April 6, 2018

Rosalyn Cochrane
Christopher McLellan
Natural Resources Canada
Office of Energy Efficiency
580 Booth Street
Ottawa, ON, K1A 0E4

RE: Gas and Oil-Fired Commercial Boilers: Technical bulletin on developing the standards

Dear Ms. Cochrane and Mr. McLellan:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP) on the Natural Resources Canada (NRCan) February 2018 technical bulletin on developing standards for gas- and oil-fired commercial boilers.[1] ASAP organizes and leads a broad-based coalition of efficiency proponents in the United States that includes efficiency, consumer, and environmental groups; utility companies; state government agencies; and others. Working together, the ASAP coalition seeks to build support for new and updated appliance, equipment, and lighting standards through technical and policy advocacy and outreach and education. We actively participated in the most recent U.S. DOE proceeding concerning commercial boiler standards.

We believe that it is appropriate for Canada to take the lead in establishing strong standards for commercial boilers. In the technical bulletin, NRCan proposed energy performance standards that would exceed those in the pre-publication final rule from the U.S. DOE [2] for the most common types of commercial boilers. Specifically, NRCan is considering condensing efficiency levels (90% efficiency) for "small" and "large" gas boilers that are intended for hot water systems.[3] The Technical Bulletin notes that federal, provincial, and territorial governments in Canada "agreed that standards for some heating products could, for climatic and market reasons, exceed the stringency of those in the United States."[4] For commercial boilers, savings on average would be greater in Canada than in the U.S. due to colder climates, making higher standard levels more cost-effective for purchasers. The Technical Bulletin further states that the proposed standards for gas boilers would help achieve Canada's

[1] http://www.nrcan.gc.ca/energy/regulations-codes-standards/20571.
[2] https://www.energy.gov/sites/prod/files/2016/12/f34/CPB_ECS_Final_Rule.pdf.
[3] The proposed standards for the remaining product types would align with those in the U.S. DOE pre-publication final rule.
[4] http://www.nrcan.gc.ca/energy/regulations-codes-standards/20571

climate change goals. We also note that the current U.S. Federal Energy Management Program (FEMP) efficiency requirements for "small" and "large" gas-fired hot water commercial boilers are 95% and 94%, respectively,[5] which means that gas-fired hot water boilers purchased by U.S. federal agencies must all be condensing.

Condensing gas-fired hot water boilers can provide large energy savings in both new and existing buildings. The National Renewable Energy Laboratory (NREL) conducted an assessment of five U.S. General Services Administration (GSA) buildings at the Denver Federal Center. In three of the buildings, condensing boilers with rated efficiencies of 95% replaced 80% efficient non-condensing boilers without making any changes to the heating distribution systems.[6] In these three buildings, NREL estimated weather-normalized savings of 16-19%.[7] The assessment noted that even greater savings could be achieved through some simple steps such as implementing a more aggressive outdoor reset schedule.

The Pacific Northwest National Laboratory (PNNL) conducted a similar assessment of a 31-story Federal office building in Atlanta (Peachtree Summit Federal Building) where condensing boilers with rated efficiencies of 95% replaced non-condensing boilers. The analysis found that the condensing boilers operated at an average efficiency of 93.5%, reducing energy consumption by 14% relative to an 80% efficient boiler plant.[8] We note that due to the impacts of high return water temperature operation and cycling, which both decrease average operational efficiency, a typical non-condensing boiler with a rated efficiency of 80% would operate with an annual efficiency below 80%. For example, in the NREL assessment, the pre-retrofit hot water boilers which had rated efficiencies of 80% had estimated actual annual efficiencies of 72-76%.[9] Therefore, savings from the condensing boilers in the PNNL assessment relative to boilers rated at 80% efficiency are likely significantly greater than 14%. Further, the assessment noted that greater savings could be achieved through a modification to the Building Automation System (BAS) to further lower the supply water temperature and the hot water flow rate during periods when the building is unoccupied.

Condensing boilers can operate a significant portion of the time in condensing mode in both new and existing buildings. Even in existing buildings where the heating systems were not designed for condensing boilers, condensing boilers can operate in condensing mode for a substantial portion of the heating season, in particular through the use of outdoor reset schedules.[10] For example, below is an outdoor reset schedule from an installation, operation and maintenance manual for an Aerco commercial packaged boiler.[11] The manual notes that the

[5] http://energy.gov/eere/femp/covered-product-category-commercial-boilers.
[6] Buildings 25, 54, and 810.
[7] http://www.nrel.gov/docs/fy14osti/56402.pdf. p. 26.
[8] http://www.gsa.gov/portal/mediaId/163539/fileName/GPG_Condensing_Boiler_-_FINAL_DRAFT_4-15-13_508.action. p. 3.
[9] Boilers in buildings 25, 54, and 810.
[10] https://www.indoorcomfortmarketing.com/can-high-temperature-baseboard-co-exist-with-condensing-boilers.html.
[11] http://aerco.com/sites/default/files/document/document/OMM-0082_0K_GF-130_BMK750_%26_1000_G-16-0450_and%20UP_03-11-16.pdf. p. 148.

default building reference temperature is 70 F and the default reset ratio is 1.2.[12] With these default settings and assuming a ΔT of 20 F,[13] the return water temperature (RWT) would be below 130 F at outdoor temperatures of 5 F and above.

Table D-4. Header Temperature for a Building Reference Temperature = 70°F

Air Temp		RESET RATIO									
°F	°C	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
70	21.1	70	70	70	70	70	70	70	70	70	70
65	18.3	73	74	75	76	77	78	79	80	81	82
60	15.6	76	78	80	82	84	86	88	90	92	94
55	12.8	79	82	85	88	91	94	97	100	103	106
50	10.0	82	86	90	94	98	102	106	110	114	118
45	7.2	85	90	95	100	105	110	115	120	125	130
40	4.4	88	94	100	106	112	118	124	130	136	142
35	1.7	91	98	105	112	119	126	133	140	147	154
30	-1.1	94	102	110	118	126	134	142	150	158	166
25	-3.9	97	106	115	124	133	142	151	160	169	178
20	-6.7	100	110	120	130	140	150	160	170	180	190
15	-9.4	103	114	125	136	147	158	169	180	191	202
10	-12.2	106	118	130	142	154	166	178	190	202	214
5	-15.0	109	122	135	148	161	174	187	200	213	
0	-17.8	112	126	140	154	168	182	196	210		
-5	-20.6	115	130	145	160	175	190	205			
-10	-23.3	118	134	150	166	182	198	214			
-15	-26.1	121	138	155	172	189	206				
-20	-28.9	124	142	160	178	196	214				

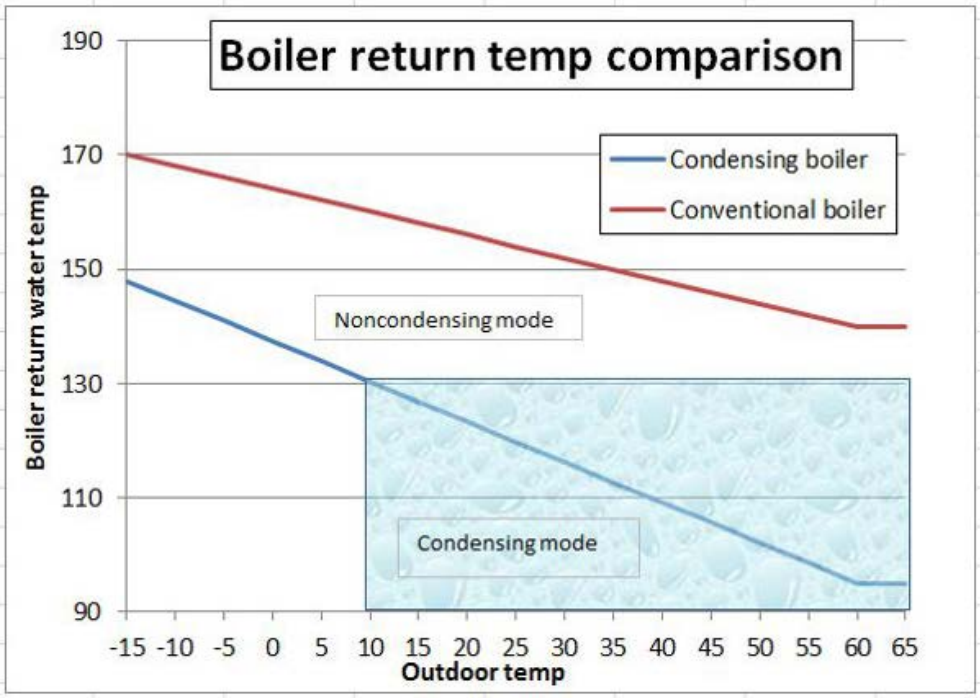
Source: http://aerco.com/sites/default/files/document/document/OMM-0082_0K_GF-130_BMK750_%26_1000_G-16-0450_and%20UP_03-11-16.pdf.

Below is a figure from the Minnesota Department of Commerce showing typical return water temperatures for both condensing and non-condensing boilers. The figure shows that in a cold climate where the design day temperature may be around -15 F, condensing boilers can operate in condensing mode at outdoor temperatures above about 10 F. A facilities and safety manager for Beltrami County, MN reported that at the Beltrami County Jail, where condensing boilers replaced non-condensing boilers, at an outdoor temperature of 42 F, the RWT was 109 F, which reflects the condensing boiler RWT curve in the figure.[14]

[12] http://aerco.com/sites/default/files/document/document/OMM-0082_0K_GF-130_BMK750_%26_1000_G-16-0450_and%20UP_03-11-16.pdf. p. 45.

[13] ΔT is the difference between the supply water temperature and the return water temperature.

[14] http://mn.gov/commerce/media/blog/success-stories/?id=17-71392#/list/appId//filterType//filterValue//page//sort//order/.



Source: http://mn.gov/commerce/media/blog/success-stories/?id=17-71392#/list/appId//filterType//filterValue//page//sort//order/.

In summary, condensing boilers can provide large energy savings in both new and existing buildings, and we believe that it is appropriate for NRCan to set standards for commercial gas-fired hot water boilers at condensing levels.

Thank you for considering these comments.

Sincerely,

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