1 Study on Alternative Fuels

1.1 Background

During the preliminary design stage for cremator installation for the project of Wo Hop Shek Crematorium, a study on the fuel characteristics and feasibility for future cremation operation in local Crematoria was conducted. In the study, Ultra-Low Sulphur Diesel (ULSD) and Towngas (both of which have been used at local crematoria), as well as natural gas (commonly used in overseas crematoria) were examined.

1.2 Summary of Findings

Comparison of considerations in supply availability, operation and maintenance flexibility and capital and operating are shown in ***Table 2-1***, below.

	Ultra-Low Sulphur Diesel	**Towngas**	**Natural Gas**
Supply	Technically feasible	Technically feasible	Currently no development plan to supply natural gas directly to end-users within foreseeable future
Emissions	Well below Target Emission Levels as proposed in the EIA Study	Well below Target Emission Levels as proposed in the EIA Study	N/A
Reliability of supply	Very high (The UG storage tank will be sized to provide 2-week consumption of the new crematorium)	High (No buffer storage for the Towngas supply and the Crematorium operation will be suspended upon supply failure)	N/A
Capital Cost	Low – provision of on-site fuel oil storage tank and associated fuel pipes	Low – gas main network is already available at Kiu Tau Road	N/A
Operating Cost	Low – nearly 3 times lower than using Towngas	High – nearly 3 times higher than using ULSD	N/A

Note: N/A – Not Applicable

Table 2-1 Comparison of Considerations in Fuel Study

1.3 Natural Gas

To determine whether natural gas supply could be available for this project, advice was sought from the Hong Kong and China Gas (HKCG) on the development of local natural gas supply. According to the reply from HKCG on 8 February 2006, natural gas from Shenzhen is used as an alternative constituent to naphtha for the production of Towngas. However, there is currently no development plan to supply natural gas directly to end-users within a reasonable future.

1.4 Comparison Between Towngas and ULSD

Towngas and ULSD are both technically feasible for the operation of new cremators at the Wo Hop Shek Crematorium and both are available for the project site, though not immediately available for the former.

Average emission data for Fu Shan Crematorium (which uses Towngas) and Kwai Chung Crematorium (which uses ULSD) Crematoria are shown in ***Tables 2-2 and 2-3***, below, respectively.

Tested Parameters	Target Emission Level	Average Emission Data
Particulate Matters mg/m^3	40*	6.3
Nitrogen Oxides, mg/m^3	380	25.1
Dioxins, I-TEQ ng/m^3	0.1*	0.008
Hydrogen chloride (excluding particulate matter), mg/m^3	30*	4.71
Carbon monoxide, mg/m^3	100*	58.9
Organic compounds (excluding particulate matter and expressed as total carbon), mg/m^3	20*	8.3

Note: * Emission limit stipulated in BPM12/2 (06)

Table 2-2 Average Emission Data of Fu Shan Crematorium (Towngas) from March 2005 to April 2007

Tested Parameters	Target Emission Level	Average Emission Data
Particulate Matters, mg/m^3	40*	9.4
Nitrogen Oxides, mg/m^3	380	35.8
Dioxins, I-TEQ mg/ ^{3}	0.1*	0.015
Hydrogen chloride (excluding particulate matter), mg/m^3	30*	3.36
Carbon monoxide, mg/m^3	100*	83.5
Organic compounds (excluding particulate matter and expressed as total carbon), mg/m^3	20*	8.8

Note: * Emission limit stipulated in BPM12/2 (06)

Table 2-3 Average Emission Data of Kwai Chung Crematorium (ULSD) from June 2003 to August 2006

From ***Tables 2-2 and 2-3***, above, it can be seen that both Towngas and ULSD can meet the latest EPD emission requirements specified in BPM12/2 (06) and also the target emission limits as proposed in the EIA study.

The air pollutants of concern in selecting the fuel using for cremation would be particulate matter, nitrogen dioxide and sulphur dioxide.

- **Particulate Matter and Nitrogen Dioxide (NO_2).** Both Towngas and ULSD produce emission well below the latest EPD BPM12/2 (06) requirement of particulate matter and proposed Target Emission Level of nitrogen oxides which consist of nitric oxide (NO) and NO_2.
- **Sulphur Dioxide (SO_2).** Although there is no emission data for SO_2, there is virtually no sulphur content in Towngas and only 0.005% sulphur content, which is below the current limit of 0.5% sulphur stipulated in the *Air Pollution Control (Fuel Restriction) Regulations,* in ULSD; as such both Towngas and ULSD

would be expected to comply with the Target Emission Level of 180mg/m^3 proposed in the EIA study.

It should be noted that the air quality impact assessment which is based on the Target Emission Levels of which both Towngas and ULSD can meet shows that the predicted concentrations of those abovementioned parameters at all the air sensitive receivers are well below the assessment criteria.

1.5 Conclusion and Recommendations

ULSD and Towngas are available and technically feasible in supply, and emission levels of both are well below the emission limits. In general, however, emissions of air pollutants such as particulate matter, nitrogen oxides and carbon monoxide will be lower for Towngas than for ULSD based on the emission data from Fu Shan and Kwai Chung Crematoria. In order to achieve lower emission levels of air pollutants thereby to be more environmental-friendly, the Project Proponent has selected Towngas as burning fuel for new cremators even though the operating cost of using Towngas would be higher than for ULSD.