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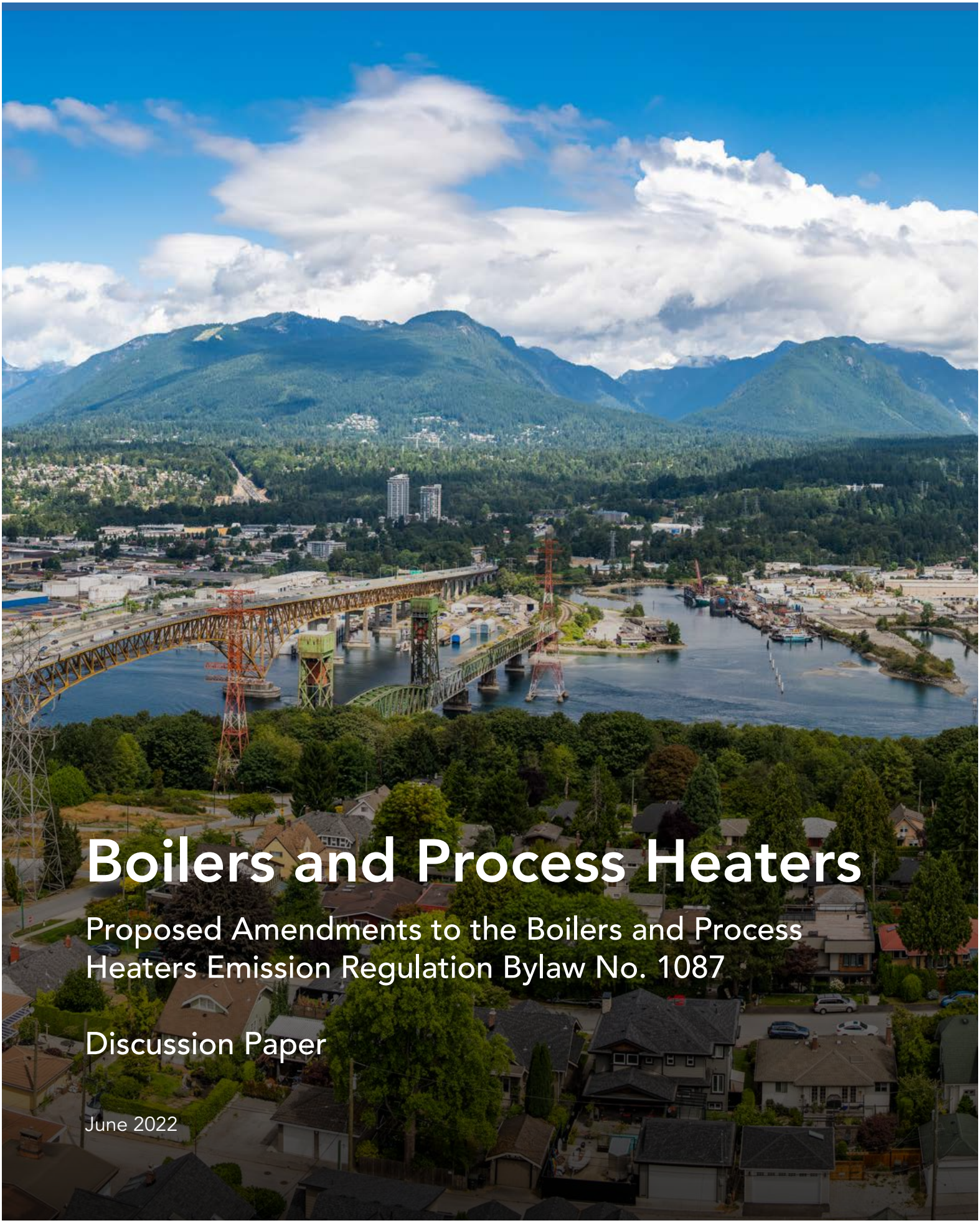

Boilers and Process Heaters

Proposed Amendments to the Boilers and Process Heaters Emission Regulation Bylaw No. 1087

Discussion Paper

June 2022

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Summary

The Metro Vancouver Board of Directors approved the *Clean Air Plan* in September 2021 to guide air quality management actions over the next ten years and to support the Board's commitment to be a carbon neutral region by 2050. The Board also set interim targets to achieve a 45% reduction in greenhouse gas (GHG) emissions by 2030 from 2010 levels; and to meet or exceed ambient air quality objectives and standards set by Metro Vancouver, the provincial government, or the federal government.

Metro Vancouver regulates the discharge of air contaminants from boilers and process heaters under the *Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation, Bylaw No. 1087, 2008* (Bylaw 1087). Boilers are commonly used to generate heat or energy for buildings or in industrial or commercial settings; process heaters are used to generate heat for industrial processes. Combustion of fossil fuels or biomass in boilers and process heaters results in the discharge of air contaminants such as nitrogen oxides and GHG emissions, although combustion of biomass is considered carbon neutral. In November 2019, the Board adopted stricter Ambient Air Quality Objectives for nitrogen dioxide (NO_2) for the Metro Vancouver region that align with the 2020 NO_2 Canadian Ambient Air Quality Standards (CAAQS). Amendments to Bylaw 1087 are required to support ongoing attainment of the Ambient Air Quality Objectives. NO_2 CAAQS will become more stringent in 2025. At that time, staff will present recommendations to the Board regarding adoption of 2025 CAAQS.

The proposed amendments to Bylaw 1087 seek to establish more stringent emission limits for nitrogen oxides emitted due to the combustion of fossil fuels and biomass in boilers and process heaters. New requirements to demonstrate attainment of Metro Vancouver's ambient air quality objectives and additional requirements for stack design are also being proposed.

The *Clean Air Plan* also calls for emission regulations to include measures to reduce GHG emissions, where feasible. About a quarter of regional GHG emissions is attributable to emissions associated with buildings due to combustion of fossil fuels. At its May 2022 meeting, the Board directed staff to initiate a separate engagement to develop an approach for managing GHG emissions from large buildings (gross floor area greater than 2322 m^2 or 25,000 sq.ft.) for space and water heating.

This discussion paper is focused on the rationale and potential means for reducing the discharge of air contaminants from the use of boilers and process heaters in buildings and industrial facilities in the region. However, decisions regarding the adoption of new technologies and equipment should be informed by Metro Vancouver's proposed approach for managing GHG emissions from large buildings. Adoption of zero emission technologies can avoid the discharge of health-harming air contaminants as well as GHG emissions from buildings.

In addition, industrial facilities that might switch to renewable natural gas or biomass to achieve reductions in GHG emissions would need to manage their discharge of health-harming air contaminants in accordance with proposed amendments to Bylaw 1087, if adopted.

Public engagement on the proposed amendments to Bylaw 1087 will highlight connections with regional *Climate 2050* goals for buildings, district energy providers, and other industries regulated through Bylaw 1087. This public engagement will enable facility owners, operators, and other affected audiences to understand and provide feedback on the ramifications for long-term capital and retrofit planning to comply with Bylaw 1087 and potential requirements to manage GHG emissions.

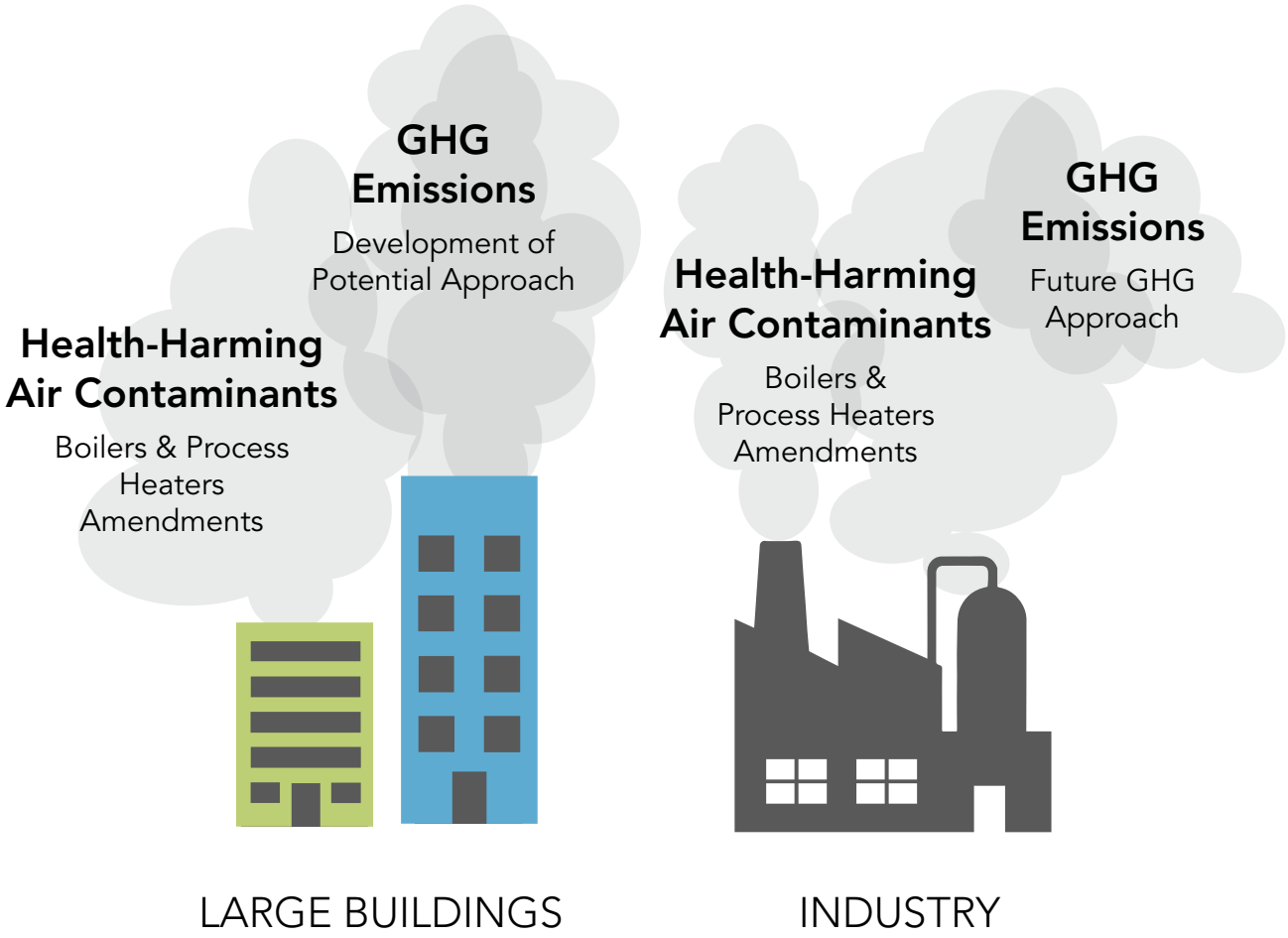

FIGURE 1: HEALTH-HARMING AIR CONTAMINANTS AND GREENHOUSE GASES ARE EMITTED BY BOILERS IN BUILDINGS, AND BOILERS AND PROCESS HEATERS IN INDUSTRIAL FACILITIES

Introduction

Metro Vancouver adopted the *Climate 2050 Strategic Framework* in 2018 and endorsed the *Clean Air Plan* in 2021.

The targets in the *Clean Air Plan* are:

- Greenhouse gas (GHG) emissions are 45% below 2010 levels by 2030.
- The Metro Vancouver region is carbon neutral by 2050.
- Ambient air quality meets or is better than the federal, provincial, and regional ambient air quality objectives and standards.

Metro Vancouver is responsible for managing and regulating air quality in the region under authority delegated from the provincial government in the *BC Environmental Management Act*. Metro Vancouver protects public health and the environment through a tiered approach to managing the discharge of air contaminants that applies the use of site-specific permits, sectoral emission regulations, and provisions in the *Greater Vancouver Regional District (GVRD) Air Quality Management Bylaw No. 1082, 2008* (Bylaw 1082). Further to Bylaw 1082, the discharge of air contaminants by an industry, trade, or business is prohibited unless the discharge is conducted strictly in accordance with an emission regulation or a permit, or unless the discharge is specifically exempted from the prohibition in Bylaw 1082. In all cases, without exception, Bylaw 1082 prohibits any person from discharging an air contaminant so as to cause pollution. Emissions of air contaminants from boilers and process heaters, with a facility capacity of 50 MW or less, are regulated under Bylaw 1087.

Activities and complex facilities with significant levels of emissions with the potential for high impacts on the environment and public health are generally authorized by site-specific permits. Activities and less complex facilities that share similar air emission characteristics are generally authorized by emission regulations. Facilities can choose to seek authorization of their emissions under an emission regulation, if they meet all the requirements, or under a permit.

Metro Vancouver has developed two separate discussion papers for engagement on two related initiatives to reduce emissions of:

- Health-harming air contaminants from boilers used to provide heat or energy for buildings, commercial, industrial or institutional settings, and from process heaters used in industrial settings
- GHG emissions from large buildings

Air Contaminant Emissions from Boilers and Process Heaters

This discussion paper focusses on emissions of health-harming air contaminants from boilers and process heaters currently managed through Bylaw 1087. Bylaw 1087 covers requirements for the control of particulate matter, nitrogen oxides (NOx), volatile organic compounds, and carbon monoxide emissions from boilers and process heaters.

NOx emissions from boilers and process heaters result in formation of nitrogen dioxide (NO_2). There is strong evidence that exposure to ambient NO_2 causes both short-term and long-term respiratory effects, and can cause mortality, as well as evidence that suggests links to a wide range of other adverse health outcomes. Additionally, NO_2 aids formation of ground-level ozone—an air contaminant that has adverse health effects on the respiratory system, and on crops and vegetation. In order to protect public health near boilers and process heater and meet increasingly stringent ambient air quality standards for NO_2, emissions of NOx from boilers and process heaters need to be reduced.

Metro Vancouver is responsible for air pollution control and air quality management in the region under the authority delegated from the provincial government in the *BC Environmental Management Act*.

The proposed amendments described in this discussion paper would reduce emissions of health-harming air contaminants from boilers and process heaters with a facility capacity of 50 MW or less, including boilers found within large buildings. The proposed amendments include more stringent emissions limits for NOx, additional requirements to demonstrate attainment of air quality objectives, and additional requirements for stack design.

The regulatory proposals in both of these discussion papers create opportunities for co-benefits in meeting our climate targets to avoid the worst impacts of climate change and to improve local and regional air quality. Electrification can simultaneously achieve zero emissions of health-harming air contaminants and GHGs. By signaling the long-term goals defined in the *Clean Air Plan*, building owners can make informed decisions about retrofits that will meet emission requirements for health-harming air contaminants and potential requirements for managing GHG emissions from large buildings.

Metro Vancouver will coordinate engagement on the proposed amendments related to discharge of air contaminants from boilers and process heaters with relevant engagement on managing GHG emissions from buildings and facilities equipped with boilers and process heaters. Engagement on the proposed air quality related amendments to Bylaw 1087 is expected to be completed in 2022 and followed by the development of bylaw amendments for consideration by the Board in 2023. Additional engagement on more detailed proposals for managing GHG emissions from various sectors would proceed later, subject to Board approval. A set of requirements to manage overall emissions from each sector could be proposed to the Board after comprehensive engagement.

Purpose

The proposed amendments to Bylaw 1087 are expected to reduce the impact of emissions from boilers and process heaters on ambient air quality, and enable continuous improvement and protection of human health by supporting attainment of science-based ambient air quality objectives and standards.

This discussion paper may be of interest to:

- Members of the public
- Owners and operators of boilers and process heaters that fall within the scope of Bylaw 1087
- Owners and developers of buildings and industrial facilities with boilers and process heaters that fall within the scope of Bylaw 1087
- Energy utilities and district energy providers
- Consultants, manufacturers, and suppliers that provide services such as air emission control
- Businesses involved in the design, installation, maintenance or operation of boilers and process heaters
- First Nations
- Metro Vancouver's member jurisdictions
- Local government facility operators
- Other orders of government
- Public health experts and health authorities
- Other interested parties affected by the proposed changes or by air quality in the Metro Vancouver region

Boilers used for agricultural purposes are covered by a separate bylaw, therefore the proposed changes to Bylaw 1087 will not affect agricultural operations.

The proposed engagement plan is designed to inform interested and impacted parties as well as the public of the rationale for amending Bylaw 1087 and the proposed changes. All feedback and comments will be welcomed. The engagement period will end November 30, 2022, but feedback will be considered until the Board makes a decision with respect to the proposed amendments.

Meeting Stricter Air Quality Objectives

In 2016, Health Canada published a report titled "Human Health Risk Assessment for Ambient Nitrogen Dioxide" to support the development of the CAAQS for NO_2. In 2017, the Canadian Council of Ministers of Environment (CCME) adopted NO_2 CAAQS. NO_2 CAAQS will become more stringent in 2025 (Table 1). The Province of BC and the MVRD Board adopted the 1-hour and annual NO_2 2020 CAAQS as the provincial air quality objectives and Metro Vancouver's ambient air quality objectives for NO_2, respectively. Closer to 2025, staff intend to present recommendations to the Board regarding updating of Metro Vancouver's ambient air quality objectives to meet or be better than the 2025 NO_2 CAAQS. Future NO_2 CAAQS and GHG requirements are an important consideration in decision-making related to upgrade boilers and process heaters in large buildings and industrial facilities.

The Board endorsed the *Clean Air Plan* in September 2021 signaling its commitment to protect human health and the environment while reducing GHG emissions. One of the three targets of this plan is to ensure that ambient air quality in the region meets or is better than the federal, provincial, and regional ambient air quality objectives and standards. Bylaw 1087 needs to be updated to enable continuous improvement in air quality and to continue meeting ambient air quality objectives in the vicinity of boilers and process heaters.

NO_2 is one of the key air contaminants associated with emissions from boilers and process heaters. Exposure to NO_2 is known to have adverse effects on human respiratory and cardiovascular health, even at low concentrations. Children, the elderly, and people with cardiac and respiratory conditions are particularly at risk.

TABLE 1: NITROGEN DIOXIDE (NO_2) CANADIAN AMBIENT AIR QUALITY STANDARDS (CAAQS)

Averaging time	Numerical Value	
	2020	2025
1-hour[a]	60 ppb	42 ppb
Annual[b]	17 ppb	12 ppb

[a] The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations

[b] The average over a single calendar year of all 1-hour average concentrations

NO_2 also contributes to formation of other air contaminants like fine particulate matter and ozone—both of which are known to have adverse health effects even at low concentrations. Emissions from boilers and process heaters can lead to high ambient concentrations of NO_2.

For these reasons, it is important to minimize the impact due to air contaminants discharged by using the best available control technology and by incorporating the most effective stack design to disperse emissions, informed by dispersion modelling where appropriate.

Zero emission technology options for heating and cooling of buildings, such as electrification, offer opportunities to avoid NO_2 and other health-harming air contaminants, as well as greatly reduce GHG emissions. However, decisions regarding the adoption of new technologies and equipment should be informed by the approach being developed by Metro Vancouver for managing GHG emissions from large buildings.

In addition, industrial facilities that might switch to renewable natural gas or biomass to achieve reductions in GHG emissions would need to manage their discharge of health-harming air contaminants in accordance with proposed amendments to Bylaw 1087, if adopted.

Guiding Principles

The proposed amendments would align with the following principles:

- Continuously improve regional air quality to protect human health and the environment, and meet or exceed the federal, provincial and regional ambient air quality objectives and standards.
- Set efficient and effective requirements that will protect the public and the environment.
- Follow a 'discharger pay' principle.
- Set fair requirements that balance the impacts of emissions and the availability and affordability of best available control technology.
- Align with the management plans and strategies adopted by the Board, including the *Clean Air Plan* and *Climate 2050*.

Emissions of air contaminants from boilers and process heaters, with a facility capacity of 50 MW or less, are regulated under Bylaw 1087.

Working Within the Legislation

Under Section 31 of the *BC Environmental Management Act* (EMA), Metro Vancouver has delegated authority for air pollution control and air quality management within the Metro Vancouver region.

EMA states that the Metro Vancouver Board "may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants". EMA defines air contaminants as substances in the air that impact or are capable of impacting health, environment, property, or the normal conduct of business [1]. Under Bylaw 1082, Metro Vancouver exercises its air quality regulatory authority with a system of permits, approvals, and emission regulations. Metro Vancouver can set emission regulations for emissions of air contaminants in the region that are more stringent than provincial regulatory requirements that apply elsewhere in the province.

Emissions from boilers and heaters with a facility capacity smaller than 50 MW are currently regulated under Bylaw 1087.

1 Please refer to the Environmental Management Act[SBC2003], for exact wording

Proposed Changes to Bylaw 1087

Existing boiler or process heater: means one that is registered or operational before the Board adopts amendments to Bylaw 1087

Replacement boiler or process heater: means one that would replace or upgrade an already registered or operational boiler or process heater.

New boiler or process heater: means one that was not operational before the Board adopts amendments to Bylaw 1087, and does not replace an operational boiler or process heater.

The following changes are proposed:

1. Introduce mandatory dispersion modelling for new boilers or process heaters fueled by propane or natural gas:
   - when the facility capacity is greater than or equal to 10 MW
   - when the facility capacity is greater than 3 MW and less than 10 MW, and the discharge point(s) are within 100 metres of sensitive receptors such as schools, hospitals, and community care facilities

   The owner or operator of such boilers or process heaters would need to conduct dispersion modelling at the facility design stage to demonstrate attainment of Metro Vancouver's ambient air quality objectives at nearby sensitive receptors.

   Operators of boilers and process heaters fueled by biomass are already required to conduct dispersion modelling under Bylaw 1087, Section 29 (1).

2. To better assess potential impacts of emissions from any boiler or process heater, the District Director may require additional testing and modelling of emissions at any time, including wind tunnel testing or computational fluid dynamics (CFD) modelling for nearby impacts. Section 29(2) of Bylaw 1087 already clarifies that the District Director may require an owner or operator to conduct dispersion modelling.

3. If dispersion modelling shows that modelled impact due to emissions from a new boiler or process heater exceeds an ambient air quality objective, the operator or owner of a new boiler or process heater would be required to make changes to the discharge of air contaminants and/or stack configuration to demonstrate attainment. Alternatively, the operator or owner of a new boiler or process heater would be required to conduct ambient air quality monitoring in accordance with an NO_2 monitoring plan approved by the District Director and implement an NO_2 exposure mitigation plan approved by the District Director. The District Director may require the operator to make ambient air quality data publicly available, or provide other relevant information, in a manner acceptable to the District Director.

4. Owners or operators of existing boilers or process heaters that demonstrate non-attainment of Metro Vancouver's air quality objectives in any dispersion modelling required by the District Director would have to demonstrate attainment within ten years of demonstrating non-attainment or when replacing an existing boiler or process heater, whichever is sooner. This timeframe is proposed to allow sufficient time for capital planning for replacement of boilers and process heaters, and consideration of the changing regulatory environment for GHG emissions.

5. Emission discharge stacks would have to be designed to discharge air contaminants vertically from all new boilers or process heaters. A minimum exit velocity is being proposed for all new boilers and process heaters, subject to operational feasibility. Rain caps on stacks would be prohibited as they are known to impede dispersion of emissions. This is to enable good dispersion of air contaminants and minimize adverse impacts on nearby sensitive receptors.

6. To minimize the discharge of NOx, any new or replacement boilers and process heaters fueled by natural gas or propane would have to be ultra-low NOx (emissions of NOx not to exceed 20 mg/m^3). Currently, the NOx emission limit for new or modified boilers and process heaters fueled by natural gas or propane is 60 mg/m^3.

7. Emissions of NOx from any new or replacement boilers and process heaters fueled by biomass would not be allowed to exceed 120 mg/m^3. Currently, Bylaw 1087 does not include a NOx emission limit for boilers and process heaters fueled by biomass.

Metro Vancouver's Clean Air Plan sets a target of 45% reduction in GHG emissions from 2010 levels, by 2030.

Electrification and zero-emission district energy can eliminate emissions of health-harming air contaminants and GHG simultaneously. These technologies would enable a facility to be prepared for the changing regulatory environment for GHG emissions. Zero emissions would also satisfy Bylaw 1087's air quality requirements.

8. By January 1, 2040, emissions of NOx from all existing boilers and process heaters fueled by natural gas or propane would not be allowed to exceed 20 mg/m^3; and emissions of NOx from all boilers and process heaters fueled by biomass would not be allowed to exceed 120 mg/m^3. This would enable continuous improvement of air quality near boilers and process heaters and at the regional level.

Metro Vancouver's *Clean Air Plan* includes targets for air quality to meet or be better than the ambient air quality objectives and standards at the regional, provincial, and federal levels.

Administration of the Emission Regulation

Metro Vancouver's regulatory system includes a system of user fees which are intended to recover the costs of developing and administering permits and regulations, following a 'discharger pay' principle. The costs associated with administering Bylaw 1087 are intended to be covered by registration and annual fees.

Following public engagement in early 2021, the Board adopted the *Air Quality Management Fees Bylaw No. 1330* on October 29, 2021. That resulted in updates to emission fee rates that would apply to annual fees payable under Bylaw 1087. Fees set out in Appendix 1 of Bylaw 1087 will be revised to align with Bylaw 1330. The updated registration and annual fees payable under Bylaw 1087 are expected to take effect in 2023, subject to the Board's approval. NOx concentrations for biomass boilers deemed to be used in the calculation of fees, specified in Appendix 1 of Bylaw 1087, would be revised to be consistent with the proposed emission limits when presented to the Board for consideration. No further changes are proposed at this time.

Providing Comments on the Proposed Amendments

Metro Vancouver is seeking input on the proposed amendments to the *Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008*, from the public as well as interested and impacted parties. Metro Vancouver welcomes feedback with respect to the regulatory proposals outlined in this discussion paper. The Board will receive a summary of the inputs received.

Metro Vancouver staff and contractors will treat comments received with confidentiality; please note that comments you provide and information that identifies you as the source of those comments may be publicly available if a freedom of information (FOI) request is made under the *Freedom of Information and Protection of Privacy Act*. If you have any questions or comments regarding the engagement process, please call 604-432-6200.

Metro Vancouver invites you to provide feedback on this discussion paper by November 30, 2022 to AQBylaw@metrovancouver.org. Feedback will be considered until the Board makes a decision in respect of the proposed amendments.

Thank you for taking the time to consider and provide input on the proposed amendments.


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