



Dual Fuel Conversion Systems for Heavy Duty Trucks

“We cut your fuel costs”

Ira Dorfman

Senior Director – Business Development

Compressed Natural Gas:

The Natural Alternative in Southeastern PA

March 20, 2012

EcoDual LLC

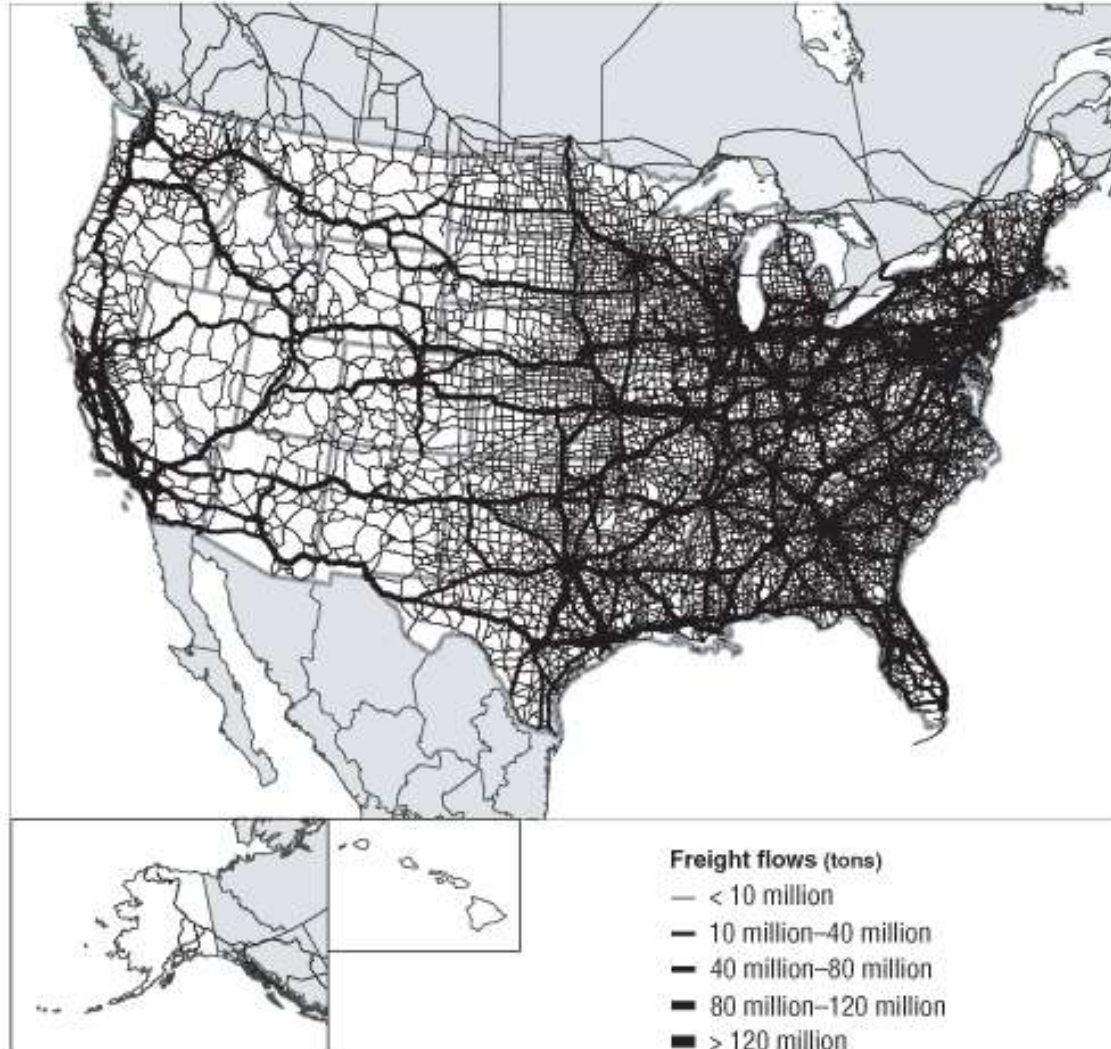
- 💧 A new (2011) company built on 20+ years of dual fuel conversion expertise
- 💧 Systems operating in the US and globally
- 💧 Recently achieved EPA compliance to begin selling and installing systems
- 💧 Offering complete solutions of systems, installations and fueling



Changing Fleet Owner Business Model

- 💧 In the last 4 years, the number of Fleet Owners in the U.S. have reduced from 7,000 to 5,000 due to the economy and increased competition
- 💧 Even the largest, most successful fleet owners operate with only an 1% to 3% profit margin
- 💧 In the last 4 years, large fleet owners are keeping their trucks longer -- from 3 years to now 5 years -- to increase payback and make a profit
- 💧 The percentage yearly operating cost of a Class 7/8 “semi” or “18-wheeler” is now:
 - *Labor 33%*
 - *Fuel 37%*
 - *Lease/Purchase, tolls, insurance, etc – 30%*

Highest Density of Routes are East of the Rockies; Most Fleet Owners Operate Routes < 300 Miles/Day



- 💧 Rail continues to grow because it is lowest cost way to transport goods from East to West Coast and back – rail is 7 time less expensive to ship goods cross-country
- 💧 The rapidly increasing use of intermodal freight transfer is requiring the need for more trucks but shorter routes – “spoke and hub model”
- 💧 The further use of the Panama Canal will increase Class 7/8 truck traffic on the East Coast
- 💧 New Class 8 truck drivers are young and want to go home every night with family
- 💧 115% yearly turn-over rate with drivers
- 💧 The average route of Swift Transportation, the largest independent Class 8 truck fleet, is now 275 miles a day

Why Dual Fuel?



- 🔥 Primary advantage is low cost – payback in 1 year
- 🔥 High reliability and easy maintenance
- 🔥 A Dual Fuel diesel engine is fitted to utilize natural gas as a supplemental fuel. The engine is basically unchanged and continues to use compression ignition of diesel for ignition of the NG fuel.
- 🔥 Class 6/7/8 heavy trucks burn nearly 25% of all the fuel used in US transportation.
- 🔥 No Range Anxiety – automatically runs on 100% diesel if natural gas runs out

Our Dual Fuel Conversion System



- 🔥 Compression ignition with up to 85% natural gas
- 🔥 100% diesel on start
- 🔥 Runs on 100% if NG runs out
- 🔥 Advanced electronic controls continuously adjust
- 🔥 OEM ECU operates normally with no changes



EcoDual System Operation

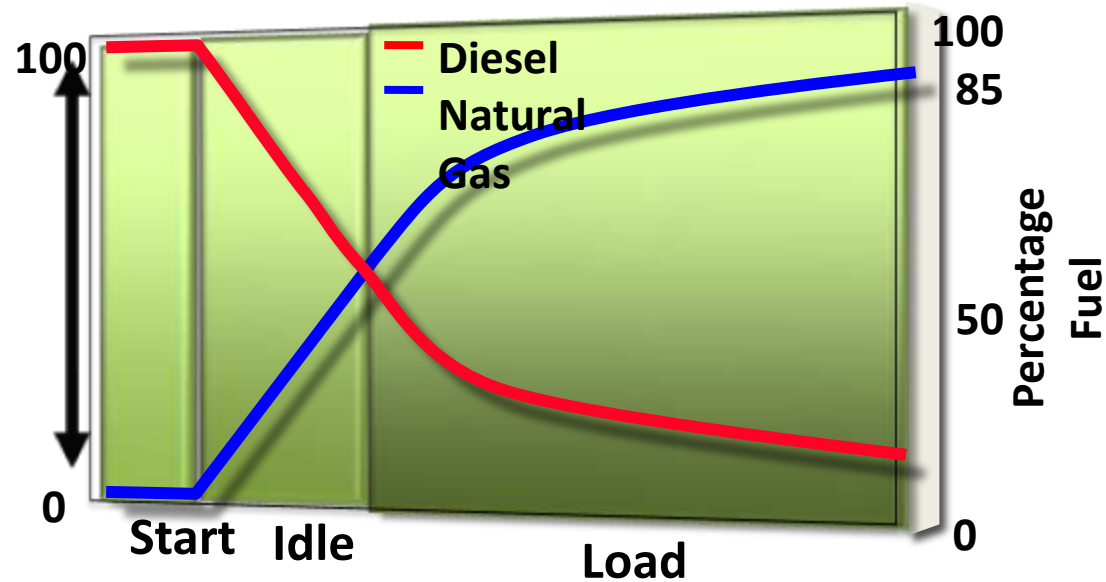


🔥 Advanced, electronically controlled fumigation

🔥 EcoDual system ECU

🔥 Starts on diesel

🔥 Up to 85% NG at highest loads



EcoDual's Patent Pending System



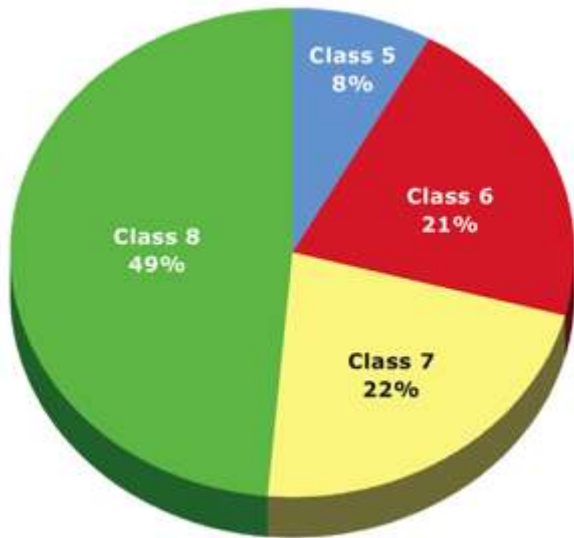
- 💧 **Runs on up to 85% natural gas**
- 💧 **One-year ROI**
- 💧 **No power loss on hills or during acceleration**
- 💧 **No loss in fuel economy (MPG)**
- 💧 **No loss in operating range**
- 💧 **Can use CNG or LNG**
- 💧 **System is installed in 3 hours and the tank in 5 hours**
- 💧 **No mechanical or electrical modifications to original engine**
- 💧 **Does NOT void the engine warranty or reduce resale value**
- 💧 **Reduces all emissions**
- 💧 **More reliable, simpler to maintain, and lower operating cost than 100% natural gas engine**
- 💧 **Significantly quieter than the original engine**
- 💧 **Runs on 100% diesel automatically if natural gas unavailable**



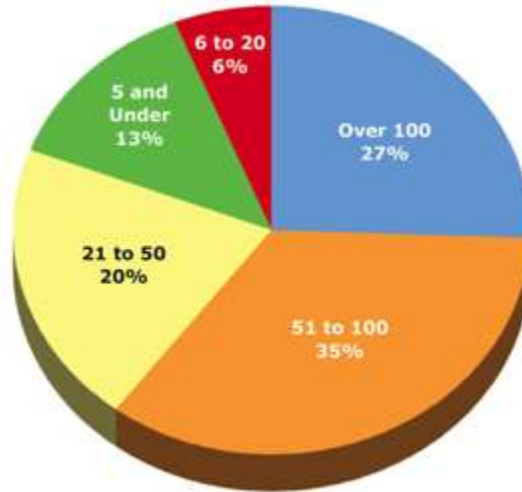
EcoDual's Market – Class 6/7/8



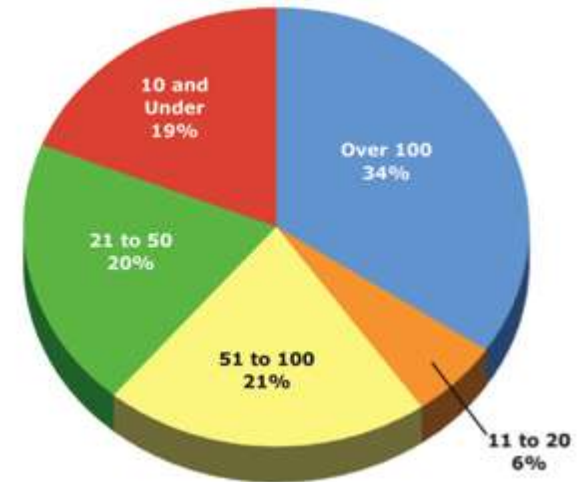
Percentage of Classes of Commercial Vehicles in Operation



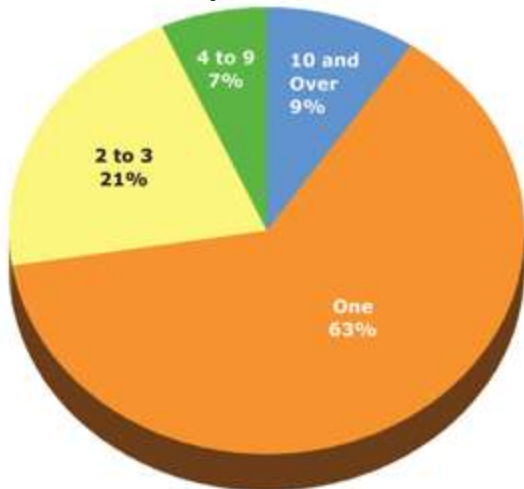
Number of Trucks in All Fleet



Private Fleets

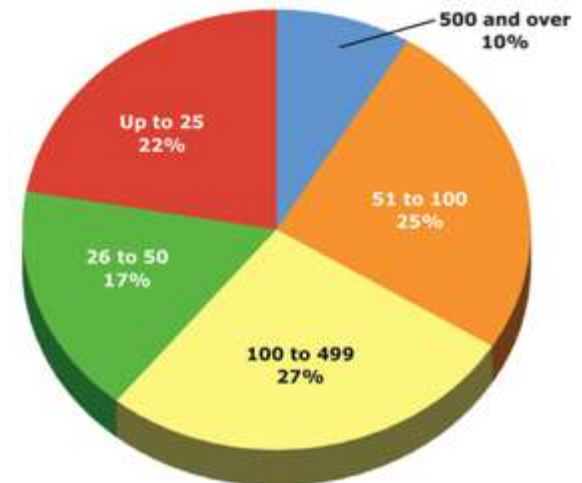


Owner/Operator Fleets



Commercial Trucks in Operation in 2008	
Class 6	1,562,000
Class 7	1,643,000
Class 8	3,608,000
Total Cl. 6/7/8	6,813,000

Commercial Carriers Fleets



70% of the 5,000 fleet owners in the US are small businesses

EcoDual is Ready to Deliver



- 🔥 Approved EPA OUL system for 2004-2009 Cummins ISX
- 🔥 System production ongoing
- 🔥 1000 systems targeted for installation in 2012
- 🔥 Full EPA/CARB certification on ISX is projected by summer 2012
- 🔥 System for Cummins ISM will be available in 2012
- 🔥 Detroit Diesel DD13, DD15 and Series 60 development and certification work ongoing



EPA's Approval List for



Outside Useful Life Clean Alternative Fuel Conversion Systems

Light-Duty and Heavy-Duty Outside Useful Life Clean Alternative Fuel Conversions

<http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm>

Fuel Information		Conversion Manufacturer	Original Vehicle Information					Conversion Vehicle Information		
Conversion Fuel	Original Fuel		Model Year	OEM	OEM Test Group	OEM Evap Families	Eng Disp	Conversion Evap Family	Conversion Test Group	Conversion Models Covered
Diesel or Diesel/CNG	Diesel	American Power Group, Inc.	2004	Caterpillar	4CPXH0928EBK		15.2		BAPGH15.2CP4	C15
Diesel/CNG	Diesel	Clean Air Power, Inc.	1998, 1999, 2000, 2001, 2002	Caterpillar, Inc.	WCPXH0729ERK, XCPXH0729ERK, YCPXH0729ERK, 1CPXH0729ERK, 2CPXH0729ERK		11.9		BCLAH0729E6J	C-12
Diesel/CNG	Diesel	Clean Air Power, Inc.	1998, 1999, 2000, 2001, 2002	Caterpillar, Inc.	WCPXH0893ERK, XCPXH0893ERK, YCPXH0893ERK, 1CPXH0893ERK, 2CPXH0893ERK		14.6		CCLAH0893E6J	C-15
Diesel/CNG/LNG	Diesel	EcoDual LLC	2009, 2008, 2007, 2006, 2005, 2004	Cummins	9CEXH0912XAK, 9CEXH0912XAL, 9CEXH0912XAM, 8CEXH0912XAK, 8CEXH0912XAL, 8CEXH0912XAM, 7CEXH0912XAK, 7CEXH0912XAL, 7CEXH0912XAM, 6CEXH0912XAK, 6CEXH0912XAL, 6CEXH0912XAM, 6CEXH0912XAH, 6CEXH0912XAJ, 5CEXH0912XAH, 5CEXH0912XAJ, 4CEXH0912XAH, 4CEXH0912XAJ		14.9	BEDGE14.9ISX	ISX	
Gasoline/LPG	Gasoline	Parnell USA	2002	Ford	2FMXH05.4BHF	2FMXE0155BAG, 2FMXE0155BAH, 2FMXE0155BBH	5.4	BPRLE0155BAG	BPRLH05.4BH2	F-350 2&4WD

Cummins and Detroit Diesel Engine Families Represent 3 Million Trucks



Engines Manufacturer	Model	Displacement	Horsepower	EPA 2004 - 2006	EPA 2007 - 2009	EPA 2010 - 2012
Cummins – Approx. 31% of our market – mostly ISXs	ISL/ISL9	8.9L	345 - 365	✓	✓	✓
	ISM/ISX12	10.8L/11.9L	280 - 500	✓	✓	✓
	ISX/ISX15	14.9L	385 - 600	✓	✓	✓
CAT - Approx. 19% of our market	C13	12.5L	350 - 525	✓	✓	
	C15	15.2L	435 - 550	✓	✓	
Detroit Diesel - Approx. 25% of our market	MBE 4000	12.8L	350 - 450	✓	✓	
	Series 60	12.7L	380 - 515	✓	✓	
	Series 60	14L)	470- 515	✓	✓	
	DD 13	12.8 L	350 - 470		✓	✓
	DD 15	14.8L	455 - 560		✓	✓
MACK/Volvo Approx. 17% of our market	Maxidyne 370	12.1L	370 /405	✓		
	MP7/D11	10.8 L	325 - 405	✓	✓	✓
	MP8/D13	12.8 L	415 - 505	✓	✓	✓
	MP10/D16	16.1 L	515 - 605		✓	✓

EcoDual & CU-ICAR Development

- 💧 **EcoDual headquarters and development center will be located at CU-ICAR in Greenville, SC**
- 💧 **EcoDual development center will initially focus on building out the Detroit Diesel product line**
- 💧 **EcoDual & ICAR will also pursue longer term major R&D projects for locomotives and novel 100% natural gas engines**
- 💧 **Full testing and fabrication facilities including two AC dynamometer cells**

Near-Term Opportunity for EcoDual System Deployment in Southeastern Pennsylvania

2012 Competitive CMAQ Program

DVRPC has set aside funds to support a Competitive CMAQ Program. Beginning in Fiscal Year 2013, **DVRPC will make a total \$8,000,000 in CMAQ funds available for Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania.** A total of **\$2,600,000 will be available for projects in Burlington, Camden, Gloucester, and Mercer counties in New Jersey.**

Examples of eligible CMAQ projects include pedestrian and bicycle projects, transit improvement programs, congestion reduction and traffic flow improvements, **diesel retrofit projects**, and funding of transportation demand management programs, among others. Public agencies and public – private partnerships with a public agency sponsor are eligible to apply for the Competitive CMAQ Program funds.



Why EcoDual System is Good Match for DVRPC Congestion Mitigation Program



EcoDual will score very well in the DVRPC program evaluation because:



- 💧 The low cost of the fuel system
- 💧 Sizeable reduction in NOx and PM
- 💧 The high mileage/high fuel consumption of the targeted Class 8 trucks

EcoDual is actively recruiting fleets with which to work on proposal submittals through Philadelphia Clean Cities