SCAQMD NEAT Working Group Meeting #3: Response Comments
PSE Healthy Energy
6 February 2018

Thank you for the opportunity to participate in the NEAT Working Group. Meeting #3 introduced numerous valuable features and inputs. In response to some of the items discussed during the meeting, I would like to suggest a few additional resources that may help inform the tool inputs.

Fugitive methane leakage
As has been discussed, upstream methane leakage rates are highly uncertain, and the scientific literature includes a broad range of estimates. In particular, the bottom-up emission estimates included in inventories such as the EPA Greenhouse Gas Inventory typically report lower emission rates than those found in top-down studies that measure atmospheric concentrations of methane.[1] This discrepancy may be due in part to the disproportionate share of emissions from super-emitters throughout the natural gas system.[2] As such, it is advisable to reference the broader body of scientific literature rather than rely on inventories alone when estimating lifecycle methane emissions associated with natural gas use.

In response to the request for additional scientific literature on end-use methane emissions, I would suggest reviewing *A Survey of Methane Emissions from the California Natural Gas System* (Fischer *et al.,* 2017).[3] This study includes a number of in-home measurements of methane leakage. Additional research from this group is pending review and is expected to provide additional in-home measurements. If needed, I would be happy to supply additional references addressing methane leakage estimates from other parts of the natural gas life cycle.

For the NEAT tool, it may be useful for the user to be able to select both the methane emission rate estimate and the global warming potential timeframe (e.g. 20- or 100-year).

Marginal emissions
I am glad to see the inclusion of marginal emission rates in the emission impact calculations, and the bounding cases currently employed are valuable. The current approach appears to be quite

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[1] Brandt, Adam R., *et al*. "Methane leaks from North American natural gas systems." *Science* 343.6172 (2014): 733-735; Schwietzke, Stefan, *et al.* "Upward revision of global fossil fuel methane emissions based on isotope database." *Nature* 538.7623 (2016): 88.
[2] Brandt, Adam R *et al*. "Methane leaks from natural gas systems follow extreme distributions." *Environmental Science & Technology* 50.22 (2016): 12512-12520.
[3] Fischer *et al.* "A survey of methane emissions from the California natural gas system." Prepared for the California Energy Commission; CEC-500-2017-033. 2017. Available at: www.energy.ca.gov/2017publications/CEC-500-2017-033/CEC-500-2017-033.pdf

detailed and may provide sufficient resolution for the purpose of this tool. For reference, it may also be useful to look into WattTime (watttime.org) which estimates marginal emissions based on historic power plant operations and grid load. WattTime works with users to shift electric loads to times of lowest marginal grid emissions. This strategy could be considered as an additional emission factor scenario for the NEAT tool, specifically by providing an option where load shifting (such as from thermal storage for water heaters) could be used to reduce emissions. In the future, for example, incentives could be designed to encourage not only low-emission technology adoption but also operation at times with the lowest marginal grid emissions.

Water heaters
A few potentially useful references for water heaters are available under "additional reference documents" at: www.bwilcox.com/BEES/reference.html

I am looking forward to seeing the next iteration of the model.

Sincerely,

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