

## Appendix B

### Handbook 130 – Uniform Regulation for Method of Sale of Commodities and Uniform Engine Fuels and Automotive Lubricants Regulation

**Items:**

232-1: Uniform Method of Sale:

2.27. Retail Sales of Natural Gas Sold as a Vehicle Fuel

237-1: Uniform Engine Fuels and Automotive Lubricants Regulation:

Section 1. Definitions – Diesel Liter Equivalent (DLE) and Diesel Gallon Equivalent (DGE)

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# Clean Vehicle Education Foundation



## Proposal for CNG & LNG - DGE

NCWM Interim Meeting  
January 28, 2013

Douglas Horne – President

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# Why DGE is Now Needed by the NGV Market

- In the 1994 NCWM set GGE at 5.66 lbs but deferred the development of DGE because:
  - The consumer market was LD gasoline conversions 
  - and diesel class NGVs were fleets such as transit that use private stations. 
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In the last twenty years the market growth has been in HD vehicles and now a national network of public CNG and LNG fueling is emerging



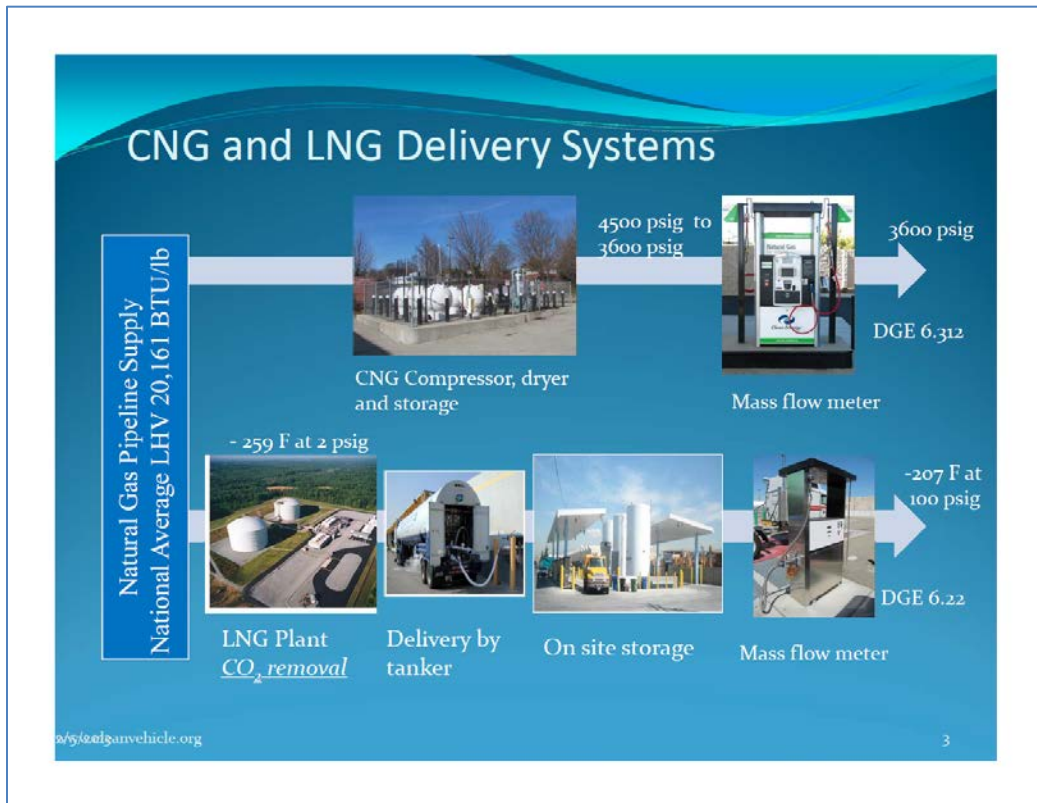
 CNG Class 8

 LNG Class 8

 CNG HD

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### DGE Based on CNG Composition Used in 1994 GGE Calculation

- The 1994 acceptance NCWM of Gasoline Gallon Equivalent (GGE) for natural gas to be equal to 5.660 lbs was based on a national weighted average composition of natural gas
  - energy content (lower heating value – LHV) of 923.7 BTU/scf
  - density of 0.0458172 lbs/scf
  - or 20,160,551 BTU/lb
- Using the the same natural gas composition and the ratio of the LHV of diesel to the LHV of gasoline as noted in Table B.4 of the DOE Transportation Energy Data Book
  - $128,700/115,400 \times 5.660$  gives the Diesel Gallon Equivalent (DGE) of 6.312 lbs
- For those NGVs that use CNG as a replacement for diesel then the average energy equivalent per gallon would be 6.312 lbs

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## DGE Based on LNG Composition

National Average Natural Gas Composition Used for GGE Standard - Applied to LNG DGE Calculation							
Components	CNG			LNG			
	LHV - BTU/LB	LBS/CF	%V <sup>1</sup>	%V <sup>2</sup>	LBS/CF	%MASS	LHV
C1	21537	0.0425	92.87	93.59	0.039777614	87.9239176	18936.17413
C2	20394	0.0803	3.34	3.37	0.00270294	5.974542668	1218.448232
C3	19807	0.1196	0.63	0.63	0.000759357	1.678473095	332.4551659
i-C4	19529	0.1582	0.07	0.07	0.000111604	0.246887517	48.17560525
n-C4	19815	0.1582	0.12	0.12	0.000191321	0.422892887	83.79622551
i-C5	19478	0.1907	0.04	0.04	7.8875E-05	0.169923459	33.09769129
n-C5	20485	0.1907	0.03	0.03	5.76562E-05	0.127442594	26.10661539
C8	19403	0.0228	0.05	0.05	1.14889E-05	0.025394958	4.927383785
N2	0	0.0744	2.07	2.09	0.001552093	3.430725227	0
CO2	0	0.117	0.78		0	0	0
			100	100	0.045240948	100	20683

Diesel<sup>3</sup> LHV= 128,700

LNG - DGE= 6.22

<sup>1</sup> CNG national average composition of natural gas from the NCWM Laws and Regulations - CNG Working Group letter 10/18/1993 Appendix A. Conversion Factor Background

<sup>2</sup> LNG composition based on CNG composition with CO2 removed

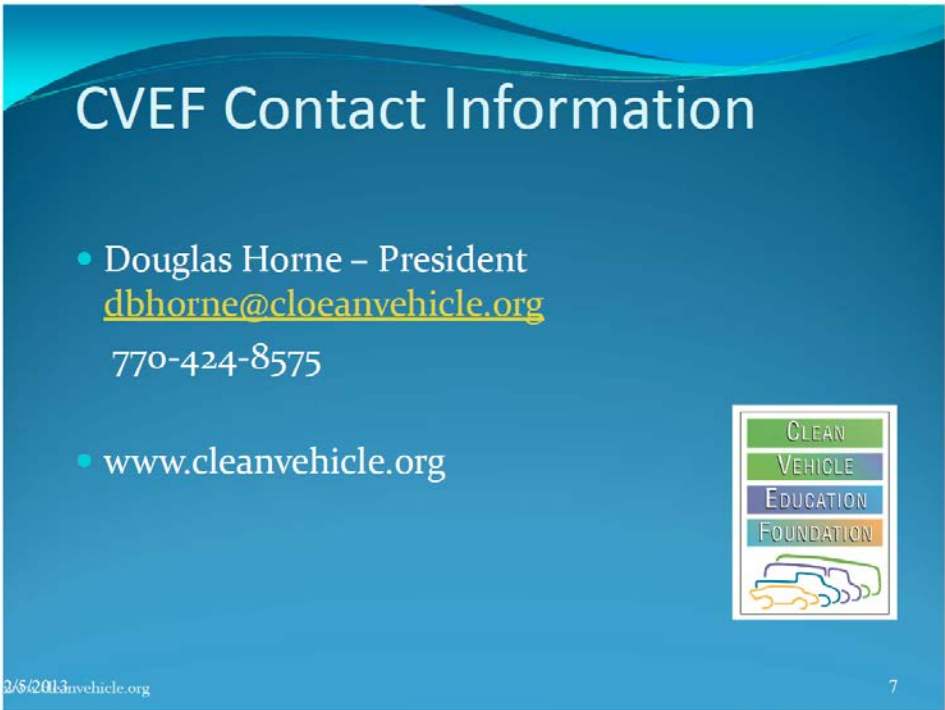
<sup>3</sup> DOE Transportation Energy Data Book Table B.4

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## Proposal


- CNG dispensers may dispense natural gas in two units:
  - GGE = 5.66 lbs
  - DGE = 6.312 lbs
- LNG dispensers will dispense LNG in one unit:
  - DGE = 6.22 Lbs

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The slide features a blue background with a white wavy line at the top. The title 'CVEF Contact Information' is in white. The contact information is listed in white text with a blue bullet point. The logo is a vertical stack of four colored boxes (green, blue, purple, orange) with the text 'CLEAN VEHICLE EDUCATION FOUNDATION' and a stylized car icon below. The footer contains the date and website URL on the left and the number 7 on the right.