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Evaluating Methane Emissions From Decommissioned Unconventional Petroleum Wells in British Columbia, Canada

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Hundreds of thousands of unconventional natural gas wells recently constructed across North America have transformed the global energy landscape and generated widespread concern relating to fugitive methane leakage. To date, no studies have evaluated the integrity of unconventional wells post-abandonment. Here, we evaluated emissions at nine decommissioned unconventional wells within the Montney region of British Columbia, Canada and found two exhibited co-emission of CH_4 and CO_2 from surrounding soils indicating integrity failure, releasing up to ~2000 kg of CO_2-eq/yr into the atmosphere. A further three wells exhibited statistically significant anomalous CO_2 fluxes of ~500 kg/year from surficial soils around the well, likely associated with minor integrity failure and derived from near total soil-based aerobic oxidation of fugitive CH_4. These findings suggest that more than half of decommissioned unconventional wells may generate emissions, however only relatively small contributions to GHG emissions result that are significantly mitigated through natural soils-based CH_4 oxidation.