



# Regulatory Advisory

February 2014



## Low Carbon Fuel Standard Regulatory Advisory 14-01

### Conversion of Compressed Natural Gas From Pounds to Standard Cubic Feet For Purposes of Reporting Compressed Natural Gas Transactions Under The California Low Carbon Fuel Standard

#### BACKGROUND AND SCOPE

Regulated parties selling compressed natural gas (CNG) as transportation fuel in California must report their transactions under the California Low Carbon Fuel Standard (LCFS) in units of standard cubic feet (scf) (California Code Regulations, title 17, §95484 (b)(3)(B)1). This Advisory provides specific guidance to CNG providers on how to calculate scf for purposes of complying with the LCFS reporting requirements.

All fuel transactions must be reported quarterly and annually ((California Code of Regulations, Title 17, §95484 (b)(3)). Quarterly and annual transactions reports are entered into or uploaded to the LCFS Reporting Tool (LRT). The LRT then calculates the credits or deficits associated with the reported fuel volumes using the formula specified in the regulation at California Code of Regulations, title 17, §95485(a)(3). In the case of CNG, that formula is as follows:

$$\left( \text{Baseline CI} - \left( \frac{\text{Pathway CI}}{\text{EER}} \right) \right) \times (\text{Reported scf} \times \text{Energy Density} \times \text{EER}) \times 0.000001$$

Where:

“Baseline (CI)” is either the gasoline or diesel baseline carbon intensity, depending upon the type of fuel being reported. The 2014 baseline CIs are 97.47 and 96.56 gCO<sub>2</sub>e/MJ for gasoline and diesel, respectively (Tables 1 and 2, California Code of Regulations, title 17, §95482(b)).

“Pathway CI” is the carbon intensity of the fuel that is being reported (California Code of Regulations, Title 17, §95486). CI values are denominated in units of grams of CO<sub>2</sub>-equivalent emissions per megajoule of fuel energy produced (gCO<sub>2</sub>e/MJ).

“EER” is the fuel’s energy-economy ratio. The EER is a unitless factor used to adjust CI values to reflect the relative efficiency of the vehicle’s drive train. EERs are found at California Code of Regulations, title 17, §95485(a)(3)(B) and (C).

“Reported scf” is the volume of fuel reported in the fuel transaction.

“Energy Density” is the amount of energy (in megajoules) contained in each unit of fuel (Table 4, California Code of Regulations, title 17, §95485(a)(1)).

0.000001 is the factor that converts greenhouse gas emissions expressed in units of gCO<sub>2</sub>e/MJ into units of metric tons of carbon dioxide equivalent greenhouse gases (CO<sub>2</sub>e). LCFS Credits and deficits are denominated in units of metric tons of CO<sub>2</sub>e.

Table 4 of the LCFS regulation (California Code of Regulations, title 17, §95485 (a)(1)) specifies the current energy densities of California reformulated gasoline (115.63 megajoules per gallon), natural gas (0.98 megajoules per scf), and other transportation fuels. Those Table 4 values are the only ones that may be used for reporting fuel transactions under the LCFS. For example, it is not appropriate to convert pounds to scf using the figure 5.66 lbs. of natural gas per gallon of gasoline, because that figure was derived (by the National Institute of Standards and Technology) from gasoline and natural gas energy density values which are different from those appearing in Table 4 of the LCFS regulation.<sup>1</sup>

CNG is typically dispensed in units of pounds. Regulated parties must therefore convert pounds of CNG sold into scf in order to complete their quarterly and annual LCFS reports. This conversion is accomplished as follows:

1. Divide total pounds of CNG sold by the mass density of natural gas. The CA-GREET 1.8b mass density value of 20.4 grams/scf should be used for this purpose<sup>2</sup>.
2. Convert the result to scf using the standard conversion factor of 453.59 grams/lb. Example: 100 lbs CNG would be converted to scf of CNG as follows:

$$100 \text{ lbs CNG} \times \frac{\text{SCF}}{20.4 \text{ grams}} \times \frac{453.59 \text{ grams}}{\text{lb}} = 2,223.48 \text{ SCF}$$

---

<sup>1</sup> National Institute of Standards and Technology, 2005. SPECIFICATIONS, TOLERANCES, AND OTHER TECHNICAL REQUIREMENTS FOR WEIGHING AND MEASURING DEVICES, NIST Handbook, 44. Standard S.5.1. of that document (“Marking of Gasoline Volume Equivalent Conversion Factor”) states that a device dispensing compressed natural gas shall have either the statement “1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 1994) The NIST standard is based on the following 1994 energy density values for U.S. gasoline and natural gas: 114,118 Btu/gal for gasoline and 20,161 Btu/lb for natural gas. For comparison with the energy density values appear in Table 4 of the LCFS regulation, these values convert to about 120.39 megajoules per gallon for gasoline and 0.96 megajoules per scf for natural gas. The corresponding Table 4 values are given in this Advisory.

<sup>2</sup> California-Modified Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation model (CA-GREET), Version 1.8b. Cell E45, “Fuel\_Specs” tab. CA-GREET is available for download at [http://www.arb.ca.gov/fuels/lcfs/ca\\_greet1.8b\\_dec09.xls](http://www.arb.ca.gov/fuels/lcfs/ca_greet1.8b_dec09.xls)