

# Sustainable Gas Systems – New Business Models



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# Agenda

- Noblehurst Green Energy (NGE)
- Biogas as a Transportation Fuel
- Critical Considerations
  - Customer
  - EPA
  - CA ARB (LCFS)
  - Production
  - Gas Delivery
- Conclusion

# NGE – Current Biogas Producer



- 1.3M gallon mixed flow anaerobic digester – 2015
- Codigestion with food waste, depackage materials, and creamery sludge
- Currently electric generation is 3M KWh./year, with 450 KWh. CHP
- 70% biogas flared
- 70% electricity net metered; 30% to National Grid
- Food waste collection through our Natural Upcycling
- Looking for a better biogas economic model. **This is our journey – Farm to RNG**

# Biogas as a Transportation Fuel

- CNG power vehicles – displace diesel
  - CNG stations
  - Return-to-home fleets
- EPA renewable fuel standard & Renewable Identification Numbers(RINs)
  - EPA sets the minimum volume of renewable fuel used in transportation sector
    - Renewable Volume Obligation (RVO)
  - Credits (RINs) are generated for each unit of renewable fuel produced
  - A RIN = energy content of one gallon of ethanol
  - Obligated parties
    - Fuel blenders
    - Fuel marketers
  - Acquire RINs through the purchase of Fuel with RINs and/or RIN only transactions
  - **Currency of compliance**
  - A retired RIN is proof that biofuels were blended

# Biogas as a Transportation Fuel

- California low carbon fuel standard credits (LCFS)
  - Reduce Carbon Intensity (CI) of Transportation Fuel by 10% by 2020 and 20% by 2030
  - Sets annual CI standards
  - CI is the measure of GHG associated with producing and consuming a fuel (gCO<sub>2</sub>e / MJ)
  - Other states (OR & WA) and parts of Canada have LCFS programs
  - Similar CA based customer as EPA RFS Customers
- The Maximum Economic Value is the sum of
  - The Fuel
  - The RIN
  - The LCFS

# Customer

- Depends on “gas type”
  - D3 / D5
- Physical fuel and “regulations”
  - RNG / RINs / LCFS
- 3<sup>rd</sup> party or direct
  - How much of the “process” do you want to own
  - High degree of regulatory reporting / compliance
  - 3<sup>rd</sup> party costs can be high

# EPA

## ➤ RIN type

RIN D Code	Fuel Type	GHG Reduction Requirement	Fuel
D3 / D7	Cellulosic Biofuels	60%	Cellulosic ethanol, cellulosic naphtha, cellulosic diesel, Renewable CNG/LNG, etc.
D4	Biomass-based Diesel	50%	Biodiesel, renewable diesel, etc.
D5	Advanced Biofuels	50%	Sugarcane ethanol, renewable heating oil, biogas, etc.
D6	Renewable Fuel	20% or less	Corn ethanol, etc.

## ➤ Implication of codigestion

# EPA

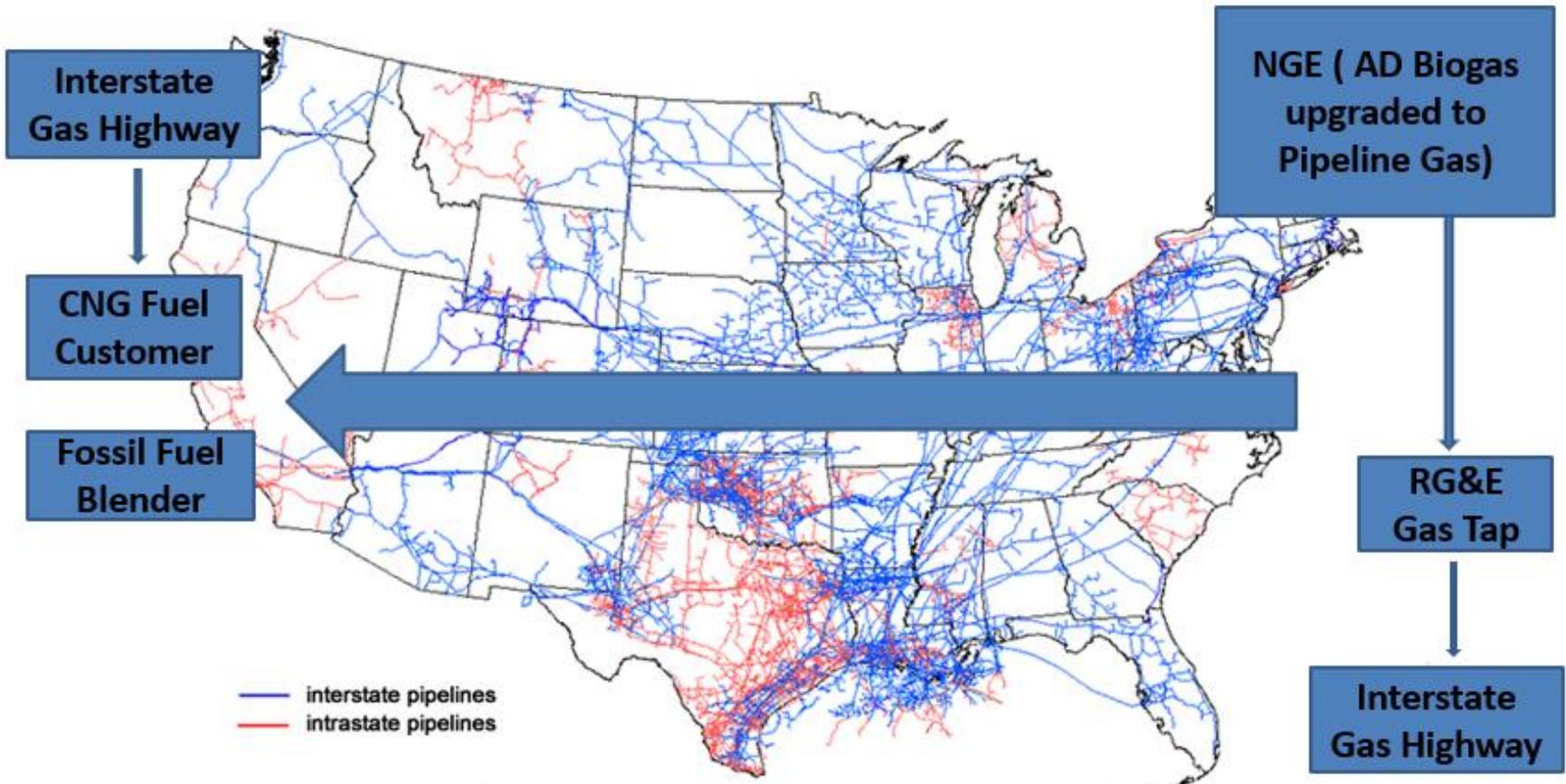
- EPA classifies an anaerobic digester (AD) as either D3 or D5
- To obtain D3
  - **75% Cellulosic; Consistent; Constant**
- Manure is an EPA approved pathway for D3
- Food waste is not cellulosic, not consistent, and not constant
- Test for cellulosic
- Obtain an approved pathway from the EPA
- EPA rules evolving and so register as D5 and adjust as rules change
- Current political environment – **oil states vs corn states**
- RIN values have declined recently

# CA LCFS

- Updated rules to extend LCFS to 2030
- Demonstrated physical pathway to CA
- Existing & new anaerobic digesters
- Carbon Register – project developer – carbon rights
- Review your CA ARB (CARB) project status
- Carbon intensity score
  - Manure
  - Codigestion
- The interest in low CI scores is to displace higher landfill type CI scores
- Reduced market interest in CI score of higher than -50
- LCFS has a 10 year registration term
- Proposed rule change in 2024 that may not compensate new registrations

# CA LCFS Physical Pathway

Map of U.S. interstate and intrastate natural gas pipelines



Source: U.S. Energy Information Administration, *About U.S. Natural Gas Pipelines*

# Production

- Anaerobic digester considerations
  - Manure / codigestion
  - H<sub>2</sub>S management
  - O<sub>2</sub> Management
  - Know your biogas production level
    - Per year, per month, per hour
- Codigestion factors and trade offs
  - D<sub>3</sub>/D<sub>5</sub>
  - Blended CI
  - Tipping Fees
  - Biogas Volume

# Production

- H2S Removal
  - Understand operating costs
- Gas Upgrade
  - Many approaches and technologies
  - Start with understanding pipeline standards, especially BTU threshold, O2 and pressure
    - **The required output**
  - Next address quality of Biogas from Anaerobic Digester
    - **Quality of Input**
- Tail gas management
- Role of CHP
- How much of the production (O&M) process do you want to own

# Gas Delivery

- Pipeline injection and/or portable delivery
- Understand type of pipeline
  - Transmission
  - Distribution – ability to take gas in non-heat season
- Pipeline gas quality requirements
  - “Spiking”
- Tap and North American Energy Standards Board (NAESB) agreements
- Injection infrastructure
  - Metering & regulation, odorization, compression, drying
- For portable delivery (“gas-on-wheel”) solutions
  - Drying, compressing, storage and delivery

# Conclusion

- Many people promising many things
- Do your homework
- Understand financing
- Understand market pricing
- Understand O&M costs
- How much of the production, selling and reporting processes, do you want to own
- Think 10 year window
- Impact of 12c / KWh.

**Thank You**