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the lung association



CANADIAN  
PUBLIC HEALTH  
ASSOCIATION

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SANTÉ PUBLIQUE



The Canadian Coalition  
for Green Health Care



Coalition canadienne pour un  
système de santé écologique

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**Re: *Canada Gazette*, Part I, Vol. 152, No. 7 — February 17, 2018 Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity. Statutory authority *Canadian Environmental Protection Act, 1999***

### **Introduction**

These comments are being offered on behalf of the Canadian Association of Physicians for the Environment (**CAPE**), The Lung Association, Asthma Canada, the Canadian Public Health Association (**CPHA**), Canadian Nurses for Health & Environment (**CNHE**), the Saskatchewan Public Health Association (**SPHA**), Ontario Public Health Association (**OPHA**), Upstream, and the Canadian Coalition for Green Health Care. As a submission from organizations that represent public health, health care, and health promoting professionals, we would like to reiterate and clarify our health interests in the proposed Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity (**Gas Regulations**).

## **Overall Comments**

We strongly support the move to phase-out coal plants across Canada by 2030. We also support many elements of the proposed gas regulations that have been developed to transition the electricity sector in Canada away from coal. However, we have concerns with several elements of the proposed regulations which may whittle away the health and climate benefits associated with the coal phase-out by encouraging investment in, and long-term reliance upon, inefficient natural gas-fired technologies.

## **Background – Health Concerns**

**We believe that climate change is the most significant public health challenge of our generation.**

Climate change affects many of the social and environmental factors that shape health, including air quality, air temperature, security and quality of drinking water, security of food supplies, the range of insect-borne diseases, and the security of housing and transportation systems.

The World Health Organization (**WHO**) has declared climate change “the greatest threat to global health in the 21st century” (WHO, 2016). It has estimated that, between 2030 and 2050, climate change will produce 250,000 additional deaths each year: 38,000 from heat exposure among the elderly; 48,000 from diarrhea; 60,000 from malaria; and 95 000 from childhood under-nutrition (WHO 2014). Children and the elderly will be the hardest hit by climate change, as will island countries and those countries struggling to feed their populations at present.

**Climate change is the ultimate health equity and social justice issue.** Countries with poor health infrastructure and low incomes that are already struggling to feed their residents are the hardest hit by climate change, while countries with the highest standards of living, such as Canada, are among the largest emitters of the greenhouse gases (**GHGs**) that are contributing to climate change.

**But Canadians will not be unaffected.** Over the last two decades, Canadian have felt the impacts of climate change first hand with floods, mudslides, droughts, ice storms, wildfires, hurricanes, tornados, and heat waves that are occurring with greater frequency and/or intensity. In northern communities, where climate warming is the greatest, people are struggling with melting permafrost, unreliable ice roads, and changing food supplies. These changing climate patterns and extreme weather events have been associated with deaths, injuries, mental stress, and financial duress (Health Canada, 2005; Lancet Countdown, 2017).

Globally, coal plants must be phased out to slow climate change and we applaud the Canadian government for moving to accelerate the closure of Canada’s coal plants to 2030. However, we think it is very important that the coal phase-out not be achieved by investing heavily in natural gas or by relying heavily on inefficient natural gas boilers or turbines. Our health concerns with natural gas are three-fold.

**First of all, there are significant upstream health concerns associated with the extraction of natural gas from the earth, particularly from hydraulic fracturing processes that are becoming more common.** Over the last decade, 1300 studies have been directed at the health impacts associated with unconventional processes for extracting natural gas (i.e. hydraulic fracturing). These peer reviewed studies, which have assessed the environmental, socioeconomic, and public health impacts of

hydraulic fracturing, have revealed both potential and actual harm to human health (CHP-NY & PSR, 2018).

A systematic review, directed at health studies on hydraulic fracturing from 2009 to 2015, released in 2018 by the Concerned Health Professionals of New York (**CHP-NY**) and the Physicians for Social Responsibility (**PSR**) found that:

- 69 percent of the original research studies on water quality found potential for, or actual evidence of, water contamination;
- 87 percent of original research studies on air quality found significant air pollutant emissions; and
- 84 percent of original research studies on human health risks found signs of harm or indication of potential harm (CHP-NY & PSR, 2018).

**Secondly, there are significant climate concerns associated with the extraction of natural gas because of the climate-forcing potential of methane which is released in significant quantities from extraction processes.** The International Panel on Climate Change (**IPCC**) estimates that methane has a half-life that averages 12 years. It also estimates that methane is 86 times more powerful as a climate forcer than carbon dioxide (**CO<sub>2</sub>**) over a 20-year period (IPCC, 2013). Present estimates suggest that the oil and gas sector in Canada are responsible for 44% of methane emissions in Canada, which account for about 15% of Canada’s greenhouse gases (**GHGs**) (Canada, 2016). But estimates of methane emissions vary considerably. New research suggests that total methane emissions from the oil and gas sector in Canada is much greater (i.e. 25 to 50% greater) than previously estimated (Johnson M et al., 2017). Given these facts, it would be irresponsible and wasteful to direct significant investments towards natural gas-based technologies as a “low carbon alternative” to coal. When the full fuel cycle for natural gas is considered, the upstream methane emissions can add 15 to 25% to the CO<sub>2</sub> emission rate for natural gas systems (Klein, 2018).

**Thirdly, while natural gas-fired technologies eliminate, almost entirely, emissions of sulphur dioxide (SO<sub>2</sub>) and mercury from electricity generation, they do not eliminate emissions of nitrogen oxides (NO<sub>x</sub>) or CO<sub>2</sub>.** As illustrated in Figure 1, inefficient natural gas-fired technologies can release substantial quantities of NO<sub>x</sub> which can harm human health in several different ways.

NO<sub>x</sub> emissions contribute to the formation of ground level ozone, the air pollutant which triggers most of the smog alerts in Canada. Ground level ozone irritates the lungs, aggravates respiratory conditions such as asthma, and increases emergency room visits, hospital admissions, and premature deaths from cardio-respiratory impacts (WHO, 2013). NO<sub>x</sub> emissions also contribute to the formation of secondary fine particulate matter (**PM<sub>2.5</sub>**) in the atmosphere. PM<sub>2.5</sub> is the air pollutant most clearly and consistently associated with increased rates of chronic heart and lung diseases and premature deaths from heart and lung conditions. PM<sub>2.5</sub> has also been associated with adverse reproductive outcomes, neurodevelopmental and cognitive deficits, and increased rates of diabetes (WHO, 2013).

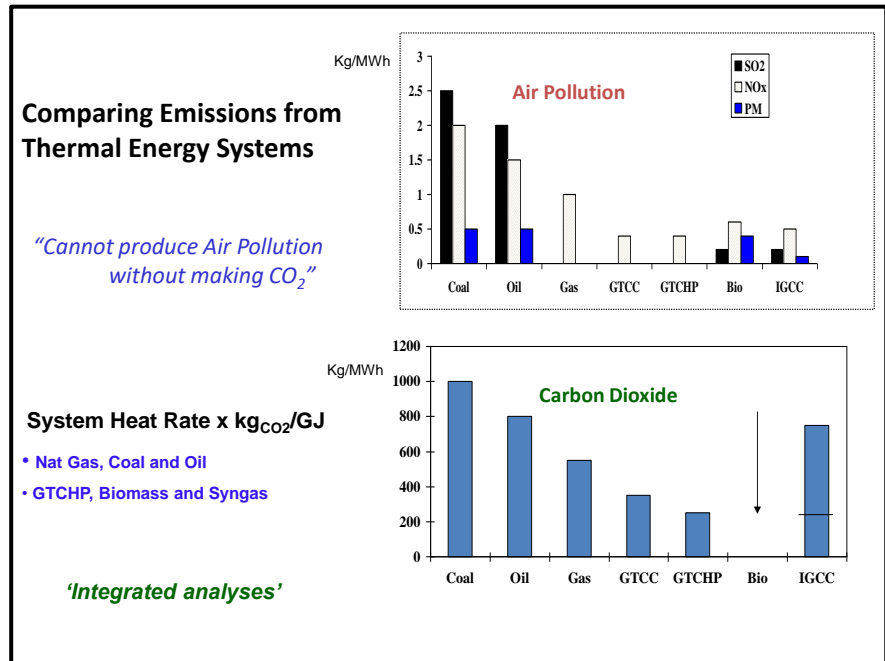
NO<sub>x</sub> also includes the gaseous air pollutant, nitrogen dioxide (**NO<sub>2</sub>**), which is harmful to human health directly as a gas. NO<sub>2</sub> is particularly irritating to the respiratory system. There is a growing body of health evidence which indicates that short- and long-term exposures to NO<sub>2</sub> can increase the risk of morbidity and mortality, mainly for respiratory outcomes (WHO, 2013).

While selective catalytic reduction (**SCR**) technologies can be added to the back end of natural gas systems to significantly reduce emissions of  $\text{NO}_x$ , these technologies are often associated with decreased efficiency, increased emissions of ammonia ( $\text{NH}_3$ ) and particulate matter (**PM**), while also presenting safety issues that can be associated with the handling of  $\text{NH}_3$  (Klein, 2018).

As illustrated in Figure 1, natural gas-fired technologies can also release significant quantities of  $\text{CO}_2$ , albeit less than that associated with coal-fired power plants. For  $\text{NO}_x$  and  $\text{CO}_2$  emissions, the efficiency of the energy system burning natural gas becomes a very important factor. While coal-to-natural gas boilers can reduce  $\text{CO}_2$  emissions from combustion by 44 to 56%, gas turbine combined cycle (**GTCC**) systems can reduce emissions of  $\text{CO}_2$  by 66% (See Figure 1 and Table 1). As illustrated in Figure 1 and Table 1, GTCC and gas turbine combined heat and power (**GTCHP**) can significantly reduce  $\text{SO}_2$ , **PM**, and  $\text{NO}_x$  emissions as well as  $\text{CO}_2$  emissions (Klein, 2018).

**Detailed Comments**

**S4(1)(a)** All new natural gas-fired units should be built to emission rates equal to, or better than, those associated with the best available technology economically achievable (**BATEA**) for  $\text{CO}_2$  (i.e. 360 kg  $\text{CO}_2$ /MWhr for **GTCC**). The draft gas regulation proposes 420 kg of  $\text{CO}_2$ /MWhr as an annual average for any new large combustion engine unit (i.e. over 150 megawatts [**MW**]). While we can accept an annual emission rate higher than 360 kg for new gas-fired units to provide room for inefficiencies beyond the control of operators, we believe that the emission rate should be set at 400



**Figure 1: Graphs provided by Manfred Klein, 2018**

Coal – in a boiler & steam turbine  
 Oil – in a boiler & steam turbine  
 Gas – in a boiler & steam turbine  
 GTCC – gas turbine combined cycle  
 GTCHP – gas turbine combined heat and power  
 Bio – biomass such as woodwaste & fibre  
 IGCC – integrated coal gasification combined cycle

*Burning biomass does release  $\text{CO}_2$ . The net amount varies depending on collection practices. Generally GHG emissions are lower than emissions from burning fossil fuels, but air pollutants may be higher than with natural gas.*

kg rather than 420 kg given that 18 out of 21 large natural gas units operating in Canada achieved annual emission rates below 400 kg in 2017 (ECCC, 2017).

It is important that no further slippage be allowed with this rate given the many exemptions already included in the draft regulation under sub-sections 3(1), 3(2) and 4(4). This annual emission rate should be re-examined every few years, and ratcheted down, to reflect advancements in these technologies.

<b>Table 1: Efficiency, Heat Rate and Carbon Dioxide Emission Rate for Energy Systems (Manfred Klein 2018)</b>			
<b>Energy System</b>	<b>Efficiency %</b>	<b>Heat Rate 3.6/Efficiency</b>	<b>CO<sub>2</sub> Rate kg/MWHR</b>
Coal Boiler (Average in Canada)			1070
Coal Boiler converted to Natural Gas	30+		475 – 600
Simple Cycle Gas/Steam Turbine	36	10	500
Gas Turbine Combined Cycle (GTCC)	50	7.2	360
Large Industrial Co-generation (IGCC)	65	5.5	270
Gas Turbine Combined Heat & Power (GTCHP)	80	4.5	225
District Energy with CHP	90	4	200

**S4(1)(b) The 550 kg CO<sub>2</sub>/MWHr emission rate proposed for medium sized combustion engine units (25 to 150 MW) should be reduced to 500 kg.** The 550 kg emission rate proposed for medium sized combustion engines appears to be quite high for a natural gas-fired unit (see range in Table 1). These units could operate at an energy efficiency rate that hovers around 30% with the 550 kg emission rate. Given that gas-fired units with a capacity factor of 33% are exempted from these regulations, we can assume that this emission rate is not intended to apply to a peaker plants. The emission rate for medium sized gas-fired units should be reduced to 500 kg given that nine medium sized natural gas-fired units operating in Canada in 2017 achieved emission rates below 500 kg (ECCC, 2017). This emission rate should be re-examined every few years, and ratcheted down over time, to reflect advancements in technology.

**S4(2) Coal-to-gas boilers that cannot achieve the 400 kg emission rate should not be allowed to operate after the coal phase-out cut-off date of December 31<sup>st</sup>, 2029.** The draft gas regulations would allow coal boilers that have been converted to natural gas to operate at emission rates well above the proposed 420 emission rate (i.e. 480 to 600 kg CO<sub>2</sub>/MWHr) for one to 10 years beyond the boiler’s end of useful life. This subsection would allow several boilers to continue operating at inefficient rates well beyond the 2030 phase-out date for coal plants.

While we appreciate the intent of Section 4(2) - to encourage a staged phase-out of coal plants before 2030 without encouraging heavy investment in natural gas facilities that could have a useful life of 35 years - we are concerned with the GHGs and NO<sub>x</sub> emissions they allow. Coal boilers converted to natural gas fuel are quite inefficient. These boilers operate with an energy efficiency rate in the 30% range and can be associated with fairly high emission rates for both CO<sub>2</sub> (i.e. 475 to 600 kg CO<sub>2</sub>/MWHr) and NO<sub>x</sub>. Given the upstream methane emissions associated with natural gas on top of these

emissions rates, we think this provision is unacceptable. It is also not necessary. There are a number of examples of coal boilers in Canada that have been replaced by a gas turbine combined cycle technology using gas turbines or existing steam turbines for a modified combined cycle (Klein, 2018).

**Stand-alone natural gas-fired combustion engines should not be allowed beyond 2040 except as peaking plants used to complement renewable energy systems.** Gas turbine combined cycle (GTCC) and coal-to-gas boilers are not the only choices available for natural gas-fired systems. Large, medium and small co-generation, combined heat and power, and district energy options, which use natural gas much more efficiently for electricity and heat, could also be used to complement new power grids built around renewable energies and supported by policies and programs that increase energy efficiency. These innovative systems provide energy reliability, diversity and resilience, which makes them a preferable energy source from both a climate adaptation and climate mitigation perspective. Because of their increased energy efficiency, they are also associated with fewer health and climate concerns upstream and during combustion. These innovative systems could also be used to reduce the climate and health impacts of the oil and natural gas sectors as well as the electricity sector in Canada.

**S4(4) To ensure that the climate goals of this regulation are not compromised by the emergency clause, they should be required to offset emissions above the applicable emission standard by purchasing allowances or offsets.** The regulations propose that energy generated, and emissions released, by replacement equipment during maintenance or repairs for up to 90 days should be excluded from the calculations used to report the annual emission rate for a specific unit. While we appreciate the need for such exemptions for reliability, we believe that companies should be required to report the GHGs emitted during these periods, and to offset those emissions that exceed the regulated emission rate.

**The monitoring system for CO<sub>2</sub> emission rates should include reporting of absolute emissions of CO<sub>2</sub> as well as emissions rates at a unit level, and these results should be made publicly available to provide transparency to the public and policy-makers.**

Thank you providing us with this opportunity to comment on the draft regulation.

**Yours sincerely,**

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cc. The Honourable Catherine McKenna, Federal Minister of the Environment  
The Honourable Ginette Petitpas Taylor, Federal Minister of Health

The Honourable Sarah Hoffman, Alberta Minister of Health  
The Honourable Shannon Phillips, Alberta Minister of Environment and Parks and Minister Responsible for the Climate Change Office  
The Honourable Bronwyne Eyre, Saskatchewan Minister of Energy and Resources  
The Honourable Jim Reiter, Saskatchewan Minister of Health  
The Honourable Serge Rousselle, New Brunswick Minister of Environment and Local Government  
The Honourable Benoit Bourque, New Brunswick Minister of Health  
The Honourable Iain Rankin, Nova Scotia Minister of the Environment  
The Honourable Randy Delorey, Nova Scotia Minister of Health and Wellness

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