Appendix 32. Methane emissions – Environmental Damage & Wasted Resource example

<u>Example</u>
Plant losing 10 kg/h methane through fugitive emissions
10 kg/h = 87,600 kg year (87.6 tonnes) methane lost
Loss as carbon dioxide equivalent = 87.6 tonnes x 28 (GWP_{100}) = 2,453 tonnes CO2e.
10kg/hr methane is 13.97Nm3 methane. If the methane is approx. 70% of biogas then 13.97/0.7 = 19.96Nm3. at biogas flow of 19.96Nm3, Co2 would be 5.99Nm3 (19.96 -13.97).
Density of Co2 at normalised conditions is 1.964kg/Nm3, so mass of CO2 would be 5.99 x 1.964 = 11.76kg.
So a loss of 10kg/hr methane would equate to a total biogas loss of 10 + 11.76 = 21.76kg/hr.

<u>Environmental Damage Cost</u>
Damage cost – using **non-traded carbon value**
Carbon value (2024) = £269/tonne CO2e
CO2e emission = 2,453 tonnes
Damage cost = 2,453 tonnes x £269/tonne = **£660,000**
[Note: any abatement costs below this figure would be cost beneficial].

<u>Lost energy</u>
10 kg/h methane = 140 kWh$_{(thermal)}$ or 56 kWh$_{(electrical)}$
= 1,226 MWh$_{(thermal)}$ year
= 490 MWh$_{(electrical)}$ year (Note: assumes 40% electrical efficiency)

<u>Lost electrical generation revenue</u>
@ standard market electricity price of 7p/kWh = £3.92 hour = £34,340 year
With additional 5p kWh (assumed average) from Feed-in-Tariff = £6.72 hour = £58,870 year

<u>Lost biomethane value</u>
@ standard market gas price of 75p/therm (2.6p/kWh) or (£0.026/kWh) = £3.64 hour = £31,890 year
With additional (Tier 1) GGSS tariff of 6.33p/kWh = £12.50 hour = £109,500 year

[Note: calculated values for electricity and biomethane production are based on continuous operation (no downtime) for 8760 hours per year]