Appendix 4.4 Generic Frequency Estimations

Appendix 4. 4 Generic Frequency Estimations

By accessing historical incidents database, the accidents involving generation, transfer, storage and use of biogas or methane, anaerobic digesters or facilities of similar nature are reviewed. The generic incident frequency can be estimated based on the information of the number of biogas plant involved, the operating period and the total number of accidents occurred within the operating period.

From the accessible information, the numbers of biogas plants in European countries are obtained. The estimated generic frequency data has been used for comparing the frequency applied this OWTF 2 Hazard Assessment (HA) Study.

Summary of Incidents

11 records of biogas/ methane release were identified in the incident databases. The databases accessed are Major Hazard Incidents Data Service (MHIDAS), eMARS, FACTS, ARIA, and eMARS covering related historical biogas/ methane incidents.

Number of Biogas Plants

The numbers of biogas plants in European countries are shown in **Table 1** below.

Table 1 Biogas Plants in European countries

Location	No. of Plants	No. of Reported Accidents	Years operated	Plant-year	Reference
Germany	3500	3	6	21000	[1]
Austria	586	-	4	2344	[2]
Italy	542	1	5	2710	[3]
France	440	1	1	440	[4]
Sweden	229	-	2	458	[5]
UK	219	-	1	219	[6]
Switzerland	125	-	1	125	[7]
Netherlands	113	-	2	226	[8]
Portugal	100	-	7	700	[9]
Denmark	75	-	7	525	[9]
Finland	73	-	2	146	[10]
Ireland	26	-	1	26	[11]
Total	**6028**	**5**	**-**	**28919**	

Estimation of generic incident frequency based on European countries operating experience

The generic accidents frequency can be estimated by:

5 (reported incidents) / 28919 (operated plant- years) = 1.73E-04 incident per plant-year.

The number of biogas plants in India is shown in **Table 2** below.

Table 2 Biogas Plants in Indian

Location	No. of Plants	No. of Reported Accidents	Years operated	Plant-year	Reference
India	4000000 (approx.)	2	4	16000000	[12]

Estimation of generic incident frequency based on Indian operating

The generic accidents frequency can be estimated by:

2 (reported incidents) / 16000000 (operated plant- years) = 1.25E-07 incident per plant-year.

Frequency Comparison of European and Indian experience

The estimated generic frequencies based on European and Indian experience are 1.73E-4 and 1.25 E-7 incident per plant-year respectively. The figure of Indian is significantly lower and considered to be optimistic. Generic frequency of 1.73E-4 incident per plant-year will be comparing with the estimated frequency for OWTF 2 HA Study on conservative approach.

Frequency used in the OWTF 2 HA Study

The overall failure frequency for OWTF 2 HA is 1.29E-3 (according to FTA shown in Appendix 4.2), which is greater than the estimated value from the European historical incidents. Therefore, the frequencies in the OWTF 2 HA Study are considered reasonably conservative.

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