Preliminary Consultation

Proposed Regulations for Air Pollutants Emission Standards for New Stationary Diesel Engines

(Also called Compression-Ignition Engines)

Electricity and Combustion Division
25 April 2017
Environment and Climate Change Canada’s Electricity and Combustion Division is pleased to share with you a preliminary proposal for developing Regulations to set emission standards for NEW stationary diesel engines.

Stationary diesel engines emit air pollutants such as particulate matter and nitrogen oxides which have a negative impact on health and the environment.

The purpose of this presentation is to provide a high-level overview of our proposed approach, to facilitate your input.

We are looking forward to receiving your feedback on this proposal.

If you have any questions or comments please contact Paola Mellow at ec.combustion.ec@canada.ca.
Logistics

• The software that we are using to host this presentation has a ‘chat’ function. Please use it to ask questions during the presentation.

• The telephone lines will be muted.

• We will pause at several points in the presentation to respond to those questions. Please note that we may not be able to address some questions during this session, e.g. technical questions. We will follow up with those bilaterally after the presentation.
AGENDA
Emission Standards for NEW Stationary Diesel Engines

Overview
• Context
• Proposed requirements
• Requests for feedback
• Summary/Next steps

Annex
• Technical details
• Summary/Next steps
OVERVIEW
Emission Standards for NEW Stationary Diesel Engines
OVERVIEW - CONTEXT

Why ECCC is proposing these Regulations

• These proposed Regulations would set standards to reduce emissions of air pollutants such as carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NO\textsubscript{x}) and particulate matter (PM).

• Emission reductions attributable to these proposed regulations will lead to health and environmental benefits for Canadians.

• These proposed Regulations are also consistent with the Pan-Canadian Framework on Clean Growth and Climate Change which addresses those same pollutants and also on the governments efforts to reduce reliance on diesel.

• Setting standards to reduce air pollutant emissions helps meet Canada’s commitment established in the Ozone Annex.

• ECCC is also engaged with international partners through key fora such as the Arctic Council, the Climate and Clean Air Coalition, the Global Methane Initiative, the International Maritime Organization and the Convention on Long Range Transboundary Air Pollution to incent and promote SLCP reductions internationally.
OVERVIEW - CONTEXT

Health and environment impact

• Emissions from stationary diesel engines negatively affect the environment (climate change) and human health (air quality).

• Short-lived climate pollutants are substances such as Black carbon, methane, hydrofluorocarbons and tropospheric ozone which have a relatively short life span in the atmosphere compared to carbon dioxide and other longer lived GHGs.

• Tropospheric ozone is expected be reduced through reductions of oxides of nitrogen and volatile organic compounds which are tropospheric ozone precursors.

• Through PM reductions, black carbon, a short-lived climate pollutant and contributor to global warming, will be reduced.
  • Black carbon sources in Canada include mobile, wood burning and industrial sources.

• Black carbon is of particular significance in the Arctic due to its additional warming effect when deposited onto snow or ice.
Stationary diesel engines in Canada

Stationary diesel engines fill many roles in Canada, including:

• To provide electricity in remote communities
• To drive fire pumps
• To keep critical systems running (e.g. operating rooms)
• To provide backup/standby power (e.g. for office buildings)
• To power irrigation systems, water pumps, compressors, etc.

In Canada, you will find stationary diesel engines in…

• Key sectors such as: power, agriculture, mining, upstream oil&gas, commercial, institutional, residential
• The majority of engines are used to provide backup power

There may be as many as 80,000 stationary diesel engines operating in Canada in 2016.

There are currently no federal emission standards for stationary diesel engines
**OVERVIEW - CONTEXT**

Examples

- Standby generator
- Standby generator
- Emergency home generator

- Portable generator
- Mobile Irrigation Pump
Once the regulation comes into force, any **NEW** stationary diesel engines imported or manufactured in Canada must meet these standards.

We are proposing that new stationary diesel engines meet:
- US EPA Tier 4 standards for stationary diesel engines with displacements <10 liters/cylinder
- US EPA Marine Tier 4 standards for stationary diesel engines with displacements ≥10 and < 30 liters/cylinder

. . . while allowing stationary diesel engines destined for remote locations and/or needed for backup to meet less stringent Tier 2 or Tier 3 standards.
OVERVIEW – PROPOSED REQUIREMENTS

Proposed Emission Standards for NEW stationary diesel engines

We propose to base our proposed emission standards on US EPA standards on the requirements for manufacturers in 40 CFR Part 60, Subpart III Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

• Our proposed Regulations would apply to NEW stationary diesel engines that have a displacement of <30 litres per cylinder.

• Organized in ‘Tiers’, where the higher the Tier, the more stringent the standard (Tier 1 to Tier 4)

• Overall, Tier 4 standards would apply, although we are considering including similar flexibilities as in the US to allow:
  ▪ Tier 2 or 3 for those destined for remote communities.
  ▪ Tier 2 or 3 for those destined for backup use.
  ▪ Tier 2 or Tier 3 do not require after-treatment, such as SCR.
### Tier 1 and Tier 4 emission standards for stationary diesel engines with an output of 560 kW and greater (g/kWh)

<table>
<thead>
<tr>
<th></th>
<th>Tier 1</th>
<th>Tier 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>9.2</td>
<td>11.4</td>
</tr>
<tr>
<td>VOC</td>
<td>1.3</td>
<td>0.67</td>
</tr>
<tr>
<td>PM</td>
<td>0.54</td>
<td>0.04</td>
</tr>
<tr>
<td>CO</td>
<td>3.5</td>
<td>0.19</td>
</tr>
</tbody>
</table>
**OVERRIDE – PROPOSED REQUIREMENTS**

What are the proposed Tier 4 emission standards (1)

We are proposing that new stationary diesel engines meet U.S. EPA Tier 4 requirements, for those <10 liters/cylinder

<table>
<thead>
<tr>
<th>Maximum engine power</th>
<th>Application</th>
<th>PM</th>
<th>NO\textsubscript{x}</th>
<th>NMHC</th>
<th>NO\textsubscript{x} + NMHC</th>
<th>CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW &lt;19</td>
<td>All</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 ≤ kW &lt; 56</td>
<td>All</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56 ≤ kW &lt; 130</td>
<td>All</td>
<td>0.02</td>
<td>0.40</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130 ≤ kW ≤ 560</td>
<td>All</td>
<td>0.02</td>
<td>0.40</td>
<td>0.19</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>kW &gt; 560</td>
<td>Generator sets</td>
<td>0.03</td>
<td>0.67</td>
<td>0.19</td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>All except generator sets</td>
<td>0.04</td>
<td>3.5</td>
<td>0.19</td>
<td></td>
<td>3.5</td>
</tr>
</tbody>
</table>
OVERVIEW – PROPOSED REQUIREMENTS

What are the proposed Tier 4 emission standards (2)

We are proposing that new stationary diesel engines meet U.S. EPA marine requirements, for those ≥10 and < 30 liters/cylinder

For those with a maximum power of < 600 KW

<table>
<thead>
<tr>
<th>Displacement (L/cyl)</th>
<th>PM (g/kW-hr)</th>
<th>NOₓ+HC (g/kW-hr)</th>
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</thead>
<tbody>
<tr>
<td>7.0 ≤ disp. &lt; 15.0</td>
<td>0.14</td>
<td>6.2</td>
</tr>
<tr>
<td>15.0 ≤ disp. &lt; 20.0</td>
<td>0.34</td>
<td>7.0</td>
</tr>
<tr>
<td>20.0 ≤ disp. &lt; 25.0</td>
<td>0.27</td>
<td>9.8</td>
</tr>
<tr>
<td>25.0 ≤ disp. &lt; 30.0</td>
<td>0.27</td>
<td>11.0</td>
</tr>
</tbody>
</table>

For those with a maximum power of ≥600 KW

<table>
<thead>
<tr>
<th>Maximum power</th>
<th>PM (g/kW-hr)</th>
<th>NOₓ (g/kW-hr)</th>
<th>HC (g/kW-hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 ≤ kW ≤ 3700</td>
<td>0.04</td>
<td>1.8</td>
<td>0.19</td>
</tr>
<tr>
<td>kW &gt; 3700</td>
<td>0.06</td>
<td>1.8</td>
<td>0.19</td>
</tr>
</tbody>
</table>
OVERVIEW – PROPOSED REQUIREMENTS
Where the emission standards will fit

We propose to include standards for stationary diesel engines in the upcoming proposed Off-Road Compression-Ignition and Large Spark-Ignition Engine Emission Regulations.

• These would maintain air pollutant emissions for off-road mobile compression-ignition engines and introduce new standards for large spark-ignition engines as well as stationary diesel.
• These would impose obligations on manufacturers/importers and not impose obligations on owners/operators.
• Emission standards and test procedures of these Regulations would be aligned with those of the U.S. EPA.
What general comments/observations do you have about this proposal?

• What issues result from this proposal?
• What benefits result from this proposal?
• We are considering allowing engines destined for remote communities or to be used as back-up, to meet emission standards that are less stringent than Tier 4 standards. Do you have comments?
• We are considering excluding fire pump engines from these requirements. Do you have any comments?
1. Please provide information/links for any existing or proposed risk management instruments that could apply to these engines?

2. What opportunities are there for coordination between those instruments and these proposed Regulations?

3. What are the characteristics of the population of engines that are covered by your instruments (both in force and proposed) (quantity, size, age, Tier, purpose)?

4. What issues arise from requiring Tier 4 emission standards for engines on your reserve, whether designed for back-up or for prime power?
1. What are the characteristics of the engines that you own or operate (make/model, size, age, hours of use per year, Tier, purpose, location)?

2. How many new engines do you plan to purchase in the next five years? For each engine, what is the anticipated year of purchase, size, Tier, purpose, and location.

3. Which provincial, territorial or municipal requirements are your engines subject to?

4. What issues have you had with maintenance of the pollution control equipment of your engines?

5. What issues arise from requiring Tier 4 emission standards for engines designed for use in remote communities or used as backup?
1. What are the characteristics of the set of engines that you have sold annually in Canada in the last five years (i.e. quantity, size, age, Tier, purpose, price)?

2. What are the characteristics of the aftermarket pollution control equipment that you have sold annually in Canada in the last five years (i.e. technology, price, reliability, effect on performance)?

3. What is the price difference between similar engines that meet the emission standards of different Tiers? For example, how much does an engine cost that meets Tier 4 standards compared to a similar engine that meets Tier 3 standards?

4. What issues arise from meeting Tier 4 emissions standards (e.g. on efficiency, lifespan, operating hours, maintenance costs)?

5. What benefits arise from meeting Tier 4 emissions standards (e.g. on efficiency, lifespan, operating hours, maintenance costs)?

6. What are the pollution control options that are offered in your product lines to meet Tier 4 standards?

7. What issues arise from requiring Tier 4 emission standards for engines designed for use in remote communities or used as backup?
1. Please provide information/links for any existing or proposed risk management instruments that could apply to these engines?

2. What opportunities are there for coordination between your instrument and these proposed Regulations?

3. What are the characteristics of the population of engines in your jurisdiction engines that are covered by your instruments (both in force and proposed) (quantity, size, age, Tier, purpose)?

4. What issues arise from requiring Tier 4 emission standards for engines in your jurisdiction, whether designed for back-up or for prime power?
OVERVIEW - SUMMARY

Our proposed approach

- We propose to set emission standards for NEW stationary diesel engines
- The key US EPA Regulations are 40 CFR Part 60 Subpart IIII — *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* — although these Regulations reference several other US EPA Regulations.
OVERVIEW - SUMMARY

Next Steps

1. We would appreciate your written comments sent to:
   ec(combustion.ec@canada.ca


   Note: We will send you this presentation and a comment template.

2. We will review your comments and engage in further discussions as needed, as we develop a regulatory proposal.

3. We will provide an update to you at the next broad engagement webinar.
   - Should you wish to be removed from the distribution list or know of someone who would like to be added, please e-mail us.

4. Target date for CGI publication in late 2018

Questions?
ANNEX
ANNEX
Recap - proposed approach . . .

... is to develop a proposed *Off-Road Compression-Ignition and Large Spark-Ignition Engines Emission Regulations (CI-LSI)* . . .

By...

1. Imposing requirements on manufacturers/importers for **new** stationary diesel engines with a displacement of less than 30 liters per cylinder.

2. Generally requiring that stationary diesel engines be certified to the appropriate US EPA Tier 4 standards (See 40 CFR 60 Subpart IIII)
   - Exhaust (nitrogen oxides, carbon monoxide, hydrocarbon, particulate matter)
   - Smoke emissions
   - Evaporative emissions
   - Crankcase emissions

3. Providing an option for less stringent emission obligations for backup stationary diesel engines, and for stationary diesel engines in remote locations
ANNEX

Before we delve into the technical details . . .

. . . It is worthwhile providing a high-level view of the structure of Canadian regulations and US EPA Regulations. . .

The legal authority to develop these proposed regulations comes from the Canadian Environmental Protection Act (1999).

The starting point for these proposed Regulations are the Canadian *Off-Road Compression-Ignition Engine Emission Regulations*

These proposed Regulations will reference the US EPA Regulations *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* (found in 40 CFR Part 60, Subpart IIII)

- These Regulations reference other US EPA Regulations.
ANNEX
The proposed emission obligations . . .

. . . directly affect manufacturers or importers of NEW stationary diesel engines

They must meet the emission standards set out in 40 CFR 60 subpart III section 60.4201(a), (c), and, (e)(2). However . . .

• if they are intended to be used as backup engines not in remote locations they may meet the emission standards set out in 40 CFR 60 subpart III sections 60.4202 (a)(1)(ii), (a)(2), (b)(2), (d), (e)(2), (e)(4), (f)(1), and (f)(2) instead,

• if they are intended to be used in remote locations they may meet the emission standards set out in 40 CFR 60 subpart III sections 60.4201(f) instead,

• if they are equipped with an AECD (Auxiliary Emission Control Device) they may meet emission standards in 40 CFR 60 subpart III section 60.4202(h) when the AECD is activated.
The requirements for new SDEs will be included . . .

• The standards would be included in the new CI-LSI Regulations being developed by the Transportation Division.

• Specifically:
  – Exclusions that exist in the current CI regulations would be modified;
  – Definitions for stationary diesel engines would be added
  – Requirements for stationary diesel engines would be incorporated

... In regulatory development that is already underway . . .
ANNEX
Modifying current exclusion . . .

Modifying the current exclusions of 5(2)(h) and (i) . . .

5(2)(h) are used or designed to be used in or on machines
designed and intended not to be moved and bear either
a label indicating that those engines are stationary
engines or the U.S. emission control information label
referred to in section 20, subpart A, of CFR 1039; or

5(2)(i) used exclusively to provide electricity for small
communities in remote areas and that bear a label to that
effect.

. . . so that those exclusions no longer provide a blanket
exclusion for stationary diesel engines . 
"Stationary diesel engine" means one that is used or designed to be used in or on machines designed and intended not to be moved.

"New engine" means one whose model year is 2019 (to be determined) or later.

"Backup engine" means one that only provides power when electric power from the local utility is interrupted.

"Remote location" means a location that is not currently connected to the North American electrical grid or to the piped natural gas network.
ANNEX

New standards incorporated . . .

stationary diesel engines would in general meet the Tier 4 emission standards set out in 40 CFR 60 subpart II. III section 60.4201(a), (c), and, (e)(2) . . .

The Tier 4 Standards are found here and would be referenced in the regulations

60.4201(a): applies to 2007 and later, maximum engine power of ≤ 2237 KW, and a displacement of <10 liters/cylinder.

60.4201(c): applies to 2011 and later, maximum engine power of > 2237 KW, and a displacement of < 10 liters/cylinder.

60.4201(e)(2): applies to 2014 and later, with a displacement of ≥10 liters/cylinder and <30 liters/cylinder.

Note: these CFR sections reference other US EPA regulations. Details on the next slide.
ANNEX

Other US EPA Regulations . . .

40 CFR 1039.101: What exhaust emission standards must my engines meet after the 2014 model year?
40 CFR 1039.105: What smoke standards must my engines meet?
40 CFR 1039.107: What evaporative emission standards and requirements apply?
40 CFR 1039.115: What other requirements apply?
40 CFR 1042.101: Exhaust emission standards for Category 1 engines and Category 2 engines
40 CFR 1042.107: Evaporative emission standards
40 CFR 1042.110: Recording reductant use and other diagnostic functions
40 CFR 1042.115: Other requirements
40 CFR 1042.120: Emission-related warranty requirements

... that are referenced in the sections of the previous slide ...
**ANNEX**

Backup stationary diesel engines not in remote locations . . .

. . . must meet the emission standards set out in 40 CFR 60 subpart IIII sections 60.4202(a)(1)(ii), (a)(2), (b)(2), (d), (e)(2), (e)(4), (f)(1), and (f)(2)

<table>
<thead>
<tr>
<th>Section</th>
<th>Maximum engine power (KW)</th>
<th>Displacement (liters/cylinder)</th>
<th>Other US EPA References (40 CFR …)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.4202(a)(1)(ii)</td>
<td>&lt; 37</td>
<td>&lt; 10</td>
<td>1039, 60 Table 2</td>
</tr>
<tr>
<td>60.4202(a)(2)</td>
<td>≥ 37 and ≤ 2237</td>
<td>&lt; 10</td>
<td>89</td>
</tr>
<tr>
<td>60.4202(b)(2)</td>
<td>&gt; 2237</td>
<td>&lt; 10</td>
<td>89</td>
</tr>
<tr>
<td>60.4202(d)</td>
<td></td>
<td>Fire pump engines</td>
<td>60 Table 4</td>
</tr>
<tr>
<td>60.4202(f)(1)</td>
<td>&lt; 3700</td>
<td>≥ 10 and &lt; 15</td>
<td>1042</td>
</tr>
<tr>
<td>60.4202(e)(2)</td>
<td>≥ 3700</td>
<td>≥ 10 and &lt; 15</td>
<td>94</td>
</tr>
<tr>
<td>60.4202(f)(2):</td>
<td>&lt; 2000</td>
<td>≥ 15 and &lt; 30</td>
<td>1042</td>
</tr>
<tr>
<td>60.4202(e)(4)</td>
<td>≥ 2000</td>
<td>≥ 15 and &lt; 30</td>
<td>94</td>
</tr>
</tbody>
</table>
ANNEX
Stationary diesel engines in remote locations . . .

. . . must meet the emission standards set out in 40 CFR 60 subpart IIII sections 60.4201(f)

60.4201(f): Notwithstanding the requirements in paragraphs (a) through (c) of this section, stationary non-emergency CI ICE identified in paragraphs (a) and (c) may be certified to the provisions of 40 CFR part 1042.
ANNEX
The requirements for stationary diesel engines.

§60.4201 What emission standards must I meet for non-emergency engines if I am a stationary CI internal combustion engine manufacturer?

§60.4202 What emission standards must I meet for emergency engines if I am a stationary CI internal combustion engine manufacturer?

§60.4210 What are my compliance requirements if I am a stationary CI internal combustion engine manufacturer?

§60.4219 What definitions apply to this subpart?
Annex

Stationary diesel engines equipped with an AECD . . .

. . . must meet emission standards in 40 CFR 60 subpart IIII section 60.4201(h)

60.4201(h): Stationary CI ICE certified to the standards in 40 CFR part 1039 and equipped with auxiliary emission control devices (AECDs) as specified in 40 CFR 1039.665 must meet the Tier 1 certification emission standards for new nonroad CI engines in 40 CFR 89.112 while the AECD is activated during a qualified emergency situation. A qualified emergency situation is defined in 40 CFR 1039.665. When the qualified emergency situation has ended and the AECD is deactivated, the engine must resume meeting the otherwise applicable emission standard specified in this section.

A “qualified emergency situation” is one in which the condition of an engine's emission controls poses a significant direct or indirect risk to human life.
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