Comments on Environment and Climate Change Canada's proposed CLEAN FUEL STANDARD: METHODOLOGY TO ESTIMATE THE INTERIM BASELINE CARBON INTENSITY VALUES FOR LIQUID FUELS (August 7, 2018)

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1. Functional unit

Compare fuels on an energy basis is going to be advantageous for certain fuels because of their different properties. Diesel (compression ignition) engines can operate at higher temperatures which results in higher efficiency.

For instance: "*Natural gas vehicles well-to-wheels GHG emissions are largely driven by the vehicle fuel efficiency, as well as methane leakage rates of both the NG supply chain and vehicle use: we estimate WTW GHG emissions of NGVs to be slightly higher than those of diesel counterparts*" (Cai et al., 2017).

Fuels also respond differently to different cycles. Quoting (Quiros et al., 2017):

> *The CNG vehicle had 3-15% lower route-average CO_2-eq emissions compared to the average all diesel vehicles (hybrid and conventional). Additionally, the CNG vehicle had 13% lower CO_2-eq emissions over the Regional Highway Route, but 12% higher CO_2-eq emissions over the Hill Climb Highway Route compared to diesel vehicles equipped with SCR. This work corroborates previous findings that 10-20% net GHG tailpipe emissions reductions can be achieved by CNG vehicles compared to conventional diesel technologies (Graham et al., 2008), but demonstrates that the* ***emissions benefits are heavily route dependent****.*

However, on a heat basis probably natural gas would score better than diesel. The clean fuel standard alone, without regulations of engine emissions and efficiency, could have detrimental environmental (and economic) consequences.

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2. Greenhouse gas emissions considered

The NIR includes CO_2, CH_4 and N_2O emissions of fuel combustion. I had a look at the contribution to CO_2eq emissions and the only time non-CO_2 emissions are "relevant" is precisely natural gas combustion in the transport sector. From the methodology it is not clear to me if CH_4 and N_2O emissions are considered.

3. System boundary

Quoting the document: *Emissions from transportation and pipeline emissions […] are not to be accounted for the interim carbon intensity*. This assumption may be ok for liquid fuels but would be unwise for natural gas. A recent top-down analysis found supply chain methane emissions in US have been considerably underestimated by the EPA (Alvarez et al., 2018).

For the fully-fledged methodology, the effects of changes in production should be carefully considered. Indirect land use change has been a problem for other clean fuels policies (see e.g. http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI%282015%29545726). As noted by the ICCT:

> "*Without any safeguards within the CFS, biofuels with high indirect emissions could substantially undermine the GHG targets of the policy. In contrast, lignocellulosic energy crops and agricultural residues typically have low or no indirect emissions, but without ILUC accounting, their superior GHG performance would not be rewarded within the CFS.*"

References

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