
EXECUTIVE SUMMARY

Petroleum Technology Alliance Canada (PTAC) has engaged InnoTech to provide a summary of cost-effective wellsite monitoring methods and to identify where gaps still exist. The main focus of this report is on monitoring and measurement of leaks from wells. A separate report called 'Identify GHG Level for Well Repair to Identify Acceptable Leak Rate' has also been provided for this project.

Devices to detect and measure low leak rates from wells are evolving as it is recognized that quantifying all emissions will be required to understand and meet Canadian emission reduction targets. Canadian oil and gas producers are required by the federal Ministry of Environment and Climate Change to implement methane leak detection and repair (LDAR) programs 1-3 times annually across a range of assets commencing in 2020.

It is also anticipated that regulators will require reporting of surface casing vent flow (SCVF) and gas migration (GM) on thermal wells in the near future. Steam in SCVF and in GM on thermal wells has made the measurement of SCVF/GM emissions on these wells particularly difficult in all-weather conditions. Monitoring legacy wells that have been abandoned, cut and capped (or closed) is becoming more important as roughly 10% of these wells are believed to be leaking.

Several low rate and accurate measurement devices have been developed in recent years for SCVF. Testing over an extended period of time is critical as SCVF leak rates can be highly variable due to a wide variety of factors.

The quantification of GM leak rates is much more difficult than SCVF as a gas leakage through the ground is not contained in a pipe or vessel where a traditional measurement device can be attached. New technology is developing for this purpose and for remote leak detection using on-ground methods, aircraft and satellites. Some of these technology companies have developed algorithms and methods to provide an estimate of the emissions rates of methane and CO₂ with remote sensing equipment.

This report provides an overview of many tools and methods that are available and the technologies that are emerging for monitoring and measuring emissions from well sites.

After a leak has been detected from a well and the leak rate possibly quantified, the sources of the leak, either the geological formations or a soil biogenic source, still must be identified. Identifying the source or sources can be very difficult and misleading. There are advanced methods of forensics and fingerprinting to help identify the source of the leaks. This is a major subject area that is not addressed in depth in this report.

The Alberta Energy Regulator (AER) has targeted reductions in methane emissions with updated requirements in Directive 060 *Upstream Petroleum Industry Flaring, Incinerating, and Venting* which went into effect on January 1, 2020, and with updates in Directive 017 *Measurement Requirements for Oil and Gas Operations* which was released in December 2018. Some definition changes were made for Petrinex reporting and revisions to both Directives were made in May 2020. Certain aspects of these requirements are discussed in this report.