

# Biogas Separation using CO<sub>2</sub>

## Cost-Effective, Flexible, Renewable

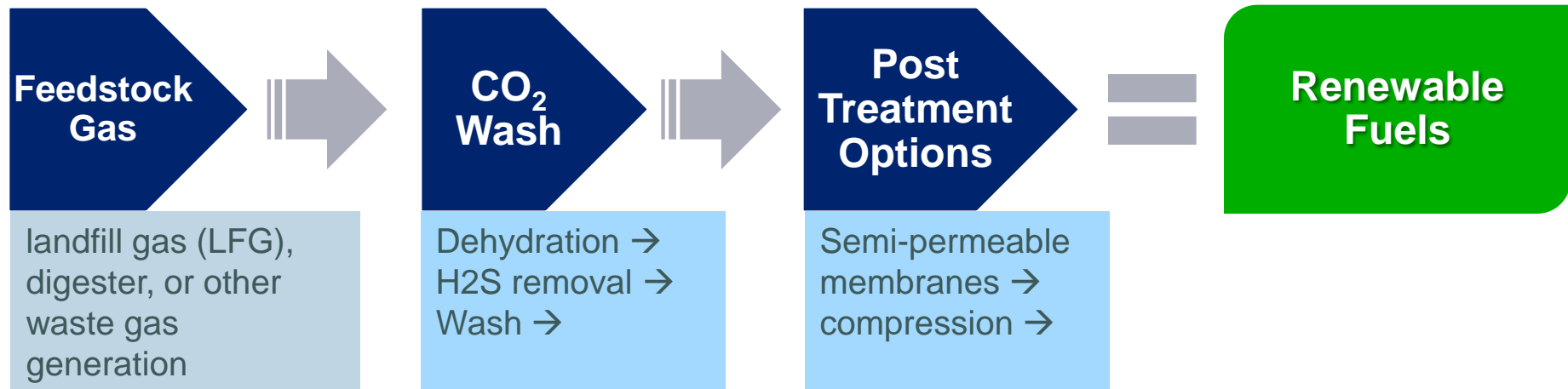
*Steve Wilburn, CEO and President  
GreenTech Connect Forum  
August 4, 2009*

## CO<sub>2</sub> Wash<sup>®</sup> Technology

- Purifies biogas into clean and green, cost-effective, alternative fuels that fleets can use TODAY
- Is a patented and proprietary technology that is tried, true and a recipient of:
  - ✓ R&D Top 100 Award Winner
  - ✓ USDOE Phase II Award Recipient
  - ✓ USEPA LMOP Project of the Year 2008



# Biogas Processing



**Cheaper...**

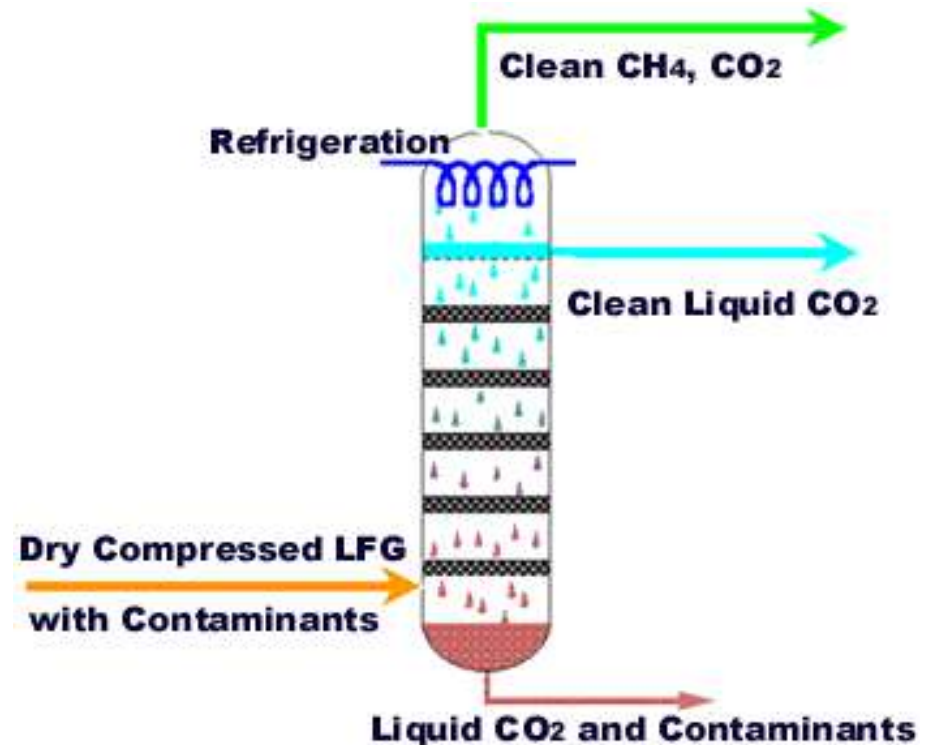
**Cleaner...**

**Greener**

# CO<sub>2</sub> Wash® Patented Technology

## Simple, Elegant Clean-up Process

- Cleans all contaminants using no outside solvents and few moving parts
- Separates Biomethane and food-grade CO<sub>2</sub> for commercial sale
- Minimal site prep to install skid mounted units



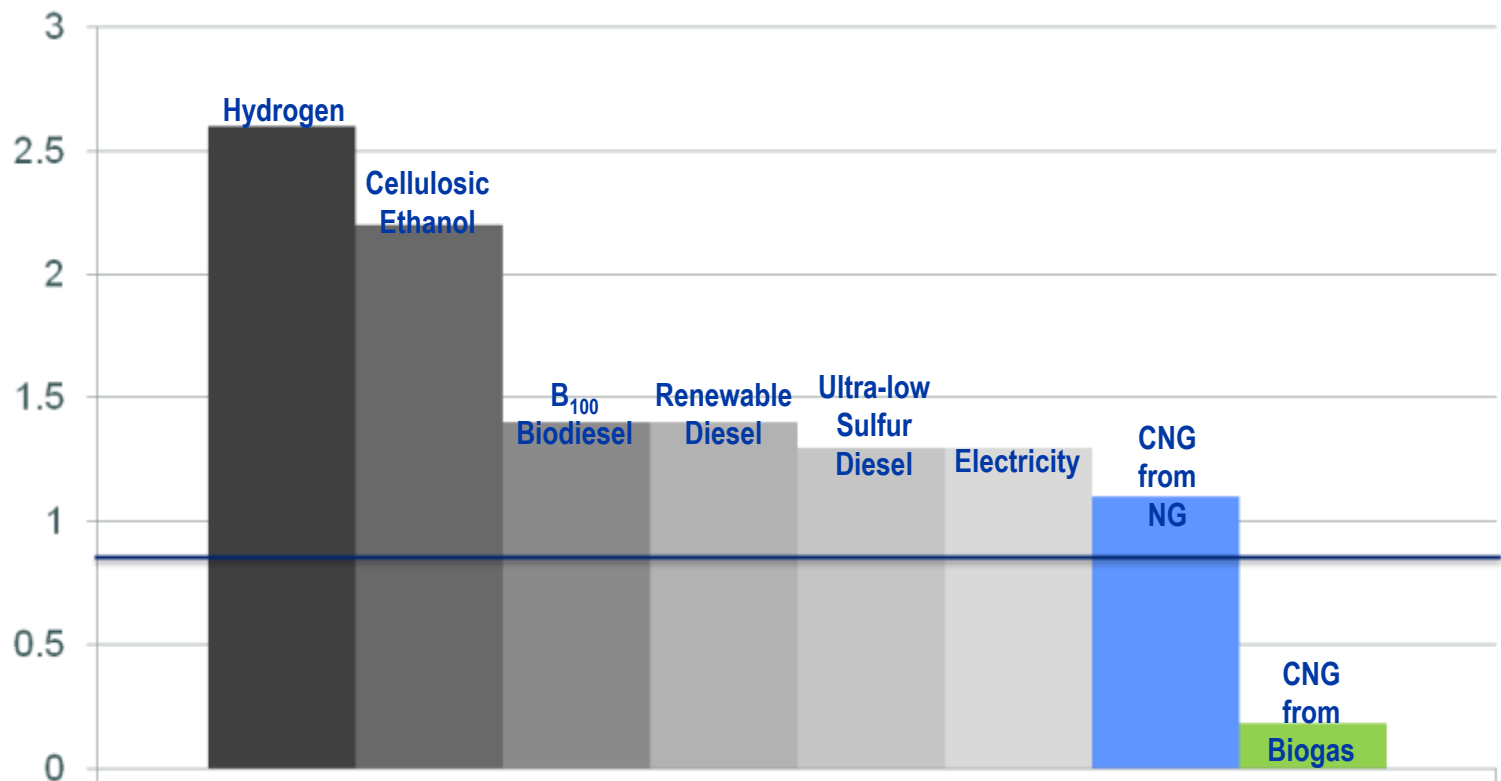
## CO<sub>2</sub> Wash® Products

- Biogas suitable for combustion in LFG-fired engines
- Food-grade CO<sub>2</sub> suitable for reuse or sequestration
- Numerous post-treatment alternatives
  - Low emission vehicle fuel (e.g. CNG or LNG)
  - Pipeline grade natural gas
  - Catalytic conversion to hydrogen
  - Hydrogen for fuel cells
  - Methanol

# Renewable Energy Efficiency Comparison

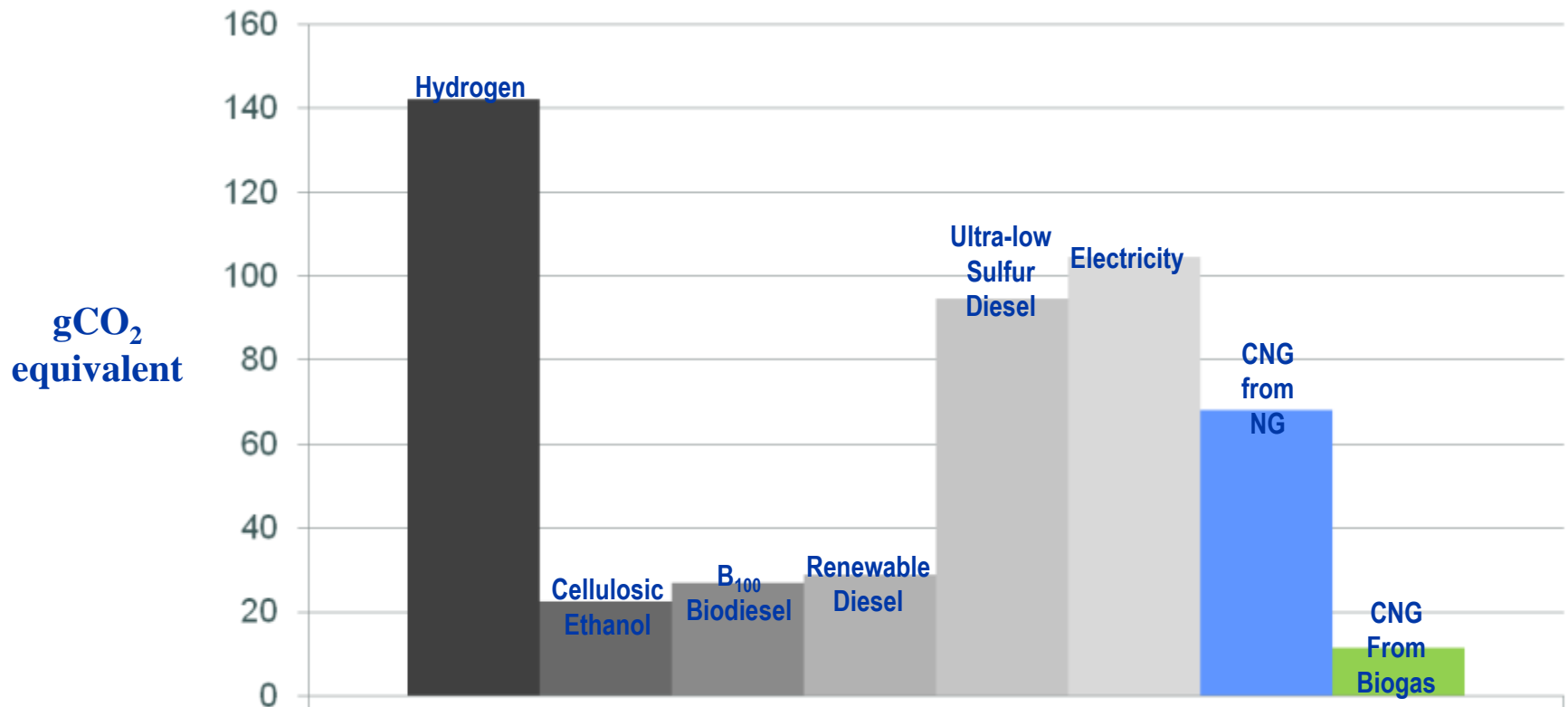
## California Air Resources Board – “Well to Wheels” Analysis

MMBtus to  
Produce  
1 MMBtu  
Renewable  
Energy



# Renewable Energy GHG Emissions / MJ

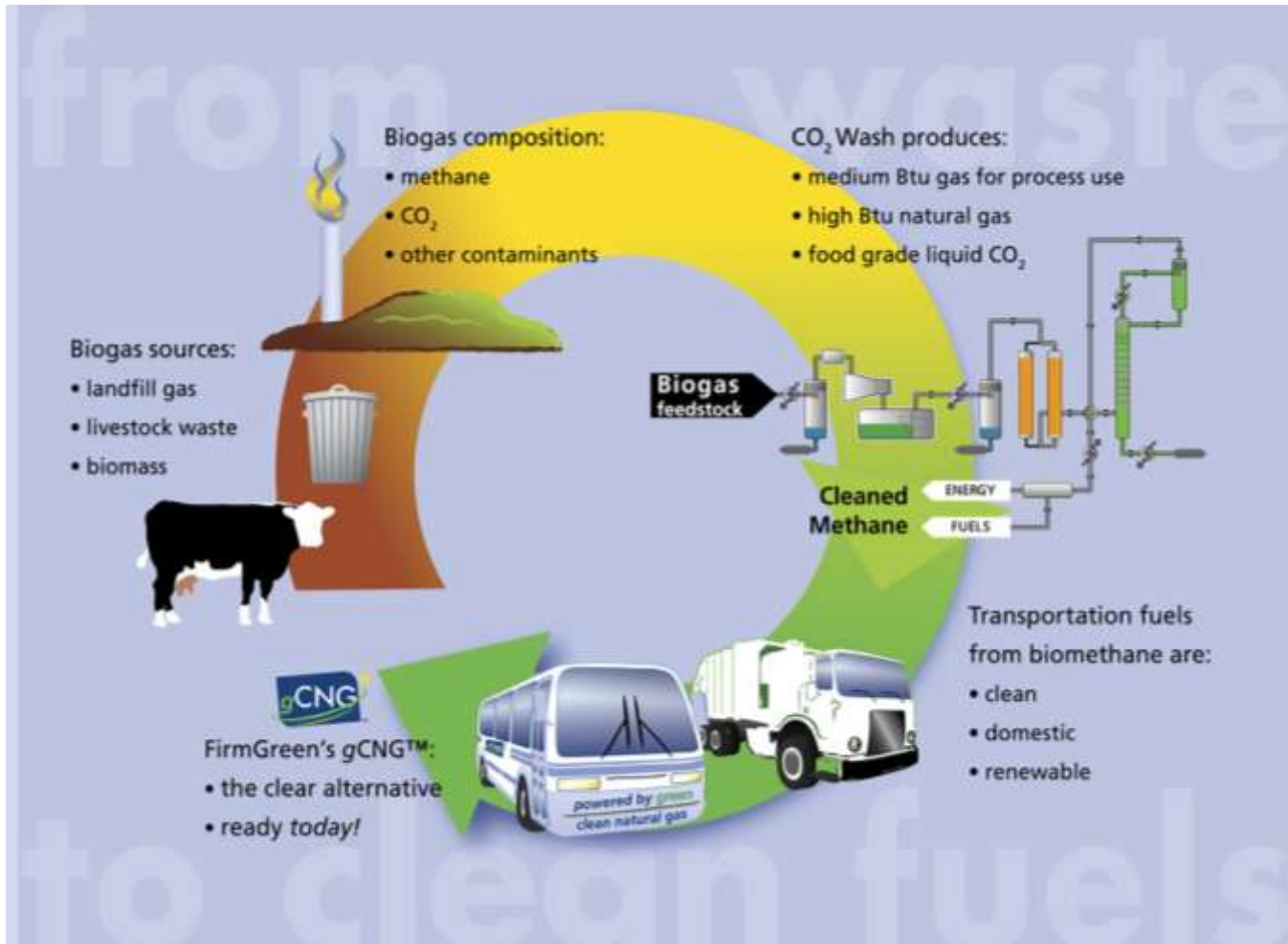
## California Air Resources Board – “Well to Wheels” Analysis



# Value Chain Opportunities

Flow (scfm)	1,000
Capital Cost	\$ 5,400,000
MMBtu available to sell (MMBtu/yr)	216,000
GGE CNG to sell (GGE/yr)	1,786,760
CO2 (tons/yr)	4,890
Revenue	
CNG @ \$1.90/GGE	\$ 3,394,850
CO2 @ \$30/ton	\$ 146,600
Renewable Energy Credits ???	
Operating Cost	\$ 1,045,700
Operating Cash EBDITA	\$ 2,495,750
Debt Service - Assume all equity	\$ -
Depreciation	\$ 700,200
Pre-Tax Income	\$ 1,795,550
Net Fed Fuel Excise Tax Refund	\$ 558,360
Total Cashflow after tax incentive	\$ 3,054,110
Simple Payback (yrs)	1.8

# gCNG™ reduces GHGs from “Well to Wheels”



# We're powering fleets with gCNG™ today



# Thank You...



## **FirmGreen, Inc.**

2901 West Coast Hwy., Suite 200

Newport Beach, CA 92663

949-270-2937

800-379-2190 (toll free fax/Voicemail)

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