



***Clean Energy***<sup>®</sup>

*North America's leader in clean transportation*

# Natural Gas Vehicles Network Development & Deployment

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- Identified threat to CA of dependence on foreign oil – AB 2076
- Development of comprehensive state strategy – AB 1007
  - Room for a poly-fuel future
- Investment in transition – AB 118
  - Recognition of role of transportation fuels in AB 32 and LCFS
- IEPR proceedings
  - Evaluation of infrastructure developments for alternative fuels

## Largest Alternative Transportation Fuel Provider

**320+**  
Fleet  
Customers

**15,000+**  
Natural Gas  
Vehicles

**175+**  
Natural Gas  
Fueling Stations

### Compressed Natural Gas (CNG)



Taxis



Government  
Vehicles



Airport  
Transit

### Liquefied Natural Gas (LNG)



Regional  
Trucking



Public  
Transit



Refuse  
Hauling

# Clean Energy Deployment Model

- Focus on high fuel use fleets
  - Class 8 Trucks ~20,000 gallons/yr/vehicle
  - Transit ~15,000 gallons/yr/vehicle
  - Refuse ~10,000 gallons/yr/vehicle
  - Taxis ~ 7,500 gallons/yr/vehicle
- Refuel at centralized locations and/or return to base
  - Not mandatory to have resident on-site fleet
- Customers focused on fuel cost savings and emission reductions
- **Add public access** to accommodate collateral fleets and expand throughput
- Modular station design for ease of deployment
- Goal – to develop a comprehensive network to expand market development

# CNG Stations



- CNG stations are combination mini “refineries” and stations
- Capital Cost - \$1.5 -2.8 million
- Dispensing Capacity 6-12,000 GGE/day
- Refinery metrics
  - \$7,900 to \$10,900 per barrel (GGE)/day
- Clean Energy capital if gas sales >300,000 GGE/yr/station
  - Provides acceptable rate of return/profit on capital
  - Provides customer with “significant” fuel cost savings
- Station dispensing capacity higher than 300,000 GGE per year
  - 1,000 SCFM compressor = 2.2 million gal/yr dispensing capacity w/12 hour fuel window

## Scale of CNG Stations

- Is it possible to build stations for less than \$1.5 million – YES
  - CE is designing smaller compressor modules for smaller stations
  - IF Customers built their own downsized stations
    - Realize lower cost
    - Private station – no Public Access
    - Private stations don't add nodes for public infrastructure
    - Any excess capacity is unusable
      - E.g. 170 PA stations in Calif – 300 private stations
  - **Encourage public policies that offer infrastructure incentives only if Public Access is made available**
- Is it possible to build smaller stations where investment can't be recovered economically through gas sales – YES
  - Home refueling appliance - \$6K installed – 540 gal/yr/veh - \$1/gal capital recovery for 10 year life

# LNG Production and Stations



- Boron - \$90 million w/ 240,000 Gal LNG/day
- \$26,800/DEG barrel/day
- Stations
  - \$2.25-7.5 million
  - \$6,500-8,000/DEG barrel/day
- Clean Energy capital if gas sales >300,000 GGE per yr
  - Provides acceptable rate of return/profit on capital
  - Provides customer with “significant” fuel cost savings
- Station dispensing capacity higher
  - 4-20 million DEG/yr

## 4 Legged Stool for NGV Industry Success

- Policy
- Funding
- Vehicles
- Infrastructure

## Policy – Where it all starts

- Policy is what everyone seems to forget
- Limited success to date
  - SCAQMD Fleet Rules
  - CARB Transit Rule
  - Airport taxi initiatives
  - LCFS (TBD)
- Notable failures
  - EPACT
- NAT GAS Act 2009 – New Alternative Transportation to Give Americans Solutions
  - Combine goal for petroleum reduction with incentives to make it happen

## International NGV Growth

	<b>August 2003</b>	<b>June 2008</b>	<b>February 2009</b>
Global NGVs	2,814,438	8,600,000	9,960,000
Global NGV Stations	6,455	13,000	14,740

1,300,000 vehicles/1,700 stations in last 8 months!

World average of 675 vehicles/station (LD)

## Notable NGV Growth

Country	NGVs 2003	NGVs 2009	Stations '03	Stations Mar '09
Argentina	1,000,000	1,745,677	1,000	1,806
Pakistan	350,000	2,000,000	200	2,600
Brazil	550,000	1,588,331	535	1,688
India	137,000	821,872	116	325
Iran	*	1,215,593	*	764
Italy	400,000	580,000	490	700
Colombia	*	280,638	*	401
China	69,300	336,500	270	1,260
<b>Global Total</b>	<b>2,814,438</b>	<b>9,962,022</b>	<b>6,455</b>	<b>14,738</b>

Worldwide: **95% NGVs are Light-duty vehicle**, 2% are Trucks, 3% are Buses

**76% of New CNG Stations are Public**

# World NGV Products – Consumer Oriented

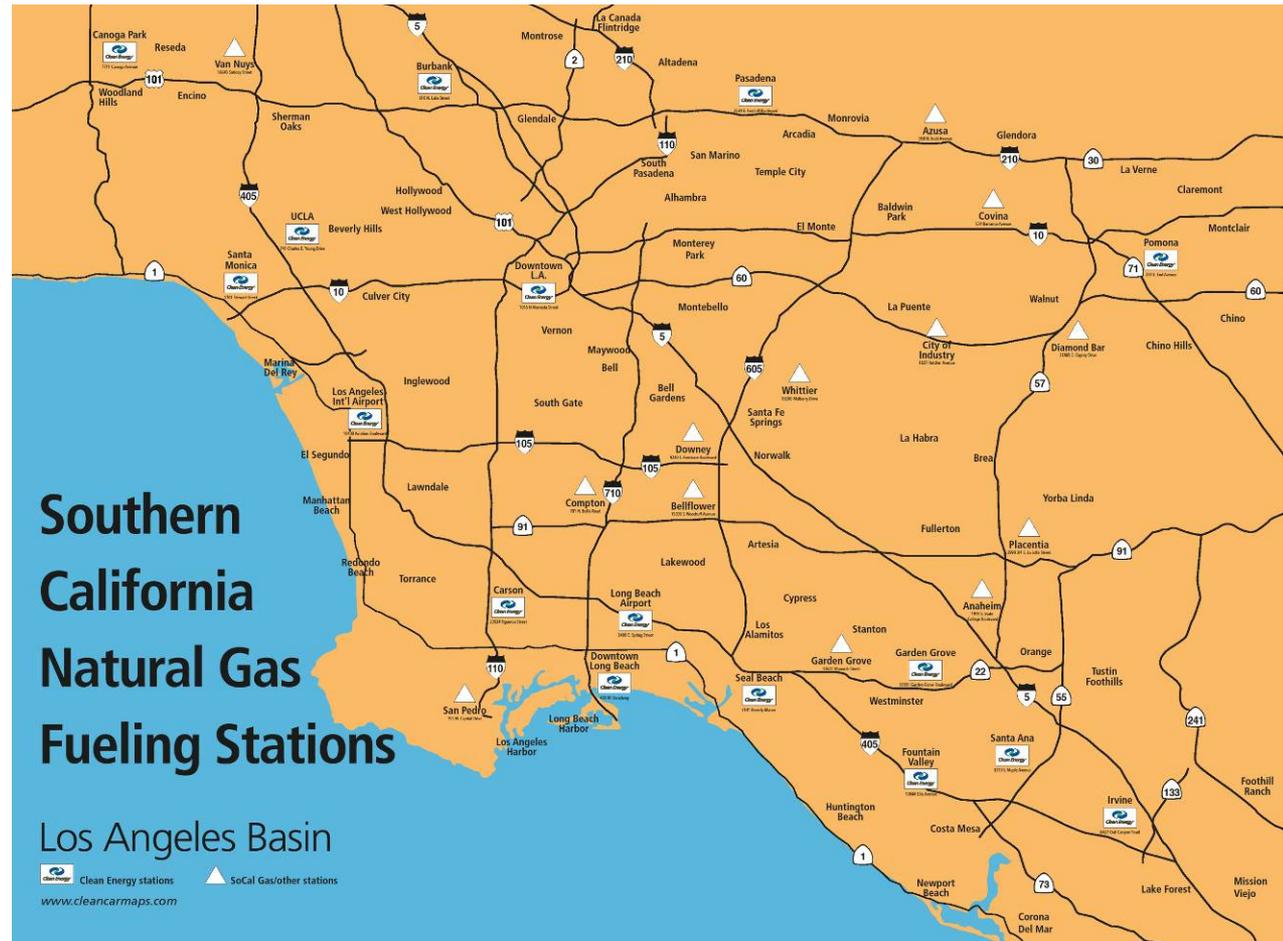


# Clean Energy Market Development Strategy

- Light-Duty Vehicles – OEM development
  - Focus on **targeted, regional** market development effort
    - Not a national product/infrastructure roll-out
  - Large metropolitan areas
  - Example of viable OEM program –
    - Ford QVM/AT&T
    - Mercedes
  - Select OEM dealerships - minimize training and spare parts logistics
  - Achieve “successful” deployment of vehicles and infrastructure
  - Repeat/expand to other metropolitan areas
- Heavy-Duty Vehicles
  - Center around regional goods movement, refuse, transit, and airports
  - Expand to long-haul trucking via targeted corridors
- Simultaneously develop profitable infrastructure and market development of vehicles

# Los Angeles Infrastructure Example of Urban Cluster

- 94 Stations in greater Los Angeles area
- Plus over 200 additional private stations
- Calif. great market opportunity to introduce product
- California has sufficient infrastructure to launch market development for OEMs
- Existing infrastructure can support hundreds of thousands or additional vehicles



# California Goods Movement Traffic

- POLA/POLB goods movement sufficient to build regional HD transportation LNG infrastructure
- Truck OEMs now engaged
- Major trucking fleets are investigating LNG for their fleet as long-term hedge against rising petroleum prices
- Abundance of U.S. natural gas resources (gas shale) and proposed federal policies should jump start market



# National Goods Movement Infrastructure

- 9,600 truck stops nationally
- Need 1,250 LNG truck stops to address a national LNG infrastructure
- Start with trucking infrastructure for regional goods movement
- Expand infrastructure for key N-S and W-E corridors



# Thank you!

For more information, please contact:

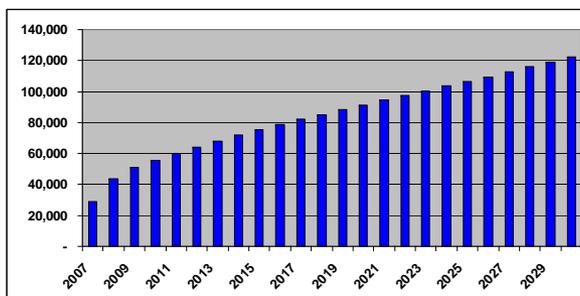
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# Clean Energy Renewable Portfolio

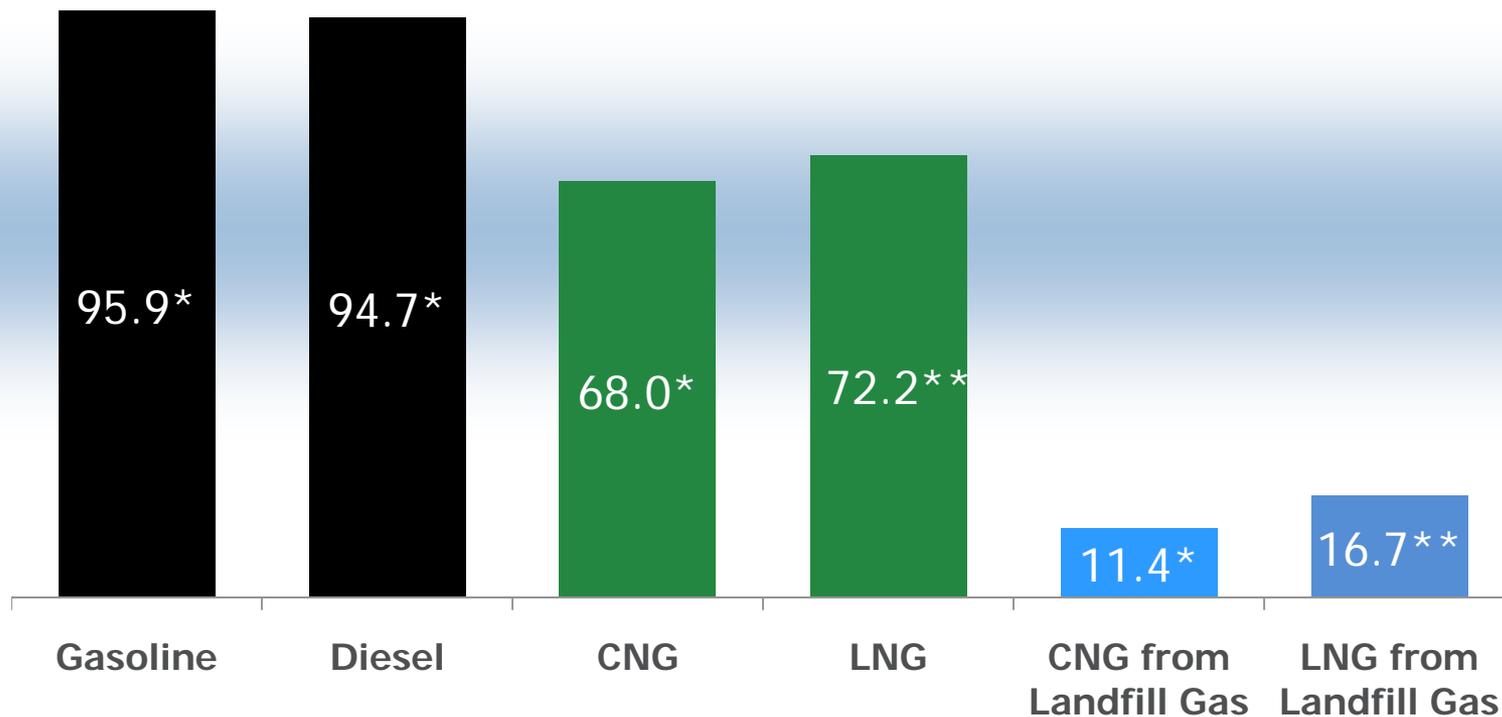
- McCommas Landfill in Dallas
  - One of nations largest landfills
  - Currently producing 3.7 million cubic feet of gas per day into natural gas pipeline (~30,000 GGE/day)
  - Will grow to over 100,000 GGE/day in 15 years
  - Beginning of a renewable portfolio for Clean Energy
  - GHG benefits of renewable natural gas to be shared with customers



# California's Low Carbon Fuel Standard

- Redefining the value of alternative fuels and renewable fuels
  - Natural gas focus always on air quality benefits
  - Newer emphasis on petroleum reduction
  - Adding greenhouse gas (GHG) reductions
- Fuels assessed on Well-to-Wheels in terms of GHG emissions
- Renewable fuels
  - Can currently monetize value in the power generation market especially with the California Renewable Portfolio Standard
  - LCFS will create an opportunity to monetize in the transportation fuels market
- **California goals**
  - **10% reduction in GHGs by 2020**
  - **80% reduction in GHGs by 2050**

## WTW Greenhouse Gas Emissions (in grams CO<sub>2</sub>eq/MJ)



\* CARB Jan 30, 2009 WTW data

\*\* TIAX Report on Boron LNG plant

# GHG Reductions with Natural Gas

Comparison	% Red. GHGs	% Red. With Landfill Gas
CNG vs. Gasoline	29%	88%
CNG (w/SI) vs. Diesel	23%	87%
LNG (w/SI) vs. Diesel	18%	81%
LNG (w/HPDI) vs. Diesel	21%	74%

If all McCommas landfill gas were blended with Clean Energy's current fuel sales – would achieve average of 38% GHG reduction TODAY!

## Conclusions for Renewables

- Renewables are going to play an increased role in natural gas market development strategy
- Other fuels can adopt and use renewables in their fuel strategies
- Natural gas industry can use renewables
  - More cost effectively
  - Without penalties of energy conversion and additional GHG production
- Vast untapped resources
  - Landfills
  - Waste water treatment plants
  - Dairy/cattle
  - Agriculture waste