



California Natural Gas Vehicle Coalition

Presentation to California Energy Commission

January 2009





Natural Gas

The Essential Transportation Fuel for California: 2020 and 2050

AB 32, Low Carbon Fuel Standard, and Governor's Executive Order S-03-05: California is committed to reducing Greenhouse Gas emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050

- 2020: Conventional natural gas is clean, low carbon, affordable, and available
- 2050: Renewable biogas from landfills, animal waste and wastewater treatment is a Super Ultra Low Carbon fuel that transforms an environmental problem into a greenhouse gas solution



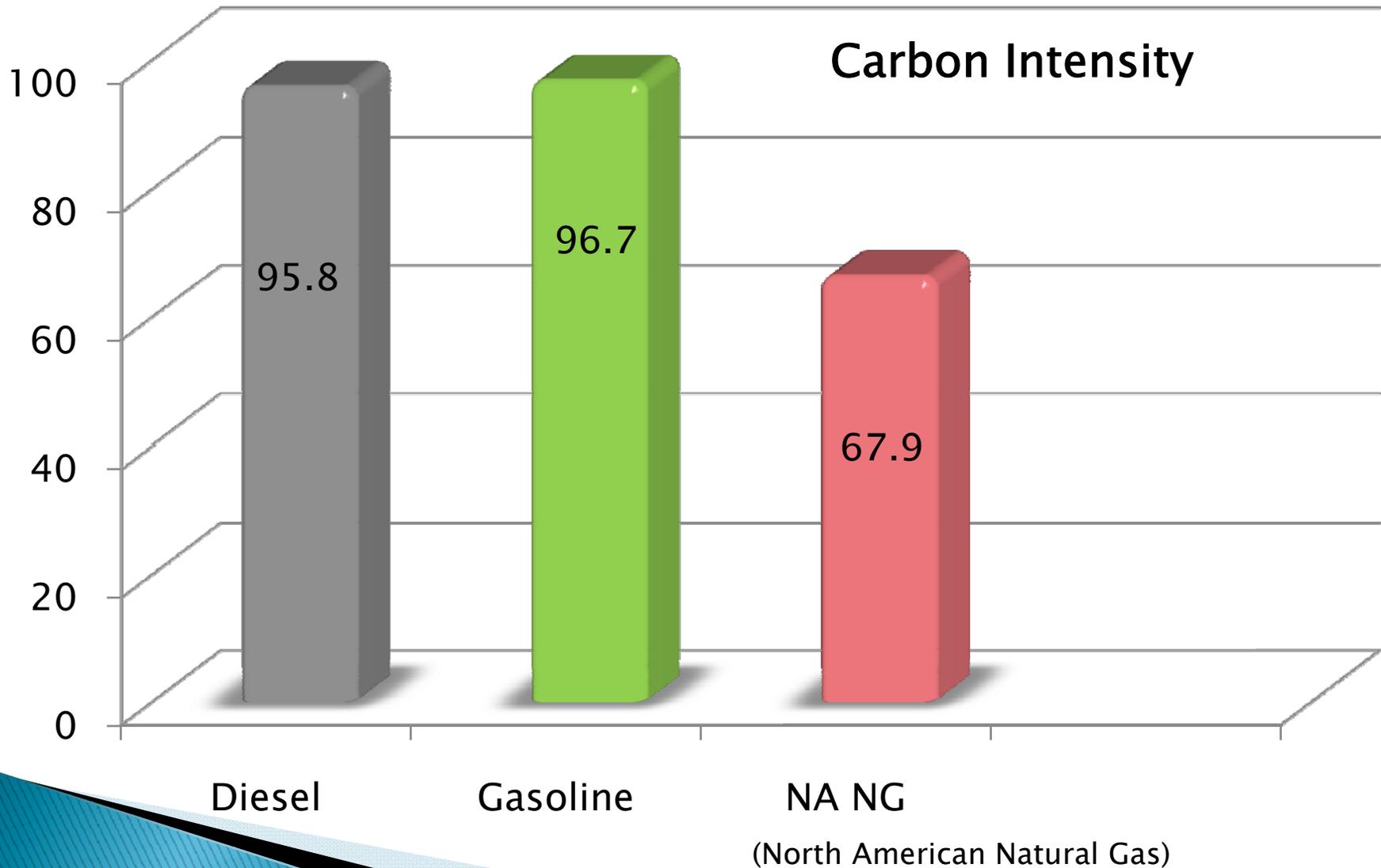
Natural Gas is Clean

Natural Gas is an inherently cleaner burning fuel that lowers tailpipe emissions of criteria air pollutants.

- Light Duty NGVs certified as cleanest fossil fueled vehicles
- Heavy Duty NGVs meet 2010 0.2g NO_x standard, 6x lower than current NO_x standard

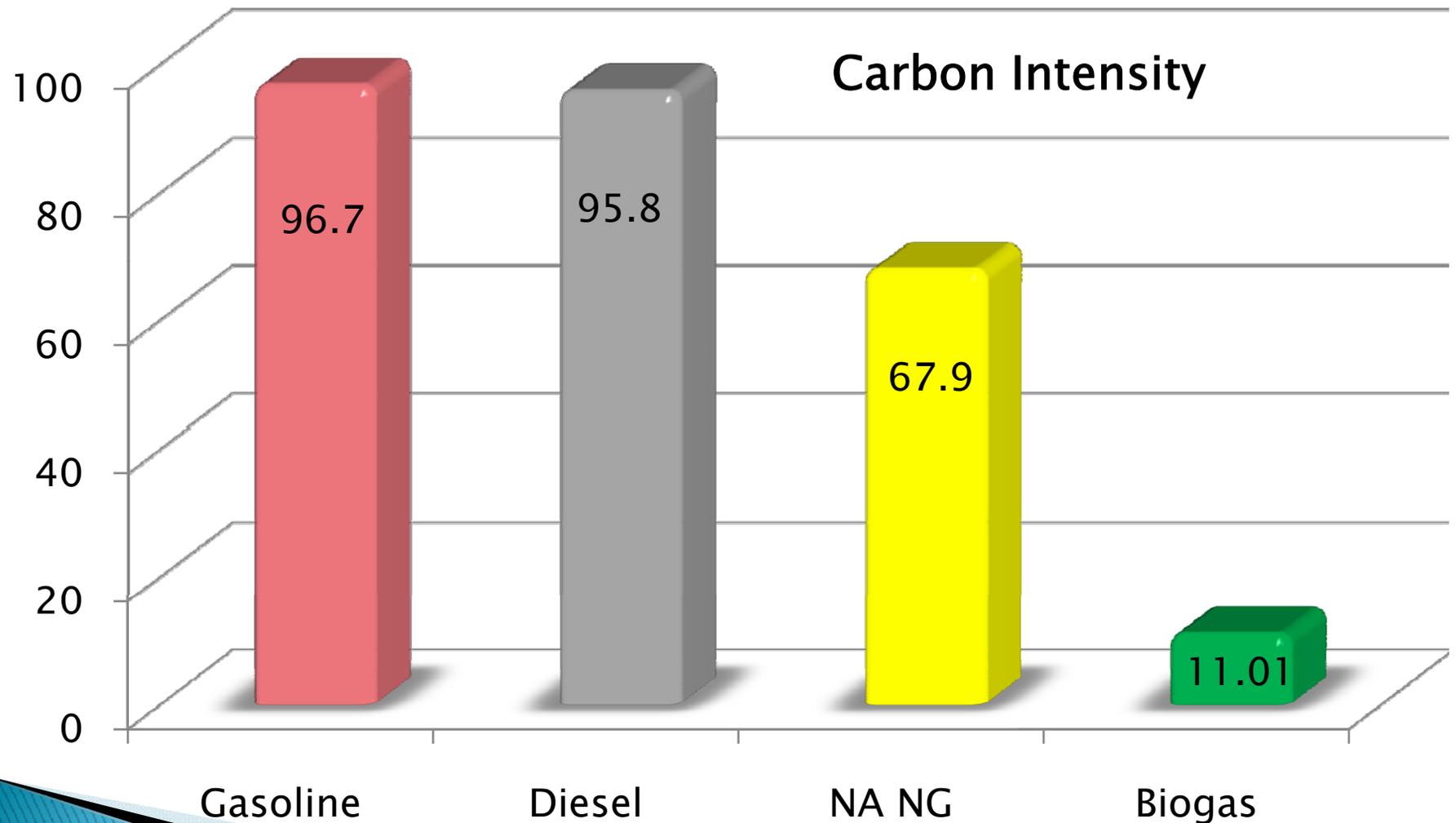


Natural Gas is a Low Carbon Fuel





And Renewable Biogas is a Super Ultra Low Carbon Fuel





NATURAL GAS IS LOW COST

West Coast Average Fuel Prices Oct. 2007 – Oct. 2008 (Clean Cities Survey)

Gasoline	\$3.49/gal	CNG (gasoline gallon equiv.)	\$2.60/gal
Diesel	\$4.01/gal	CNG (diesel gallon equiv.)	\$2.90/gal

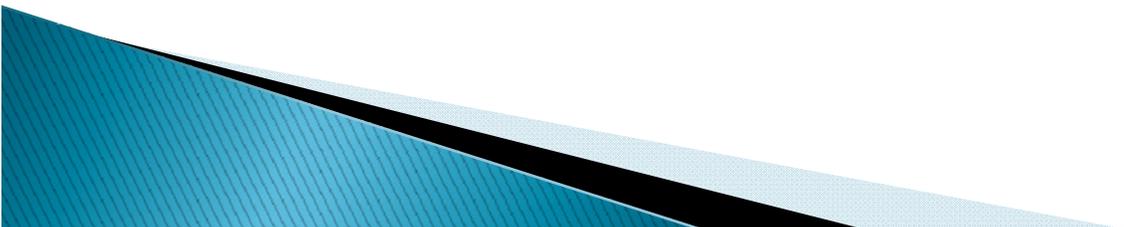
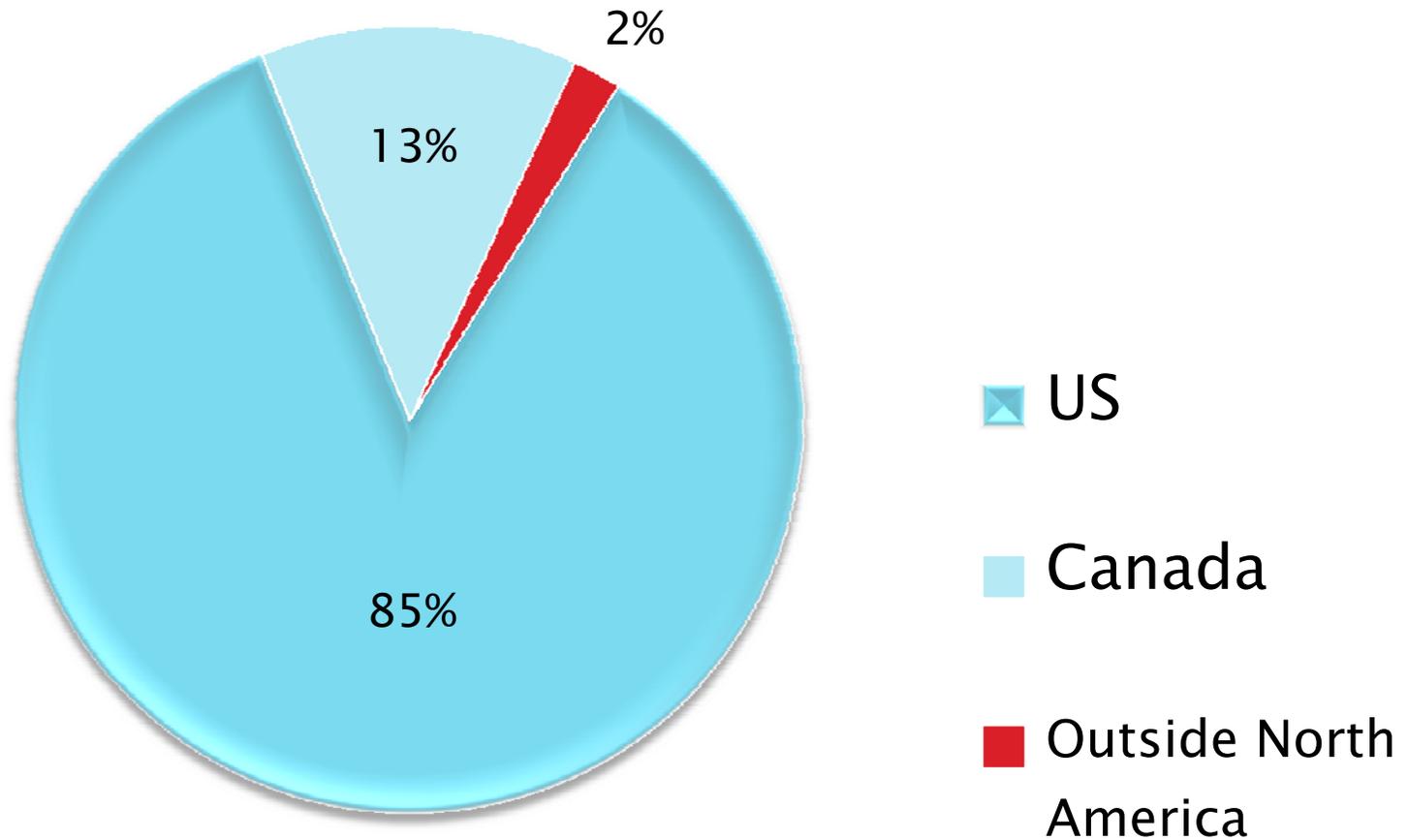
Prices for high fuel use fleets (transit buses, school buses, refuse trucks) are even lower: \$1.45-\$1.85/gal. ~90% of CA CNG used by high use fleets.

“NGVs will have a significant advantage in life-cycle costs when crude oil is priced at \$60/barrel (in 2005 \$\$) on an average life-cycle basis.” (TIAX, 2005)

	<u>Break-Even Price of Oil</u>	<u>Annual Benefit @ \$60/barrel</u>
Refuse Trucks	\$21/barrel	\$4,700
Transit Buses	\$30/barrel	\$2,900
Trucks	\$28/barrel	\$5,300

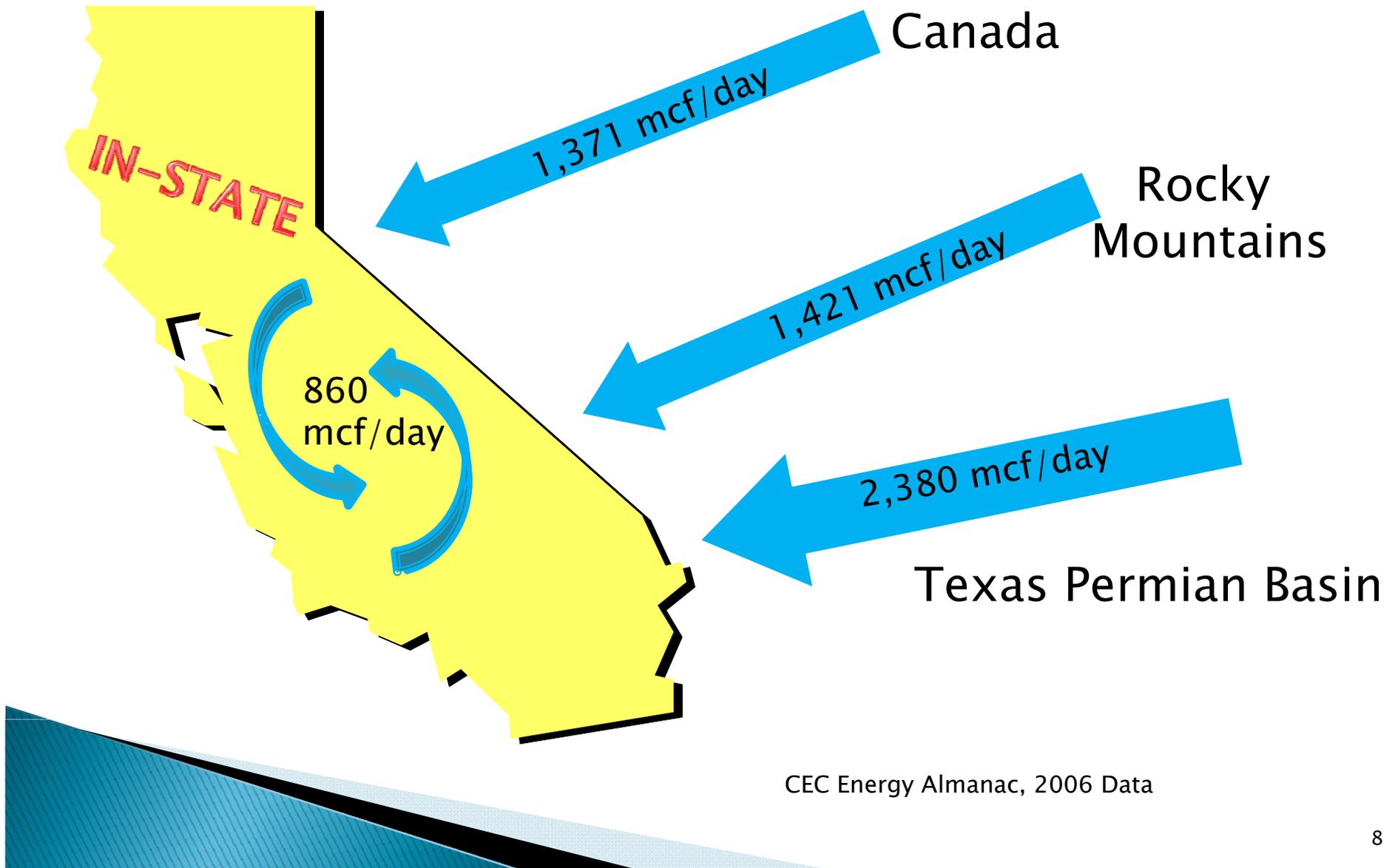


Natural Gas is Abundant, Available and Secure



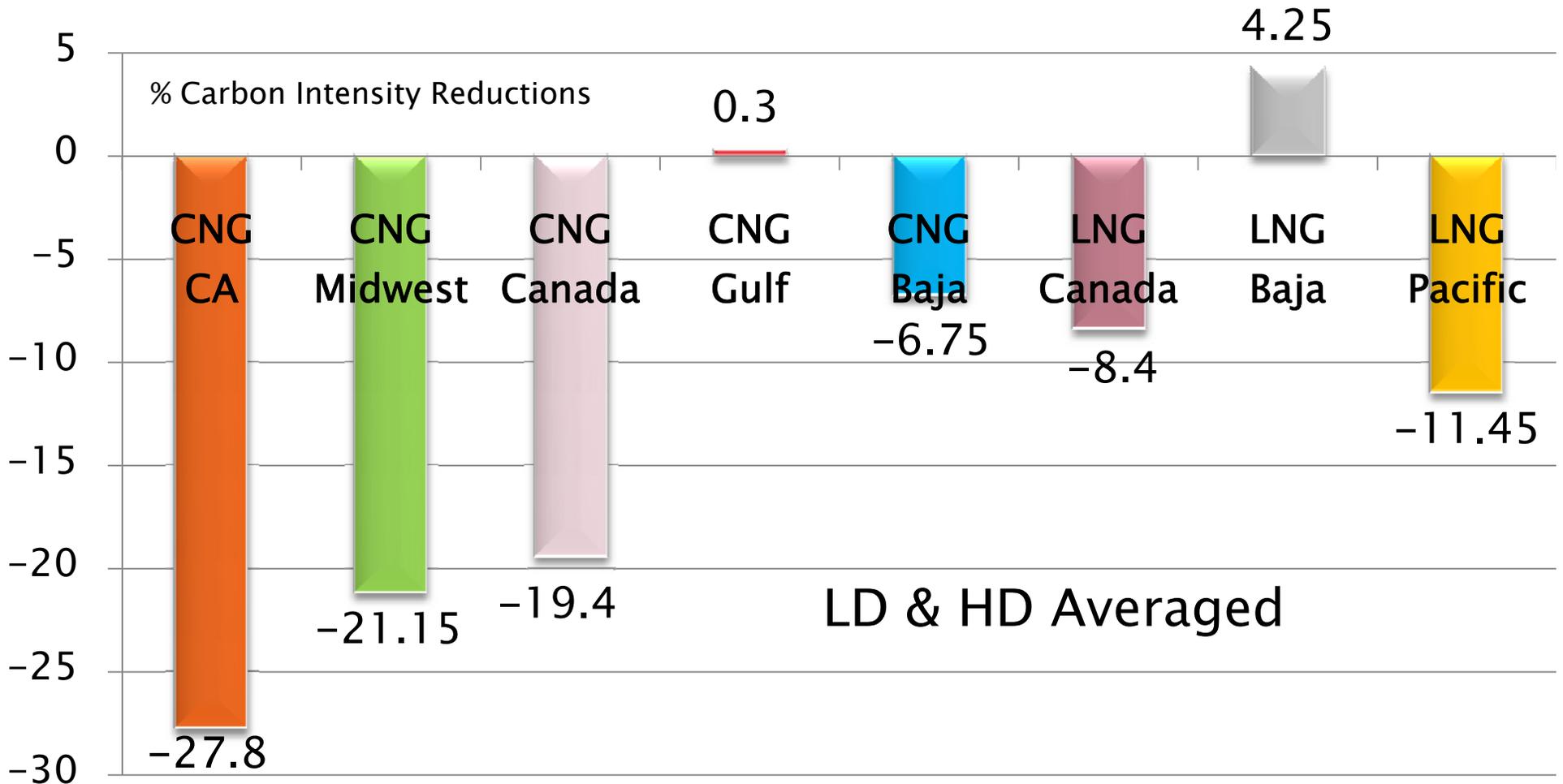


Natural Gas Pathways





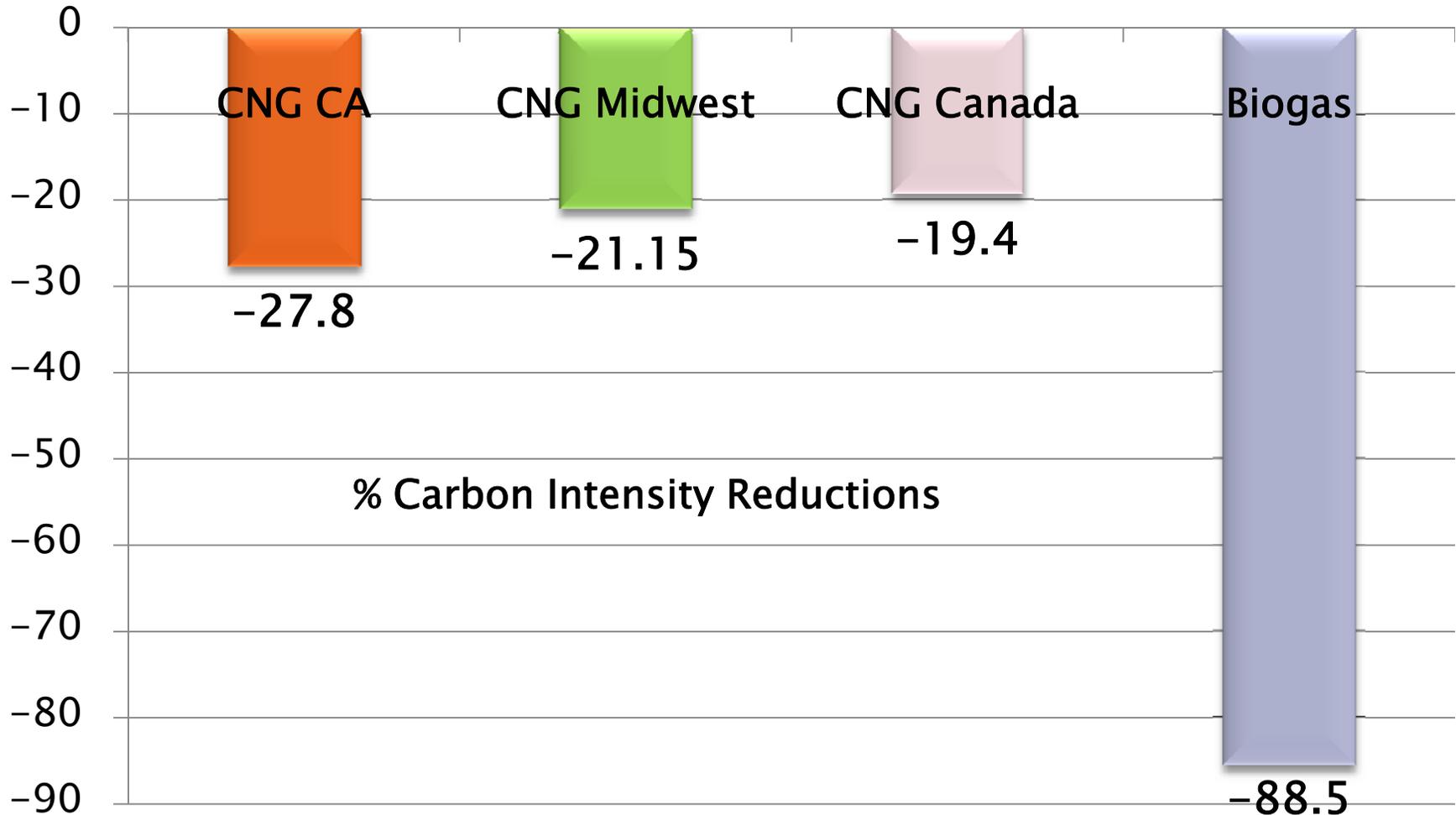
ARB Pathway Analysis of Natural Gas Carbon Intensity vs CARB diesel



ARB Analysis



Carbon Intensity Reductions from Current and Likely Future Pathways of California Natural Gas



% Carbon Intensity Reductions

LD & HD Averaged



Renewable Biogas

A Super Ultra Low Carbon Renewable Transportation Fuel
Made From Human and Animal Waste



Landfill



CAFO

Confined Animal Feed Operations



Wastewater
Treatment



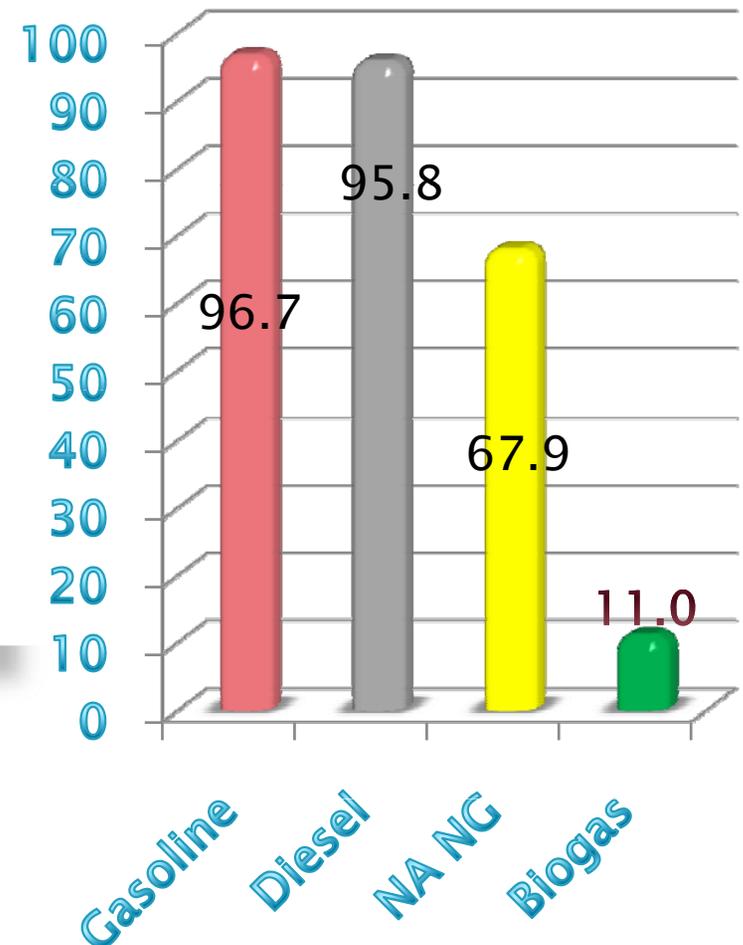
Renewable Biogas

Near Zero GHG Emissions WTW

GHG Emissions (gCO₂e/MJ)

LFG Recovery	0.49
LFG Transport	0.00
LFG Processing	-49.34
Transportation & Distribution	0.06
Compression at Station	2.01
Total (WTT)	46.69
Carbon in Fuel	55.2
Vehicle CH ₄ & N ₂ O	2.5
Total WTW	11.01

Carbon Intensity



ARB, GREET Analysis for CNG from landfill gas, Oct. 2008



How Much Renewable Biogas Available in California?

Estimates of feasibly recoverable biogas per year

Landfill Gas & Wastewater treatment:	106 bcf
Dairy Waste:	15 bcf
TOTAL	121 bcf

Billion cubic feet

CEC, A Roadmap for the Development of Biomass
in California, Nov. 2006

U. Of San Diego, Energy Policy Initiative
Center, Biogas Production and Uses on
California Dairy Farms, Aug, 2007



Recoverable biogas can displace 29% of diesel currently used in California and reduce 8.05 MMTCO₂e

- ▶ 121 bcf biogas recoverable in California
- ▶ 121 bcf equals .86 billion DGE
- ▶ 3.0 billion gallons diesel used in California as transportation fuel in 2007
- ▶ .86 billion DGE biogas would displace 29% of all diesel transportation fuel used in 2007
- ▶ This equals a reduction of 8.05 MMTCO₂e



How Much Renewable Biogas Available in California?

Estimates of future feasibly recoverable bio gas per year

Gasification: 250 bcf

Together with 121 bcf from landfill, waste water and dairy, future Bio-SNG reserves can displace a total of 60% of diesel currently used in California and reduce 16.22 MMTCO₂e.



Renewable Biogas: in California and Beyond

Altamont

Will produce 13,000 gallons per day and over 4 million gallons annually of LNG as a bio-fuels product in California.



McCommas Landfill, TX

- 3rd largest landfill in US
- Producing 3.6 million cubic feet of gas per day



Sweden's highly developed natural gas and biogas infrastructure provides 25% of its energy from biomass.





Natural Gas Vehicles



- ▶ 150,000 Natural Gas Vehicles in U.S.
- ▶ 27,000 Natural Gas Vehicles in California

8.6 million worldwide

In other countries drivers have a wide choice of
NGVs.



World Manufacturers of Natural Gas Vehicles

GM/Opel	Chevrolet	Ford	Mercedes
Volkswagen	Fiat	Citroen	Hyundai
Renault	Peugeot	Tata	Mitsubishi
Toyota	Honda	Nissan	Isuzu
Skoda	Volvo	Geely	Lifan

**GM alone makes 18 NGV
models worldwide**





Austria – Aug 2008 NGV Vehicles



Standard Factory Models

Citroen (3)

Fiat (7)

Ford (3)

Iveco (1)

Mercedes (3)

Opel (3)

Peugeot (2)

Renault (1)

Skoda (1)

Volkswagen (4)

Total 28 Factory Models



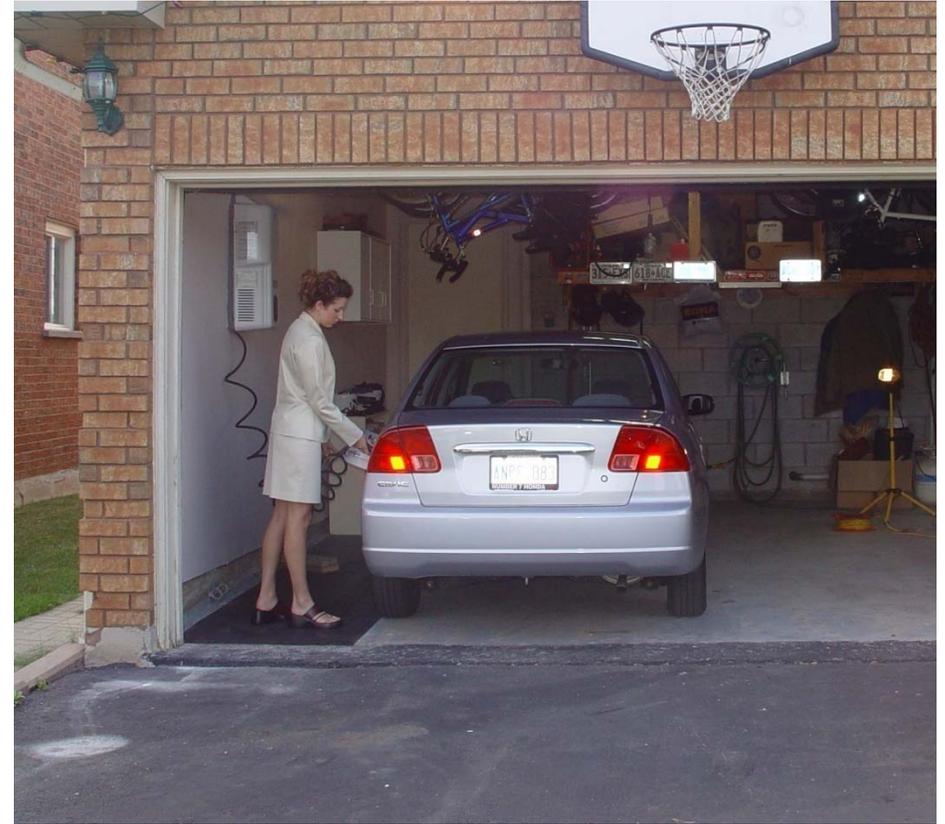
U.S. NGV Applications





Natural Gas Fueling Infrastructure

- ▶ In California we have 425 natural gas fueling stations -more than any other alternative fuel



City of Burbank's 24-hour CNG Fueling Station

Natural Gas Vehicles may also be refueled at home re-fueling stations



What more is needed?

CEC Draft Investment Plan of Dec. 2008 proposes several important project categories that will significantly benefit the expansion of clean renewable gas and are consistent with CNGVC recommendations, including:

- ▶ Incentives for LD, MD, and HD natural gas vehicles for OEM and upfitted vehicles
- ▶ Support development of advanced MD/HD natural gas engines and fueling and fuel storage technologies
- ▶ Increase government fleets and fueling infrastructure
- ▶ Provide incentives for waste water, dairy, landfill and Bio-SNG production
- ▶ Promote mixed use H₂ and H₂/CNG fueling infrastructure as bridge to hydrogen deployment
- ▶ Support for low cost production of H₂ from biomethane



Opportunities for Expanding Clean Natural Gas Vehicles in California

- ▶ Vehicle Incentive/Buydowns
- ▶ Renewable Natural Gas for Vehicle Fuel
- ▶ Vehicle Certification
- ▶ Natural Gas Blends
- ▶ Natural Gas-Hybrids
- ▶ NGV Infrastructure Incentives

