



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Renewable Natural Gas Standard (RNGS)

- \* Similar to RPS, which aided the development of renewable electric power
- \* Create an RNG Standard requiring natural gas marketers in California, including investor owned utilities, to procure a minimum percentage of their total gas purchases from RNG .
- \* Such percentage should increase incrementally each year from the inception of the standard until the percentage goal is reached.
- \* We recommend that the RNG Standard begin at .5% and increase every year by .25 -.5% until a 2-3% RNG Standard goal is reached.

Please email: [Johannes@rngcoalition.com](mailto:Johannes@rngcoalition.com) for additional RNGS details



# RNG: Industry Insight

## Recommendations for Government Actions in California

### State Vehicle Mandate

- \* Require that all State and Municipal CNG and LNG Vehicles procure at least 25% of their natural gas fuel from RNG, with in-state sources of RNG receiving double credit if used to satisfy this requirement, in order to provide an incentive for procurement of in-State resources.



# RNG: Industry Insight

## Recommendations for Government Actions in California

Encourage development and operation of RNG projects in California by affording the following:

### Sales tax exemption

- \* for equipment used to collect, process, produce and deliver RNG
- \* This duplicates the concept incorporated into SB 71, which provides for a 100% exclusion of the value of solar energy property from property taxation



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Real and Personal property tax exemption for RNG property

- \* Similar to type of exemption available to solar projects

### Transferable California Tax Credit

- \* To be applied against California taxes equal to a percentage of either of the following:
  - i. the value of the RNG facility installed, or
  - ii. the value of the RNG energy sold each year for 10 years
- \* Transferability allows developer to utilize value of credits by monetizing them with California entities with large tax bills – same concept used for federal Section 29 tax credits



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Grant for Specified Percentage

- \* For example, 30% of installed capital costs of RNG project payable 60 days after it is “placed in service.”
- \* Use same approach as Section 1603 grant provided by federal government, which has proven to be a very successful program for other development.



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Minimum “Cap and Trade”

- \* Provide minimum ‘cap and trade’ pricing and transferable and tradable credit for carbon capture benefits realized from in-state RNG projects
- \* Specifically exclude carbon capture credits from environmental attributes that must be transferred to obligated utility in order to meet RPS requirement
- \* Coordinate carbon capture credits allowable with LCFS Offset credits to avoid double dipping when RNG used as vehicle fuel



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Financing Assistance

- \* Provide California guarantee of debt used to finance project development
- \* Provide California guarantee of debt used to finance up to 90% of project costs provided that project can support minimum 1.2: 1 debt coverage ratio
- \* Authorize and provide preferential tax exempt bond cap allocation to in-state RNG projects for use of tax-exempt bonds to finance RNG projects in California

*Note:* when coupled with state guarantee provision above, will help obtain investment grade rating for bonds that improve marketability of bonds and reduce interest expenses to project



# RNG: Industry Insight

## Recommendations for Government Actions in California

### Feed-In Tariff

- \* Used successfully to increase available renewable electric power in California (and other states).
- \* Premium prices to be paid would allow costs to be recoverable as part of the utilities rate base.
- \* Pipeline utilities would also be excused from offering feed-in tariff if RNG project sells biomethane, transports it through the natural gas pipelines to an in-State electric power utility or marketer (for RPS) or to a transportation fuel supplier (for LCFS purposes).



# RNG: Industry Insight

## Recommendations for Government Actions in California

### In-State Transportation of Fuel by Displacement

- \* Provide clarification that physical transportation by displacement of biomethane is acceptable for purposes of using RNG as a vehicle fuel in California, for Low Carbon Fuel Standard (LCFS) purposes
- \* This would ensure that implementation of an approved LCFS is consistent with rules for the Federal EPA's Renewable Fuel Standard 2 (RFS2).



# Contact Information

- \* For additional information, or to learn more about the Coalition For Renewable Natural Gas, contact:

[Johannes@rngcoalition.com](mailto:Johannes@rngcoalition.com)

916.520.4764



- \* ***RNG 2013: Fuel, Heat, Power & Policy Conference***

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