Deadline 5: Applicant's Response to the Examining Authority's Further Written Questions (ExQ3)

Appendix D – Carbon Burden from Waste Transportation

Wheelabrator Kemsley (K3 Generating Station) and Wheelabrator Kemsley North (WKN) Waste to Energy Facility Development Consent Order

PINS Ref: EN010083

Document 13.2

June 2020 – Deadline 5

K3/WKN DCO Application – EN010083

Document 13.2 (Response to ExQ3) – Appendix D

Assessment of Transport Related Carbon Impacts, June 2020

Context

Q1A.1.17 stated the following: *WHFAR [APP-086] paragraph 1.4.7 states "…there is a carbon burden associated with the transport of fuel to the facilities…". What is the quantification of that burden and how if at all would this burden be affected if fuel were taken more locally than is envisaged in the proposed application but in accordance with KCC and SEWPAG policies?*

Please provide a reasoned justification for your answer including any quantification of benefit that can reasonably be assessed.

At Deadline 3 the Applicant responded to Q1A.1.17 to indicate in broad terms that the carbon burden would be directly related to the distance travelled by waste and stated that the carbon benefits gained by the efficient recovery of energy in K3/WKN materially outweighs the carbon burden. The Applicant then noted that an assessment was being prepared to quantify the carbon burden; this document has been prepared by SLR Consulting Ltd and is the assessment in question.

The redirection of fuel from its current baseline destination to the K3 and WKN facilities is likely to result in comparable or small additional transport-based carbon impacts. The assessment undertaken and results set out below demonstrates that the transport related carbon impacts represent a small proportion of the broader carbon impact benefits each facility will deliver to the environment.

Quantification of Carbon Burden

In order to fully understand the change in carbon impact of fuel transportation to K3 and WKN, the carbon emissions from transport to the current destination (baseline management destination) must first be accounted for. Once the carbon impact of transport to the baseline destination is estimated, the carbon impact of redirecting this fuel to K3 and WKN can be quantified. With both carbon impact figures calculated, it is then possible to quantify the estimated change (increase or decrease) in carbon impacts associated with fuel transportation.

It should be noted that the exact sources of all fuel feedstocks for K3 and WKN are not fully known; and furthermore, the source locations are likely to change during the facility lifetime. As K3 and WKN are developed and constructed, Fuel Supply Agreements (FSAs) will be entered into with waste management companies and waste brokers to secure the delivery of the fuel to the facilities. A number of FSA's have been agreed for K3 but until the facility becomes fully operational the exact origin of the fuel will not be known. No FSA's have yet been agreed for WKN. The K3 FSA's have been used to inform assumptions on the likely sources of fuels and hence the potential distance travelled, calculated as 25 km distance bands (see tables below for K3 and WKN respectively):

K3 Assumed Fuel Supply Distances

Distance Assumptions	Proportion of Fuel Tonnage
Transport Distance to K3	
25km	45%
50km	25%
75km	24%
100km	4%
125km	0%
150km	2%
Sub-total K3 Transport	***100%***

WKN Assumed Fuel Supply Distances

Distance Assumptions	Proportion of Fuel Tonnage
Transport Distance to WKN	
25km	19%
50km	44%
75km	37%
Sub-total WKN Transport	***100%***

As with the above noted uncertainty, the existing distances that fuel is transported to its baseline destination is also unknown. For the purposes of this modelling it has been assumed one third is each transported 25 km, 50 km and 75 km distances.

Using the above assumptions, transport of fuel has been modelled in the WRATE life cycle assessment tool. Transport of fuel to K3 (657 kt) and WKN (390 kt) has been modelled with a user defined process articulated vehicle with a payload setting of 13.6 tonnes (consistent with other transport analysis in the DCO application). The carbon impacts of each transport distance assumption are presented in column 2 of the below tables, with column 4 of each table presenting the derived (column 2 x column 3 = column 4) carbon impact.

K3 Carbon Impact of Transportation Results

Distance Assumptions	Carbon Impact for ALL Fuel Tonnage (tCO_2e)	Proportion of Fuel Tonnage	Indicative Carbon Impact (tCO_2e)
Transport Distance to Baseline Management Destination			
25km	4,675	33%	1,558
50km	9,350	33%	3,117
75km	14,024	33%	4,675
Sub-total Baseline Transport	*-*	***100%***	***9,350***
Transport Distance to K3			
25km	4,675	45%	2,102
50km	9,350	25%	2,368
75km	14,024	24%	3,406
100km	18,699	4%	680
125km	23,374	0%	0
150km	28,049	2%	502
Sub-total K3 Transport	*-*	***100%***	***9,057***
Total Transport Carbon Impact Change	**-**	**-**	**-292**

For K3, the analysis shows the baseline transportation is estimated to generate 9,350 tCO_2e, and the redirection of the fuel to K3 is estimated to generate 9,057 tCO_2e. Thus, the carbon impacts from transport to K3 is comparable to the baseline transport carbon impacts, and actually indicates a reduction of 292 tCO_2e. To put this into context, the net benefit of K3 compared to landfill is a carbon saving of circa 232,100 $_t$CO2e and therefore the transport to the facility increases the carbon saving of the facility by circa 0.1%.

WKN Carbon Impact of Transportation Results

Distance Assumptions	Carbon Impact for ALL Fuel Tonnage (tCO_2e)	Proportion of Fuel Tonnage	Indicative Carbon Impact (tCO_2e)
Transport Distance to Baseline Management Destination			
25km	2,775	33%	925
50km	5,550	33%	1,850
75km	8,325	33%	2,775
Sub-total Baseline Transport	*-*	***100%***	***5,550***
Transport Distance to WKN			
25km	2,775	19%	516
50km	5,550	44%	2,455
75km	8,325	37%	3,095
Sub-total WKN Transport	*-*	***100%***	***6,066***
Total Transport Carbon Impact Change	**-**	**-**	**516**

For the WKN facility, the analysis shows that the baseline transportation is estimated to generate 5,550 tCO_2e, and the redirection of the fuel to WKN is estimated to generate

6,066 tCO_2e. Thus, redirection of fuel to the WKN facility is estimated to result in an increase in carbon impacts of 516 tCO_2e. Again, for context, the previous assessment of WKN demonstrated the net benefit of WKN compared to landfill created a carbon saving of circa 63,800 tCO_2e, and therefore if the transportation of fuel to WKN facility is accounted for, the carbon saving of WKN is reduced by less than 1%.

WKN Carbon Impact of Transportation Sensitivity Scenario

As mentioned above, FSA's are yet to be agreed for WKN, so the K3 FSA's have been used to inform assumptions on the likely sources of fuels and the potential distance that they are transported. Noting this uncertainly, a 'downside case scenario' has been considered where all of the fuel for WKN is sourced from 75 km away, the results of which are tabulated below.

Distance Assumptions	**Carbon Impact for ALL Fuel Tonnage (tCO_2e)**	**Proportion of Fuel Tonnage**	**Indicative Carbon Impact (tCO_2e)**
Transport Distance to Baseline Management Destination			
25km	2,775	33%	925
50km	5,550	33%	1,850
75km	8,325	33%	2,775
Sub-total Baseline Transport	-	***100%***	***5,550***
Transport Distance to WKN			
25km	2,775	0%	0
50km	5,550	0%	0
75km	8,325	100%	8,325
Sub-total WKN Transport	-	***100%***	***8,325***
Total Transport Carbon Impact Change	**-**	**-**	**2,775**

The sensitivity analysis shows that the redirection of the fuel to WKN is estimated to generate 8,325 tCO_2e. Thus, redirection of fuel to the WKN facility is estimated to result in an increase in carbon impacts of 2,775 tCO_2e. Therefore, if the transportation of fuel to WKN facility is accounted for under this assumed 'downside case scenario', the carbon benefit of WKN of circa 63,800 tCO_2e is still only reduced by a modest proportion of circa 4.4%.

Summary

As noted above, there is a high level of uncertainty surrounding the exact sources of the fuel however, this assessment has sought to model realistic transport distances, and proportions of fuel from each distance, based on the current status of fuel supply discussions to date with third parties. This approach has demonstrated that redirection of fuel from its current baseline destination to the K3 and WKN facilities is likely to result in similar or small additional transport based carbon impacts; however the above results also demonstrate that the transport related carbon impacts represent a small proportion of the broader carbon impact benefits each facility will deliver to the environment.

The analysis presented is deemed to be conservative, as in many cases fuel being delivered to K3 and WKN is likely to be delivered in vehicles with higher payloads than those assumed (up to 24 tonnes is viable with modern articulated tractor and trailer units) and over time vehicles are becoming more efficient in their fuel consumption, and road fuels are increasing the proportion of renewable content, thus emissions associated with transport will be reduced.