

Appendix 4.3 Event Tree Analysis

Appendix 4.3 - Event Tree Analysis

Figure 1 Gasholder Release

	Leak Size	Ignition	Explosion	Outcome	Frequency
Gasholder Release (size= 800 m ³)	Leak, 300 mm hole (~ 2 kg/s) 4.23E-04	Immediate		Jet Fire	1.48E-05
		Delay 0.035	Yes 0.12	VCE	1.77E-06
			No 0.88	Flash Fire	1.30E-05
			No 0.93	No Consequence	3.93E-04
	Rupture (release quantity = 800m ³) 1.24E-05	Immediate		Fire Ball	1.86E-06
		Delay 0.15	Yes 0.3	VCE	5.58E-07
			No 0.7	Flash Fire	1.30E-06
			No 0.7	No Consequence	8.67E-06

Note: Design capacity of Gasholder is 1,387 m³, 1,600 m³ of biogas stored in 2 gasholders on site is assumed, on conservative approach.

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Figure 2 Digester Release

	Leak Size	Ignition	Explosion	Outcome	Frequency
Digester Release (biogas volume size= 286 m ³)	Leak, 300 mm hole (~ 3.5 kg/s) 5.23E-04	Immediate		Jet Fire	1.83E-05
		Delay	Yes	VCE	2.19E-06
			No	Flash Fire	1.61E-05
		No		No Consequence	4.86E-04
		0.93			
	Rupture (release quantity ~ 286m ³) 4.24E-05	Immediate		Fire Ball	6.36E-06
		Delay	Yes	VCE	1.91E-06
			No	Flash Fire	4.45E-06
		No		No Consequence	2.97E-05
		0.7			

Note: Total biogas volume inside the three digesters is about 858 m³ in total, a biogas volume of 286 m³ is assumed in each digester.

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Figure 3 Aboveground Piping Release

Leak Size		Ignition	Explosion	Outcome	Frequency
Aboveground Piping Release	Leak, 30 mm dia.(~ 0.03 kg/s) 3.02E-04	Immediate		Jet Fire	1.51E-06
		Delay	Yes	VCE	6.03E-08
			No	Flash Fire	1.45E-06
		No		No Consequence	2.99E-04
		0.99			
	Rutpure, 300 mm dia.(~ 3.5 kg/s) 5.34E-05	Immediate		Jet Fire	1.87E-06
		Delay	Yes	VCE	2.24E-07
			No	Flash Fire	1.64E-06
		No		No Consequence	4.97E-05
		0.93			

Note: 200m length of DN300 aboveground pipeline is assumed, on conservative approach.

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Figure 4 Sulphur Absorption Vessels

Leak Size		Ignition	Explosion	Outcome	Frequency
Sulphur Absorption Vessels (size= 5 m ³ / 7 kg of methane)	Leak, 10 mm hole (~ 0.014kg/s) 4.23E-04	Immediate		Jet Fire	2.11E-06
		0.005			
		Delay	Yes 0.04	VCE	8.45E-08
		0.005	No	Flash Fire	2.03E-06
	Rupture (release quantity = 5m ³) 3.24E-05		0.96		
		No		No Consequence	4.18E-04
		0.99			
		Immediate		Fire Ball	1.13E-06
		0.035			
		Delay	Yes 0.12	VCE	1.36E-07
		0.035	No	Flash Fire	9.97E-07
			0.88		
		No		No Consequence	3.01E-05
		0.93			

Note: The volume of the two sulphur absorption vessels is 5 m³ each.

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Figure 5 Purification Unit Release

	Leak Size	Ignition	Explosion	Outcome	Frequency
Purification Unit Release	Leak, 10 mm dia.(~ 0.25 kg/s) 4.02E-04	Immediate		Jet Fire	2.01E-06
		Delay	Yes	VCE	8.03E-08
			0.04		
		0.005	No	Flash Fire	1.93E-06
		0.96			
	No		No Consequence	3.98E-04	
	0.99				
	Rutpure, 100 mm dia.(~ 112 kg/s) 6.34E-05	Immediate		Jet Fire	9.51E-06
		Delay	Yes	VCE	2.85E-06
			0.3		
0.15		No	Flash Fire	6.66E-06	
0.7					
No		No Consequence	4.44E-05		
0.7					

Note: The purification unit is represented by a 100m DN100 piping at 20 barg.