EARSC

European Association of Remote Sensing Companies

## EARTH OBSERVATION FOR METHANE MONITORING

### Earth Observation Technological Feasibility Assessment - Proposal for a Regulation on methane emissions reduction in the energy sector and amending Regulation (EU) 2019/942 –by article.

This document has been produced by the EARSC Green Deal working group.

| Article | Comment on Technological Feasibility |
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| Context of the proposal (page 2)<br>Reasons for and objectives of the proposal<br>● *Improve the accuracy of information on the main sources of methane emissions associated with energy produced and consumed within the EU.*<br>● *Improve the availability of information* | ● Satellites are a cost-effective and proven system for observing emissions, proving accurate, reliable and frequent data to support decarbonization strategies<br>● Satellite derived data can provide regular detection and quantification of methane in particular hard to reach areas or instances where large geographic coverage are required *(large spatial coverage and repeat coverage datasets)*[1]<br>● It also provides a cost-effective solution (cheaper alternative to other technologies especially when large geographic coverage is required), by using an existing infrastructure. |
| (page 10)<br>*…Methane emissions are increasingly subject to public attention, including scientific and stakeholder campaigns to detect and quantify emissions. Supported by increasing spatial and temporal resolution of satellite data, such public scrutiny is a valuable resource in monitoring the impact of the proposal and identifying shortcomings in implementation….*<br><br>*The International Methane Emission Observatory will provide additional scrutiny of submitted methane emissions data, including the possibility to cross-reference them with other sources such as satellite imaging and products* | ● New satellite missions are working to increase their spatial and spectral resolution in order to obtain more accurate data - currently working a GSD (ground sample distance) of less than 40 m which is more than enough to identify two emission sites from one another.<br>● Environmental agreements are hard to enforce without independently verified data but satellites — with advances in computing — can help monitor pollution helping to measure whether governments are hitting their targets.Thanks to powerful technologies, such as high-resolution satellite data, scientists are now able to underline the impact of frequent and intentional methane releases, also known as 'venting.'[2] |
| (56) (page 22)<br>*…It would provide methane emission data from different sources of fossil energy from* | ● Satellite-derived data and services complement as an innovative approach to measure and map GHG emissions on a local, regional and global scale and can |

[1] As stated in the "Estimating methane emissions" section of the "Global methane Tracker 2022 report" of the International Energy Agency, the "Satellites and better data will play a key role in improving policy"
"...Nevertheless the limitation due to cloud cover, reducing the number of days when detections can be made.. They can struggle to provide readings in many environments such as offshore areas, mountain ranges, snowy or ice-covered regions, and at high latitudes....."

[2] https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/Monitoring_methane_emissions_from_gas_pipelines

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| *around the globe - including from source-level estimations and measurements as well as from aerial/satellite monitoring…* | also identify specific emitting sources and provide almost real time data on GHG emissions sources (e g power plants) leakages or hotspots (e.g. emission anomalies such as methane leaks) |
| Article 2 - Definitions (page 25)<br>*'site-level measurement' means a top-down measurement and typically involves the use of sensors mounted on a mobile platform, such as vehicles, drones, aircrafts, boats and satellites or other means to capture a complete overview of emissions across an entire site;* | • Combining commercial satellite derived data and Copernicus data, verification of the "site-level measurement" could be done to differentiate sites as well as giving the option to detect leaks for gas pipes/networks.<br>• On the importance of including gas networks: satellite capabilities offer a wide range of applications and services to rapidly detect methane emissions and leaks in a variety of gas extraction, processing, storage, transmission and distribution settings, covering large areas in a short time and therefore significantly reducing the cost of the emissions monitoring and leak detection. |
| Article 14 - Leak detection and repair (page 35)<br>• *In carrying out the surveys, operators shall use devices that allow detection of loss of methane from components of 500 parts per million or more.*<br>• *Operators shall repair or replace all components found to be emitting 500 parts per million or more of methane.* | **Units of measurement**<br>• 500 ppm concentration is relevant mostly to terrestrial instrumentation and very much dependent on the spatial resolution. Ideally the proposal should include units for ppm / column density or in a more advanced case kg/h.<br>• kg/h will need a conversion including modeling [3] (knowing wind speed and direction)<br><br>**Operational solutions**<br>A list of all the current missions is available at the GEO booklet for the GHG Monitoring from Space**.**<br><br>-For European public Copernicus programme:<br>Sentinel 5p: (i) larger detection of methane emissions in very large areas (spatial resolution of 5.5 km by 7 km) (ii) minimum detection threshold is 5 tons of methane/h (iii) helps identify super-emitters and near daily readings of methane concentration across major oil and gas basins<br>Sentinel 2: (i) very fine spatial resolution (spatial resolution of 20 meters by 20 meters) (ii) minimum detection threshold is at 0.5 tons of methane/h (iii) helpful to differentiate sites as well as giving the option to detect leaks for gas pipes/networks.<br><br>-For commercial missions, an operational example is GHG-sat[4]<br>(i) GSD ≈ 25 m (ii) 100 kg h−1 for nominal conditions (iii) provides increasing amounts of high-fidelity, actionable data to industrial operators worldwide, ultimately leading to significant emissions reductions.<br><br>**Technology potential**:<br>• Existing and new commercial providers (i.e, high resolution satellites but also coarser resolution with a broader spatial and temporal coverage) are looking at providing detection thresholds down to 500ppm or lower.<br>• A number of academic papers[5] demonstrate the |

[3] Here is an example where data is taken from ppm and given in kg/h/https://acp.copernicus.org/articles/22/9617/2022/

[4] https://amt.copernicus.org/articles/14/2127/2021/amt-14-2127-2021.pdf

[5] Sentinel 2 SWIR bands paper: https://amt.copernicus.org/articles/14/2771/2021/

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| | potential of the technology in increasing the accuracy thanks to the combination of fine pixel resolution (20m)[6] and rapid revisit rates. |
| Article 20 - Monitoring and reporting (page 39)<br><br>Article 25 - Monitoring and reporting (page 41) | ● Satellite derived data and services can improve the efficiency of monitoring activities by automatically highlighting areas of interest (i.e. super-emitters, location of a critical infrastructure, etc). This can drive a more effective use of limited resources, supporting the validation and reporting process.<br>● Satellite-derived data is globally consistent offering harmonized and comparable information facilitating the reporting process.<br>● Cloud computing is effective in activating and mining large-scale heterogeneous data and has been widely applied to Remote Sensing BIg Data (RSBD) over the past years[7]. As cloud platforms advance in technology the sharing and usage of data between satellites has become increasingly efficient. |
| Article 29 - Methane emitters global monitoring tool (page 44)<br>● *By … [two years after the date of entry into force of the Regulation], the Commission shall establish a global methane monitoring tool based on satellite data and input from several certified data providers and services, including the Copernicus component of the EU Space Programme.* | ● As the field is rapidly evolving through technology and data processing innovations, EO satellites are increasingly capable of monitoring GHG emissions with precision and scale. The sector is already offering data and services in an operational manner. Thanks to the Copernicus programme and private missions which help to collect and maintain accurate and relevant GHG emission datasets on all scales to unlock climate action. |
| Regulation on methane emissions reduction in the energy sector and amending Regulation (EU) 2019/942 (starts page 13)<br><br>(36) flaring & venting “on-site” | ● Flaring releases carbon dioxide and some methane into the atmosphere, contributing to global warming and making it essential for regulators to keep close tabs on the activity. Track gas flaring is essential and satellite derived data can pin point these events (spot tiny hotspots due to flaring as well as larger ones) |

Worldview 3 SWIR bands paper: https://www.researchgate.net/publication/354732769_Mapping_methane_plumes_at_very_high_spatial_resolution_with_the_WorldView-3_satellite

[6] Here is a paper that mentions getting down to 3.7m https://amt.copernicus.org/articles/15/1657/2022/

[7] https://www.tandfonline.com/doi/full/10.1080/17538947.2022.2115567