Hi Diane,

As follow-up to our call, we looked at the GHG impacts of projects for which we issued permits in the last 5 years. The list below only includes permitted projects that could emit 10,000 (or more) metric tons CO2e annually from direct, on-site, combustion of fossil fuels. We hope this will be helpful in getting a feel for what projects might be captured through the GAP rule.

Briefly, any natural gas heater or boiler with a heat input exceeding 21.5 MMBtu/hr has the potential to emit more than 10,000 metric tons of CO2e per year. Units in this size range are common at a variety of industrial facilities, not just refineries. The list below includes boilers that supply steam to lumber dry kilns, boilers at a milk drying facility, and boilers at a naval base.

Facility	Project Summary	CO2e (MT/yr)	Equipment type	Project heat input (MMBtu/hr)	Fuel	Major permit (PSD)?
BP refinery	Replace old coker heaters with new, larger heaters, each at 303 MMBtu/hr	286,523	heater	552	refinery fuel gas	Yes
BP refinery	Retrofit existing heater with low-NOX burners and increase capacity	60,730	heater	117	refinery fuel gas	No
Darigold	Add diesel as back-up fuel for gas boiler at milk drying facility	25,591	boiler	55	natural gas, diesel back-up	No
Tesoro refinery	Thermal oxidizer to control vapors from marine loading operation	55,834	thermal oxidizer	120	tanker vapor + natural gas	No
Darigold	Replacement boiler to provide steam at milk drying facility	23,264	boiler	50	natural gas	No
Naval Air Station Whidbey Island	2 replacement boilers, each at 24.3 MMBtu/hr, to provide steam for central heating plant	22,334	boiler	48	natural gas	No
Teal Jones	3 boilers, each at 15.8 MMBtu/hr, to provide steam for new lumber drying kilns	21,868	boiler	47	natural gas	No
P66 refinery	Heater to help remove sulfur from petroleum feedstocks	12,977	heater	25	refinery fuel gas	No

I've attached the spreadsheet used to create the table. The tab labeled "EF & Calcs" offers a chance to look at how the numbers work out for different boilers and heaters. So, for example, a 53 MMBtu/hr natural gas boiler emits 24,660 metric tons of CO2e each year.

A couple of thoughts about the table:

- All of the listed projects can emit 10,000+ metric tons of CO2e/yr, but only one received a major-source (PSD) permit. All of the others received minor-source permits.
- Several of the projects include the installation of multiple units. The emissions of a single unit would, by itself, be below the 10,000 metric ton threshold. This highlights the impact of setting the rule cut-off based on project-wide emissions vs single-unit emissions.
- If the rule cut-off was set at 25,000 metric tons instead of 10,000, the list of projects would shrink. Most of the projects outside the refineries would drop off the list. The only remaining non-refinery project would be the 55 MMBtu/hr Darigold boiler.
- If the rule cut-off was set at 25,000 metric tons, we would capture 84% of the CO2e that would be captured using the 10,000 ton threshold.

I hope you find this information helpful. We could go back further than 5 years if a larger list of projects is needed.

Please give me a call if any questions. Happy to talk at an time, and looking forward to working with you on the GAP rule!

Thank you,

Agata McIntyre, P.E.
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Northwest Clean Air Agency
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Emissions estimates based on heat input and fuel

heat input   53 MMBtu/hr

GHG estimate for Natural Gas							
Pollutant	Heat Input	hrs/yr	MMBtu/yr	EF (kg/MM	GWP	kg/yr	MT/yr
CO2	53	8,760	464,280	53.06	1	24,634,697	24,635
CH4	53	8,760	464,280	0.001	25	11,607	11.61
N2O	53	8,760	464,280	0.0001	298	13,836	13.84
						Total CO2e	24,660

GHG estimate for Refinery Fuel Gas							
Pollutant	Heat Input	hrs/yr	MMBtu/yr	EF (kg/MM	GWP	kg/yr	MT/yr
CO2	53	8,760	464,280	59	1	27,392,520	27,393
CH4	53	8,760	464,280	0.003	25	34,821	34.82
N2O	53	8,760	464,280	0.0006	298	83,013	83.01
						Total CO2e	27,510

GHG estimate for Diesel (Distillate #2)							
Pollutant	Heat Input	hrs/yr	MMBtu/yr	EF (kg/MM	GWP	kg/yr	MT/yr
CO2	53	8,760	464,280	73.96	1	34,338,149	34,338
CH4	53	8,760	464,280	0.003	25	34,821	34.82
N2O	53	8,760	464,280	0.0006	298	83,013	83.01
						Total CO2e	34,456

Facility	Project Summary	Project CO2e (MT)	Equipment type	Project heat input (MMBtu/hr)	Fuel	Trigger major permit (PSD)?
BP refinery	Replace old coker heaters with new, larger heaters, each at 303 MMBtu/hr	286,523	heater	552	refinery fuel gas	Yes
BP refinery	Retrofit existing heater with low-NOX burners and increase capacity	60,730	heater	117	refinery fuel gas	No
Darigold	Add diesel as back-up fuel for gas boiler at milk drying facility	25,591	boiler	55	natural gas, diesel back-up	No
Tesoro Refinery	Thermal oxidizer to control vapors from marine loading operation	55,834	thermal oxidizer	120	tanker vapors + natural gas	No
Darigold	Replacement boiler to provide steam at milk drying facility	23,264	boiler	50	natural gas	No
Naval Air Station Whidbey Island	MMBtu/hr, to provide steam for central heating plant	22,334	boiler	48	natural gas	No
Teal Jones	3 boilers, each at 15.8 MMBtu/hr, to provide steam for new lumber drying kilns	21,868	boiler	47	natural gas	No
P66 refinery	Heater to help remove sulfur from petroleum feedstocks	12,977	heater	25	refinery fuel gas	No