Annex: Calculation of E_Cs,y

All the data and information contained in the monitoring report, including the calculation of electricity consumption for the HFC23 storage, E_Cs,y, is calculated by using a formula defined in "The Calorific Equilibrium of Continuous distilling equipment", Chemical Engineering Principle, 2006, and calculated to be conservative.

Technical specification of the refrigerator is listed blow:

Refrigeration capacity	Shaft power	Electro motor power	Actual circulate current (Im)	Power factor (Cosφ)
163 kW/h	84 kW	132 kW	175A	0.88

Therefore,

1) Actual electricity consumption of the refrigerator (Pin)

$$Pin = \sqrt{3}Ue \operatorname{Im} Cos\phi = \sqrt{3} * 380 * 175 * 0.88 / 1000 = 101.36 kWh/h$$

Here, Ue is three-phase alternating-current voltage, 380V;

2) The actual efficiency/energy ratio (means actual refrigeration quantity per electricity consumption) of the refrigerator is $163/101.36 = 1.608$

3) At -20°C, the latent heat of evaporation of HFC23 is 41.3kCal/kg. Refrigeration is needed in the following processes, including first condensation; rectify circumfluence in distillation tower and pure HFC23 liquifiaction for filling in steel bottles. Generally, the ratify circumfluence is 2~4. To be conservative, we use the ratify circumfluence is 4. The refrigeration demand ratio for these processes is 1:4:1. Therefore, the refrigeration demand for 1-ton HFC23 storage is:

$$41.3 * 1000kg * (1+4+1) = 247800 \text{ kCal / t-HFC23}$$

4) The effective electricity consumption is: $247800/860/1.608 = 179kWh/ t\text{-}HFC23$

Here, 1kWh = 860 kCal.

5) Refrigerating loss:

Generally, the refrigerating loss of pipelines is around 15-20%. Considering the used equipments are small-scale with low refrigeration consumption. Consequently, the refrigerating loss for pipeline insulation is slightly higher than usual conditions. To be conservative, refrigerating loss of pipelines is estimated to be around 50%. The actual electricity consumption of 1-ton HFC23 storage: $(1+50\%)*179 = 268kWh//t\text{-}HFC23$

Therefore:

Based on the above calculation, the connected load associated with HFC23 storage activity, E_Cs,y, is estimated as **268**kWh/t-HFC23.