

A photograph of an industrial facility, likely a biogas upgrading plant, featuring large vertical storage tanks, a complex network of pipes, and a conveyor system. The scene is brightly lit, suggesting a sunny day. The text "Renewable Natural Gas (Biomethane)" is overlaid in a large, orange, serif font.

Renewable Natural Gas (Biomethane)

Critical Barriers Impeding RNG as a Transportation Fuel in California

Suggested Policy Solutions

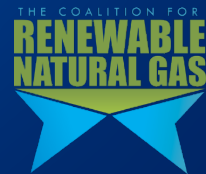
September 17, 2015



Meet the Presenter

➤ Evan Williams – President of Cambrian Energy Development LLC

- Developer of 50 LFG-to-energy projects and 3 RNG Projects; co-developer of largest RNG production project in U.S. at McCommas Bluff Landfill in Dallas, Texas
- Chairman and co-founder of Coalition for Renewable Natural Gas
- Major equity holder and manager of group of companies that cost-effectively convert existing medium and heavy duty diesel engines to CNG using remanufactured to like-new repowered engines.



Coalition for Renewable Natural Gas

➤ **Non-Profit Organization (501 c 6)**

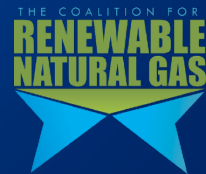
- Founded in 2011
- Membership Based
- Mission Driven
- Public Policy Focused

➤ **RNG Industry Trade Association**

- 70+ Leading Companies
- Members in US, Canada, Brazil, UK
- Represent Each Source & Sector of RNG Industry

➤ **Mission:**

- Exists to advocate for the increased utilization of RNG, including for renewable electric power generation, thermal heat applications and **transportation fuel uses**.



Overview

- RNG Developer's Essential Requirement – Secret Formula
- Financing Fundamentals for RNG Projects
- California Impediments to Development of RNG projects
- Potential Policy Solutions
- Critical Math Lesson



What is Largest Challenge to Development of an RNG Project?

- Making Money!
- For an RNG project to be successful it must meet the requirements of the Secret Formula



What is the Secret Formula?

- Revenues > Expenses
- Predictably



RNG Financing 101

- Debt is less costly than Equity
- RNG projects are typically financed with both equity and debt



Essentials for RNG Transportation Fuel Use Project

Transportation Fuel Market

- Access to Pipeline or other delivery method needed
- CNG/LNG Vehicles to Use RNG Fuel needed

Financing

- Available & Affordable Financing Essential
- Predictability of Term of Supporting RNG Fuel Sale Agreement must match term of debt financing
- Government guarantee of debt helps
- Tax credits help
- Grants help

Technology to Produce RNG

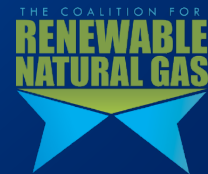
- Proven, Warranted & Affordable Equipment to convert biogas to RNG

Economics

- Must Make Money
- Environmental Attribute Value and/or tax credit or grant support essential

Supportive Policies

- Air permitting policies
- Land Use policies
- Economic & Financing Support policies
- Reduced Operating Expense policies



Project Finance Lenders and the Secret Formula

- **Debt payments (principal and interest) are Expenses in the Secret Formula**
- **Project Finance Lenders require minimum Debt Service Coverage Ratio**
- **Debt Service Coverage Ratio (“DSCR”)**
 - Amount of Cash Flow (Revenues – Expenses other than debt) available to meet annual interest and principal payments on debt
 - DSCR is typically a minimum of 1.2:1, but usually is higher for RNG projects
- **Debt Service Coverage Ratio is contractual requirement to meet Secret Formula with a margin of safety to pay debt**
- **Duration of RNG Sale Agreement with creditworthy counterparty and Predictable Revenues must be at least equal to term of Debt or debt must be guaranteed by creditworthy party irrespective of term of RNG Sales Agreement**



Revenues



Revenues – Elements Needed

- **RNG Prices must be high enough to allow Revenues to exceed Expenses (and meet DSCR)**
- **Access to Markets**
 - Without this, there are no Revenues
- **Duration of RNG Sale Agreement at least equal to Term of Debt**



Typical Costs for LFG to Pipeline Quality RNG Project Outside California

| Gas Processing Cost For 2 million Feet/Day Inlet in \$/MMBtu | |
|--|--|
| \$2.50 | Plant Capital Amortization (Debt) |
| \$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 | Royalty to Landfill Owner |
| <u>\$6.18</u> | Total Cost Per MMBtu |



Index Price of Natural Gas

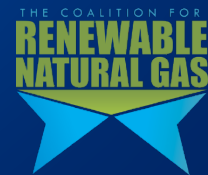
➤ NYMEX Natural Gas Futures Prices Quoted February 21, 2015 per MMBtu

| | |
|------------|--------|
| – May 2015 | \$2.91 |
| – Nov 2015 | \$3.11 |
| – Dec 2015 | \$3.27 |
| – Jan 2016 | \$3.43 |
| – Feb 2016 | \$3.41 |
| – Apr 2016 | \$3.15 |



If RNG costs \$6.18/MMBtu to Produce & Natural Gas Commodity Price is <\$4.00/MMBtu, how does an RNG Producer make Money?

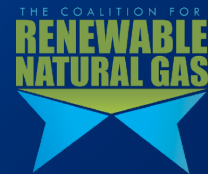
- **Additional Value realized from sale of environmental attributes associated with RNG**
 - Sold as low carbon intensity transportation fuel to meet EPA Renewable Fuel Standard 2 federal requirements and state Low Carbon Fuel Standard requirements
 - Commodity price of Natural Gas + RINS + LCFS credits
 - 11.72 RINS per MMBtu of RNG
 - D-3 RIN recent market price = \$1.00; value of RINS = \$11.72/MMBtu
- **Financial Engineering for RNG projects is more critical than Technical Engineering in achieving success**



Revenue Components for Different Sources of RNG as Transportation Fuel

| RNG Source | Tipping Fee | Natural Gas Commodity Price | RINS | LCFS |
|--|-------------|-----------------------------|------|------|
| Landfill | No | Yes | Yes | Yes |
| WWTP | No | Yes | Yes | Yes |
| Organic digester & co-digester* | Yes | Yes | Yes | Yes |
| Organics Gasification to Produce Syngas Upgraded to RNG* | Yes | Yes | Yes | Yes |

* California policy to divert organics from landfills will cause shift in production of RNG from landfills to organic digesters & gasification-to-syngas-to RNG projects. More expensive disposal costs for waste will result since new infrastructure must be financed.



Access to Markets



Natural Gas Pipeline Access

- Typically no Revenues for RNG project is realized unless RNG project is near to and can meet pipeline quality specifications for injection into natural gas pipeline
- Standards for pipeline quality RNG (biomethane) apply to all sources of RNG
 - Landfills, WWTP, anaerobic digesters, gasified organics-to-syngas-to-RNG



Stated Goal of AB 1900



New Public Utilities Code Section 399.24

- **Promote the In-State Production and Distribution of Biomethane**
- **Facilitate the Development of a Variety of Sources of In-State Biomethane**
- **Superseded Health & Safety Code Provisions that codified the Hayden Amendment adopted in 1988**



Current Regulatory Standards That Could be Improved to Promote the In-State Production and Distribution of Biomethane (RNG)

- **990 Btus/standard cubic foot minimum heating value**
 - Commonly 950 Btus/scf in other states
- **Testing of large amount of Constituents**
 - Frequent and costly with opportunity for outside lab errors that could result in loss of all Revenues
- **Maximum allowable Siloxane content that approaches non-detect levels**
 - Recent lab test of natural gas in California pipeline show natural gas in pipeline failed proposed siloxanes standard
 - GTI 2012 RNG Report states no siloxanes in natural gas
 - So....lab error or some siloxanes in California natural gas?
- **Pipeline interconnection costs**
 - Range of \$1,500,000 - \$3,000,000 in California vs \$71,000 - \$282,000 in other states



RNG Market Needs More of These...



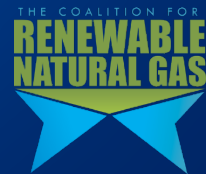
CNG Truck

Barriers to Increase in Number of Medium Duty & Heavy Duty CNG/LNG Trucks

- **Cost**
- **New CNG truck is \$30,000 to \$100,000 more than comparable diesel truck**
- **Until diesel prices increase, fuel savings alone won't provide payback on increased price**
- **Solution: repower of existing diesel trucks to CNG with remanufactured CNG engines**
 - Total conversion costs are less than cost of new diesel truck and approximately one-half cost of new CNG truck
- **Barrier: development of expedited process at CARB to provide certification of repowered CNG engines**
- **California financial assistance from tax credits or grants**



Predictability



Predictability an Issue for RNG Transportation Fuel Projects

- RNG sold for transportation fuel provides potentially higher Revenues than RNG sold to utilities to produce renewable electric power
- Uncertainty of duration of RFS2 and California LCFS programs result in obligated parties unwillingness to commit to firm pricing for purchase of RNG and value for RINS and LCFS credits beyond 2022
- Short duration of RNG Sale Agreement with predictable pricing will not support needed project finance debt for RNG project



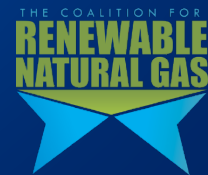
Recommended Solution to Financing of RNG Projects for Transportation Fuel

- California state agency guarantee of 90% of RNG project asset-secured debt (whether bonds or commercial debt) with term of 15 years (including up to 2 years of construction and 13 year amortization) used to finance up to 80% of capital expenditures and related debt costs for RNG project
 - Balance of Capital Expenditures financed by equity
- Require projected Debt Service Coverage Ratio of 1.2:1 to qualify for state agency guarantee



Recommended Solution to Financing of RNG Projects for Transportation Fuel

- **Solution solves predictability issue with respect to needed debt for RNG for transportation fuel**
- **State credit rating made available to RNG project without immediate, or perhaps any, use of tax dollars**
 - Similar debt guarantee program already exists for conversion of diesel vehicles owned by small fleets to alternative fuels
- **Obligated parties under LCFS probably willing to enter into 15 year RNG Purchase Agreement with formula for pricing RINS and LCFS credits (as opposed to fixed price) and with “regulatory out” as to RINS if RFS2 program terminates and as to LCFS credits if LCFS program in California terminates**
- **Loan guarantee would support RNG projects that would meet California objectives of getting diesel vehicles off roads and adoption of alternative fuel vehicles, such as CNG/LNG**
 - RNG is lowest carbon intensity transportation fuel available



Policy Solutions to Encourage RNG Production in California

- A full menu of policies that could be adopted to encourage RNG production in California was prepared by the Coalition for Renewable Natural Gas and presented at a Workshop of the California Energy Commission in 2013 in connection with the CEC Biennial Energy Plan
- A Copy of that presentation is available from the Speaker upon request



Development of RNG Projects is a Delicate Numbers Game

- Usually only works at larger landfills, WWTPs and anaerobic digester projects due to fixed costs of development and O&M
- Must meet Secret Formula
- Cannot engage in Fuzzy Math as to prospective financial outcome of project



What is Fuzzy Math?



Thanks for Listening!!

Evan Williams
Cambrian Energy
(213) 628-8312
evan@cambrianenergy.com

