

Future Natural Gas Qualities - Fact sheet

With the expansion of the Danish gas transmission system larger variations in natural gas qualities are expected. The natural gas will be of second Gas family type H. The gas can be imported from the Danish Nord Sea, bio gas production around the country, or from Germany. The gas from the Danish North Sea sector has a high content of ethane, propane, and butanes and therefore has a high calorific value and high density.

Upgraded biogas has similar combustion characteristics to natural gas and normally consists of a mixture of methane, CO₂, nitrogen, and oxygen. Upgraded biogas typically has a lower density and calorific value compared to the usually delivered natural gas in Denmark.

The gas from Germany is a mix of domestic, Norwegian, Russian, and Dutch H-gas. The gas has typical a lower calorific value and lower density than the Danish North Sea gas. Greater variation will occur because of more different sources.

The gas in Energinet.dk's grid shall always be within the Danish Gas Specifications and the limits listed in Rules for Gas Transport appendix 1.

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	Min Value	Max Value
Wobbe index (kWh/Nm ³)	13.9	15.5
Relative density (-)	0.555	0.700

Table 1 The table shows current limits for wobbe index and relative density.

In the table below 5 different expected gas compositions are shown. The expected gas qualities in the Danish transmission grid are a span of the 5 variations and mixtures of those though additional gas compositions within the specification are possible.

		Example of expected imported gas quality	Example of expected imported gas quality	Example of expected gas quality from the North Sea after 2018	Danish North Sea gas quality 2005-2009	Example of bio natural gas quality in transmission grid
Methane	mole - %	89.85	96.59	85.07	89.64	99.40
Ethane	mole - %	5.01	2.46	8.20	5.87	0
Propane	mole - %	1.01	0.13	3.81	2.32	0
I-butane	mole - %	0.10	0.042	0.27	0.38	0
N-butane	mole - %	0.12	0.023	0.70	0.53	0
I-pentane	mole - %	0.021	0.0046	0.074	0.12	0
N-pentane	mole - %	0.017	0.0029	0.084	0.078	0
Hexane+	mole - %	0.016	0.0043	0.026	0.056	0
Nitrogen	mole - %	2.53	0.41	0.38	0.29	0.25
Oxygen	mole - %	0	0	0	0	0.18
Carbon dioxide	mole - %	1.33	0.34	1.38	0.72	0.16
Gross calorific value	kWh/Nm ³	11.30	11.23	12.50	12.14	11.00
Gross calorific value	MJ/Nm ³	40.67	40.43	44.99	43.72	39.59
Wobbe index	kWh/Nm ³	14.38	14.82	15.32	15.26	14.72
Wobbe index	MJ/Nm ³	51.78	53.34	55.16	54.95	52.99
Relative density	-	0.617	0.574	0.665	0.633	0.558
Normal density	kg/Nm ³	0.798	0.743	0.860	0.818	0.722

Table 2 The table shows possible gas qualities in the transmission grid.

Below is a table of the variation of the single gas components and the derived properties. The list is based on historical values and does therefore not cover extreme maximum or minimum values.

Expected maximum and minimum values for each parameter			
		Min	Max
Methane	mole - %	83	100
Ethane	mole - %	0	10
Propane	mole - %	0	5
I-butane	mole - %	0	0.5
N-butane	mole - %	0	1
I-pentane	mole - %	0	0.2
N-pentane	mole - %	0	0.2
Hexane+	mole - %	0	0.2
Nitrogen	mole - %	0	5
Oxygen	mole - %	0	0.5
Carbon dioxide	mole - %	0.03	2.5
Gross calorific value	kWh/Nm ³	10.69	12.79
Gross calorific value	MJ/Nm ³	38.48	46.03
Wobbe index	kWh/Nm ³	13.91	15.46
Wobbe index	MJ/Nm ³	50.08	55.64
Relative density	-	0.555	0.69
Normal density	kg/Nm ³	0.71	0.89

Table 3 The table shows the maximal and minimal value of each parameter.

References

Rules for Gas Transport (RfG) <http://www.energinet.dk/EN/GAS/Regler-for-gastransport/Sider/default.aspx>

The Danish Gas Specification (Gasreglementet only available in Danish) can be found at the homepage of The Danish Safety Technology Authority <http://www.sik.dk/>

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