

# Application for variation to DPS IPPC Permit: New Plant

## Appendix 1 (Rev. A): Comparison of different operational conditions

### C1.2: Fuel storage requirements

Fuel type	Number of fuel tanks	Capacity of each tank (m <sup>3</sup> )
Heavy fuel oil (1% S) <sup>1</sup>	Existing: 2 storage + 1 (not yet commissioned) New: 2 buffer + 2 service	Existing: 2 x 25,540 + 1 x 5000 New: 4 x 125
Heavy fuel oil (0.7% S) <sup>1</sup>	Same as for 1% S	Same as for 1% S
Diesel (0.1% S)	Existing: 4 storage New: 1 day storage	Existing: 1 x 8600 + 3 x 8428 New: 1 x 140
Natural gas <sup>2</sup>	See footnote 2	See footnote 2

### C2.2: Raw materials usage

#### Base load operation

Fuel type	Raw material used per annum (tonnes)				
	Fuel	Sodium bicarbonate	Urea	Lubricating oil	Etc. <sup>3</sup>
HFO (1% S)	226,700	11,800	10,260	784	N/A
HFO (0.7% S)	226,700	8,260	10,260	784	N/A
Diesel (0.1% S) <sup>4</sup>	212,400	Nil	10,260	784	N/A
Natural gas	193,100	Nil	less than for Diesel	784	N/A

#### Two-shift operation<sup>5</sup>

Fuel type	Raw material used per annum (tonnes)				
	Fuel	Sodium bicarbonate	Urea	Lubricating oil	Etc.
HFO (1% S)	130,300	5,386	4,682	460	N/A
HFO (0.7% S)	130,300	3770	4682	460	N/A
Diesel (0.1% S)	122,000	nil	4682	460	N/A
Natural gas	111,000	nil	less than for Diesel	460	N/A

### C2.5.2: Energy efficiency

Fuel type	Energy efficiency (in %) (gross/ net)	
	Base load	Two-shift
Heavy fuel oil (1% S)	46.9/ 45.1	46.2/ 44.62
Heavy fuel oil (0.7% S)	46.9/ 45.1	46.2/ 44.62
Diesel (0.1% S)	46.8/ 45.1	46.3/ 44.62
Natural gas <sup>6</sup>	See footnote 6	See footnote 6

### C3.1.1: Waste generation

#### *Base load operation*

Quantity generated per annum	Fuel type			
	HFO (1% S)	HFO (0.7% S)	Diesel (0.1% S)	Natural gas
Flue gas desulphurisation waste <sup>7</sup> (tonnes)	9,880 t (see 3.1.1)	6,916 t	Nil (see footnote 8)	nil
Spent catalyst <sup>9</sup>	see footnote 9	see footnote 9	see footnote 9	see footnote 9
Oil sludge (tonnes)	993	993	nil	nil
Boiler washdown sludge (m <sup>3</sup> )	8	8	n/a (see footnote 10)	n/a (see footnote 10)
Catalyst wash water	nil	nil	nil	nil
<i>Etc.</i>	see table 12.2 in doc. C3.1.1	see table 12.2 in doc. C3.1.1		

#### *Two-shift operation*

Quantity generated per annum	Fuel type			
	HFO (1% S)	HFO (0.7% S)	Diesel (0.1% S)	Natural gas
Flue gas desulphurisation waste <sup>7</sup> (tonnes)	6,000	4,200	nil	nil
Spent catalyst <sup>9</sup>	see footnote 9	see footnote 9	see footnote 9	see footnote 9
Oil sludge (tonnes)	457	457	nil	nil
Boiler washdown sludge (m <sup>3</sup> )	8	8	n/a (see footnote 10)	n/a (see footnote 10)
Catalyst wash water	nil	nil	nil	nil
<i>Etc.</i>	see table 12.2 in doc. C3.1.1	see table 12.2 in doc. C3.1.1		

### C3.5: Air emissions (concentrations) [Maximum figures]

#### Base load operation

Fuel type	Sulphur content	Emission levels (at 15% O <sub>2</sub> )							
		NO <sub>x</sub>	SO <sub>2</sub>	Dust	Ammonia	Ni <sup>11</sup>	V <sup>11</sup>	As	PAHs <sup>12</sup>
Heavy fuel oil	1%	160 mg/Nm <sup>3</sup>	120 mg/Nm <sup>3</sup>	50 mg/Nm <sup>3</sup>	5 ppm	84 mg/s	755.4 mg/s	1.3 mg/s	2.1mg/s
Heavy fuel oil	0.7%	160 mg/Nm <sup>3</sup>	120 mg/Nm <sup>3</sup>	50 mg/Nm <sup>3</sup>	5 ppm	84 mg/s	755.4 mg/s	1.3 mg/s	2.1mg/s
Diesel	0.1%	160 mg/Nm <sup>3</sup>	56 mg/Nm <sup>3</sup>	<50 mg/Nm <sup>3</sup>	5 ppm	3.7 mg/s	3.7 mg/s	no data	no data
Natural gas	negligible	160 mg/Nm <sup>3</sup>	negligible	13 mg/Nm <sup>3</sup>	5 ppm	nil	nil	nil	nil

#### Two-shift operation

Fuel type	Sulphur content	Emission levels (at 15% O <sub>2</sub> )							
		NO <sub>x</sub>	SO <sub>2</sub>	Dust	Ammonia	Ni <sup>11</sup>	V <sup>11</sup>	As	PAHs <sup>12</sup>
Heavy fuel oil	1%	160 mg/Nm <sup>3</sup>	120 mg/Nm <sup>3</sup>	50 mg/Nm <sup>3</sup>	5 ppm	84 mg/s	755.4 mg/s	1.3 mg/s	2.1mg/s
Heavy fuel oil	0.7%	160 mg/Nm <sup>3</sup>	120 mg/Nm <sup>3</sup>	50 mg/Nm <sup>3</sup>	5 ppm	84 mg/s	755.4 mg/s	1.3 mg/s	2.1mg/s
Diesel	0.1%	160 mg/Nm <sup>3</sup>	56 mg/Nm <sup>3</sup>	<50 mg/Nm <sup>3</sup>	5 ppm	3.7 mg/s	3.7 mg/s	no data	no data
Natural gas	negligible	160 mg/Nm <sup>3</sup>	negligible	13 mg/Nm <sup>3</sup>	5 ppm	nil	nil	nil	nil

### C4.1: Annual air emission loads (tonnes)

Fuel type	Base load operation				Two-shift operation			
	NO <sub>x</sub>	SO <sub>2</sub>	Dust	Ammonia	NO <sub>x</sub>	SO <sub>2</sub>	Dust	Ammonia
HFO (1% S) <sup>1, 13</sup>	1064	798	360	21	665	499	225	13
HFO (0.7% S) <sup>13</sup>	1064	798	360	21	665	499	225	13
Diesel (0.1% S) <sup>14</sup>	1064	425	<360	21	665	244	<225	13
Natural gas <sup>15</sup>	1064	negligible	~ 95	21	665	negligible	~ 95	13

1. The HFO tanks at Delimara Power Station only contain 0.7% HFO. There is no fuel containing 1% Sulphur at Delimara Power Station.
2. The number of tanks to be installed shall depend on the solution adopted following the decision to use natural gas as fuel. Should a pipeline solution be adopted, then, there is no storage requirement at Delimara. Should an LNG solution be adopted, then, the number and capacity of tanks required shall depend on the size and frequency of the shipping of this fuel.
3. Other raw materials used are negligible in quantity.
4. The quantity of De-SOx reagent on gasoil shall depend on whether the bag filters require a renewed coating for protection during gasoil firing.. There is no De-SOx requirement on gasoil operation. It is considered at this point that such coating may not be required.
5. These are updated values from the original application data in Ref. Doc. C2.2
6. There is no data available for the Combined Cycle Diesel engine plant operation on natural gas. However, it is expected that the plant efficiency shall not vary significantly from the liquid fuel figures.

7. The relative density of the flue gas DeSOx byproduct is between 0.7- 1.0, but is closer to 0.9.
8. There is no DeSOx requirement when operating on gasoil. However, the amount of waste generated by this fuel shall depend on whether the bag filters require a renewed coating of reagent when operating on this fuel. It is considered at this point that such coating may not be required.
9. Catalyst renewal is dependent on catalyst reaction depletion levels and follows a saw tooth curve. The first expected exchange of one catalyst layer, made of 484 elements is rated at 60,000 hours of operation.
10. The boiler washdown sludge when the plant is operating on gasoil or natural gas is not known, however, it is expected to be significantly lower than the case for HFO firing.
- 11 These values are based on the maximum levels of the fuel purchasing specifications (Worst case). Actual values depend on consignment quality data.
12. Using BaP as a marker
13. Abatement plant, including DeSOx plant in operation
14. Abatement plant in operation excluding DeSOx plant since no DeSOx required on Gasoil
- 15 DeNOx plant only in operation.