

CNG/LPG Strategy - Existing & Future

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March 1st, 2013

BUILT Ford TOUGH

The Power of Innovation

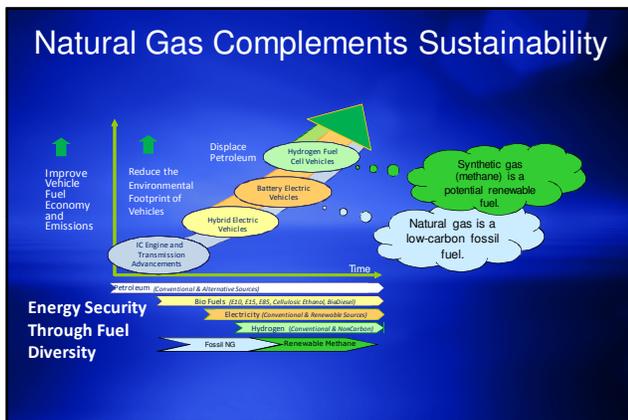
Sustainability at Ford

SUSTAINABILITY
ECONOMICALLY FEASIBLE
SOCIALY RESPONSIBLE
ENVIRONMENTALLY FRIENDLY

The Power of Innovation

Vehicle	All Electric	Plug-in Hybrid	Hybrid	EcoBoost™	E85	CNG/LPG	B20
Focus	⊕						
C-MAX		⊕	⊕				
Fusion		⊕	⊕	⊕			
Taurus				⊕	⊕		
Escape				⊕			
Explorer				⊕			
Transit Connect						⊕	
E-Series Van/Bus					⊕	⊕	
Chassis/ Cutaway					⊕	⊕	
F150				⊕		ID*	
F250-F350					⊕	⊕	⊕
F450-F550						⊕	⊕
F650-F750		⊕				⊕	⊕
Stripped Chassis						⊕	

* In Development



The Power of Innovation

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F450-F550						⊕	⊕
F650-F750		⊕				⊕	⊕
Stripped Chassis						⊕	

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Customer Desire for CNG

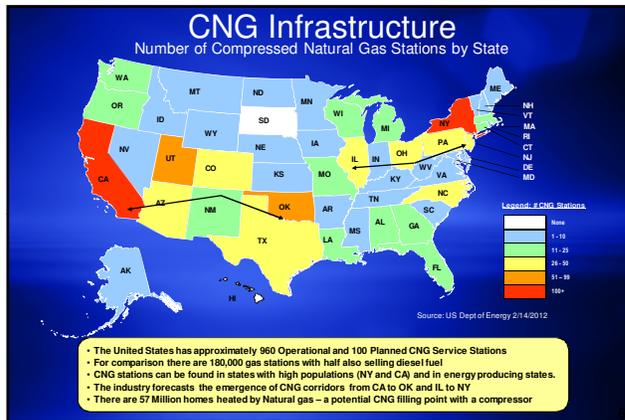


- Abundant
- Affordable
- American
- Clean



Customer Challenges with CNG

- Lower energy density => lower vehicle mileage & unfavorable package
- Additional weight of fuel tanks
- Energy losses for gas compression
- Uprfit costs
- Fueling station costs
- Lack of fueling station infrastructure



CNG Fuel Finder

Google "Smartphone Apps Alternative Fuels"

Search engine provides dozens of smartphone applications that help find CNG stations in your area!



Ford's Propagation of CNG/LPG

- Gaseous Prepped Engine offerings
- Q-185 bulletin (Ford's guide to Product Requirements)
- QVM Gaseous Fuel Qualification for Up-Fitters
- Alternate Fuel Buyer's Guide



QVM Process & Quality

Qualified Vehicle Modifier (QVM) Support



Ford is offering a broad base of vehicles and powertrains that are prepped for CNG up-fit (includes premium valves, valve seats, and spark plugs to maintain high mileage durability)

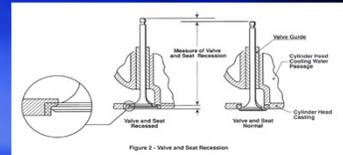


Figure 2 - Valve and Seat Recession

Qualified Vehicle Modifier (QVM) bulletin #Q-185.r1 released in February 2011 added the 2.0L Transit Connect, 6.2L SuperDuty and 6.8L/3V SuperDuty calibration guidance in addition to the previously provided 5.4L 2V and 6.8L 2V E-Series for proper engine operating parameters to maintain Ford base engine warranty coverage.

QVM bulletin #Q-185 communicated on Ford's fleet website www.fleet.ford.com/truckbbas/topics/qvmp.html, as well as industry publications, at fleet events and tradeshows, and through Ford's marketing account managers.



Ford Commercial Vehicle Sustainability



- Concentrate our commercial vehicle efforts on four sustainable technologies:
 - CNG/LPG – Dedicated and Bi-Fuel
 - Hybrid Electric Vehicles (HEV)
 - Plug-In Hybrid Electric Vehicles (PHEV)
 - Battery Electric Vehicles (BEV)
- Partner with proven reliable Up-Fitters for consistent vehicle quality and performance
- Release Up-Fitter guidelines to ensure the highest quality conversions and utility to our customers.
- Develop and produce OEM Prep packages suitable for up-fitting and maintain factory warranties for Ford provided components.



Updated Q-185 bulletin

- In late 2009 we began releasing important engine operating and calibration information to assist our up-fitters in their gaseous fuel conversions.
- The Q-185 bulletin provides detailed engine operating parameters required to maintain Ford powertrain warranties. (example below)
- Calibration information for future offerings will be released several months prior to Job#1 allowing up-fitters to prepare conversions in advance of product availability.

Measured Value	Units	Limits	-2.0L	-6.2L	-6.8L	-5.4L	-6.8L
			4V 14	V8	3V V10	V6	2V V10
Max. Peak Cyl. Pressure	psi	1250	-	X	-	-	-
Max. Mean Peak Cyl. Pressure	psi	1100	-	X	-	-	-
Max. Exh. Gas Port Temp	°F	1600	-	X	-	-	-
Max. Valve temperature	°F	1400	-	X	-	-	-
(280 C)Max. Piston temperature (crown)	°F	536	-	X	-	-	-
(240 C)Max. Piston temperature (Behind top Groove)	°F	464	-	X	-	-	-
(900 C) Max. Spark Plug Tip temperature @ MET +2-degrees	°F	1652	-	X	-	-	-
Max. Continuous Engine Speed	RPM	6000	-	X	-	-	-
Max. Intermittent Engine Speed (fuel shut off)	RPM	6250	-	X	-	-	-



Q-185 / QVM Requirements



- Vehicles must be ordered with the proper sales order code for gaseous fuel prepped engines
- Participate in initial qualification and yearly product quality and manufacturing process assessments.
- Demonstrate calibration meets Q185 Engine Specs.
- Vehicle must meet US Federal, California, or Canadian emissions and F/CMVSS requirements.
- Modifier must provide information to the customer that explains CNG fuel system operation and maintenance.
- Modifier is responsible for warranty of the new CNG fuel system components
- Modifier must provide proper contacts for parts and service of the CNG fuel system



Commercial Vehicle Alternate Fuel Buyers Guide



QVM Qualification for Gaseous Fuel Up-Fitters

- In 2010 Ford began a qualification process for CNG/LPG Up-fitters. In addition to adherence to our Q-185 Bulletin technical requirements, Up-fitters must meet high standards for:
 - Manufacturing
 - Assembly
 - Quality Operating Systems
 - Customer Satisfaction



Gaseous Prepped by Model Year

Avail or Planned Offerings	Prepped Engine	2010 MY	2011 MY	2012 MYTD	Total
Transit Connect	2.0L	-	1366	3479	4845
E-Series - All	5.4L/6.8L	3201	3618	2589	9408
F-Series Super Duty					3389
F250 / F350	6.2L	-	-	2568	
F450 / F550	6.8L 3V	-	146	675	
F650	6.8L 3V	-	-	July 2012	
F53/F59 Commercial Strip Chassis	6.8L 3V	-	143	161	304
Totals		3201	5273	9472	17946

QVM Offerings

QVM							
BAF	CNG	CNG	CNG	CNG	CNG		
Venchurs			CNG				
Roush		LPG	LPG	LPG	LPG	LPG	LPG
LandiRenzo		CNG	CNG	CNG	CNG		
BRC / IMPCO	CNG	CNG	CNG		CNG		
Westport LD			CNG	CNG			
Altech-Eco		CNG	CNG				

Ford's CNG Plans and Policies



- Provide a broad and complete portfolio of CNG prepped engines for commercial vehicle applications
- Build a network of Commercial Vehicle Up-fitters with the experience and competency to provide a "No Compromise" solution to CNG Fleet operators.
- Use existing commercial equipment up-fitters and ship-through locations to provide conversion flexibility and innovation not possible from a single source or modifier.
- Utilize our industry recognized QVM Program to work with Q185 compliant Up-Fitters providing technical requirements for engine conversions ensuring durability and reliability.
- Monitor the market and opportunities to determine if a fully integrated model would support an on-going business case.





Cost of Ownership Example – E-250

GLAD Cost of Ownership (CoO)

Model Year Make	Vehicle A		Vehicle B	
	2012 Gas Engine Ford	2012 CNG Engine Ford	2012 Gas Engine Ford	2012 CNG Engine Ford
Vehicle	E-250 (E2E/750A) XL Crew Cab 158"WB 4x2 5.4L V8 Gas	E-250 (E2E/750A) XL Crew Cab 158"WB 4x2 5.4L V8 CNG	E-250 (E2E/750A) XL Crew Cab 158"WB 4x2 5.4L V8 Gas	E-250 (E2E/750A) XL Crew Cab 158"WB 4x2 5.4L V8 CNG
Price	\$27,507	\$27,507	\$27,507	\$27,507
Net Transaction Price	\$26,007	\$26,007	\$26,007	\$26,007
Depreciation	\$19,032	\$25,297	\$19,032	\$25,297
State Fees	\$2,597	\$3,501	\$2,597	\$3,501
Fuel Costs	\$32,174	\$19,100	\$32,174	\$19,100
Maintenance	\$1,545	\$1,545	\$1,545	\$1,545
Net Operating Cost	\$57,996	\$53,281	\$57,996	\$53,281
Ave. Net Operating Cost per Month	\$1,208	\$1,113	\$1,208	\$1,113
Ave. Net Operating Cost per Mile	\$0.43	\$0.34	\$0.43	\$0.34
Operating Cost less Fuel	\$25,822	\$24,150	\$25,822	\$24,150
Fuel Save per Year	Base	\$3,251	Base	\$3,251
Payback (in Years)	Base	2.4	Base	2.4

- ### Cost of Ownership Assumptions
- Retail calculations
 - Sales tax (6%)
 - 20% down, 80% financed @ 6%
 - Vehicle pricing based on known transaction pricing, not MSRP
 - Fuel prices
 - Diesel - \$4.00
 - Gasoline - \$3.70
 - CNG - \$2.20
 - <http://www.epa.gov/average-cng-prices/Pages/default.aspx>
 - Planned 4 years in service @ 30,000 miles per year
 - Auction prices are estimated based on best available data
 - Fuel economy based on EPA data where available, estimated otherwise

- ### Future Planned Actions
- Continued development and release of new commercial vehicle offerings with gaseous fuel prepped engines
 - Establish seamless process with QVM Up-fitters for warranty repairs and service information
 - Further establish communications and alliances between Up-fitters, Body Builders and ship-through locations
 - Closely monitor CNG industry growth with respect to fuel pricing and demand for potential OEM applications
 - Future product needs:

Vehicle	Engine J#1	Vehicle CNG J#1
Transit	July 2013	September 2013
F-150	TBD	
MKT Town Car	TBD	

Cost of Ownership Example – F-250

GLAD Cost of Ownership (CoO)

Model Year Make	Vehicle A		Vehicle B		Vehicle C	
	2012 Gas Engine Ford	2012 Diesel Engine Ford	2012 Gas Engine Ford	2012 Diesel Engine Ford	2012 CNG Engine Ford	2012 CNG Engine Ford
Vehicle	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 5.2L V8 Gas	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 6.7L V8 Diesel	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 5.2L V8 Gas	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 6.7L V8 Diesel	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 5.2L V8 CNG	F-250 (NDA/800A) XL Crew Cab 156"WB 4x2 5.2L V8 CNG
Price	\$31,321	\$37,928	\$31,321	\$37,928	\$31,321	\$31,321
Net Transaction Price	\$29,921	\$34,528	\$29,921	\$34,528	\$29,921	\$29,921
Depreciation	\$19,146	\$21,193	\$19,146	\$21,193	\$19,146	\$21,193
State Fees	\$2,627	\$3,484	\$2,627	\$3,484	\$2,627	\$3,484
Fuel Costs	\$25,839	\$42,588	\$25,839	\$42,588	\$25,839	\$19,100
Maintenance	\$3,382	\$3,382	\$3,382	\$3,382	\$3,382	\$3,382
Net Operating Cost	\$53,279	\$53,365	\$53,279	\$53,365	\$53,279	\$46,886
Ave. Net Operating Cost per Month	\$1,110	\$1,124	\$1,110	\$1,124	\$1,110	\$980
Ave. Net Operating Cost per Mile	\$0.44	\$0.45	\$0.44	\$0.45	\$0.44	\$0.34
Operating Cost less Fuel	\$27,420	\$31,278	\$27,420	\$31,278	\$27,420	\$24,150
Fuel Save per Year	Base	Base	Base	Base	Base	\$3,251
Payback (years)	Base	4.2	Base	4.2	Base	2.4

The Broadest Product Portfolio

Logos for various Ford technologies: EcoBoost, Flex Fuel, Power Stroke, CNG, LPG, Electric, Plug-in Hybrid, and Hybrid.

