NEW ENERGY LTD.
Agro Food Park 13,
DK-8200 Aarhus N,
Denmark.

Det Norske Veritas
DNV GL Business Assurance Sweden AB
17106 Solna
Sweden

ISCC Identifier: SE205

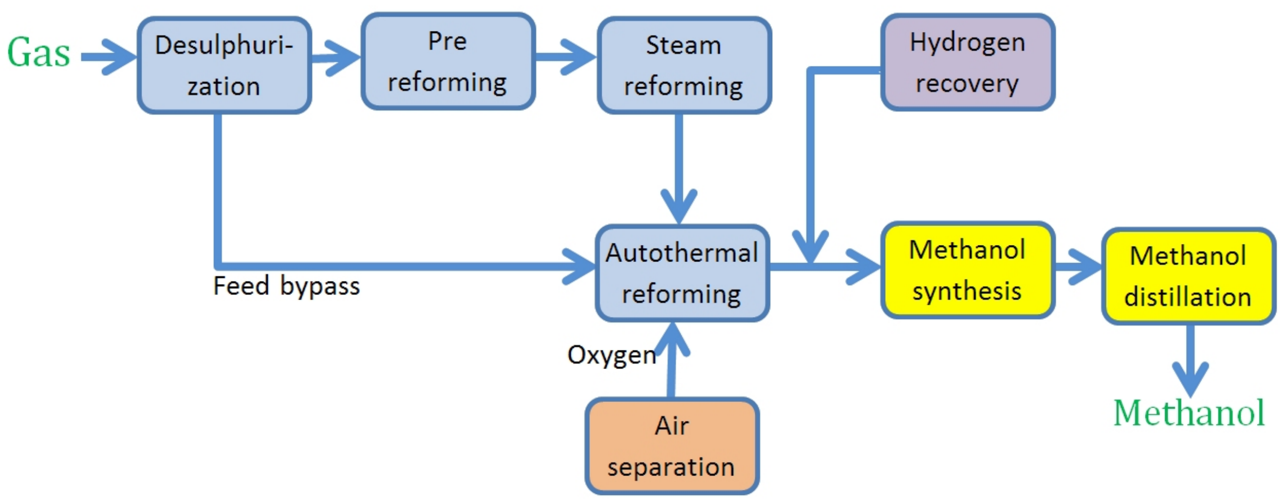
Aarhus, 3. March 2015

Re: ISCC EU certification of methanol plant.
Agreement of 3. March 2015 with DNV Danish arm DNV GL Business Assurance Denmark A/S.

ISCC EU certification for a Methanol Plant with a conversion unit and a single warehouse:

Conversion unit: Methanol Plant, c/o Statoil Tjeldbergodden, N-6699 Kjørsvikbugen, Norway,
Single Warehouse: Tank Yard, c/o Nordalim A/S, Samoavej 1, DK-8000 Aarhus C, Denmark.

Process. Gas is received piped under pressure. The gas is cleaned and catalytically converted at a high temperature to synthesis gas further catalytically processed into methanol. Crude methanol is distilled and stored temporarily in local tanks before being shipped. The entire process takes place continuously in a closed system and with an exhaust to a chimney. In 2003 915,518 tons of methanol was produced at Tjeldbergodden with an uptime of 98.6 %.



Combined reforming in principle. The gas is catalytically reformed to synthesis gas, which is further catalytically converted to methanol. The various exothermic reactions do not release enough energy to power the process and gas in excess is required. 68 % of gas energy is recovered as methanol energy. This is 85 % of theoretical (stoichiometric) maximum of 80 %. Source: "www.newfuel.dk/img/WMC1998.pdf".

Mass balance.

E	Process GHG emissions	gCO_{2eq}/MJ_{LHV} Methanol	gCO_{2eq}/MJ_{LHV} Methanol	Note Annex
e_p Conversion I	Biomass + Fuel + El → biogas → default 16 gCO_{2eq}/MJ_{LHV} gas. Emission brought forward: 16 * 1,467= 23,47 gCO_{2eq}/MJ_{LHV} Methanol		23,470	6
e_p Conversion II	1,467 MJ_{LHV} Gas → 1MJ_{LHV} Methanol → 12 gCO_{2eq} . By-product as heat is most likely zero[1]	12,000		1, 2, 3
e_{td} Transport:	Bunker oil → 1,04 gCO_{2eq}/MJ methanol	1,040		4
e_{td} Warehousing:	El → 0.001 gCO_{2eq}/MJ methanol	0,001		5
E	Emission from methanol production	13,041	13,041	
E_B	Total emission brought forward:		36,511	

Conversion I takes place at biogas plants outside battery limits. Acc. RED methodology section 17 greenhouse gas emissions are divided between the produced main product methanol and the by-product heat in proportion to their energy content. The applicable heat is, however, assumed to be zero.

Acc. RED methodology section 19 the stated value of EF = 83,8 gCO_{2eq}/MJ_{LHV} is used, after which emission savings acc. section 4 preliminary becomes $(E_F-E_B)/E_F$ = (83,8-36,511)/83,8 = 56 %. This figure has potential for improvement [Re. Annex 6]. The GHG saving meets the sustainability criteria for biofuels and bioliquids in Article 17 RED[2].

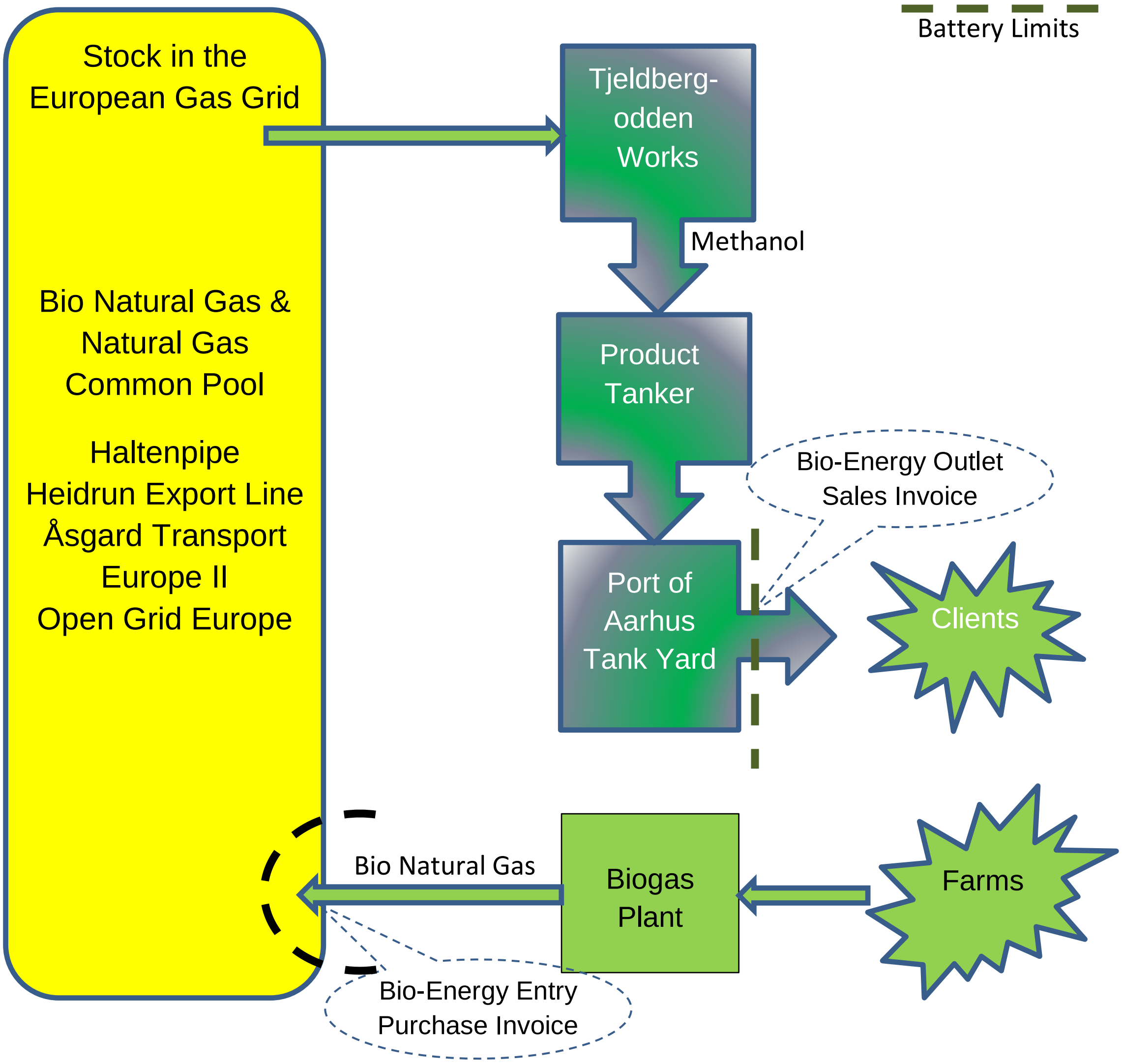
Energy Flow.

The energy flow is as outlined by Katharina Wübben, ISCC System GmbH, Hohenzollernring 72, 50672 Köln, Germany in mail of 16-01-2015:

> *ISCC certifications are site-specific. As already mentioned before, the economic operator feeding into the gas grid and the economic operator taking gas out of the grid must be physically connected and certified. In this case the gas grid can be considered a means of transport. If contractual agreements between New Energy and Statoil (for example a „tolling agreement“) enable the certification body to audit all ISCC requirements for conversion units at the location of the conversion unit (i.e. access to the facilities, relevant documentation etc.), it is possible to certify the operational site under the name of New Energy. The certificate in this case would be in the name of New Energy with the address of the operational unit in Tjelbergodden/ Norway.*

[1] The metanol plant makes its own electricity, and this is included in the 1,467 MJ_{LHV} Gas. The electricity produced is typically from condensation and extractions turbines. From condensing turbines the outlet temperature is too low for district heating. For extraction turbines the steam is used for distillation. Here comes a condensate, which in principle is warm enough for district heating, but this heat is re-used in water and steam balance in metanol plant

[2] Biofuels must deliver greenhouse gas (GHG) savings of at least 35 % compared to fossil fuels, rising to 50 % in 2017 and to 60 % in 2018 for biofuels from new plants.



The outlined energy flow is depicted in the accounts where bio natural gas purchase invoice triggers a storage inlet and methanol sales invoice triggers an outlet from the same stock account. Both financial and stock transactions are booked with an online accounting program e-conomic and stock account exhibit at all times the same showing as the company's certificate account with energinet.dk[3]. Storage and certificate accounts are held synchronously and comparable in bio natural gas equivalents using the in annex 1 gas consumption factor on methanol transactions.

3. March 2015

[3] http://www.newfuel.dk/img/biogaskonto-newenergy.xlsm New account statement is generated about the 18th of the month, when there are changes.

Annex 1.

Table 7.14. *Input and output data for a methanol plant with combined reforming and methanol synthesis*

	I/O	Unit	Amount
Natural gas	Input	$MJ/MJ_{methanol}$	1.467
Methanol	Output	MJ	1.000
CO_2 emissions	–	$g/MJ_{methanol}$	12

Methanol is produced from natural gas via combined reforming and downstream methanol synthesis. The technical data for the methanol plant have been derived from a methanol plant located in Tjeldbergodden in Norway (Larsen, 1998) (see Table 7.14).

Table 7.14 by Werner Weindorf and Ulrich Bünger is published December 2010 in the book: "The Hydrogen Economy - Opportunities and Challenges" edited by Michael Ball and Martin Wietschel and others. (Helge Holm-Larsen, Haldor Topsø, "The 2400 MTPD Methanol Project at Tjeldbergodden" presented at the 1998 WORLD METHANOL CONFERENCE in Frankfurt)

Gas is traded in upper heating values[4] while RED convention is lower heating values[5] for fuels. Energinet.dk publish the relation between net calorific value (NCV) and gross calorific value (GCV) which has been calculated to 0.90116 for bio natural gas/upgraded biogas and cleaned biogas[6] and an emission factor of 57,28 gCO_{2eq}/MJ_{HHV} natural gas[7].

The manufacture of 1 MJ_{LHV} methanol requires 1,467 MJ_{LHV} gas equivalent to 1,467/0,90116 = 1,63 MJ_{HHV} gas, which figure is used as the conversion factor for accounting stock transactions for methanol and gas.

Biogas is manufactured from feedstock's listed in "List of material eligible for ISCC EU certification". 16 gCO_{2eq}/MJ_{LHV} biogas is applied as default value acc. to RED, Annex V, D. Disaggregated default values for biofuels and bioliquids, biogas from wet manure as compressed natural gas.

Contribution from biogas to the emission: 16 * 1,467 = 23,47 gCO_{2eq}/MJ_{LHV} methanol.

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[4] Acc. HMN Naturgas I/S: 1 Nm^3 natural gas = 11 kWh_{LHV} = 12,157 kWh_{HHV}. ~ 0,90483. [http://hmn.naturgas.dk/erhverv/kundeservice/priserogbetingelser/gaskvalitet/]

[5] Biomethanol (methanol produced from biomass, to be used as biofuel) : MJ_{LHV}/kg = 20; MJ_{LHV}/l = 16. [RED ANNEX III, Energy content of transport fuels]

[6] [http://www.energinet.dk/EN/GAS/biogas/Stoette-til-biogas/Sider/Biogas-PSO.aspx]

[7] http://www.energinet.dk/DA/GAS/Sider/Naturgas-lige-nu.aspx]

Annex 2.

Energinet.dk informs[8] , that average emissions from electricity generation in Norway, 0 g CO_2/kWh, because the predominant source is hydroelectric. Anyway the methanol plant produces it own electricity from waste process steam.

Default contribution from electricity to the GHG emission: zero gCO_{2eq}/MJ_{LHV} methanol.

Statoil industrial complex at Tjeldbergodden

Units:

1 kWh = 3,6 MJ.

Methanol : 16 MJ_{LHV}/l = 20 MJ_{LHV}/kg; 0,069 kg CO_2/MJ

Methane: 36 MJ_{LVH}/Nm^3 = 50 MJ_{LHV}/kg; 0.056 kg CO_2/MJ

27. February 2015

[8] [http://energinet.dk/DA/El/Engrosmarked/Udtraek-af-markedsdata/Sider/Om-Elsystemet-lige-nu.aspx]

Annex 3.

Tjeldbergodden industrial complex.

The Tjeldbergodden industrial complex[9] in the Nordmøre region of western Norway has three components – a gas receiving terminal, plants for methanol and air separation. It was officially inaugurated on 5 June 1997.

Statoil industrial complex at Tjeldbergodden

Tjeldbergodden's methanol plant is Europa's biggest, and ranked at its opening as the first Norwegian use of natural gas in large-scale industrial production. Deriving its feedstock from the Heidrun field in the Halten Bank area of the Norwegian Sea, the facility has an annual capacity of about 900,000 tonnes of methanol. That volume corresponds to 25 % of Europe's total production capacity for this chemical, and 10 % of the continent's consumption.

Environment

The Tjeldbergodden plant is one of the world's most energy-efficient methanol producers, which means that its carbon dioxide emissions per tonne produced are low - 12 gCO2eq/MJLHV methanol acc. "The Hydrogen Economy - Opportunities and Challenges" 2010 edited by Michael Ball and Martin Wietschel and others.

Stoichiometric: CH_4 (25 g & 1,250 MJ) + O (25 g) → CH_3OH (50 g &1 MJ) + Loss (0,250 MJ)

Stoich.+ CH_4: CH_4 (29,34 g & 1,467 MJ) + O (29,34 g) → CH_3OH (50 g & 1 MJ) + Loss (0,467 MJ) + CO_2 (8,68 g)

Empirical: Gas is not pure CH_4 and reactions not truely stoichiometric. This and CO_2 in gas increases emission with one third.

Emission from the production: 12 gCO_{2eq}/MJ_{LHV} methanol.

27. February 2015

[9] http://www.statoil.com/en/OurOperations/TerminalsRefining/Tjeldbergodden/Pages/default.aspx

Annex 4.

Transport of methanol from Tjeldbergodden to our tank yard at the Port of Aarhus is by tanker. A typical transport will be undertaken by Anders Utkilens Rederi AS, Bergen with type of vessel as shown below.

MT Sundstraum. 4 737 DWT; Anders Utkilens Rederi AS, Bergen.

Arnt Stensen, Utkilens Rederi , Bergen informs:

Typisk skipslast er rundt 5000 mt
Skipene bruker fra 12-14 tonn i døgnet.
En reise fra Tjeldbergodden til Århus tar ca 2,5 døgn
1 tonn bunkers = 3200 kg CO2

Actual contribution to the emission: 3.200.000*(13*2,5)/5.000.000/20 = **1,04 gCO_{2eq}/MJ_{LHV} methanol**

27. February 2015

Annex 5.

Produktionschef Bjarne Maaløe, Nordalim A/S oplyser:

Når Nordalim's to lagertanke fyldes, anvendes skibets pumper.

El forbrugende udstyr på Nordalim ved indpumpning til lagertank er scrubberanlæg med effekt på 1,5 kW, Pumpehastighed er 250 ton/h. Aftryk : 1,5/250 = 0,006 kWh/ton. Udlevering 56 ton/h ved 2,36 kW. Aftryk 2,36/56 = 0,042 kWh/ton. Samlet aftryk = 0,048 kWh/ton.

On emissions from electricity generation energinet.dk informs as follows:

Environmental impact statements for electricity. Each year in March Energinet.dk publishes an environmental impact statement for electricity[10]

Environmental impact statement supplied in Denmark 2013	
Emissions to air	**g/kWh**
CO_2 (Carbon dioxide - greenhouse gas)	377
CH_4 (Methane - greenhouse gas)	0.12
N_2O (Dinitrogen oxide - greenhouse gas)	0.005
Green house gases (CO_2-equivalents)	382

382 gCO_{2eq}/kWh = 106 gCO_{2eq}/MJ.

0,048 kWh/t methanol is equivalent to 0,048*382 = 18,34 gCO_{2eq}/t methanol. 1 ton methanol = 20*1000 = 20.000 MJ_{LHV} .

Actual emission from *warehouse handling:* 0,048*382/20.000 = 0.001 gCO_{2eq}/MJ_{LHV} methanol

27. February 2015

[10] [http://energinet.dk/EN/KLIMA-OG-MILJOE/Miljoedeklarationer/Sider/Miljoedeklarering-af-1-kWh-el.aspx]

Annex 6

Biogas as feedstock - outside battery limits.

Biogas, typical and default values acc. RED Biofuel and bioliquid production pathway	Typical greenhouse gas emissions (gCO_{2eq}/MJ)	Default greenhouse gas emissions (gCO_{2eq}/MJ)
biogas from municipal organic waste as compressed natural gas	17	23
biogas from wet manure as compressed natural gas	13	**16**
biogas from dry manure as compressed natural gas	12	15

RED, Annex V, D. Disaggregated default values for biofuels and bioliquids. Biogas from wet manure as compressed natural gas default value is applied.

Actual values, example

Biogas capacity	Input								Output
Feedstock	As is t/year	% DM	DM t	%	VS/DM	VS %	t VS	GVS	Nm[3] CH_4/y
Pig slurry, hogs	155.000	5%	7.750	20%	80%	4%	6.200	280	1.909.600
Cattle manure slurry	110.000	8%	8.800	22%	80%	6%	7.040	200	1.548.800
Straw briquettes	26.500	86%	22.790	58%	90%	77%	20.511	290	6.543.009
Total	291.500	13%	39.340	100%			33.751		10.001.409

Substrate for 10 million Nm[3] methane ~ 360 million MJ gas
Source: Business Plan, Farmers Gasoline BP 01-3e by Agro Industries A/S

Energybalance and emission, example

	MJ/t substrate	kJ Fuel /MJ Gas	Fuel	gCO_{2eq}/MJ_{LHV} fuel	gCO_{2eq}/MJ_{LHV} CH_4
Substrate transport	7,56	6,12	Diesel	83,8	0,51
Substrate heating	61,70	49,95	El	106	5,29
Process electricity	18,00	14,57	El	106	1,54
Upgrading[11]		21	El	106	2,23
Compression[12]		10	EL	106	1,06
Total	87,26				10,63

Energy consumption per t substrate is acc. "Kogebog for etablering af biogasanlæg 2012 by K. Tybirk, Agro Business Park.

Substrate heating is the major contribution to biogas GHG-emission and is affected by substrate concentration, type of fuel for heating and the efficiency of heat exchange of fresh substrate against digestate. By fueling with straw or wood pellets emissions may be brought quite down. Actual emissions will for effective biogas plants be preferable to RED-default values.

2. March2015

[11] highly selective membrane separation (MS-HS [http://www.dirkse-milieutechniek.com/dmt/do/download/_/true/211689/Next_generation_biogas_upgrading.pdf]

[12] Carsten Rudmose, HMN Naturgas oplyser 2. marts 2015 :
Vi har erfaring med at der bruges ca. 0,1 kWh el pr. Nm³ metan som komprimeres fra 5 bar til 45 bar.