February 26, 2013 Project No: 121-23044-00

Mr. Eshetu Beshada
Environmental Engineer, Environmental Assessment and Licensing Branch
MANITOBA CONSERVATION
Suite 160, 123 Main Street
Winnipeg, MB, R3C 1A5

Dear Mr. Beshada,

RE: ENVIRONMENT ACT PROPOSAL – Greenwald Colony Farm Biomass Pelletizing Plant TAC Questions Response.

The following is in response to your email dated February 25, 2013 requesting responses to the TAC member's comments.

Karen Robinson MD, FRCPC
Medical Officer of Health
Interlake-Eastern Region

1. Please provide estimates of the types and amounts of emissions from burning the pellets, and how do these compare with other types of commonly used fuels such as wood or natural gas?

   During combustion, nitrogen (N), sulphur (S) and chlorine (Cl) in the fuel may lead to atmospheric pollutants: nitrogen oxides (NOx: NO, NO2 and N2O), sulphur dioxide (SO2), hydrogen chlorine (HCl) and chlorinated hydrocarbons [t]. Emissions of carbon monoxide (CO) and unburned hydrocarbons (UHC) such as methane (CH4), particles, tar and PAH are caused by an incomplete combustion.

   Please refer to Tables below for comparative values.

2. What are the possible impacts and most likely impacts on air quality from burning of the pellets?

   CO_2 emissions from burning woody fuels are actually relatively high, calculated per kWh of energy, compared to most fossil fuels, owing to the relatively low calorific value of woody material. However, the carbon released by burning the pellets was removed from the atmosphere recently, is part of the current carbon cycle and, if the fuel was obtained from a sustainably managed source like crop straw, will be taken up again by

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subsequent growth. This is why biomass is frequently described as "carbon neutral".

Straw pellets used for fuel purposes usually contains 8% water that vaporises during burning. The dry matter left consists of less than 50% carbon, 6% hydrogen, 42% oxygen, and small amounts of nitrogen, sulphur, silicon and other minerals, e.g., alkali (sodium and potassium) and chloride.

3. Who are the anticipated users of the pellets produced and what will they be used for e.g., heating buildings?

   The users of the pellets include members of the Greenwald and Brightstone Hutterite Colonies. The pellets will be used to fuel boilers to heat the colony members' homes, schools, barns and workshops.

Brian Wiebe, Ph.D., P.Ag.
Nutrient Management Program Coordinator

1. Water Quality Management has no concerns about water quality impacts from this proposed project. The proposal appears to be for the pelletizing of straw (agricultural crop residue) however the conditional use approved by the RM in the attached meeting minutes is for peat harvesting and pelletizing. Does this affect their application:

   Greenwald Colony Farms Ltd. has subsequently requested an amendment to the Conditional Use Permit for a Straw Pelletizing Operation. The RM of Alexander currently is reviewing the request.

Laureen Janusz
Fisheries Science and Fish Culture Section
Fisheries Branch,
Manitoba Conservation and Water Stewardship

1. There are some clear discrepancies between what Council approved and the proposal content as presented. Of most concern to fisheries would be the use of peat moss instead of the straw bales due to potential effects on

surface water from the harvest of peat. Second the applicants indicate supplying local farm operations. This does not give the reader the sense that the supply is just for colony use as required as a condition of the resolution. We would appreciate clarification on these discrepancies:

Greenwald Colony Farms Ltd. has subsequently requested an amendment to the Conditional Use Permit for a Straw Pelletizing Operation. The RM of Alexander currently is reviewing the request.

The users of the pellets include members of the Greenwald and Brightstone Hutterite Colonies. The pellets will be used to fuel boilers to heat the colony members' homes, schools, barns and workshops.

Regards,

GENIVAR

Iain D. A. Pimlott, B.Sc., C. Tech, CCEP
Senior Environmental Scientist

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Table 19. Typical chemical composition for a range of fuels

	Coal	Peat	Wood chips	Wood pellets	Wheat straw	Wheat straw pellets	Bagasse
Water content (%-ww)		53.2		7.7	15	8	
Higher heating value MJ/kg	28	22.3	20.2	20.3	17.8	18.5	19.2
Lower heating value MJ/kg			19.1	19.0	16.5	17.2	
Elementary analysis (% d.m.)							
Ash	12.1	5.4	1.4	0.51	6.2	7.1	3.3
Volatiles (% d.b.)			81	80	78	75	83.0
Carbon (C)	74	53.6	51	50.3	44.3	45.8	46.3
Hydrogen (H)	4.8	6.2	6.0	5.7	5.3	5.9	5.7
Oxygen (O)	11.4	31.2	41.8		40.2	40.1	42.7
Nitrogen (N)	1.3	3.20	0.35	0.22	0.57	0.45	0.4
Sulphur (S)	0.35	0.19	0.03	0.03	0.15	0.16	0.2
Chlorine (Cl)	0.012	0.01	0.02	0.02	0.50	0.40	0.5
Ash analysis (% d.m.)							
Silicium (SiO_2)	59.9	28.2	15.9	-	51.5	39.0	72.2
Potassium (K_2O)	1.2	1.1	11.9	-	17.1	29.0	6.4
Sodium (Na_2O)	1.9	0.2	0.77	-	0.56	0.44	1.2
Phosphorus (P_2O_5)	0.6	2.3	5.84	-	2.13	4.70	-
Calcium (CaO)	3.1	19.2	26.1	-	6.57	9.90	0.9
Magnium (MgO)	0.7	0.7	5.68	-	1.73	2.20	-
Aluminium (Al_2O_3)	27.4	4.3	5.10	-	0.79	0.95	1.5
Iron (Fe_2O_3)	5.2	24.0	6.07	-	0.40	0.95	1.0
Fusion temperature (°C)			1200		850		
Melting temperature (°C)			1300		1240		1360

Sources: data gleaned and crossed from various sources and database

Table 5.4: Indicative Comparison of Emissions from Biomass and Fossil Fuels in Small Boilers

Pollutants	Emission factors, g GJ^{-1}									
	Aggregate advanced wood combustion	Default gas		Default oil		Default coal		Default MSF		Aggregate advanced coal
	<1 MW	<50kW	<1 MW	<50kW	<1 MW	<50 kW	<1 MW	<50 kW	<1 MW	<1 MW
SO_2	30	0.5	0.5	140	140	900	900	500	500	495
NO_X (as NO_2)	150	70	70	70	100	200	200	200	150	195
PM	122	0.5	NA	5	5	300	200	120	100	107
PM_{10}	108	0.5	NA	3	3	260	170	100	80	93
$PM_{2.5}$	108	0.5	NA	3	3	260	170	100	80	93
CO	590	30	30	40	40	4000	5	3000	1500	760
nm VOC	43	10	3	15	15	300	3	200	100	48
	mg GJ^{-1}[15]									
As	0.5	NA	NA	1	1	5	5	3	4	0.6
Cd	0.55	NA	NA	2	0.3	3	3	0.7	0.7	2
Cr	4.3	NA	NA	20	20	15	15	10	10	2
Cu	1.9	NA	NA	10	10	30	30	20	20	9
Hg	0.5	NA	NA	1	1	10	10	10	7	1
Ni	2	NA	NA	300	300	20	20	13	13	3
Pb	21	NA	NA	20	20	200	200	120	100	82
Se	0.05	NA	NA	NA	NA	2	2	1.5	1.5	0.7
Zn	80	NA	NA	10	10	300	300	200	160	110

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PAH	77	NA	NA	30	26	710	320	150	90	96
										ITEQ ng/ GJ
PCDD/F	75	NA	2	10	10	500	400	200	100	86

Source: CORINAIR Emission Inventory, Chapter B216

FUELS FOR HEATING AND POWER

Fuel	Net calorific value (MJ/kg)	Carbon content (%)	Approx. life cycle CO_2 emissions (including production) See note 1		Annual total CO_2 emissions to heat a typical house (20,000 kWh/yr)		
			kg/GJ	kg/MWh	kg	kg saved compared with oil	kg saved compared with gas
Hard coal	29	75	**134**	**484**	9680	-2680	-4280
Oil	42	85	**97**	**350**	7000	0	-1600
Natural gas	38	75	**75**	**270**	5400	1600	0
LPG	46	82	**90**	**323**	6460	540	-1060
Electricity (UK grid)	-	-	**150**	**530**	10600	-3600	-5200
Electricity (large scale wood chip combustion)	-	-	**16**	**58**	1160	5840	4240
Electricity large scale wood chip gasification)	-	-	**7**	**25**	500	6500	4900
Wood chips (25% MC) Fuel only	14	37.5	**2**	**7**	140	6860	5260
Wood chips (25% MC) Including boiler	14	37.5	**5**	**18**	500	6500	4900
Wood pellets (10% MC	17	45	**4**	**15**	300	6700	5100

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Fuel	Net calorific value (MJ/kg)	Carbon content (%)	Approx. life cycle CO_2 emissions (including production) See note 1		Annual total CO_2 emissions to heat a typical house (20,000 kWh/yr)		
			kg/GJ	kg/MWh	kg	kg saved compared with oil	kg saved compared with gas
starting from dry wood waste) See note 3							
Wood pellets (10% MC) Including boiler See note 3	17	45	**7**	**26**	660	6340	4740
Grasses/straw (15% MC)	14.5	38	**1.5 to 4**	**5.4 to 15**	108 to 300	6892 to 6700	5292 to 5100

These represent figures for the carbon or carbon dioxide emitted by full combustion of each fuel, per unit of energy. Note that life cycle CO_2 emissions depend strongly upon details of supply chains, production techniques, forestry or agricultural practice, transport distances, etc.

Notes:

1. Life cycle analysis data from: Carbon and energy balances for a range of biofuels options Elsayed, MA, Matthews, R, Mortimer, ND. Study for DTI URN 03/836 and: Comparison of energy systems using life cycle assessment A special report for the World Energy Council July 2004
2. www.electricity-guide.org.uk/fuel-mix.html
3. These figures for wood pellets include the hammer mill and pelleting process, however do not include sourcing the feedstock and any pre-processing such as drying. If starting from green wood then drying could be a very major component, however pellets are often made from dry waste wood that has been dried for another purpose, such as joinery. These figures also do not include transport (which is included in the figures for wod chips).

Source:
http://www.biomassenergycentre.org.uk/portal/page?_pageid=75,163182&_dad=portal&_schema=PORTAL