

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

This paper outlines a proposal to clarify and update the regulatory requirements for facilities assessing and modelling operating conditions for the purposes of determining compliance with the air standards in Ontario Regulation 419/05: Air Pollution - Local Air Quality (O. Reg. 419/05).

Table of Contents

1. Introduction
2. Background
3. Rationale for the Proposed Policy
 - a. Type of Contaminants
 - b. Identifying Contaminants for TOC
 - c. Operating Conditions
 - d. Analysis of Sectors and TOC
4. Jurisdictional Review
5. Stakeholder Input
6. Proposed Regulatory Changes for discussion
7. Questions for Stakeholders

1. Introduction

Under O. Reg. 419/05 (also referred to as “the Regulation”), facilities must demonstrate compliance with air standards at a point of impingement (POI) by using approved dispersion models and documenting results in an Emission Summary and Dispersion Modelling (ESDM) report. ESDM reports need to be submitted in support of an application for an Environmental Compliance Approval (ECA) and in support of a registration in the Environmental Activity Sector Registry (EASR) under Ontario Regulation 1/17: Registrations Under Part II.2 of the Act-Activities Requiring Assessment of Air Emissions. These reports are also required to be prepared and annually updated by facilities in sectors identified in Schedules 4 and 5 of O. Reg. 419/05, and there are other circumstances where these reports are required by the ministry.

Paragraph 1 of subsection 10 (1) of O. Reg. 419/05 requires a facility use an approved dispersion model with an operating scenario that assumes operating conditions that would result in the highest concentration of a contaminant at a POI that the facility is capable of. In other words, the model must be used with emission inputs from an operating scenario that would result in the maximum POI concentration. The Regulation states:

10. (1) An approved dispersion model that is used for the purposes of this Part shall be used in accordance with one of the following scenarios for each averaging period applicable to the relevant contaminant under section 19 or 20, whichever is applicable:

- 1. A scenario that, for the relevant averaging period, assumes operating conditions for the facility that would result in the highest concentration of the contaminant at a point of impingement that the facility is capable of.*

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

2. *A scenario that, for the relevant averaging period, uses actual operating data for the facility for the occasion when the highest concentration of the contaminant at a point of impingement resulted during,*
 - i. *the year preceding the year in which the model is being used, or*
 - ii. *the year in which the model is being used, if the facility did not operate at any time during the year referred to in subparagraph i. O. Reg. 516/07, s. 6 (1); O. Reg. 507/09, s. 8 (1).*

In general, a facility must assess all operating scenarios that may occur, when the facility is operating as it is designed, to determine which scenario results in the maximum POI concentration. This scenario may occur when the facility is at the maximum production level or it may occur when the facility is running at a lower production level.

Guideline A10: Procedure for Preparing an Emission Summary and Dispersion Modelling (ESDM) Report (referred to as “the Procedure” or “ESDM Procedure”) provides guidance that supplements section 10 of O. Reg. 419/05. Chapter 8.3 of the Procedure includes reference to assessing operations or processes that are in transition under certain circumstances with a focus on those scenarios where there are emissions of contaminants with acute health effects. Transitional Operating Conditions (TOC) in some instances can result in the highest POI concentration that the facility is capable of. The wording in the Procedure has not been consistently interpreted by the regulated community and air practitioners.

The proposed amendments to the Regulation discussed in this paper would clarify which types of operating conditions are to be assessed under paragraph 1 of subsection 10(1) and indicate when facilities would be required to assess specific operating conditions in addition to those that are required to be assessed under paragraph 1 of subsection 10 (1). The proposed amendments focus on discharges of contaminants with the potential for acute health effects. Imposing clear, enforceable provisions in the regulation would allow for consistent application of the rules, more accurate compliance assessments and may prevent short-term exposures to harmful emissions.

2. Background

In June 2009 (EBR Registry Number: 010-6587), the Ministry of the Environment and Climate Change (MOECC/ministry) posted a proposal to amend O. Reg. 419/05. The proposal included proposed changes to section 10 of O. Reg. 419/05 to address TOC (referred to as start up, shut down and malfunctions or SSM in the proposal). Industry and consultants did not support the changes to section 10 of the Regulation which proposed to clarify requirements to assess emissions during TOC. As such, the ministry did not move forward with those particular section 10 amendments in December 2009 but rather committed to further discussion with stakeholders and indicated that changes may be proposed in the future.

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

Since 2009, the ministry has been gathering information and discussing, both internally and with stakeholders, how the TOC guidance in the ESDM Procedure could be updated (see Chapter 5 of this document). On December 18, 2015, the ministry posted on the Environmental Registry proposed changes to the ESDM Procedure document and noted in Chapter 8.3 that it was working to clarify guidance to address the type of TOC that should be considered in modelling and included in an ESDM report.

On March 8, 2017, along with several other documents that support the implementation of the Regulation, the ESDM Procedure was updated (EBR Registry Number 012-4167). Chapter 8.3 of the Procedure was not updated at the time, as the draft guidance was still under review. The ministry is now proposing regulatory amendments.

Excerpt from the ESDM Procedure:

Chapter 8.3 Transitional operating conditions

The operating condition that corresponds to the maximum POI concentration may occur when the facility is at the maximum production level or running at a lower production level or the process is in transition. Persons preparing an ESDM report must assess all operating scenarios to determine the scenario that results in the maximum POI concentration for that contaminant.

The frequency and duration of an operating condition may also be considered in the analysis, depending upon the contaminant and effect. For example, focusing the analysis on steady-state operating conditions may be reasonable if there are no acute effects associated with the contaminant during transitional operating conditions and transitional operating conditions last only for a few hours a few times per year.

3. Rationale for the Proposed Policy and Regulatory Amendments

This document outlines the rationale and scope of the proposed policy and related regulatory changes related to TOC. The aim of the proposed policy is to address the concern that some TOC can result in increased emissions of contaminants that may have the potential for more immediate health effects on individuals in the surrounding community. In developing the proposal there was a review of:

- contaminants that may have acute effects and that may be emitted during TOC;
- the types of operating conditions that may require assessment; and
- Ontario sectors that potentially emit these contaminants during TOC.

a. Type of Contaminants

Contaminants with Acute Effects

Short-term exposures to elevated concentrations in air of a contaminant with an acute health effect are of concern and should be prevented from occurring.

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

“An acute health effect is any impairment that may occur after short-term exposure to an air contaminant.”

Generally, an acute effect would be observed after minutes or hours of exposure. Examples of acute health effects include watery eyes, irritation of nasal passages, nasal lesions and bronchial constriction (respiratory sensitization; asthma attack). The frequency with which the TOC occurs is not relevant in the case of emissions of contaminants that may have acute adverse health effects; one event or one exposure may have the potential to be harmful. The ministry aims to prevent these effects. Acute health effects range in severity, and are dependent on the interaction of three key factors – the magnitude of the exposure, the inherent hazard of the contaminant, and the sensitivity of the exposed person.

Many contaminants can cause acute effects at high enough levels. The ministry generally sets air standards to be protective in long-term continuous exposures (i.e., chronic air standards). However, a small number of air standards have also been set to be protective in acute exposures. Air standards for acute health effects are typically set with an averaging period of one hour or less. It should be noted that some standards in the Regulation are dated. As such not every standard in Schedule 3 that is set with an averaging period of one hour may be based directly on an acute health effect. Also, some one-hour guideline values are based on odour, although they are to be updated.

Other Contaminants

Many contaminants have air standards intended to protect over long-term continuous exposures. This is where there are concerns in regards to chronic effects. As such, exposure to elevated emissions of these contaminants once over a short period may not be of concern. However the ministry recognizes that consideration should be given in those instances where TOC for these contaminants are regular, frequent or lengthy in duration.

b. Identifying Contaminants for TOC

To support the work on the TOC policy, the ministry has undertaken an assessment to identify those contaminants that have the potential to cause adverse health effects during short-term periods of elevated exposure and which may be released during TOC. The assessment included two parts: 1) identification of contaminants for inclusion based on hazard-emissions ranking and operational assessment; and 2) review of air standards with averaging periods less than 24 hours as numerical limits in TOC policy and in further identification of contaminants to be considered.

The process involved the identification of:

- contaminants using a scan of other jurisdictions acute values;
- sectors that emit those contaminants using NPRI;
- the potential for TOC for those contaminants in those sectors to determine the proposed contaminants to be assessed in TOC; and

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

- if TOC may be addressed through other O.Reg.419/05 compliance approaches such as site-specific standards or technical standards.

Based on the information reviewed, SO₂ has been identified as the initial focus on the ministry's proposed TOC policy.

Sulphur dioxide

SO₂ is an airborne pollutant that adversely impacts human health (respiratory effects) and causes damage to plants and materials. SO₂ also contributes to the formation of particulate matter (PM_{2.5}), which has additional adverse health and ecosystem impacts (acid deposition). Fine particulate matter is associated with an increased risk of premature mortality and aggravation of respiratory and cardiovascular diseases, resulting in increased hospital, emergency department and doctor's visits.

As SO₂ adversely affects respiratory health, the proximity to emission sources is a key risk factor. People with asthma are especially susceptible to the effects of SO₂, which can cause breathing difficulties, wheezing, chest tightness and shortness of breath, particularly when exercising. In Ontario up to 7% of Ontarians (910,000 people) have asthma. Children and the elderly are considered more susceptible to the adverse health effects of SO₂. Children also appear to be more susceptible due to greater time spent outdoors while playing.

The one-hour air standard for SO₂, set in 1974 is being updated based on acute effects and may be considered for application to TOC events (e.g., in terms of level of protection and averaging period). The existing SO₂ standards would be applied in TOC assessments until a new SO₂ takes effect.

Other Contaminants

Notwithstanding this analysis, it is understood that other contaminants may also result in acute health effects and may need to be addressed. Other contaminants may be addressed in the proposed TOC policy in the future as additional information about sectors and TOC events becomes available.

Even if a contaminant has a ministry standard that was set based on chronic health effects, there may be a concern about acute health effects for that contaminant during TOC. Notwithstanding any other provision, section 14 of the Environmental Protection Act (EPA) prohibits discharges that may cause an adverse effect.

Additionally, there are currently 10-minute standards and guidelines for some contaminants based on odour effects. While discharges of odorous contaminants may cause adverse effects as defined in the EPA, odour effects may or may not be considered for the purpose of the TOC guidance.

c. Operating Conditions

It is proposed that that the regulation be amended to clarify that a facility would need to assess compliance with air standards when it is operating as it is designed to function and in some instances, when it is operating in transition.

Since the regulation applies to many facilities across a broad range of sectors, there is a wide range of operating conditions that are designed for and assessed. The ESDM Procedure provides guidance on the development of realistic scenarios that result in the highest concentration.

Chapter 8.1 Operating Conditions

Determining the appropriate Operating Conditions should be based on the following:

- *the averaging period for the ministry POI Limit(s) for the contaminant;*
- *information contained in the Facility Description of the ESDM report;*
- *simultaneous versus sequential operations and emission estimates that are based upon either design capacities or actual operating data; and*
- *technical and operational limitations on production.*

Similarly there could be a range of TOC that could occur. During policy development, the ministry identified the following:

- In some instances TOC are regularly occurring and in some instances they are not.
- Processes that start-up and shut down are transitional in nature but are often planned for resulting in emissions that are managed or controlled.
- Some facilities currently include TOC such as start-up and shutdown in their ESDM reports and some do not.
- There are operating scenarios that have been designed to occur when a facility fails to operate normally in order to deal with process upsets and equipment failures. Examples of these TOC include the operation of a flare, such as acid gas flaring at petroleum refineries and stand-by or backup systems.
- There may be some crossover between a spill and a TOC. The ministry has a comprehensive framework for dealing with spills, including Part X of the EPA, O. Reg. 224/07 (Spill Prevention and Contingency Plans) and O. Reg. 675/98 that address spills.

d. Analysis of sectors and TOC

SO₂ is emitted by a large number of facilities across a number of sectors.

As part of the work the ministry has undertaken to identify those contaminants that have the potential to cause adverse effects during short-term periods of elevated exposure and which may be released during TOC, a number of industrial sources were confirmed as potential sources of SO₂.

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

A review of NPRI for 2014 emissions shows that 104 facilities reported annual emissions of SO₂ to air. Based on emissions reported through the NPRI, 92% of all SO₂ emissions in Ontario come from larger industrial facilities, including base metal smelters, petroleum refineries, integrated iron and steel plants, basic inorganic chemical manufacturing, cement plants, and pulp and paper plants.

The Ministry's assessment to date showed that the following sectors are known to experience TOC for SO₂: petroleum refineries, base metal smelters, sulphuric acid, sulphides and sulphites manufacturers, cement manufacturing, conventional oil and gas extraction, ore concentrators and lime manufacturing.

Petroleum refineries are of particular concern as high levels of SO₂ can be emitted as a result of acid gas flaring (that is flaring of process gases that contain sulphur). For example, flaring is part of routine operations. However, during TOC such as start-up, shut down, process upset and when equipment fails or is bypassed, acid gas flaring can result in much higher emissions of sulphur dioxide. TOC emissions from this sector are not currently assessed for compliance purposes.

Data from NPRI shows that, after base metal smelters, the petroleum sector is the highest emitter of SO₂. Processes to address SO₂ emissions have been in place for base metal smelters for decades. Facilities under the base metal smelters NAICS code operate under a site-specific standard process and significant investments have been made to address SO₂ and other air pollutants. The site-specific standards process will ensure follow up reviews of these actions when these instruments expire. A review of incidents reported to the ministry shows that the petroleum sector has multiple TOC type occurrences per year. In addition, local community concerns in the Sarnia area have been raised repeatedly on this issue. See also jurisdictional review for the petroleum sector below.

4. Jurisdictional Review

The Ministry conducted a review of regulatory requirements in a number of Canadian and US jurisdictions. In general the reviewed jurisdictions did not have air emission requirements that parallel those in Ontario. For example, Ontario is the only jurisdiction where air emissions assessed as POI concentrations must be compared against regulatory standards that apply equally to all facilities regardless of size or industry sector. However, some states such as Texas have state concentration-based air standards that require air dispersion modelling for certain types of air permits and limited numbers of contaminants including sulphur dioxide.

Most jurisdictions reviewed have technology/equipment and requirements for best management practices that are specific to various industry sectors. These requirements may supplement applicable emission limits for those sectors/facilities. In the US, rules related to start-up, shutdown and malfunctions (SSM) apply in the broader context of the Clean Air Act which regulates contaminant emissions in a number of different ways including: State Implementation Plans (SIPs) for the National Ambient Air Quality Standards (NAAQS) applicable to a limited number of contaminants such as particulate matter, carbon monoxide, sulphur dioxide, etc.;

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

National Emission Standards for Hazardous Air Pollutants (NESHAP) and New Source Performance Standards (NSPS) for over 180 hazardous air pollutants; Chemical Accident Prevention (a.k.a. Risk Management Program) applicable to 60-70 substances under specific circumstances. States can also impose rules that are more stringent than federal rules.

One of the key aspects of the US regulatory framework is mandating specific equipment/technology, process controls, operational practices, emission limits, separately for a large number of industry sectors. These requirements may range from lowest achievable emission rate (LAER) to maximum achievable (MACT) to best available (BACT) to generally available (GACT) control technology. Industry-specific rules may include requirements related to SSM that are tailored to those sectors. In Ontario, sector-based technical standards (or site-specific standards) applicable to a limited number of facilities have some consideration for emissions from TOC.

Clarifying the ministry's requirements with respect to emissions that occur during TOC is consistent with recent action taken in US jurisdictions. Most significantly, in 2015 the US EPA updated its policy related to how SIPs address emissions of criteria contaminants (including SO₂) from SSM events. In addition, the US EPA has since been updating NESHAP and NSPS rules to incorporate an updated approach to SSM emissions. Some of the new US EPA SSM rules allow alternate emission limitations during start-up/shutdown that are work practices instead of actual contaminant limits.

In regards to petroleum refineries and acid gas flaring, facilities in Ontario operate under Environmental Compliance Approvals which may include specific conditions related to sulphur recovery units such as maximum production rates or reporting requirements and all facilities are required to meet the air standards in the Regulation. There are currently no specific mandated equipment requirements to control SO₂ emissions and minimize acid gas flaring in regulation. These requirements vary in other jurisdictions but other jurisdictions generally have more specific requirements for petroleum facilities.

US EPA rules (known as "Sub-part Ja" of the Clean Air Act were updated in 2008) include requirements related to in stack limits for SO₂ for incinerators and requires tail gas treatment; requirements for Root Cause Analysis for incidents and notifications and corrective actions based on daily emission triggers. Several states, including Texas and California, have additional rules in place for petroleum refineries. These include, but are not limited to, redundancy requirements for sulphur recovery units and tail gas treatment units; specific requirements for sour water storage tanks; process safety management requirements and requirements for 99.8% sulphur recovery if greater than 10 tons per day processing capacity or 96% if less than 10 tons per day. US EPA has required best available control technology for sulphur dioxide in new and certain modified major sources including petroleum refineries as part of the Prevention of Significant Deterioration Program which was introduced in 1977.

5. Stakeholder Input

The Ministry has consulted on proposed regulatory amendments related to TOC in 2009 and initiated further discussions since then on a TOC policy and related guidance to be incorporated in the ESDM Procedure. These are summarized below:

December 2009 (EBR Decision Registry Number: 010 - 6587)

Industry and consultants did not support the changes to section 10 of O. Reg. 419/05 which proposed to clarify requirements to assess emissions during TOC (formerly SSM). Consultants expressed concern that there is a lack of data needed to assess these emissions and that this could lead to more delays in the approvals process. Industry stakeholders were also concerned that this may lead to an increase in the need for site-specific standards. Stakeholders understood the need to address this issue, but felt that other avenues such as Spills or Emergency Planning should be explored and that more discussion is needed. Some industry comments said they are not opposed to changes to subsection 10(2) which would have allowed the Ministry to issue a legal notice requiring specific operating conditions to be assessed.

Air Standards/Local Air Quality Regulation – External Working Group (EWG)

Since then the Ministry has engaged with external stakeholders including a multi-stakeholder external working group comprised of members from industry, industry associations, Public Health Units (PHU), Environmental Non-Governmental Organizations (ENGOS) and representatives from First Nations. The EWG is one avenue the Ministry uses to facilitate discussion on matters concerning or relating to O.Reg.419/05 among the broad range of interests represented in this group. Meetings, where draft TOC guidance (SSM policy direction) was presented, were held in 2010 and continued in 2011. Since then the Ministry continued to collect information and discuss this policy internally.

In April 2015, the EWG was notified that the Ministry was reviewing the draft TOC guidance. In November 2015, a TOC ad hoc group of the EWG was suggested to be put in place to provide feedback.

In 2016, a series of meetings were held to share proposed TOC guidance with the EWG, TOC ad hoc group of the EWG, the Ontario Air Practitioners Group (OAPG) and other industry stakeholder groups.

- TOC ad hoc group (which include members of the broader O. Reg 419/05 External Working Group) included: First Nations , Industry and Industry Associations (Canadian Fuels Association/Imperial Oil/Canadian Vehicle Manufacturers' Association/Toyota), Air Practitioners, ENGOS (Ecojustice, Environment Hamilton, Wallaceburg Advisory Team for a Cleaner Habitat (WATCH))
- Ontario Air Practitioners Group and Industry groups (Canadian Manufacturers and Exporters, Canadian Fuels Association)
- O. Reg. 419/05 External Working Group (includes above stakeholders, other associations and industries, Public Health Ontario and some Public Health Units)

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

Stakeholder feedback to date includes the following:

- TOC policy should prevent impacts from contaminants with acute effects.
- TOC should be defined to include routine and non-routine flaring events.
- Ministry should consider safety-related emissions in different context, outside of O. Reg. 419/05 compliance.
- The Ministry should include in the guidance which contaminants should be assessed for TOC emissions and consult before new contaminants are added to the list.
- Modelling TOC could place a significant number of facilities in many industry sectors in non-compliance with air standards.
- Modelling TOC scenarios/events regardless of whether these events are actually occurring could result in unjustified capital investments. This approach does not consider operational controls and would penalize 'good performer' facilities.
- The ministry should aim at minimizing TOC events by requiring facilities to implement/strengthen operational controls (potentially via ECA conditions).
- If in non-compliance with an air standard during TOC, facilities have to request alternative compliance options (TS and SSS) which are complex, costly, and time-consuming to obtain. (Typically, TS and SSS require facilities to install best available technologies which may require capital investment. The development of these compliance options may take several years as they are complex.)
- Subsection 10 (1) of O. Reg. 419/05 requires modelling of any scenario that results in maximum Point of Impingement (regardless of contaminants and types of scenarios).
- Listing specific contaminants with acute health effects in TOC guidance is not precautionary. Additional contaminants that may potentially have acute health effects should also be included.
- Need transparency and better compliance tools to control the emissions in Sarnia.
- Additional reporting requirements should be considered for contaminants with acute effects emitted during TOC.

6. Proposed Regulatory Changes for discussion

The Ministry is proposing to amend the Regulation to include specific provisions related to TOC. These regulatory amendments will be supported by guidance as needed.

A three-pronged approach is being proposed for regulatory amendments that would (i) address SO₂ emissions from TOC such as acid gas flaring at petroleum refineries, specifically facilities in North American Industrial Classification System (NAICS) codes 324110 or 324190, (ii) clarify the operating conditions to be considered by all facilities for the purpose of paragraph 1 of subsection 10 (1) and (iii) to require modelling of TOC for other facilities as needed, on a case-by-case basis. These proposed amendments to the Regulation would take effect upon filing. For a detailed description of each proposed provision, refer to the document [Proposed amendments related to Sulphur Dioxide](#).

7. Questions for Stakeholders

TOC Contaminants

Contaminants that cause acute health effects over a short time period of exposure are of concern. SO₂ emissions have been identified to be of concern during TOC.

The ministry recognizes that additional contaminants with acute health effects may be addressed by the proposed TOC policy in the future as more information becomes available and that regulatory tools to deal with emissions of contaminants during TOC are needed.

The ministry is specifically seeking input and comment on the following:

- i. For this proposal should contaminants other than SO₂ be considered and if so which ones and why?
- ii. How do you think information on contaminants with acute health effects emitted during TOC could be collected? What resource information is available?
- i. The ministry is considering developing a list of contaminants that have acute health effects and are of concern during TOC. How do you think this information should be communicated? e.g. Appendix to Air Contaminant's Benchmarks (ACB) list.
- ii. In the absence of updated air standards with one-hour averaging periods based on acute effects, should acute health based benchmarks be developed to support assessment of TOC events? i.e., benchmarks for ammonia, chlorine, total reduced sulphur, etc.

Operating Conditions

The ministry is proposing the following in regards to clarification of operating conditions and would like your input.

- i. Does the term "maximum design capacity" reflect the concept of maximum or peak production at facility that would be assessed to determine the scenario that results in the highest concentration?
- ii. In addition to flaring and operation of stand-by or back-up systems what operating scenarios (e.g. bypass vents and pressure valves) that have been designed to occur when the facility is not operating normally should be considered and when? Are there methods to quantify emissions from these TOC?

Other Considerations

To issue the regulatory notice to require that a specific operating condition, which would not otherwise be considered under paragraph 1 of subsection 10 (1), be assessed, the Director would need to be of the opinion that the operating condition is designed to occur at the facility.

Discussion Paper on Proposed Regulatory Changes Related to Transitional Operating Conditions

In addition, the ministry is considering factors for the Director to take into account in making the decision to issue this notice and would like your input on whether the following are adequate and if there are other factors to be included.

- a. The nature of the contaminant.
- b. Whether there are any acute effects associated with the contaminant;
- c. Proximity to places referred to in subsection 30(8) of the Regulation (a health care facility, a senior citizens' residence or long-term care facility, a child care facility, an educational facility, a dwelling) nearby;
- d. For emissions where there is no concern for acute effects, the frequency that the operating condition may occur at the facility;
- e. Whether there may be adverse effects associated with the TOC emissions