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I. BACKGROUND

In 2024 the European TSO carried out complex LDAR surveys with source level measurement campaigns and site level measurements at 2 compressor stations, moreover at all typical, representative transmission stations (mainly gas delivery stations, regulating and metering stations).

The stations involved into the reconciliation process were chosen by our sampling strategy, taking into account several major parameters. For the reconciliation process, we strived to carry out all measurements during the typical operation mode of the stations, so we are able to compile proper “snapshot” reconciliations.

Source level emission

Our normal LDAR survey was performed by our own dedicated technicians, using FID handheld devices and OGI camera for leak detection. During the process, our technicians measured and recorded the methane concentration of each leak and later these data were converted to mass flow, based on the correlations of EN15446 standard. All more significant leaks (>50.000 ppm) were also measured with High Flow Sampler. These results were aggregated to receive the source level emission (in kg/h) of a given station.

Site level emission

The site level measurements at **compressor stations** were performed by an environmental specialist company ([Home – ReSource Solutions Sweden](#)) following their own methodology (GASTRAC Flux – mass balance modelling). During this kind of “downwind” measuring methodology, the specialists applied very sensitive methane sensor mounted on a drone and the methane concentration in the gas plume (in lots of points) were measured. Furthermore the precise wind data were also measured with a weather station and all of them were recorded for the calculation (mass flow) of site level emission.

The site level measurements at all typical, representative **transmission stations** were performed by our own dedicated and trained technicians, as a post-inspection to find the possible missing leaks. This process was carried out with an OGI camera. Our transmission stations have only fugitive emission (coming from leaks), so using OGI camera for site level measurement is allowed by OGMP 2.0 opinion during the interim period.

All measurement reports (e.g. site level measurement at compressor stations) and calculations (source level measurement) are available at EUROPEAN TSO Ltd.

II. TSO A COMPRESSOR STATION



Gas turbine driven compressor units at the station



Location and coordinates of the station

Aggregated source level emission with uncertainty

Source level measurement campaign was performed between 10.09.2024 – 14.10.2024.

Fugitive

	CH ₄ emission (kg/h)	uncertainty
Connections (flanges, seals, joints)	0,1025	-45% / +73%
Valves and control valves	0,0673	-45% / +73%
OEL	0,0029	-45% / +73%

Only few and very small leaks were detected and measured during our source level measurement in September 2024.

Vents

	CH ₄ emission (kg/h)	uncertainty
Seals of the compressor units	6,3302	-45% / +73%

Only 1 compressor unit was in operation during the source and site level measurement campaign.

Total emissions

	CH ₄ emission (kg/h)	uncertainty
Fugitive + Vents	6,5029	-45% / +73%

No compressor units were in operation during the source and site level measurement campaign.

Total emissions with uncertainty

	CH ₄ emission (kg/h)
Fugitive + Vents	6,503 [3,577; 11,250]

Site level emission with uncertainty

Measurements in 13 transects were carried out by Resource Sweden on 17.09.2024.

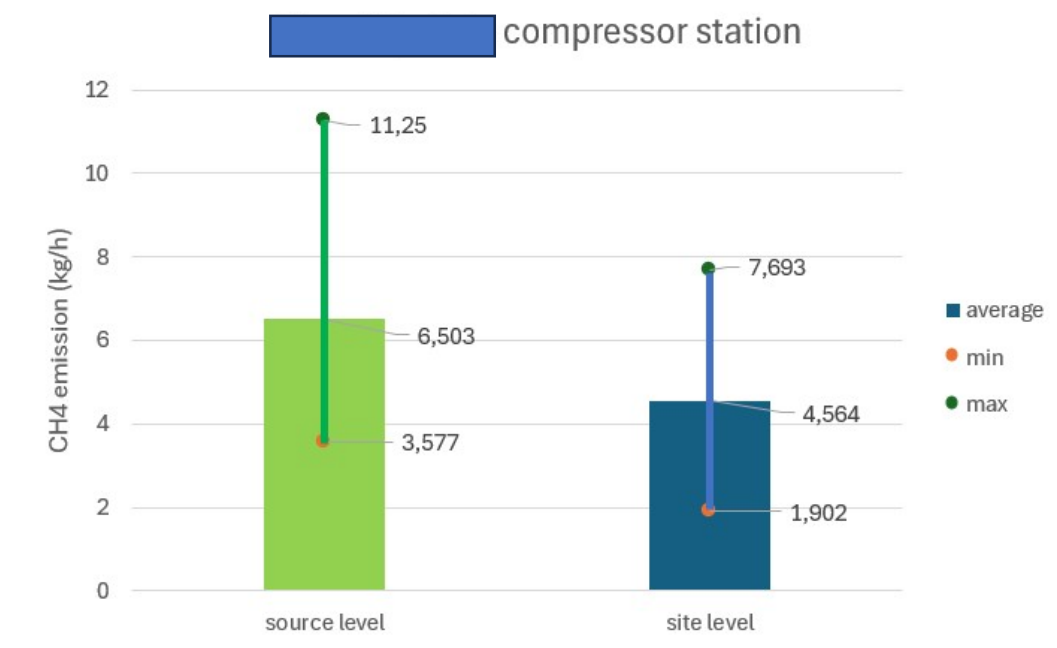
Measurement	Target source	Calculated CH ₄ emissions flux (Kg·h ⁻¹) at 95% CI	Time of flight (local)
1	Site-level	3,152 [1,337; 5,038]	2024-09-17 10:48:48 - 10:53:51
2	Site-level	4,85 [2,958; 6,778]	2024-09-17 10:58:53 - 11:05:38
3	Site-level	3,745 [1,879; 6,163]	2024-09-17 11:13:48 - 11:19:34
4	Site-level	5,569 [3,097; 8,819]	2024-09-17 11:25:48 - 11:32:34

5	Site-level	4,878 [2,205; 7,933]	2024-09-17 11:39:36 - 11:45:56
6	Site-level	1,627 [0,542; 2,8]	2024-09-17 12:37:24 - 12:44:24
7	Site-level	7,17 [3,716; 10,98]	2024-09-17 12:56:09 - 13:03:02
8	Site-level	4,35 [1,399; 7,631]	2024-09-17 13:09:11 - 13:14:45
9	Site-level	6,354 [3,053; 9,660]	2024-09-17 13:20:34 - 13:26:48
10	Site-level	3,373 [1,502; 6,068]	2024-09-17 13:38:21 - 13:45:22
11	Site-level	6,735 [2,179; 12,62]	2024-09-17 14:15:15 - 14:22:22
12	Site-level	4,206 [1,219; 7,443]	2024-09-17 15:06:41 - 15:13:49
13	Site-level	3,323 [1,706; 5,394]	2024-09-17 15:18:16 - 15:25:25
Average		4,564 [1,902; 7,693]	

Hourly emission value (4,564 kg/h) extrapolated to annual emission value: **39 981 kg/y**

Reconciliation result to Level 5 reporting

Taking into account uncertainty values, the overlapping between the site and the source level measurement values is suitable. The discrepancy is also low between the average values.



Conclusion: Uncertainty of the site and source level measurement shall be mitigated.

III. TSO B COMPRESSOR STATION



Gas turbine driven compressor units in halls at the station



Location and coordinates of the station

Aggregated source level emission with uncertainty

Source level measurement campaign was performed between 09.09.2024 – 19.09.2024.

Fugitive

	CH4 emission (kg/h)	uncertainty
Connections (flanges, seals, joints)	0,292	-45% / +73%
Valves and control valves	0,1039	-45% / +73%
OEL	0,2829	-45% / +73%

Only a few and very small leaks were detected and measured during our source level measurement in September 2024, except 4 vent stacks where we found comparatively significant emission at the open end of the lines (OEL).

Vents

	CH4 emission (kg/h)	uncertainty
Seals of the compressor units	0	-45% / +73%

Compressor units were not in operation during the source and site level measurement campaign.

Total emissions

	CH4 emission (kg/h)	uncertainty
Fugitive + Vents	0,679	-45% / +73%

Total emissions with uncertainty

	CH4 emission (kg/h)
Fugitive + Vents	0,679 [0,373; 1,175]

Site level emission with uncertainty

Measurements in 12 transects were carried out by Resource Sweden on 18.09.2024.

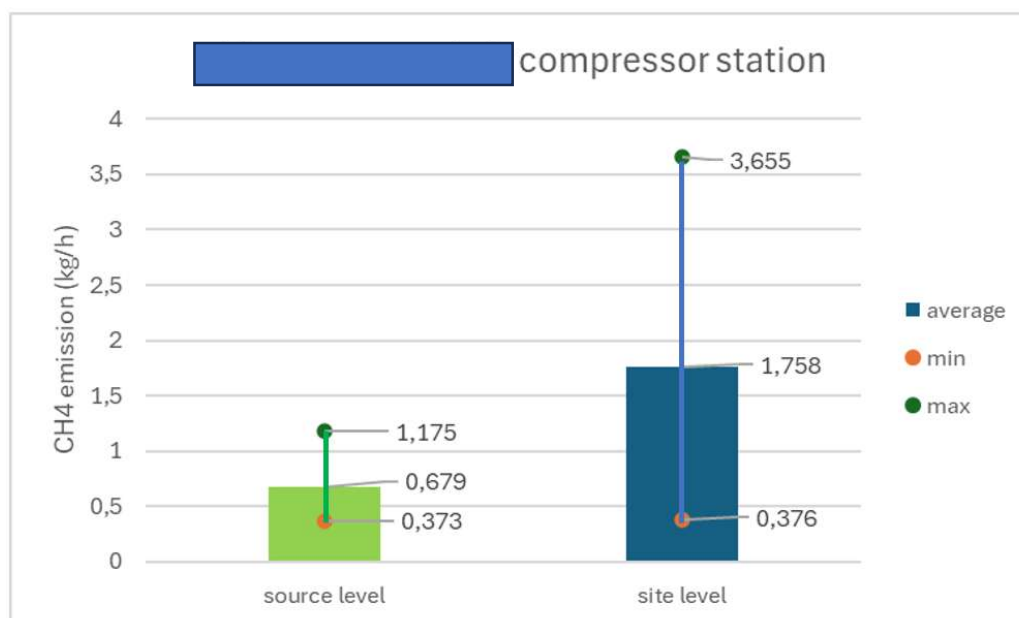
Measurement	Target source	Calculated CH ₄ emissions flux (Kg·h ⁻¹) at 95% CI	Time of flight (local)
1	Site-level	1,214 [0,186; 2,581]	2024-09-18 11:42:38 - 11:49:16
2	Site-level	1,053 [-0,09401; 2,375]	2024-09-18 11:56:26 - 12:02:21
3	Site-level	1,164 [0,4433; 2,118]	2024-09-18 12:10:56 - 12:16:51

4	Site-level	1,165 [0,1249; 2,443]	2024-09-18 12:26:38 - 12:32:23
5	Site-level	1,319 [0,4997; 2,429]	2024-09-18 12:50:38 - 12:54:19
6	Site-level	1,93 [1,024; 2,938]	2024-09-18 13:18:22 - 13:23:52
7	Site-level	2,996 [1,293; 5,379]	2024-09-18 13:54:48 - 14:00:41
8	Site-level	1,426 [0,3244; 3,005]	2024-09-18 14:09:04 - 14:16:36
9	Site-level	3,381 [1,136; 6,848]	2024-09-18 14:34:37 - 14:40:42
10	Site-level	2,445 [0,3485; 5,418]	2024-09-18 15:05:36 - 15:12:46
11	Site-level	1,178 [-0,1647; 2,453]	2024-09-18 15:28:22 - 15:35:12
12	Site-level	1,831 [0,381; 3,855]	2024-09-18 15:45:46 - 15:52:36
Average		1,758 [0,376; 3,655]	

Hourly emission value (1,758 kg/h) extrapolated to annual emission value: **15 400 kg/y**

Reconciliation result to Level 5 reporting

Taking into account uncertainty values, the overlapping between the site and the source level measurement values is suitable, but a significant discrepancy is also seeable between the average values.



Conclusion: During the source level measurement process, we realized that one out of four emitting vent stacks (OEL) released more methane compared to the other 3 lines. We assume that our measurement technique in this case was not accurate enough to determine right emission value of this stack. We decided that we have to improve our measurement method for high vent stacks. Moreover the uncertainty of the site and source level measurement shall be mitigated.

III. TRANSMISSION STATIONS

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