PRIORITIES AND INITIATIVES TOWARDS STRENGTHENING EMISSION STANDARDS FOR COAL-FIRED POWER PLANTS AND POLLUTING INDUSTRIES

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Air Quality Management Section Chief
Policies and Particulate Matter (PM$_{10}$ and PM$_{2.5}$) Monitoring

PM$_{10}$ has significantly improved by 57% (from 60 ug/Ncm in 2012 to 26 ug/Ncm in 1st Quarter of 2023) nationwide and 47% (from 70 ug/Ncm in 2012 to 37 ug/Ncm in 1st Quarter of 2023) for Metro Manila.

PM$_{2.5}$ significantly improved by 22% (from 23 µg/Ncm in CY 2015 to 18 ug/Ncm in 1st Quarter of 2023) nationwide and 30% (from 27 ug/Ncm in 2012 to 19 ug/Ncm in 1st Quarter 2023).
Proposed Road Map for Clean Air

- **2023**
  - Ongoing revision of ambient air quality standards (hazardous air pollutants) and emission standards (mass emission rate standards)
  - Emission Charge System (ECS) review
  - Review of Euro V Emission and Fuel Standards
  - Implementation of at least 5% of Corporate and Government Fleets shall be EVs; govt.-bet.
  - Review/revision of guideline values for PM$_{10}$
  - Review/implementation of policy for Local Air Quality Monitors, e.g. sensors
  - Development of mass emission rate standards

- **2024**
  - Full implementation of real-time DAHS for firms with CEMS
  - The transition of PETC to PMVIC
  - Designation of attainment/non-attainment airshed areas
  - Development of Guideline Values for additional hazardous air pollutants (black carbon, dioxin, furans, some trace metals)
  - Review/revision of guideline values for other criteria pollutants
  - Initial Airshed Attainment Designation
  - Additional Online systems for Stack Testing & Accreditation, CEMS-RATA Submission
  - Implementation of emission charge system

- **2025**
  - Adoption of Euro V Fuel Standards
  - Implementation of at least 5% of Government Fleets shall be EV (EMB proposal)
  - EVIDA Law CREVI
  - Transition to 10% ethanol (gasoline) and 5% (diesel)
  - Review of Ambient Air Qty Guideline Values
  - Implementation of development mass emission rate standards, Emission Quota (Industrial Airshed)

- **2026**
  - Development of Guideline Values for additional hazardous air pollutants (BC, PAH, VOC, H$_2$S, DF, metals, Criteria Air Pollutants)
  - Review/revision of guideline values for other criteria pollutants
  - Implementation of developed mass emission rate standards
  - Implementation of emission charge system
  - Implementation of emission standards mass emission rate standards, Emission Quota (Industrial Airshed)

- **2027**
  - Adoption of Euro V Emission Standards
  - Full implementation of the PUVMP, including VULP

- **2028**
  - Improvement in air quality and reduction of air pollution
Establishment of the EMB Data Center: Review of NESSSAP Towards Mass Emission Rate Standards
Implementation of MC 2021-14: “Establishment of an Integrated Air Quality Network Center using a Uniform Data Acquisition and Handling System (DAHS) which shall act as Repository of Firms with Continuous Emission/Opacity Monitoring Systems (CEMS/COMS)”
MC 2021-14
SECTION 6: DETERMINATION OF EXCEEDANCE THROUGH THE USE OF EXCESS EMISSION AVERAGING TIME

The DAHS shall automatically determine the excess emission averaging time and compare it with the applicable standards:

1. **Opacity** - any **rolling 5-minute period** during which the average opacity of emission exceeds 20% opacity.
2. **Oxides of Sulfur as Sulfur Dioxide (SO\textsubscript{x} as SO\textsubscript{2})** - any **rolling 3-hour period** during which the average emission (rolling arithmetic average of 3 contiguous 1-hour periods, reported every 5 minutes) exceeds the applicable standards.
3. **Oxides of Nitrogen as Nitrogen Dioxide (NO\textsubscript{x} as NO\textsubscript{2})** - any **rolling 3-hour period** during which the average emissions (rolling arithmetic average of 3 contiguous 1-hour periods, reported every 5 minutes) exceeds the applicable NO\textsubscript{x} as NO\textsubscript{2} standards.
4. **Particulate Matter (PM)** – any **rolling 1-hour period** during which the average emissions (rolling arithmetic average of 1-hour periods, reported every 5 minutes) exceed the applicable standards.
5. **Carbon Monoxide (CO)** - any **rolling 4-hour period** during which the average emissions (rolling arithmetic average of 4 contiguous 1-hour periods, reported every 5-minutes) exceed the applicable standards.
MC 2021-14
SECTION 7: ACTIONS TAKEN IN CASE OF EXCEEDANCES

Exceedance detected by the DAHS

Email SCO to the proponent

Proponent to submit explanation in 24 hours

If no explanation, exceedance shall be considered legitimate

Endorsement to PAB
ANNEX D
DATA TRANSMISSION

1. Opacity (any rolling five-minute period)

c.g:

30% Opacity Exceedance No. 1 for Day 1:
8:05AM to 8:10AM
5-minute exceedance (1 hour average is composed of 12 X 5-minute reading)
reported 8:10AM)

30% Opacity Exceedance No. 2 for Day 1:
9:10AM to 9:15AM
5-minute exceedance (1 hour average is composed of 12 X 5-minute reading)
reported 9:15AM)

Note: Show cause order (SCO) reported for Day 1, showing Exceedance No.1 and No.2

Exemption: As per Section 2 (b) of Rule XXV of DAO 2000-81-Visible Emission Standards for Smoke and Opacity, exceptions to the requirements stated herein may be allowed under the following circumstances:

1. The opacity limit hereinbefore prescribed shall not apply to the emission of dark smoke for less than five (5) minutes in a period of one (1) hour provided that the total period of such emission shall not exceed an aggregate of fifteen (15) minutes in any twenty-four (24) hours;

Scenario 1: Day 1

Opacity=21% (0400-0404); 30% (0415-0418); 45% (0445-0448)
Opacity Exceedance >20% = 4 minutes + 3 minutes + 3 minutes = 10 minutes
Evaluation: <5 minutes per occurrence; within 1 hour; <15 minute Aggregate, within 24 hour cut off

Scenario 2: Day 2

Opacity=23% (0400-0406); 32% (0410-0418); 41% (1200-1207 - Sept 13, 2020)
Opacity Exceedance >20% = 6 minutes + 8 minutes + 7 minutes = 21 minutes
Evaluation: <=5 minutes per occurrence; not within 1 hour; >15 minute Aggregate, passed 24 hour cut off (0000 to 1200)
Particulate Matter (PM) (32 Units of CFBs)

Average Concentration: 21.86 mg/Ncm
% Below std. = 85.42%

PM Standard: 150 mg/Ncm

Carbon Monoxide (CO) (38 Units of CFBs)

Average Concentration: 44.77 mg/Ncm
% Below std. = 91.05%

CO Standard: 500 mg/Ncm

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
CEMS Data Analysis (32 CFB Units)

Nitrogen Oxide as Nitrogen Dioxide (NOx as NO2) (38 Units of CFBs)

- NOx as NO2 Standard (Existing Source): 1500 mg/Ncm
- NOx as NO2 Standard (New Source): 1000 mg/Ncm

Average Concentration: 157.80 mg/Ncm  
% Below std. for New Sources = 84.12%

Sulfur Oxide as Sulfur Dioxide (SOx as SO2) (38 Units of CFBs)

- SOx as SO2 Standard (Existing Source): 1500 mg/Ncm
- SOx as SO2 Standard (New Source): 700 mg/Ncm

Average Concentration: 254.87 mg/Ncm  
% Below std. for Existing Sources = 83.01%

% Below std. for New Sources = 63.59%
Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

Coal-Fired Power Plants Emission Assessment of NESSAP and 2022 CEMS Data AERMOD 11.2 NESSSAP Domain in Three (3) Luzon Areas

Bataan, Region 3

Batangas, Region 4A

Quezon, Region 4A
Coal-Fired Power Plants Emission Assessment of NESSAP and 2022 CEMS Data

1 hr 98th Percentile NESSAP

1 hr 98th Percentile 2022 CEMS Data 32 CFBs

GLC max Plume Cross Section
Coal-Fired Power Plants Emission Assessment of NESSAP and 2022 CEMS Data

AERMOD 11.2 NESSSAP

PM 24 hr 98th Percentile NESSAP

24hr 98th Percentile 2022 CEMS Data 32 CFBs

GLC max Plume Cross Section
Assessment of Ambient Air Qty Data in Reviewing the NESSAP using Applications of Statistical Analysis in Air Quality Management

<table>
<thead>
<tr>
<th>Annual PM 10, ug/NCM</th>
<th>Actual (Predicted, 95% UCL) Number of Health Outcomes per 100,000 people</th>
<th>WHO (2021)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>251 (395)</td>
<td></td>
<td><strong>Recommended Annual GV</strong> 2-4 in 10,000</td>
</tr>
<tr>
<td>30</td>
<td>241 (413)</td>
<td>2-4 in 10,000</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>236 (431)</td>
<td>2-4 in 10,000</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>231 (449)</td>
<td><strong>Recommended revised DAILY GV</strong> 2-4 in 10,000</td>
<td></td>
</tr>
<tr>
<td>60 (current annual GV)</td>
<td>226 (467)</td>
<td>15 ug/m³ (Annual) 2-5 in 10,000</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>210 (521)</td>
<td>2-5 in 10,000</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>194 (575)</td>
<td>2-6 in 10,000</td>
<td></td>
</tr>
<tr>
<td>150 (current)</td>
<td>170 (429)</td>
<td>45 ug/m³ (Daily) 2-6 in 10,000</td>
<td></td>
</tr>
</tbody>
</table>

**Health Outcomes: COPD, Asthma**

<table>
<thead>
<tr>
<th>Summary of the Linear Regression</th>
<th>Intercept</th>
<th>Standard Error</th>
<th>95% LCL</th>
<th>95% UCL</th>
<th>Value</th>
<th>Standard Error</th>
<th>95% LCL</th>
<th>95% UCL</th>
<th>R-Square</th>
<th>Adj. R-Square</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observed Number of Health outcomes PER 100,000</strong></td>
<td><strong>Value</strong></td>
<td><strong>Standard Error</strong></td>
<td><strong>95% LCL</strong></td>
<td><strong>95% UCL</strong></td>
<td><strong>Value</strong></td>
<td><strong>Standard Error</strong></td>
<td><strong>95% LCL</strong></td>
<td><strong>95% UCL</strong></td>
<td><strong>R-Square</strong></td>
<td><strong>Adj. R-Square</strong></td>
</tr>
<tr>
<td>Number of Points</td>
<td>164</td>
<td>256.91832</td>
<td>51.84152</td>
<td>154.49514</td>
<td>359.34151</td>
<td>0.51873</td>
<td>1.17375</td>
<td>-2.83772</td>
<td>1.90025</td>
<td>0.00128</td>
</tr>
</tbody>
</table>

1 in 10,000: High risk
1 in 100,000: Moderate risk
1 in 1,000,000: Low risk

*(US EPA, 2005)*
Industry Category MERS review

1. **Liquid fuel**
   - Fuel-burning equipment using light fuel oil (LFO) i.e. gensets and boilers

2. **Solid fuel**
   - 2A: Coal, power plants, both on-grid and off-grid
   - 2B: Biomass power plants

3. **Gaseous fuel**
   - 3A: Fuel-burning equipment using CNG, etc.
   - 3B: Industrial process equipment – cement industry

4. **Industrial process equipment**
   - 4A: Steel smelting and/or rolling; steel sintering
   - 4B: Glass manufacturing and others
Way Forward Policies

OPMS Requirements for PTO Application (Updates, Improvements)
Way Forward Policies

Air Quality Management Online Systems

<table>
<thead>
<tr>
<th>≤2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>≥2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Acquisition and Handling System (DAHS)</td>
<td>Online Permitting and Monitoring System (OPMS v2.0) for PTO</td>
<td>Online Stack Sampling and Monitoring System (OSSMS) Phase I</td>
<td>Online Stack Sampling Accreditation System (OSSAS) Phase I</td>
<td>Air Quality Management and Information System (AQMIS)</td>
</tr>
<tr>
<td>Realtime Ambient Air Quality Monitoring Dashboard</td>
<td>Dynamic Display Dashboard for Realtime CEMS/COMS Monitoring</td>
<td>Online Emissions Inventory System (OEIS) Phase II</td>
<td>Online Relative Accuracy Test Audit System (ORATA) Phase</td>
<td>Electric Vehicle Assessment System (EVAS)</td>
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<tr>
<td>Realtime Industry CEMS/COMS Monitoring</td>
<td></td>
<td></td>
<td>Online Stack Sampling and Monitoring System (OSSMS) Phase II</td>
<td></td>
</tr>
<tr>
<td>Online Permitting and Monitoring System (OPMS v1.0) for COC</td>
<td></td>
<td></td>
<td>Online Stack Sampling Accreditation System (OSSAS) Phase II</td>
<td>Online Relative Accuracy Test Audit System (ORATA) Phase II</td>
</tr>
<tr>
<td>Air Dispersion Modelling</td>
<td></td>
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</tbody>
</table>

Legend:  
- Completed  
- Targeted
**Way Forward Policies**

**Development of Emission Charge System**

\[
EC = En \times R
\]

- **EC**: Emission charge or emission discharge fee (in Php/year or Php/quarter)
- **En**: Rate per kilogram of priority pollutant emitted (eg., Php/kg of PM)
- **R**: Net mass emission discharge (kg/year or kg/quarter)

\[
En = \left[ Ec \times Qf \times Nf \right] \times CF
\]

- **Ec**: Emission concentration (mg/Ncm) from stack sampling/CEMS (whichever is applicable)
- **Qf**: Dry standard volumetric flow rate of stack emission (Nm\(^3\)/day)
- **Nf**: Number of days/year in operation emitting pollutants
- **CF**: Unit conversion

The outcome of the calculation was an emission fee for PM\(_{10}\), which is roughly equivalent to Php 110,000++/ton or Php 110/kg.
Thank you for listening!

Please visit
https://air.emb.gov.ph/
For Air Quality Permits, please visit

For Air Quality Statistics