

NSERC FlareNet Strategic Network

The NSERC FlareNet Strategic Network is a new, five-year, \$6.9 million national-scale research initiative, led by Carleton University in partnership with University of Alberta, University of British Columbia, University of Waterloo, Western University, and National Research Council. The core objective of FlareNet is quantitative understanding of flare generated pollutant emissions critical to science-based regulations, accurate pollutant inventories, understanding of climate forcing and health implications, and engineered mitigation strategies to minimize environmental impacts in the energy sector. FlareNet is strongly backed by a large number of national and international partners including Petroleum Technology Alliance of Canada (PTAC), Natural Resources Canada, Environment and Climate Change Canada, Alberta Energy Regulator, World Bank, United Nations Climate and Clean Air Coalition (CCAC), Clearstone Engineering Ltd., Telops Ltd., Canadian Standards Association (CSA), Carbon Limits, and Canadian Association of Petroleum Producers (CAPP).

Background

Emissions from flaring are a significant global concern. Satellite data suggest worldwide flared volumes exceed 140 billion m³ annually, where much of it is associated with development of unconventional oil and gas resources. In addition to being an important source of climate forcing CO₂ emissions, flaring is implicated as a critical source of black carbon and other air toxic species. Flaring in Canada has risen sharply in recent years, directly related to a rapid expansion in hydrofractured tight oil and tight gas developments. Issues of flare emissions are most acute at these sites, where flaring during flowback operations has potential to burn entrained aerosol species originating as injected fracturing fluids and/or returning formation liquids. Data and models to accurately predict flare emissions are critically lacking such that current emission factors relied upon to calculate pollutant inventories and guide regulation are questionably relevant.

Objectives

The overarching objective of this NSERC Strategic Network is to provide a quantitative understanding of flare generated pollutant emissions critical to enabling science-based regulations, accurate pollutant inventories, understanding of climate forcing and health implications, and engineered mitigation strategies to minimize environmental impacts in the energy sector. Led by Prof. Matthew Johnson at Carleton University in Ottawa, the Network integrates leading Canadian researchers and national and international partners capable of meeting these research challenges through ambitious, collaborative, large-scale experiments that will significantly advance the field, directly impacting new policy and regulation in Canada and internationally.

Importance

The energy sector is a dominant force in the Canadian economy but also has wide-ranging environmental impacts, which are often poorly quantified and difficult to regulate. As global consumption of fossil fuels continues to rise, outpacing the increase in renewable energy consumption on an absolute unit of energy basis, any immediate actions to improve air quality and mitigate climate change impacts must begin with engineering and regulatory solutions for the energy sector. The historic March 2016 meeting of first ministers in Canada confirmed this urgency, with all provinces committing for the first time to transition toward “carbon pricing mechanisms” and to work “toward the establishment of a pan-Canadian offset protocols framework and verified carbon credits that can be traded internationally”. Critically, however, carbon trading for significant sources such as flares will have limited impact without the ability to accurately quantify emissions, especially the enhanced climate forcing impacts associated with emitted methane and BC. This issue has added importance in Canada, since global flaring is the dominant source of BC deposition on snow and ice in the Arctic, contributing directly to accelerated warming relative to the rest of the planet, and

leading to a range of acute social impacts to First Nations communities. The FlareNet Strategic Network will directly address these critical issues.

Impacts:

Through the success of FlareNet, policy decision-makers and regulators will be empowered with essential knowledge and models required for effective, science-based regulations. Industry will benefit significantly from quantitative guidance in operating procedures to drive improved environmental performance, representing new expertise in the hands of Canadian operators that can be applied around the globe. Environmental scientists, combustion scientists, and climate modellers will gain invaluable new data on climate forcing and emissions from a globally important source. Engineers and technology developers will finally acquire the detailed information necessary to develop new and practical mitigation solutions. National and international partners will be able to build business cases for demonstration projects and mitigation actions that can be copied globally. Ultimately, society as a whole will benefit from a cleaner environment and reduced carbon footprint in the energy sector.

