

**Appendix K:**  
**Combined Heat and Power**



11<sup>th</sup> August 2011

Mr Glenn Jones  
Combined Power & Heating (Highlands) Ltd.  
10 Sandbach,  
Great Lumley,  
Chester le Street,  
Co Durham  
DH3 4LL

Dear Glenn

### Utilisation of Waste Heat

As previously discussed Alcan Aluminium is interested in the utilisation of waste heat arising from your proposed waste to energy development at the Cromarty Firth Industrial Park (CFIP). The layout of the CFIP, with most facilities set around the in-filled former cell room area, lends itself to the easy distribution of the heat.

A number of tenants have indicated their interest in employing the heat if it was made available close to their premises, and I am sure, if available at a competitive price, the waste heat would be a significant attraction to new tenants who would wish to avail themselves of such energy for process or heating purposes.

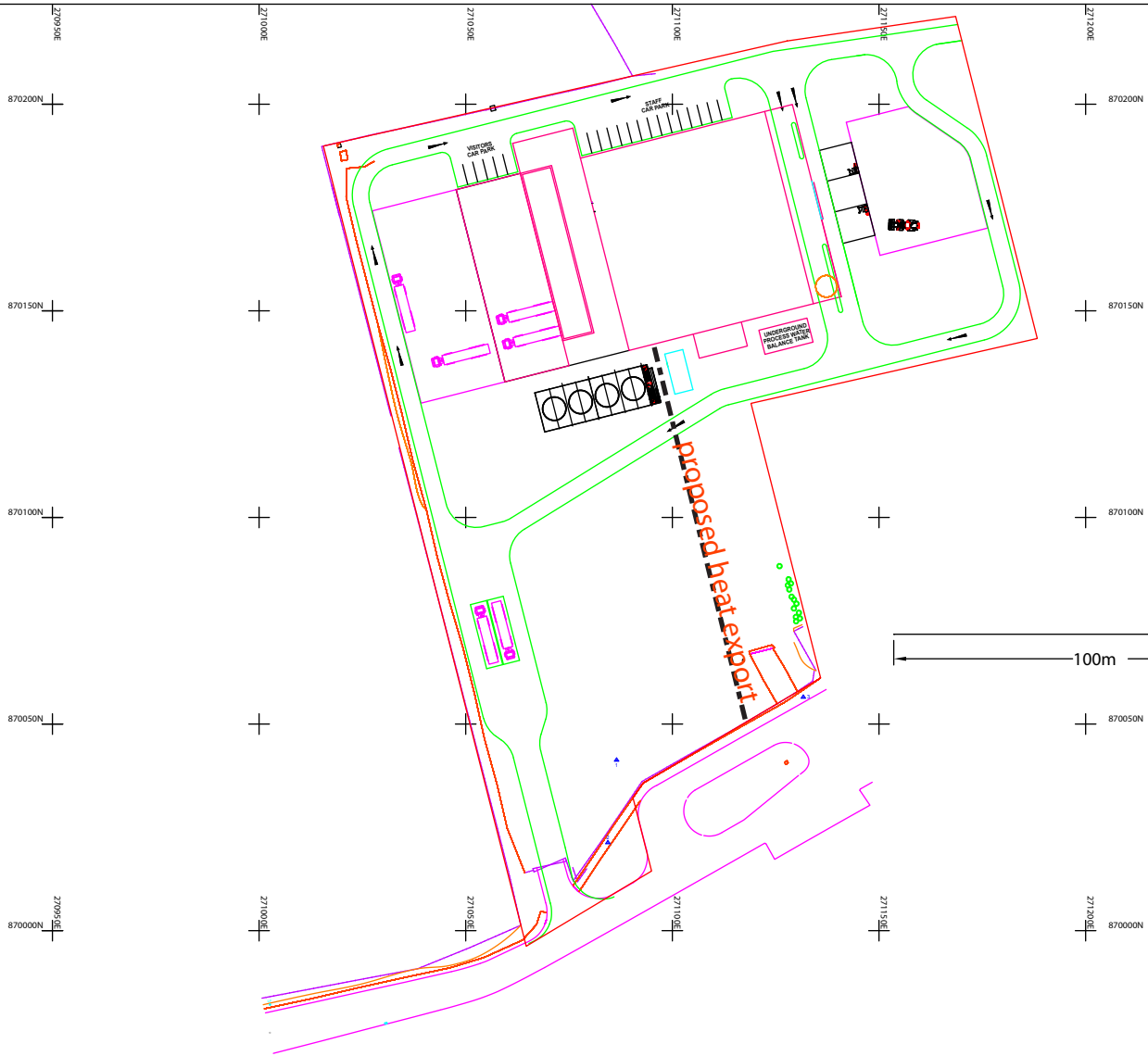
Please keep me informed of progress with respect to your planning appeal so that we can firm up on Alcan's and our tenant's interest.

Yours Sincerely



M L Dunley

Manager (CFIP)



**Proposed line of  
heat export pipes**  
COMBINED POWER & HEAT  
(HIGHLANDS) Ltd.

Calculation basis for CHPQI in Invergordon

Model turbine output	4650 kW	
Model steam flow (basis for turbine specification)	22.3 tph	
	6.19 kg/s	or
Specific output of turbine	0.75 MW(e)/kg/s	
Defined operating point with additional bled steam for heat export		
Increased bled steam flow to facilitate heat export	2 kg/s	
Assumed heating value of steam (latent heat at bled steam conditions)	2169 kJ/kg	
Heat export	4338 kW(e)	
Electrical output at nominated export point	3650 kW(e)	
Ratio of power to heat	4.34	
Expected steam flow for single 16.3 MW(th) stream	17.0 t/h	Data derived from Grimsby
Expected steam flow for Invergordon 2 x 16.3 MW(th)	34.0 tph	
	9.44 kg/s	or
Expected power generation for the Invergordon plant	7.09 MW(e)	
CHPQI		
Coefficient for power	370	
Coefficient for heat	140	
Thermal input to plant	32.6 MW	

**$[(370 \times \text{power export}) + (140 \times \text{heat export})] / \text{thermal input}$**

Summary CHPQI for a range of heat export values

Energy Export		
MW(e)	MW(th)	CHPQI
7.1	0	80.6
6.6	2.2	84.2
6.1	4.3	87.9
5.6	6.5	91.5
5.1	8.7	95.1
4.6	10.8	98.8
4.1	13.0	102.4