The Evolution of Air Emissions Inventories in Ontario, Canada

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ABSTRACT

The monitoring of air quality to develop meaningful air programs and policies has been an on-going initiative in the province of Ontario, Canada. Ontario has been monitoring and reporting on air quality throughout the province since the 1970s. In 1993 the Ontario Ministry of the Environment (MOE) embarked on its first effort to inventory Ontario's point source emissions through the use of a voluntary survey. This survey was distributed annually to industrial facilities throughout the province, requesting annual activity data for the estimation of Ontario facility air emissions. This exercise consistently yielded a low response from Ontario point sources. In January of 2000, the MOE proposed an air quality initiative that would consist of a regulation requiring the mandatory monitoring and reporting of air emissions from point sources. This proposal became reality when Ontario Regulation 227 (O. Reg. 227/00 - "Electricity Generation - Monitoring and Reporting") came into effect in May of 2000. This regulation applied to certain Ontario electricity generation facilities and regulated 28 airborne contaminants. The goal of a regulated air emissions inventory program applicable to a wide spectrum facilities was realized when the MOE promulgated Ontario Regulation 127 (O.Reg.127/01) regulating air emissions from industrial, commercial, institutional, and municipal point sources in the province. Facilities are able to report their air emissions under O.Reg.127/01 via the MOE's web-based reporting and registration site titled "*OnAIR*". This study will chronicle the evolution of air emissions inventories in the province of Ontario, describing the progression from voluntary to mandatory point source air emissions reporting, provide observations of the air emissions reports submitted by Ontario point sources, and discuss the future direction of air emissions reporting in the province.

INTRODUCTION

The province has been monitoring and reporting on air quality throughout Ontario since the 1970s, however, information on point source air emissions has been limited. In 1993 the MOE embarked on its first effort to inventory Ontario's point source emissions through the use of a voluntary survey. This survey was distributed annually to approximately 3,000 facilities throughout the province, requesting annual activity data for the estimation of Ontario facility air emissions. This exercise consistently yielded a survey response rate of approximately 20 percent.

O. Reg. 227/00 Electricity Generation - Monitoring and Reporting

In January of 2000 the MOE proposed an air quality initiative that would consist of a regulation requiring the mandatory monitoring and reporting of air emissions from point sources. Leading up to this announcement, the ministry held a workshop on emission disclosure and reporting for the electricity sector to the ministry on December 2, 1998. The majority of the participants, including some industrial associations, prefer mandatory reporting since it provides a level playing field and the allocation of resources to participate in the program. A consultation meeting was held for the electricity sector on February 23, 2000. Comments from the Environmental Registry posting (RA00E0003) and this meeting were incorporated into the final emission reporting and monitoring regulation for the electricity generation sector.

The proposal to regulate air emissions reporting from the electricity generation sector became reality when Ontario Regulation 227 (O. Reg. 227/00 - "Electricity Generation - Monitoring and Reporting") came into effect in May 2000. O.Reg.227/00 covered 28 substances and required a generation facility that exceeded the reporting threshold for any of the 28 substances to file annual and smog season (May 1 to September 30) emissions reports.

O.Reg.127/01 Airborne Contaminant Discharge - Monitoring and Reporting

After the first year of mandatory point source air emissions reporting was successfully implemented, the vision to expand this program to a wider spectrum of point sources was to be realized soon thereafter. The MOE consulted extensively with stakeholders in developing this proposed "all sectors regulation". These consultation meetings provided opportunities for input on the proposed regulation, the substance list with reporting thresholds and the reporting system. Various stakeholder feedback from these consultation meetings was incorporated into the development of the “all sectors regulation”, the "Step by Step Guideline for Emission Calculation, Record Keeping and Reporting For Airborne Contaminant Discharge” (the Guideline) and the Help Desk for reporting.

On May 1, 2001, O.Reg.227/00 was superceded by the “all sectors regulation” titled Ontario Regulation 127 (O.Reg.127/01 - “Airborne Contaminant Discharge - Monitoring and Reporting”). The implementation of O.Reg.127/01 extended point source reporting to industrial, commercial, institutional and municipal sectors, regulating the air emissions of over 350 contaminants. Facilities subject to O.Reg.127/01 are required to report this information to the provincial government and also make their reports available to any member of the public who wishes to view the facility report. The reporting organization/facility is responsible for the validity and quality of its reported data.

Facilities in Ontario that meet the reporting requirements are required to calculate and report on their

facility air emissions of any of the over 350 contaminants regulated under O.Reg.127/01. The regulation covers various contaminants that are considered toxic, contribute to climate change, and affect smog and acid rain. These contaminants are listed in Tables 2A, 2B and 2C of the Guideline. Table 2A lists 11 contaminants comprised of criteria air contaminants and greenhouse gases, which have release based reporting thresholds. Table 2B lists 76 contaminants with graded MOE manufactured, processed or otherwise used (MPO) reporting thresholds. Table 2C lists contaminants which are common to the Canadian federal National Pollutant Release Inventory (NPRI) list and have the same reporting criteria as NPRI.

Implementation of O.Reg.127/01

The application of O.Reg.127/01 to various facilities was phased-in. Phase I began on May 1, 2001 and required electricity generation facilities (Class A), and facilities with large source emissions, including iron and steel manufacturers and petroleum refineries (Class B), to monitor and report emissions in accordance with the regulation. Phase II began on January 1, 2002 and requires that facilities with small source emissions, including food manufacturers and bulk dry-cleaning facilities, as well as municipal facilities [e.g. commercial buildings, sewage treatment plants, municipal landfills and transportation maintenance yards] (Class C), monitor and report in accordance with the regulation.

Reporting under O.Reg.127/01

The regulation requires annual and smog season emission reporting from facilities captured under the regulation, and defines criteria for emission monitoring systems and quarterly reporting requirements for sulphur dioxide and oxides of nitrogen. The annual reports will provide Ontarians with key information about air emissions from the electricity generation sector and other large source emitters. The first year of reports covering the period May 1 to December 31, 2001 were due June 1, 2002. Thereafter, Annual and Smog Season reports for all sectors were due on June 1st of every year for the preceding year's data (January 1 to December 31).

O.Reg.127/01 Objectives

The objectives of O. Reg. 127/01 - "Airborne Contaminant Discharge - Monitoring and Reporting" are:

- better public access to information on industrial emissions in the province;
- province-wide emission reductions, since having more information available to the public may motivate companies to reduce their emissions;
- informed decisions on the purchase of environmentally friendly electricity and other products;
- a level playing field for companies in all economic sectors in the province regarding requirements for monitoring and disclosure of environmental pollutants;
- a detailed information base on air pollution that will help industry and government

develop future environmental policies and abatement (reduction) strategies; and

- a mechanism for tracking the progress of the ministry's air quality initiatives designed to address smog, acid rain, climate change and other air issues.

O.Reg.127/01 Outreach

The MOE has enhanced its emission reporting outreach activities under O.Reg. 127/01 to further promote awareness among Ontario reporting facilities. The MOE provides and hosts training on O.Reg.127/01 through annual workshops.

Also, the O.Reg.127/01 Stakeholder Workgroup was developed by the Ministry to assist in the regular update and improvement of the "Step by Step Guideline for Emission Calculation, Record Keeping and Reporting for Airborne Contaminant Discharge", including the substance list and reporting thresholds, and emission estimation methods. Members include representatives from industry, environmental groups, and the government. Members of the O.Reg.127/01 Stakeholder Workgroup assist and participate in various outreach activities such as O.Reg.127/01 training workshops that are hosted in collaboration with industry associations.

O.Reg.127/01 Data Repository and Reporting Website - OnAIR:

In order to provide Ontarians with timely access to information about air emissions in their communities the MOE developed *OnAIR*, an internet based O.Reg.127/01 data repository and air emissions reporting website. *OnAIR* has been operating since May 15th 2002 and allows facilities that are required to report under O.Reg.127/01 to submit their air emissions report to the MOE via the internet. The public can access these reports through the *OnAIR* website at:

http://www.ene.gov.on.ca/environet/onair/splash.htm

It should be noted, however, that Ontario's air quality is affected by emissions within the province, as well as by long-distance transboundary pollution from upwind jurisdictions. The emissions data posted to the public Web site correspond to only those originating from specified Ontario sectors.

Online reports do not include ambient air quality measurements, environmental effects data, analysis or interpretation of the submitted data.

OBSERVATIONS

O.Reg.127/01 Reports for the Year 2002

On June 1, 2003, Annual and Smog Season reports for all sectors were due for year 2002 data. Currently, 4,110 Ontario facilities have submitted their Annual and Smog Season air emissions reports under O. Reg.127/01 to the MOE. All reports have been entered onto *OnAIR*, the MOE's emissions reporting web site.

Of the 4,110 facilities:

- 4 % represent Class A facilities (electricity generation facilities);
- 49 % represent Class B facilities (vehicle manufacturers, iron and steel manufacturers, petroleum refineries, chemical producers and other large industries); and,
- 47 % represent Class C facilities (food manufacturers, bulk dry-cleaning facilities, municipal facilities [e.g., sewage treatment plants, municipal landfills]).

O.Reg.127/01 Reporting Trends - 2000, 2001, and 2002

On May 1, 2001, O.Reg.227/00 was revoked by O.Reg.127/01, which extended reporting to various industrial, commercial, institutional and municipal sectors. O.Reg.127/01 was phased-in, whereby Phase I began on May 1, 2001 and required electricity generation facilities (Class A), and facilities with large source emissions, including iron and steel manufacturers and petroleum refineries (Class B), to monitor and report emissions in accordance with the regulation. Phase II began on January 1, 2002 and requires that facilities with small source emissions, including food manufacturers and bulk dry-cleaning facilities, as well as municipal facilities [e.g. commercial buildings, sewage treatment plants, municipal landfills and transportation maintenance yards] (Class C), monitor and report in accordance with the regulation. The table below outlines the trend of Annual & Smog Season emission reports submitted by Ontario facilities (by Class A, B and C) from year 2000 to 2002 under O.Reg 227/00 and O.Reg 127/01.

O.Reg.227/00 and O.Reg.127/01 Annual & Smog Season Facility Reports Trend by Class (A, B, and C)

	2000 (O.Reg.227/00)	**2001 (O.Reg.127/01)**	**2002 (O.Reg.127/01)**
CLASS	ANNUAL/SMOG	ANNUAL/SMOG	ANNUAL/SMOG
A	153	128	152
B	N/A	1,805	2,041
C	N/A	244	1,889
Other	N/A	29	28
Total	**153**	**2,206**	**4,110**

Year 2000 air emissions data was limited to the electricity generation sector as per O.Reg.227/00 and consisted of 153 Annual and Smog Season reports submitted by Ontario facilities captured under this

regulation. There were no Class B or C facility reports in 2000 because O.Reg.227/00 only regulated the electricity generation sector (i.e., Class A).

The results reveal that as the regulation was phased-in their was an increase in the number of facilities submitting air emission reports under the regulation.

The total number of facilities in Class A (electricity generation facilities) that submitted air emission reports decreased from 153 in 2000 (under O.Reg.227/00) to 128 in 2001 (under Phase I of O.Reg.127/01) and increased to 152 in 2002 (under Phase II of O.Reg.127/01). The total number of facilities in Class B (large source emissions, e.g. iron and steel manufacturers, automobile manufacturers, and petroleum refineries) that submitted their air emission reports increased from 1,805 in 2000 (under Phase I of O.Reg.127/01) to 2,041 in 2002 (under Phase II of O.Reg.127/01), an increase of 13%. Variations in the number of facilities reporting can be due to whether these facilities have experienced increases or decreases in production and/or air emissions from one year to the next. Such variations in production can affect whether these facilities meet the reporting requirements or not. The reporting requirements determine whether or not a facility is required to report under the regulation.

The impact of the Phase-in of O.Reg.127/01 is most apparent when results from Class C are considered. The total number of facilities in Class C (small source emissions, e.g., including food manufacturers and bulk dry-cleaning facilities, and municipal facilities) that submitted air emissions reports increased from 244 in 2001 (under Phase I of O.Reg.127/01) to 1,889 in 2002 (under Phase II of O.Reg.127/01). This increase of 1,645 facilities that submitted reports illustrates the improved coverage in air emission reporting when it is regulated. Phase I of O.Reg.127/01 did not include Class C facilities in reporting, yet 244 facilities chose to submit reports on a voluntary basis. Once Phase II of the regulation became effective, requiring Class C facilities to report, the number of Class C facilities that submitted air emissions reports to the MOE increased to 1,889.

The total number of air emission reports submitted by all Classes (A, B, and C) of Ontario facilities increased from 153 in 2000 (under O.Reg.227/00) to 2,206 facility reports under Phase I of O.Reg.127/01 to 4,110 facility reports under Phase II of O.Reg.127/01. Ontario facility reporting has increased by 3,957 facilities as a result of the expansion of reporting requirements between O.Reg.227/00 and O.Reg.127/01, improving the accountability and coverage of point source air emission sources in the province of Ontario.

QA/QC and Compliance

The Ministry reviews the reports submitted by facilities and performs quality assurance and quality control (QA/QC) procedures. The procedures make use of staff knowledge of industrial process associated with the emissions and emissions data from similar facilities in other jurisdictions.

The Ministry has conducted QA/QC of the emission reports and contacted facilities concerning anomalous data, including gross error checks and data consistency checks. Specifically, QA/QC consisted of:

- substance release outliers;
- consistency between smog season, annual and quarterly emission values reported;
- outliers within sectors;
- individual species against group for volatile organic compounds (VOCs) and particulate matter; and
- consistency with NPRI.

In addition, QA/QC has been performed on the O.Reg. 127/01 report data, with a focus on the top 100 Criteria Air Contaminant (CAC) emitters, to verify that the data submitted by the facilities is reflected correctly in the public *OnAIR* website.

The MOE has implemented compliance audit and inspection activities to identify non-reporting facilities and bring them into compliance with O. Reg. 127/01.

CONCLUSIONS

In regulating air emissions reporting, the province of Ontario has established a mandatory point source air emissions inventory that covers 4,110 facilities. Within three years the province has improved Ontario facility reporting by 3,957 facilities as a result of the expansion of reporting requirements between O.Reg.227/00 and O.Reg.127/01, improving the accountability and coverage of point source air emission sources in the province of Ontario. Through this regulated point source air emissions inventory Ontario is on its way to achieving its objectives of better public access to information on industrial emissions in the province which will assist the public in making informed decisions on the purchase of environmentally friendly electricity and other products. Through O.Reg.127/01 Ontario has established a level playing field for companies in all economic sectors in the province regarding requirements for monitoring and disclosure of environmental pollutants. Ontario is using the data gathered via O.Reg.127/01 to create and build a detailed information base on air pollution that will help industry and government develop future environmental policies and abatement strategies. O.Reg.127/01 is a prime mechanism for tracking the progress of the ministry's air quality initiatives designed to address smog, acid rain, climate change and other air issues. Through increased awareness and regulated air emissions inventories Ontario is moving forward and working with industry to achieve province-wide emission reductions that will contribute to the overall improvement of the provincial atmospheric environment.

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KEYWORDS

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