# SAFCell Aims to Revolutionize Canada's Oilpatch by Drastically Reducing Methane Emissions in Pneumatic Equipment

***"The Canadian government, along with some provincial governments, have set policies to cut methane emissions from between 40 to 45 per cent of baseline value by the year 2025. Baselines might differ between governments, but the overall targeted reductions by Canada are about 25 Mt CO2e of methane emissions by 2025. The gas supply chain can be broadly divided into upstream, midstream, and downstream sectors where sources of methane emissions are identified, and mitigation technologies are assessed from wellhead to burner-tip. Methane emission from the sectors can be further grouped into source categories such as fugitives, flared, vented, line heating, and burner-tip." Canadian Energy Research Institute (CERI), Economic & Environmental Impacts of Methane Emissions Reductions in the Natural Gas Supply Chain (published January 2019).***

## Quick Facts:

1. Canada is currently the fifth largest producer of natural gas in the world, having produced more than 161 Bcf/day in 2017.
2. Methane is a potential global warming gas with a current climate forcing potential – over a 100-year period – estimated in the range of 28 and 36 times above that of carbon dioxide, dependent on the estimation method.
3. The U.S. Environmental Protection Agency (EPA) reports methane releases can happen during development, production, supply, and use of natural gas and the supply chain can be broadly divided into upstream, midstream, and downstream segments.
4. **Sector breakdown:**
   - Upstream sector contributes 95 per cent of overall Canadian methane emissions from oil and gas wells;
   - Midstream sector contributes three per cent (9.642 per cent in gathering, 2.845 per cent transmission, 0.663% gas processing,0.043% LNG storage, 0.395% distribution/storage, 0.002% oil sands); and
   - Downstream sector contributes a mere two per cent (0.220% burner tips and the rest distribution).
5. **Provincial breakdown:**
   - Alberta had an estimated 25.4 Mt CO2e from oil and gas wells and gathering facilities;
   - Saskatchewan had an estimated 16.2 Mt;
   - British Columbia had an estimated 3.6 Mt;
   - Manitoba had an estimated 1.3 Mt; and
   - Ontario had 90 per cent from fugitive and vented emissions.

## Emission Share for Geological Storage

| PROVINCE | GEOLOGICAL STORAGE |
|---|---|
| Alberta | 57.55% |
| Ontario | 28.20% |
| British Columbia | 9.95% |
| Saskatchewan | 3.77% |
| Quebec | 0.52% |
| Manitoba | 0.00% |
| New Brunswick | 0.00% |
| Nova Scotia | 0.00% |
| Newfoundland & Labrador | 0.00% |
| Prince Edward Island | 0.00% |

*(Figure 1)*

In the late 1990s, a team of scientists and engineers at the California Institute of Technology developed a new fuel cell technology (solid acid fuel cells) and in 2009, the group-SAFCell and it's Alberta-based partner, Calscan, banded together to bring the SAFCell to market targeting stationary and portable power applications in oil and gas, military, industrial and commercial sectors. In 2017, the scientists were awarded $1.94 million by Sustainability Development Technology Canada (SDTC) and Emissions Reduction Alberta (ERA) to "support the development of the near zero emissions well control system" and get it deployed at multiple Canadian oil and gas production sites.

The government of Canada and the Alberta government are jointly trying to reduce methane emissions by 40 to 45 per cent by 2025 (compared to 2012 levels). Since its launch, near zero emissions well control systems have been installed at multiple Canadian oil and gas sites. In 2018, a successful eight-month trial was completed at Shell Canada's Rocky Mountain House well site. SAFCell

## Facility Inventory Across Canada

| DESCRIPTION | ALBERTA | BRITISH COLUMBIA | SASKATCHEWAN | MANITOBA |
|---|---|---|---|---|
| Wells | 128,454 | 5,310 | 64,571 | 5,503 |
| Compressor stations | 5,931 | 852 | 3,307 | - |
| Batteries | 25,212 | 3,620 | 14,507 | 661 |
| Gas gathering systems | 3,311 | 475 | 1,846 | - |
| Gas plants | 673 | 97 | 375 | - |

*(Figure 2)*

installed multiple RP50-M units (50 W -unit) and demonstrated operability in the field at both low and high temperatures.

Last winter (2018-2019), trials were extended to 11 partner companies including: Shell Canada, Cenovus Energy, Repsol Oil & Gas, and Husky Energy. The first RP-50-M commercial units were deployed with Bellatrix Exploration under a SAFCell early access program and is currently operating successfully. SAFCell plans to extend its commercial rollout of the RP-50-M and pilot rollout of the RP-250-M (250-watt unit) across Canada, targeting 185,00 well sites in the Western Canadian Sedimentary Basin.

**According to SAFCell officials, the company's patented fuel cell generators are:**

- Low cost – operates at mid-range temperatures (200-300 degrees Celsius) while using inexpensive materials, fuel efficient providing the potential to save thousands of dollars in costs/year; and installation take hours, not days, and requires little to no maintenance;
- Fuel efficient – operates on a range industrial grade fuel readily available on-site (e.g. methanol, ethanol, propane, diesel, and natural gas) and is 10 times more fuel efficient than thermoelectric generators and five times more efficient than internal combustion engines; and
- Rugged military design -- tolerates extreme weather conditions and temperatures making it suitable for remote locations and it requires little to no maintenance, having a lifespan twice as long as other fuel cells.

**For more information, please visit www.safcell.com.**



## Methane Emission Quantification – Provincial Level (tCH4)

| DESRIPTION | AB | BC | SK |
|---|---|---|---|
| Oil & gas wells | 827,591 | 117,952 | 599,112 |
| Gathering | 144,804 | 7,616 | 30,705 |
| Gas processing | 5,497 | 5,785 | 1,319 |
| Oil sands | 32 | 0 | 0 |
| Transmission | 21,391 | 7,504 | 11,673 |
| Geological storage | 4,212 | 729 | 276 |
| LNG storage | 0 | 69 | 0 |
| Distribution | 8,501 | 3,776 | 2,647 |
| Burner-tips | 2,098 | 372 | 349 |
| Total emissions | 1,014,125 | 143,804 | 646,080 |

*(Figure 3)*

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