Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring
and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of
the European Parliament and of the Council (Text with EEA relevance) (repealed)

ANNEX IV

Activity-specific monitoring methodologies related to installations (Article 20(2))

23.   **Geological storage of CO_2 in a storage site permitted under Directive 2009/31/EC**

A.   *Scope*

The competent authority shall base the boundaries for monitoring and reporting of emissions from geological storage of CO_2 on the delimitation of the storage site and storage complex as specified in the permit pursuant Directive 2009/31/EC. Where leakages from the storage complex are identified and lead to emissions or release of CO_2 into the water column, the operator shall immediately carry out all of the following:

(a)   notify the competent authority;

(b)   include the leakage as an emission source for the respective installation;

(c)   monitor and report the emissions.

Only when corrective measures in accordance with Article 16 of Directive 2009/31/EC have been taken and emissions or release into the water column from that leakage can no longer be detected shall the operator delete the respective leakage as emission source from the monitoring plan and no longer monitor and report those emissions.

Each operator of a geological storage activity shall consider at least the following potential emission sources for CO_2 overall: fuel use by associated booster stations and other combustion activities including on-site power plants; venting from injection or enhanced hydrocarbon recovery operations; fugitive emissions from injection; breakthrough CO_2 from enhanced hydrocarbon recovery operations; and leakages.

B.   *Quantification of CO_2 emissions*

The operator of the geological storage activity shall not add CO_2 received from another installation to its calculated level of emissions, and shall not subtract from its calculated level of emissions any CO_2 which is geologically stored in the storage site or which is transferred to another installation.

B.1.   Vented and fugitive emissions from injection

The operator shall determine emissions from venting and fugitive emissions as follows:

CO_2 emitted [t CO_2] = V CO_2 [t CO_2] + F CO_2 [t CO_2]

Where:

V CO_2 =   amount of CO_2 vented;
F CO_2 =   amount of CO_2 from fugitive emissions.

Each operator shall determine V CO_2 using measurement-based methodologies in accordance with Articles 41 to 46 of this Regulation. By way of derogation from the first sentence and upon approval by the competent authority, the operator may include in the monitoring plan an appropriate methodology for determining V CO_2 based on industry best practice, where the application of measurement-based methodologies would incur unreasonable costs.

The operator shall consider F CO_2 as one source, meaning that the uncertainty requirements associated with the tiers in accordance with section 1 of Annex VIII are applied to the total value

instead of the individual emission points. Each operator shall provide in the monitoring plan an analysis regarding potential sources of fugitive emissions, and provide a suitable documented methodology to calculate or measure the amount of F CO_2, based on industry best practice guidelines. For the determination of F CO_2 the operator may use data collected in accordance with Article 32 to 35 and Annex II(1.1)(e) to (h) of Directive 2009/31/EC for the injection facility, where they comply with the requirements of this Regulation.

B.2.   Vented and fugitive emissions from enhanced hydrocarbon recovery operations

Each operator shall consider the following potential additional emission sources from enhanced hydrocarbon recovery (EHR):

(a)   the oil-gas separation units and gas recycling plant, where fugitive emissions of CO_2 could occur;

(b)   the flare stack, where emissions might occur due to the application of continuous positive purge systems and during depressurisation of the hydrocarbon production installation;

(c)   the CO_2 purge system, to avoid high concentrations of CO_2 extinguishing the flare.

Each operator shall determine fugitive emissions or vented CO_2 in accordance with subsection B.1 of this section of Annex IV.

Each operator shall determine emissions from the flare stack in accordance with subsection D of section 1 of this Annex, taking into account potential inherent CO_2 in the flare gas in accordance with Article 48.

B.3.   Leakage from the storage complex

Emissions and release to the water column shall be quantified as follows:

$$CO_2 \text{ emitted } [t\ CO_2] = \sum_{T_{Start}}^{T_{End}} L\ CO_2\ [t\ CO_2/d]$$

Where:

L CO_2 = the mass of CO_2 emitted or released per calendar day due to the leakage in accordance with all of the following:

   (a)   for each calendar day for which leakage is monitored, each operator shall calculate L CO_2 as the average of the mass leaked per hour [t CO_2/h] multiplied by 24;

   (b)   each operator shall determine the mass leaked per hour in accordance with the provisions in the approved monitoring plan for the storage site and the leakage;

   (c)   for each calendar day prior to commencement of monitoring, the operator shall take the mass leaked per day to equal the mass leaked per day for the first day of monitoring ensuring no under-estimation occurs;

T_{start} = the latest of:

   (a)   the last date when no emissions or release of CO_2 into the water column from the source under consideration were reported;

(b)		the date the CO_2 injection started;
(c)		another date such that there is evidence demonstrating to the satisfaction of the competent authority that the emission or release into the water column cannot have started before that date.
T_{end}	=	the date by which corrective measures in accordance with Article 16 of Directive 2009/31/EC have been taken and emissions or release of CO_2 into the water column can no longer be detected.

The competent authority shall approve and allow the use of other methods for the quantification of emissions or release of CO_2 into the water column from leakages where the operator can show to the satisfaction of the competent authority that such methods lead to a higher accuracy than the methodology set out in this subsection.

The operator shall quantify the amount of emissions leaked from the storage complex for each of the leakage events with a maximum overall uncertainty over the reporting period of 7,5 %. Where the overall uncertainty of the applied quantification methodology exceeds 7,5 %, each operator shall apply an adjustment, as follows:

$$CO_{2,Reported} \ [t \ CO_2] = CO_{2,Quantified} \ [t \ CO_2] * (1 + (Uncertainty_{System} \ [\%]/100) - 0,075)$$

Where:

$CO_{2,Reported}$	=	the amount of CO_2 to be included in the annual emission report with regards to the leakage event in question;
$CO_{2,Quantified}$	=	the amount of CO_2 determined through the used quantification methodology for the leakage event in question;
$Uncertainty_{System}$	=	the level of uncertainty associated with the quantification methodology used for the leakage event in question.