Natural gas in the transport sector in EU MS - Tax level and consumption

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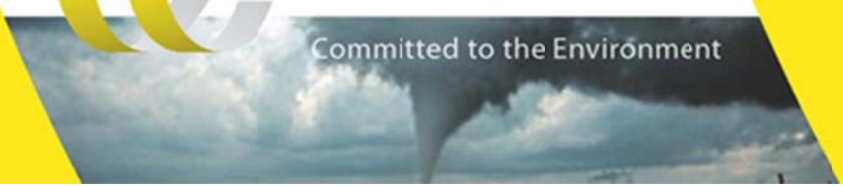

Natural gas in the transport sector in EU MS - Tax level and consumption

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1 Introduction

The aim of the study is to compare the tax rates that the 28 EU member states and Switzerland and Norway levy on the use of natural gas in transport to the tax levels for diesel and petrol. This study provides insight in the tax differences between natural gas/biomethane (CNG/LNG) and conventional diesel; note that this study does not investigate vehicle taxes.

This short report is structured as follows:

- in the next section we will discuss the tax rate of natural gas, biomethane, diesel and gasoline in transport per country;
- in Section 3 we will provide an overview of the final energy consumption in road transport of these fuels;
- in Section 4 we will discuss the total fuel tax income loss per country by comparing the natural gas fuel tax with the diesel fuel tax[1];
- in the last chapter we present our conclusions.

2 Overview of fuel tax rates

The road fuel taxes and VAT per EU member state are listed in the EC Excise duty tables; the most recent version is from July 2016 (European Commission, 2016). We collected the fuel taxes and VAT from Norway and Switzerland from the national tax organisations. Whenever there was a different tax rate depending on the sulphur content of diesel and petrol, we quoted the low-sulphur content tax rates.

Generally, the excise duty tables do not differentiate between natural gas, CNG, LNG or biomethane, bio-CNG and bio-LNG. In order to collect the tax rates for CNG, LNG and the biogases, we sent an e-mail survey to all country contact persons in the EU excise duty tables document[2]. Some missing information is collected mainly from the national governments websites and the RES Legal database (RES Legal, 2016). The references are provided in detail per country and are listed below Table 1. It was not possible to make a distinction between heavy and light duty vehicles.

Tax rates in other currencies than the euro are converted to euro by the ECB exchange rates of 1 October 2015, in line with the exchange rates used in the EC Excise duty tables. Please note that the tax rates are converted to €/GJ; in the case of natural gas the energy content and energy density (gross calorific value based) are different per country, it is not a unique value and not known specifically for the CNG and LNG at hand. This will result in some uncertainty in the natural gas tax levels in €/GJ, for completeness all unit conversion factors are given in Annex A.

Table 1 on the next page gives an overview of the results of the inventory.

[1] It cannot be determined if petrol or diesel is replaced by natural gas or biomethane, we choose to take diesel as a reference since it is the most consumed fuel in road transport in the EU28 (Eurostat, 2016).

[2] The following countries did not reply on our request: AT, BG, GR/EL. FI, FR, MT, RO, UK.

Table 1 Overview of fuel taxes on road fuels in EU28, Norway and Switzerland (situation July 2016) in €/GJ

Country	Fossil reference		Fossil gas			Renewable gas			Other	Vat (%)
	Diesel	Petrol (unleaded)	Natural gas (transport)	CNG	LNG	Biomethane (transport)	bio-CNG	bio-LNG		
European Union	9.22	11.29	2.60							
Austria	11.09	15.16	1.66			0.00				20%
Belgium	12.98	19.47	0.00	0.00	0.00	0.00	0.00	0.00	0.1753	21%
Bulgaria	9.23	11.42	0.43							20%
Cyprus	12.57	15.06	2.60	2.60	2.60	2.60	2.60	2.60		19%
Czech Republic	11.26	14.86	0.70	0.70	0.70	0.00	0.00	0.00		21%
Germany	13.14	20.58	3.86	3.86	3.86	3.86	3.86	n.a.		19%
Denmark	11.62	19.22	11.46	11.46	11.46	10.08	10.08	10.08		25%
Estonia	12.51	14.62	0.00	0.00	0.00	0.00	0.00	n.a.		20%
Greece	9.22	21.07	0.00							13%
Spain	9.25	13.36	1.15	1.15	1.15					21%
Finland	14.14	21.42	4.84							24%
France	13.91	20.16	1.05			1.05				20%
Croatia	11.19	15.89	0.00	0.00	0.00	0.00	0.00	0.00		25%
Hungary	9.85	12.06	2.63	2.63	6.21	2.63	2.63	6.21		27%
Ireland	13.38	18.48	2.60	2.60	2.60	1.57	1.57	1.57		23%
Italy	17.25	22.91	0.09			0.09				22%
Lithuania	9.22	13.66	6.56	6.56	6.56	6.56	6.56	6.56		21%
Luxembourg	9.36	14.53	0.00	0.00	n.a.	0.00	0.00	n.a.		8%
Latvia	9.53	13.71	2.67			0.00				21%
Malta	13.20	17.28	0.00							18%
Netherlands	13.53	24.21	4.57	4.57	4.31	4.4	4.57	4.31		21%
Poland	9.60	12.93	3.18	3.18	3.63	0.00	0.00	0.00		23%
Portugal	13.03	20.49	3.25							23%
Romania	12.00	14.49	2.79			2.79				20%
Sweden	17.39	21.16	6.66	6.66	6.66	0.00	0.00	0.00		25%
Slovenia	13.21	17.22	3.45	3.45		0.00	0.00	0.00		22%
Slovakia	10.79	16.75	2.60	2.60	n.a.	n.a.	n.a.	n.a.		20%
United Kingdom	18.83	21.20	6.59	6.59	6.59	6.59	6.59	6.59		20%
Norway	13.47	19.82	2.22	2.22	2.22	0.00	0.00	0.00		25%
Switserland	19.44	21.09	4.01	4.01	4.97	0.00	0.00	0.00		8%

Note: It might well be that the tax level is not defined formally and is subject to Article 2.3 of EC Directive 2003/96/EC stating: "When intended for use, offered for sale or used as motor fuel or heating fuel, energy products other than those for which a level of taxation is specified in this Directive shall be taxed according to use, at the rate for the equivalent heating fuel or motor fuel". In that case the biomethane is taxed as natural gas etc., and also CNG will be taxed as natural gas.

Remarks:

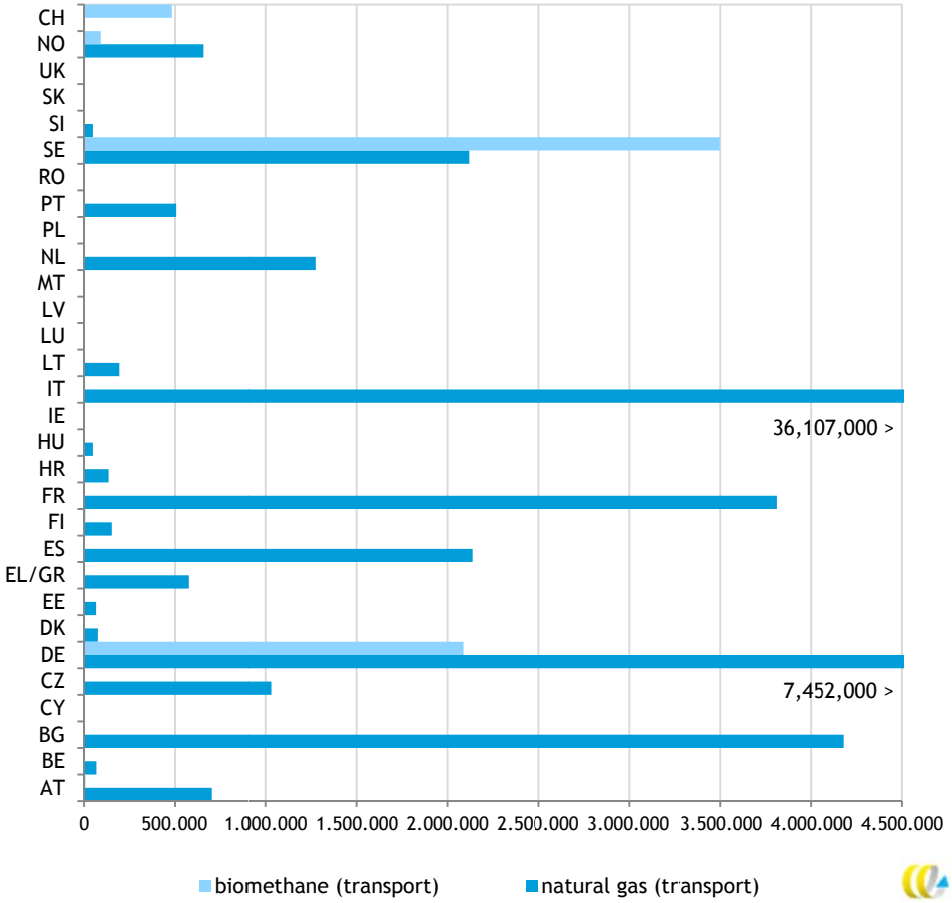
- **EU:** minimum excise duty levels. Article 15.1 (h) allows for deductions on natural gas used as propellants. References: (1);
- **AT:** biomethane is only exempt from tax in the case of 100% biomethane without blending in the gas grid; no response on survey. References: (2, 14);
- **BE:** no excise duty on natural gas, but a federal contribution applies (stated under 'Other'); References: (2, 15, 49);
- **BG:** no response on survey, RES Legal (RES Legal, 2016) mentions no tax exemption for biogas. References: (2);
- **CY:** References: (2, 33);
- **CZ:** References: (2, 37);

- **DE:** biomethane in transport was until 2016 free from fuel tax; after 31 December 2018 natural gas, CNG and LNG are taxed at a higher rate (about 2.3 times higher). References: (2, 17 18, 26);
- **DK:** Including a CO_2 tax of 1,31 €/GJ, not levied on biomethane. Only pure biomethane has a reduced tax rate, when mixed with NG the NG tax rate applies. References: (2, 31);
- **EE:** taxes increases from February 2017 (diesel: 13.77; petrol 16.10) and July 2017 (natural gas/CNG: 1.27; LNG: 1.23). Formally only gaseous biogases are free of excise duty. References: (2, 23, 24);
- **EL/GR:** no response on survey. References: (2);
- **ES:** no response on survey. References: (2, 41);
- **FI:** no response on survey. References: (2);
- **FR:** the excise duty includes a CO_2-tax; no response on survey. References: (2);
- **HR:** References: (2, 19, 20, 39);
- **HU:** LNG is until April 2017 taxed as LPG, thereafter as natural gas. References: (2, 46);
- **IE:** natural gas is currently not used as a propellant: CNG not significantly and LNG/biomethane/bio-CNG/bio-LNG not at all. References: (2, 28);
- **LT:** References: (2, 50);
- **LU:** LNG is not available in Luxembourg. References: (2, 29);
- **LV:** References: (2, 42);
- **MT:** no response on survey, but natural gas is currently not used as a propellant in Malta. References: (2);
- **NL:** LNG, € (336.34-125) /1000 kg; same as LPG with a refund of € 125 /1000 kg for 2014-2018. No survey send. For natural gas (transport) we took the value of CNG. References: (2, 11);
- **PL:** Excise duty including fuel tax. For natural gas (transport) we took the value of CNG. References: (2, 36);
- **PT:** value from survey, the EC Excise Duty tables quote a value of 3.21 incl. 0.37 CO_2-tax. References: (2, 44);
- **RO:** References: (2, 21);
- **SE:** References: (2, 35, 43);
- **SI:** fossil fuels includes CO_2-tax in the amount of 0,874 € per GJ 0,0331 € per m3 (Energy value (GCV): 1000 m3 = 37,9 GJ) . References: (2, 39);
- **SK:** for petrol we used the arithmetic mean of different fuel types depending on biofuel content, for diesel the tax level of diesel with <6.9% biodiesel. References: (2, 22, 38);
- **UK:** no response on survey. References: (2, 50);
- **NO:** fossil fuels include a CO_2-tax, which is not liable to biomethane products. References: (3, 4, 5, 6, 7, 34);
- **CH:** includes mineral oil and CO_2-tax. References: (8, 9, 10, 27).

3 Final energy consumption in road transport

The final energy consumption in road transport is given by Eurostat (Eurostat, 2016). The most recent data is from 2014 and covers natural gas and biogas consumption in the EU28 and Norway. Data for Switzerland for natural gas in road transport specifically, was not found. The biogas consumption is not significant (or unknown/confidential) for many countries. Table 2 and Figure 1 give an overview, no data is available for (bio-)CNG and (bio-)LNG.

Figure 1 Final energy consumption of natural gas and biogas in road transport in GJ



Note: most recent data of 2014 from Eurostat; note that when Eurostat reports a zero, the final energy consumption is either not significant, not available, confidential or indeed zero. The data for Denmark is gather in the e-mail survey and is not of 2014 but 2015, see reference (31).

Table 2 **Overview of final energy consumption in road transport for natural gas and biomethane in EU28 (data of 2014), Norway and Switzerland in GJ**

Country	Fossil gas	Renewable gas	Share biomethane in total gas consumption in road transport
	Natural gas (transport)	Biomethane (transport)	
European Union	60,614,000	5,601,000	8.5%
Austria	702,000	7,000	1.0%
Belgium	68,000	0	
Bulgaria	4,179,000	0	
Cyprus	0	0	
Czech Republic	1,031,000	0	
Germany	7,452,000	2,088,000	21.9%
Denmark	76,000[1]	1,000[1]	1.3%
Estonia	66,000	0	
Greece	576,000	0	
Spain	2,138,000	0	
Finland	153,000	7,000	4.4%
France	3,812,000	0	
Croatia	135,000	0	
Hungary	49,000	0	
Ireland	1,000	0	
Italy	36,107,000	1,000	0.0%
Lithuania	194,000	0	
Luxembourg	0	0	
Latvia	0	0	
Malta	0	0	
Netherlands	1,275,000	0	
Poland	0	0	
Portugal	507,000	0	
Romania	0	0	
Sweden	2,120,000	3,498,000	62.3%
Slovenia	49,000	0	
Slovakia	0	0	
United Kingdom	0	0	
Norway	656,000	92,000	12.3%
Switserland	?[1]	482,516[1]	

Notes: most recent data of 2014 from Eurostat; note that when Eurostat reports a zero, the final energy consumption is either not significant, not available, confidential or indeed zero. No data available for subdivision of natural gas and biomethane in (bio-)CNG and (bio-)LNG.

[1] Data from 2015, received in the e-mail survey

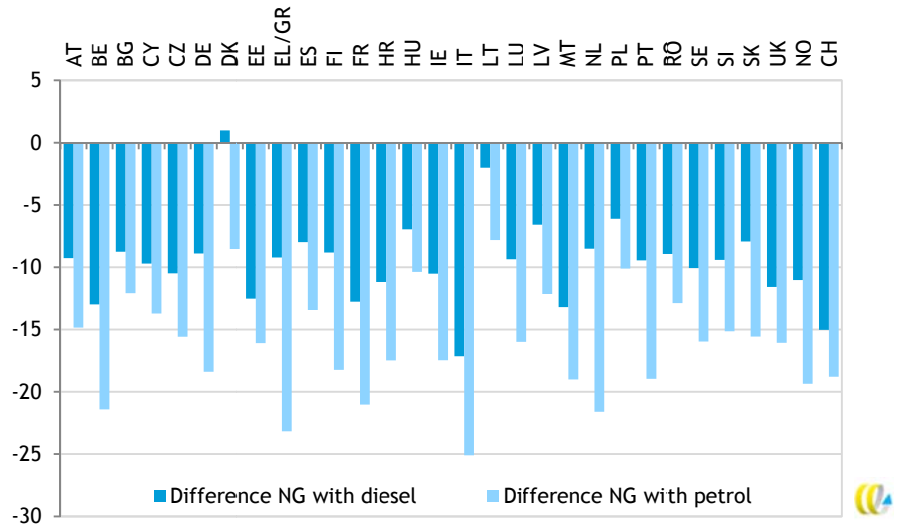
[2] No data available for natural gas in road transport only; biogas in transport assumed to be only in road transport.

4 Fuel tax income loss

We calculated the fuel tax income loss per GJ per country by comparing the natural gas (transport) fuel tax with the diesel fuel tax and petrol fuel tax separately, Figure 2 presents the results in €/GJ_{diesel}, while Figure 3 presents the relative difference. Because natural gas and petrol engines have a different engine efficiency compared to diesel engines, we expressed the tax difference in terms of €/GJ_{diesel}.

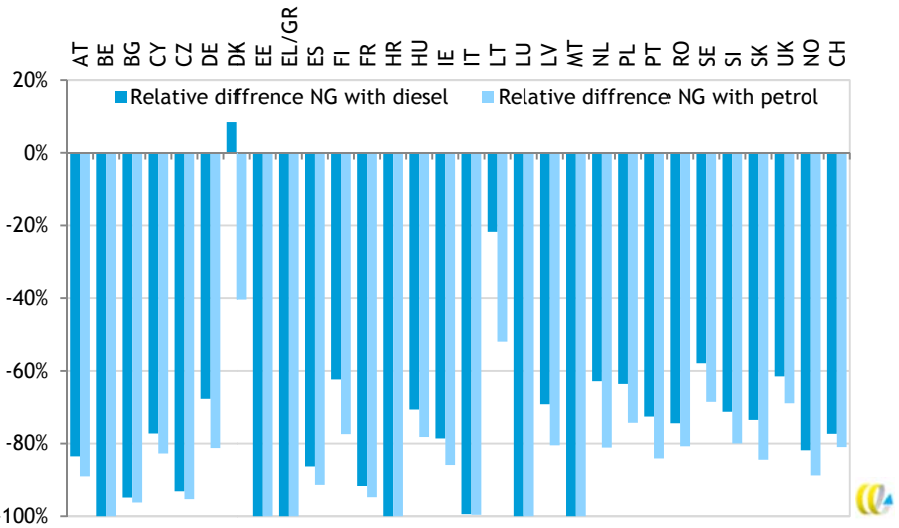
This is done by dividing the natural gas tax in €/GJ_{NG} and the petrol tax in €/GJ_{petrol} by the relative engine efficiency of a CNG passenger car compared to a diesel passenger car of 0.91 GJ_{diesel}/GJ_{NG} (CE Delft, ECN and TNO, 2013), and a petrol passenger car compared to a diesel passenger car of 0.91 GJ_{diesel}/GJ_{petrol} (CE Delft, ECN and TNO, 2013). We assumed most of the natural gas in transport is consumed as CNG, therefore we used the natural gas (transport) tax tariff, or when unknown the CNG tax tariff, and used the relative engine efficiency of a CNG engine. Furthermore, it cannot be determined if petrol or diesel is replaced by natural gas or biomethane, we choose to present both tax differences in Figure 2 and Figure 3, but take diesel as a reference for the total tax income loss since it is the most consumed fuel in road transport in the EU28 (Eurostat, 2016). We assume that bio-CNG and bio-LNG will result in climate benefits. We therefore not include the difference between these tax rates and the tax rates of diesel in the total loss of fuel tax income.

Figure 2 **Fuel tax difference of natural gas in road transport compared to diesel and petrol in €/GJ_{diesel}**



Note: the federal contribution in Belgium is not included

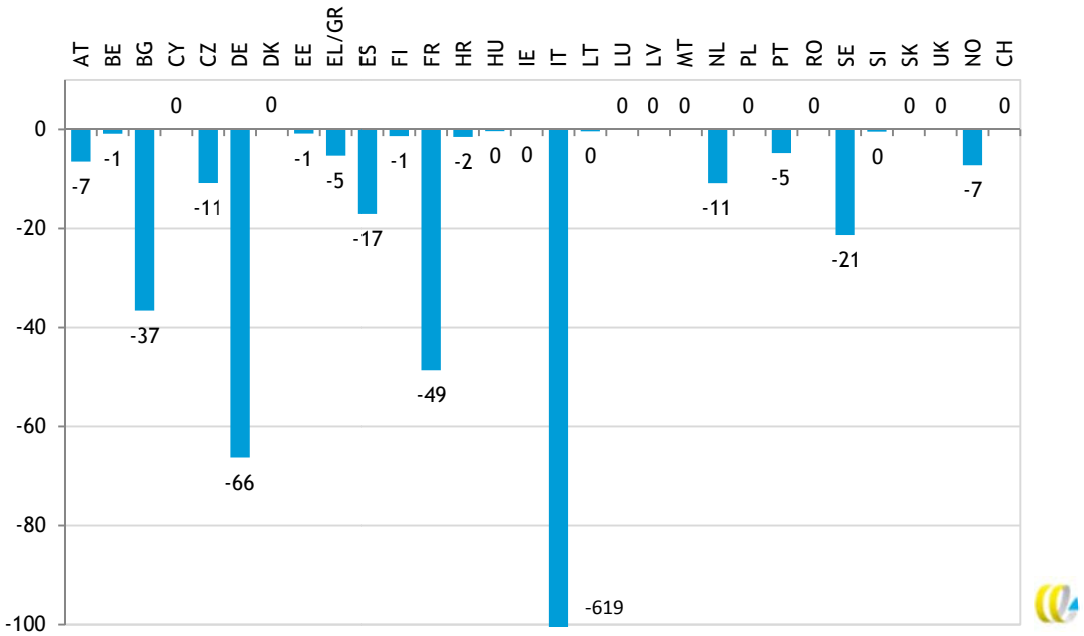
Figure 3 **Relative fuel tax difference of natural gas in road transport compared to diesel and petrol in %**



Note: the federal contribution in Belgium is not included

The total tax income loss due to tax reduction for natural gas compared to diesel is calculated by multiplying the difference in fuel tax with the final energy natural gas consumption in road transport. The results are shown in Figure 4. The numbers presented are an indication of the total tax income loss based on the most recent data available, since the tax rate data are from 2016 while the final energy consumption is from 2014.The total estimated tax income loss in 2014 is 860 million euro, with a 72% share of tax income loss in Italy.

Figure 4 **Estimated total tax income loss due to tax reductions on natural gas compared to the diesel fuel tax in million euro (M€)**



Note: the federal contribution in Belgium is not included

5 Conclusions

Within the EU28 (and Switzerland and Norway) there are substantial differences in the consumption of natural gas and biomethane in transport and the tax levels applied. According to the available data natural gas consumption is high in Germany, Italy and France, while biomethane consumption is high in Sweden, Germany, Norway and Switzerland.

When the final energy consumption data are combined with the tax differences total tax income losses are substantial in the countries with high natural gas consumption, especially in Italy (this is also the country with the most natural gas vehicles), Germany and France. However, countries with the highest natural gas consumption are not necessarily the countries with the largest tax differences. So it is likely that other factors or policy incentives are also responsible for the uptake of natural gas in transport.

On average, tax losses in €/GJ amount 14.02 €/GJ compared to diesel and 21.80€/GJ compared to petrol. This equals a relative difference of 91% for diesel and 94% for petrol. Note that this is weighted average taking into account the large differences in natural gas volumes. This makes that the average is mainly determined by countries, like Italy. Without taking these

differences in consumption into account the tax losses amount, on average, 9.51 €/GJ compared to diesel and 16.21 €/GJ compared to petrol. This equals a relative difference of about 76% for diesel and 85% for petrol.

Annex A Conversion factors and references

A.1 Conversion factor

ID	Energy content NG (GCV)	Unit	Reference
NO	40.00	MJ/Sm3 NG	(5)
CH	40.68	MJ/m3	(10)
	0.80	kg/m3	(10)
	50.85	MJ/kg = GJ/ton	calculation
EE	37.25	MJ/m3 NG	(25)
Russian NG	38.02	MJ/m3 NG	(25)
Currency	**Exchange rate (1/10/2015)**	**Unit**	**Reference**
NOK	9.4565	NOK/EUR	(6)
CHF	1.0903	CHF/EUR	(8)
DKK	7.4605	DKK/EUR	(2)
PLN	4.2459	PLN/EUR	(2)
CZK	27.1730	CZK/EUR	(2)
SEK	9.3754	SEK/EUR	(2)
HUF	312.8000	HUF/EUR	(2)
ID	**LNG energy density**	**Unit**	**Reference**
NL	49.00	MJ/kg = GJ/ton	(11)
EE	53.44	MJ/kg = GJ/ton	calculation
PL (CNG)	53.90	MJ/kg = GJ/ton	(45)
Russian NG (also assumed for SE)	54.54	MJ/kg = GJ/ton	calculation
Fuel	**Fuel energy density**	**Unit**	**Reference**
Petrol	31.8	MJ/L = GJ/1000L	(16)
Diesel	35.8	MJ/L = GJ/1000L	(16)
LPG	49.3	GJ/ton	(47), GCV
ID	**Standard density NG**	**Unit**	**Reference**
Russian NG	0.697	kg/m3 NG	(25)

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