

# Practical Defensible PM 2.5 Emission Factors for Flares

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In recent work supported by AUPRF and NRCAN, we have exposed serious flaws in the U.S. EPA emission factor database from which current CAPP particulate matter emissions for flares are based. Factors in the U.S. EPA database are either based on landfill gas flares or in one case were shown to be incorrectly calculated from source data. Current CAPP factors have been conservatively derived from these poor quality data, and results from our recent lab-scale experiments, in which we have directly measured soot above reduced-scale flare flames, have now shown that the current CAPP emission factors are likely too high by a factor of two. However, because of the differences in flow regime between full- and lab-scale flares, it is not yet possible to develop a fully defensible emission factor model for flares typical of the Alberta upstream oil and gas industry. This proposal aims to address this gap by furthering ongoing efforts to quantify soot emissions from full-scale flares. Building on recently published development of a novel camera technology to measure soot emissions of

strongly sooting flares under field conditions (Johnson et al., Environ. Sci. Tech., 2010), we propose to adapt the technique to support a series of controlled tests on full-scale flares at the Zeeco Ltd. flare test facility in Tulsa, OK, who have expressed interest in supporting this work following recent presentations to the International Flame Research Foundation in late September 2010. A secondary site for testing in Western Canada is also potentially available. Finally, through this proposal, we will leverage co-funding from Natural Resources Canada to continue lab-scale experiments to support analysis of the acquired field data. The outcome of this work will be significantly improved emissions factor data for soot emissions from flares in Alberta that will address the serious limitations of current data, inducing a number of positive benefits for all stakeholders

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