



Project Canary

Request for Alternative Test Method for Periodic Screening

Executive Summary
December 23, 2024

1 Submission Information

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| Application Request Number | ALTTECH-75 |
| Submittal Date | December 23, 2024 |
| Company Name | Project Canary, PBC |
| Point of Contact | Brian Taylor |
| Technology | Canary X Continuous Methane Monitoring System |
| Technology Type | Periodic Screening |
| Applicability | Broadly applicable |
| Target Emission Leak Rate Threshold | 10 kg/hr |

2 Summary of Technology

Project Canary provides high-fidelity continuous methane sensing devices, which utilize a Tunable Diode Laser Absorption Spectroscopy (TDLAS) methane sensor, supporting software tools, and data analytics to allow customers to identify, quantify and localize methane emissions on oil and gas production facilities. The Canary X Continuous Methane Monitoring system employs several individual Canary X devices placed strategically around a facility to maximize methane detections. Each device houses the sensor and supporting hardware components in a sturdy, weather resistant container, minimizing atmospheric interferences and ensuring consistent operation and methane detection capabilities. The devices detect and upload methane enhancements, onsite meteorological data, and device health information to the cloud every minute.

The data is then pre-processed to ensure the inputs to Project Canary's quantification model meet strict quality standards. Valid data is then run through a forward model followed by an inverter using a recursive Bayesian state estimator, every 15 minutes, generating facility-level methane mass emissions rates.

The Canary X Continuous Methane Monitoring system has been used extensively in the oil and natural gas industry for several years across basins in the United States and internationally. The system's methane detection and quantification capabilities have been tested extensively, validating the system's results.



A summary of the documentation provided in this Alternative Test Method application is provided in Section 4. Supporting Documentation files listed in Section 4.2 below, were originally included with the ALTTECH-46 application, submitted on July 30, 2024 or in the application update submitted on November 8, 2024. All of the Supporting Documentation files remain applicable to this periodic screening application, as such, Project Canary has not re-submitted the files listed in Section 4.2 below but can do so upon request.

3 Application Updates

| DATE | DESCRIPTION |
|-------------------|--|
| December 23, 2024 | Initial periodic screening application submittal |

4 Summary of Documents Submitted

4.1 Description of Technology

| DOCUMENT NAME | DESCRIPTION | CBI |
|---|--|-----|
| Project Canary Periodic Description of Technology – PUBLIC_10.pdf | Detailed description of the Canary X Continuous Methane Monitoring system, with CBI portions removed. | |
| Project Canary Periodic Description of Technology – CBI_10.pdf | Detailed description of the Canary X Continuous Methane Monitoring system, with CBI portions included. | X |

4.2 Supporting Documentation

| DOCUMENT NAME | DESCRIPTION | CBI |
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| <i>ADED2024_facility_emission_error_status-CBI.csv</i> | Data used to explore the quantified rate errors as a function of atmospheric stability from ADED2024. | X |
| <i>all_devices_15min-CBI.csv</i> | Fifteen-minute average quantification values with all devices to support a detailed sensor density analysis from METEC's ADED testing protocols. | X |



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| <i>all_devices_7day-CBI.csv</i> | Seven-day average quantification values with all devices to support a detailed sensor density analysis from METEC's ADED testing protocols. | X |
| <i>Anemometer Spec Sheets.pdf</i> | File containing specification sheets for several makes/models of sonic anemometers Project Canary may install on a Canary X device. | |
| <i>bg_rates_kgph-CBI.csv</i> | Data to support system's ability to detect 0.40 kg/hr above a noisy baseline. | X |
| <i>classifiedData_final-CBI.csv</i> | Data directly from METEC containing blinded ADED2024 error statistics and evaluations. | X |
| <i>Device Health Table-CBI.xlsx</i> | A summary of parameters which may limit quantification capabilities, potentially resulting in downtime. | X |
| <i>End User Data Extraction Examples.pdf</i> | Document providing all end user data extraction parameters pulled through the SENSE™ dashboard. | |
| <i>Engineering Alarm Definitions-CBI.csv</i> | File showing engineering alarm types, definitions, causes, and response actions. | X |
| <i>engineering_estimate_event_comparison-CBI.csv</i> | Data supporting quantification comparison to engineering estimates for specific events at operational facilities. | X |
| <i>feb_leak_operator_estimate-CBI.csv</i> | Data to support quantification comparison to published leak events on an operational facility. | X |
| <i>feb_leak_quantification-CBI.csv</i> | Data to support quantification comparison to published leak events on an operational facility. | X |
| <i>Field Operations Employee Safety Manual-CBI.pdf</i> | Project Canary safety manual for personnel working in field operations. | X |
| <i>flyover_comparison-CBI.csv</i> | Data to support quantification comparison to coincident flyover data. | X |
| <i>HealthApiFaults-CBI.csv</i> | File showing device health indicators including types, definitions, triggers, potential causes, and response actions. | X |
| <i>HRRR Model Data Validation-CBI.pdf</i> | Document demonstrating suitability of utilization of the HRRR model as an alternative to onsite wind data. | X |



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| hrrr.csv | Data from HRRR model corresponding to sample site data timeframes, included the file <i>site_sample_data-CBI.zip</i> . | X |
| <i>measurements_background_plus_fugitive-CBI.csv</i> | Data to support system's ability to detect 0.40 kg/hr above a noisy baseline. | X |
| <i>measurements_background-CBI.csv</i> | Data to support system's ability to detect 0.40 kg/hr above a noisy baseline. | X |
| <i>nov_leak_operator_estimates-CBI.csv</i> | Data to support quantification comparison to published leak events on an operational facility. | X |
| <i>nov_leak_quantification-CBI.csv</i> | Data to support quantification comparison to published leak events on an operational facility. | X |
| <i>oooob_aded_timeseries.csv</i> | A file providing raw sensor data from ADED 2024. Used to assess atmospheric conditions during blind controlled testing. Found in <i>atmospheric_raw_data-CBI.zip</i> | X |
| <i>oooob_atmospheric_conditions.csv</i> | A file providing raw sensor data from operational facilities. Used to define atmospheric conditions in the field and compare them to ADED atmospheric conditions. Found in <i>atmospheric_raw_data-CBI.zip</i> | X |
| <i>oooob_operational_blind_timeseries.csv</i> | A file providing methane concentration data from operational facilities. Used to assess time periods of "blindness" in the field. Found in <i>atmospheric_raw_data-CBI.zip</i> . | X |
| <i>Operator Case Studies-CBI.pdf</i> | A file providing case studies of quantification alerting at operational facilities | X |
| <i>Point Sensor Network Detects Short Releases Under Favorable Wind Conditions.pdf</i> | Detailed analysis of controlled release experiments originally performed by METEC team at operational facilities. | |
| <i>PostDataSample-CBI.json</i> | Sample JSON file showing valid data packet from firmware and sent to the cloud. | X |
| <i>Project Canary 2024 ADED Results.pdf</i> | Continuous Monitoring Final Report from METEC's ADED 2024 protocol, detailing results of the Canary X Methane Monitoring system. | |
| <i>Project Canary Quality Assurance and Control Diagram - CBI.png</i> | Flowchart describing Project Canary's Quality Assurance and Control processes. | X |



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| <i>Project Canary Visual Workflow Diagram - CBI.png</i> | Workflow diagram depicting Project Canary's process from data collection through quantification, alerting and reporting. | X |
| <i>quant_output_background_plus_fugitive -CBI.csv</i> | Data to support system's ability to detect 0.40 kg/hr above a noisy baseline. | X |
| <i>quant_output_background-CBI.csv</i> | Data to support system's ability to detect 0.40 kg/hr above a noisy baseline. | X |
| <i>Quantification Validation-CBI.pdf</i> | A detailed analysis of the Project Canary methane emissions quantification algorithms and support of their use through testing and field validations. | X |
| <i>reduced_devices_15min-CBI.csv</i> | Fifteen-minute average quantification values with reduced devices to support a detailed sensor density analysis from METEC's ADED testing protocols. | X |
| <i>reduced_devices_7day-CBI.csv</i> | Seven-day average quantification values with reduced devices to support a detailed sensor density analysis from METEC's ADED testing protocols. | X |
| <i>sample_data_ingested.csv</i> | Sample of raw data after being ingested in the system's database, included the file <i>site_sample_data -CBI.zip</i> | X |
| <i>sample_data_processed.csv</i> | Sample of data after QA and quantification preprocessing, included the file <i>site_sample_data -CBI.zip</i> | X |
| <i>sample_data_quantified.csv</i> | Sample of output of quantification model, included the file <i>site_sample_data -CBI.zip</i> | X |
| <i>sample_data_sensitivity.csv</i> | Sample of source receptor sensitivity from output of the forward model, included the file <i>site_sample_data -CBI.zip</i> | X |
| <i>Site_{id}_grind.png</i> | A picture showing the site sources, potential sensor locations, and optimal sensor locations. Found in <i>siting_tool_data-CBI.zip</i> | X |
| <i>Site_{id}_sources.csv</i> | A file containing site specific emission sources. Found in <i>siting_tool_data-CBI.zip</i> | X |
| <i>Site_{id}_windrose.png</i> | A picture showing the site specific windrose for the time periods used in the optimization process. Found in <i>siting_tool_data-CBI.zip</i> | X |
| <i>siting_tool_data-CBI.zip</i> | Various data files to support Project Canary's siting tool analysis and process. | X |



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| <i>Siting_tool_output_site{id}.csv</i> | A file containing the output of the siting tool showing the optimal sensor locations. Found in <i>siting_tool_data-CBI.zip</i> | X |
| <i>sources.csv</i> | List of potential sources from sample facility, included the file <i>site_sample_data-CBI.zip</i> | X |
| <i>TDLAS Sensor Spec Sheet.pdf</i> | Specification sheet for the sensor used in the Canary X Methane Monitoring devices. | X |
| <i>temp_humidity_chamber_testing-CBI.csv</i> | Temperature and humidity data in support of broad applicability across varying temperature and humidity regimes. | X |
| <i>TransformedDataSample-CBI.json</i> | Sample JSON file showing transformed data for ingestion. | X |
| <i>Wind_data_site{id}.csv</i> | A file providing the wind data used in the optimization process. Found in <i>siting_tool_data-CBI.zip</i> | X |
| <i>Project Canary Response 11-2024.pdf</i> | Formal response to questions and request for additional information received through the ATM portal on September 27, 2024 | |
| <i>Project Canary ADED 2 Results.pdf</i> | Summary of results from METEC "ADED 2.0" testing performed in August and September 2024 | |
| <i>blindly_reported_rates - CBI.csv</i> | Project Canary system reported quantification rates during ADED 2.0 testing | X |
| <i>METEC_release_rates - CBI.csv</i> | METEC controlled release rates during ADED 2.0 testing | X |
| <i>threesensor_quantification_output - CBI.csv</i> | Project Canary system quantified emission rates with reduced sensor density for ADED 2.0 testing | X |



4.3 Formal Alternative Test Method

| DOCUMENT NAME | DESCRIPTION | CBI |
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| Project Canary Periodic Alternative Test Method_10.pdf | Formal Alternative Test Method for the Canary X Continuous Methane Monitoring system | |

