

## **METHANE MEASUREMENT PLAN**

Methane Emissions Reduction Program for Marginal Conventional Wells

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### **SUBMITTED BY**

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## **Methane Measurement Plan**

The Virginia Department of Energy (Virginia Energy) received funding through the “Methane Emissions and Waste Reduction Incentive Program for Petroleum and Natural Gas Systems”, also referred to as the Methane Emissions Reduction Program (MERP). Specifically, these funds are targeted to incentivize Virginia’s natural gas and oil operators to plug marginal conventional wells (MCWs), thereby eliminating the potential for emissions from these wells.

These activities are expected to result in methane and other greenhouse gas (GHG) emission reductions. To ensure this, Virginia Energy will implement this Methane Measurement Plan to be followed by all operators utilizing grant funds to plug MCWs.

Methane measurement can be divided into two main targets.

- Measure methane emissions to provide a preliminary screening of emissions from MCW sites as a mechanism to inform plugging prioritization
- Measure methane emissions from MCW sites prior to and following the plugging and abandonment to quantify mitigated emissions

For screening purposes, operators are not required to utilize equipment that captures emission rates. Qualitative equipment may be used for this step. Similar qualitative equipment may also be used to record the post plugging readings, with an understanding that quantitative equipment may be required if post-plugging emissions are detected.

The following information outlines specific requirements for measurement, reporting, and data sharing.

### **Measurement for Preliminary Screening and Post-Plugging**

Methane emission measurements for screening purposes may implement qualitative techniques to make initial screening more efficient. Post plugging measurements may also implement these techniques. These techniques include methods that measure methane concentrations (in units such as ppm or percent volume).

Screening techniques may include the following:

- *Portable instruments for quick measurements of methane presence and/or concentration*
  - LEL monitors
  - Portable flame ionization detectors (FIDs)
  - Infrared controlled interference polarization spectrometers
  - Visual screening utilizing US EPA Method 21
  - Audio Visual Olfactory (AVO) inspections

- *Optical Gas Imaging (OGI) instrumentation*
  - Provides a means to visualize leaks by using radiation absorption properties
  - Can also be used post-plugging to verify zero emissions
  
- *Column-Integrated concentration instrumentation*
  - Standoff laser-based, hand-held detectors

These techniques should be observed for a 3–5-minute evaluation period. The following information should be recorded at the time of measurement:

- Date and time of day
- Measurement approach
- Wellsite description to include equipment on site or picture of site
- Listing of all emission points
- Results at each emission point
- Name of qualified person performing measurement

### **Pre-Plugging Methane Measurement**

It is important to quantify mitigated methane emissions. To properly accomplish this, an accurate quantitative emission measurement is imperative. As outlined in the Methane Measurement Guidelines for Marginal Conventional Wells, quantitative approaches should have a minimum detection limit (MDL) of less than 100 grams/hour.

These readings can be achieved with the following:

- Direct source emission measurements such as High Flow Sampling, Flux Chambers, Bag Sampling, and others
- Near-field measurements that position analytical instruments at a distance
- Remote sensing techniques can be utilized, but data from aircraft surveys and satellites is not recommended at this time

The selected measurement approach should include current and traceable calibration.

### **Pre-Approval of Operator Measurement Plan**

Each operator is required to submit a Methane Measurement Plan outlining their specific equipment and techniques. This plan must be approved by the Federal Project Manager prior to signing the contract with Virginia Energy to approve moving forward with plugging operations.

The Plan must include a detailed description of the method, equipment, personnel, safety protocols, and calibration information. Additionally, the following must be followed:

- The weather/environmental conditions, under which the method is effective, should be documented (i.e., wind speed, temperature, and cloud cover)
- MDLs for emissions measurements, resulting in a 'non-detect' classification, should be no more than 100 g/h with a 90% probability of detection
- Measurements must be performed by a qualified measurement specialist.
- A quality assurance (QA)/quality control (QC) process is required where the contractor or qualified measurement specialist makes a second set of measurements at ~5% of randomly chosen wells to verify the precision of the selected methodology. These repeat measurements should be done on the same day because of possible longer-term, temporal variability in emission rates

### **Data Reporting Requirements**

Virginia Energy will publish information about the methane emissions measurements from wells plugged utilizing grant funds on its public Methane Grant website. The website will include the following information relevant to the methane emissions measurements:

- Wellhead location (decimal degrees, 5–7 decimal places, WGS84) and the American Petroleum Institute (API) number
- Estimated annual reduction of methane emissions from each plugged well
- Total estimated annual reduction of methane emissions from all plugged wells

Note: annual emissions are estimated assuming the pre-plugging reading was constant over the previous year.

The following information is also recommended to be documented while performing methane measurement activities.

- Date(s) and time(s) of the emissions measurements for pre-and post-plugging
- Weather conditions at the time of measurements (temperature, barometric pressure, etc.)
- Name and affiliation of the qualified measurement specialist(s)
- Observations from the audio, visual, and olfactory (AVO) inspection
- Description of the measurement approach, including instrumentation and calibration protocols
- Well status (i.e., shut-in, idle, producing, etc.)
- Pre- and post-plugging well site description (listing of equipment on site; photographs recommended)
- A description and listing of the sources of emissions
- Approach and results for post-plugging and verification/quantification of methane emissions reductions
- Abnormal site conditions (e.g., dilapidated equipment, open tank valves)
- Documentation of challenges and solutions

## References

U.S. Department of Energy, National Energy Technology Laboratory. (2024). *Methane Measurement Guidelines for Marginal Conventional Wells*.