**NOx Rate Update for NEEDS v6 (rev 9-14-2018)**

Attachment 3-1 of the EPA Platform v6 documentation summarizes the NOx rate development approach in EPA Platform v6. The following hierarchy of NOx rate data sources is used for this approach:

1. 2017 Emission Tracking System (ETS)
2. Comments on NOx rates
3. 2016/2015/2014//2011/2009/2007 ETS
4. 2015 EIA Form 860
5. State-level defaults
6. National-level defaults

The state and national-level default NOx rates are calculated for different configurations of plant type, fuel type, and emission controls. The calculation is performed for a configuration only if the configuration has at least two units having NOx rates from data sources 1 through 4 above.

For **NEEDS v6 (rev: 09-14-2018),** an attempt was made to reduce the number of units currently being assigned national-level default NOx rates. Two new sources[[1]](#footnote-1) of NOx emissions were identified, which are discussed below.

I. National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources. The NEI is released every three years. The data is based primarily upon data provided by State, Local, and Tribal air agencies for sources in their jurisdictions. It is further supplemented by data developed by the U.S. EPA. The current version of NEI NOx emission data is of the 2014 vintage (<https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>). The individual records in NEI are presented at the facility ID, point ID, process ID, and standard combustion code (SCC) level. The EPA OAQPS provided a mapping between NEEDS ID and NEI’s facility ID and point ID, which was used to map the records in the NEI with individual NEEDS units that were being assigned default NOx rates. For those records that could be mapped to NEEDS, and had both fuel use[[2]](#footnote-2) and NOx emission data available, the data was aggregated to the facility ID and point ID level. The NEEDS unit-level heat input and NOx emissions were used to calculate NEEDS unit-level NOx rates. This procedure yielded NOx rates for 451 NEEDS Unique IDs from the NEI. These NOx rates were further evaluated to remove outliers as per the steps listed below. The result yielded 402 out of 451 NEI NOx rates that were adopted in this update.

1. If the unit’s NEI NOx rate was within the rate range of 2017 ETS NOx rates for the relevant plant type, the NEI rate was adopted.
2. If the unit’s NEI NOx rate was higher than the highest of 2017 ETS NOx rate for the relevant plant type, the NEI rate was not adopted.
3. If the unit’s NEI NOx rate was below the lowest of 2017 ETS NOx rate for the relevant plant type and 0.006 lbs/MMBtu, which is the lowest NOx rate for a combined cycle unit, the NEI rate was not adopted.
4. If the unit’s NEI NOx rate was below the lowest of 2017 ETS NOx rate for the relevant plant type and above 0.006 lbs/MMBtu, which is the lowest NOx rate for a combined cycle unit, the NEI rate was adopted.
5. NEI has become the primary data source for IC engines. There were 159 units of this plant type with NEI NOx rates. These NOx rates vary between 0.011 lbs/MMBtu and 28.11 lbs/MMBtu, and have a median value of 3.12 lbs/MMBtu. The cut-off rate was assumed to be 4.80 lbs/MMBtu, which was the 85 percentile. For IC engines, if the NEI NOx rate was higher than 4.80 lbs/MMBtu, then the NEI rate was not adopted.

II. California Air Resources Board (CARB) hosts an online database of facility-level criteria and toxic plus risk data (<https://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php>). The most current NOx emissions are of the 2016 vintage. However, the CARB database does not have any fuel use information. In order to obtain the fuel use information, ICF mapped the CARB facility ID to 2016 EIA Form 923. The fuel use from the EIA Form 923 and the NOx emissions from CARB were used to calculate facility-level NOx emission rates. If only one plant type was under the facility ID in NEEDS, the facility-level NOx rate was considered for all NEEDS Unit ID’s at that facility. If multiple plant types were under the same facility ID in NEEDS, the CARB facility-level NOx rate was not adopted in this update. This approach yielded NOx rates for 395 NEEDS Unique IDs from CARB. These 395 NOx rates were further evaluated to remove outliers. The result yielded 287 out of 395 CARB NOx rates that were adopted in this update.

CARB NOx emission rates are calculated using information from two independent data sources.As mentioned above, the calculated rates were further evaluated to remove outliers as per the steps defined below.

1. If the unit’s CARB NOx rate was higher than the default NOx rate based on 2017 ETS NOx rate, the CARB NOx rate was not adopted.
2. If the unit’s CARB NOx rate was below the default NOx rate based on 2017 ETS NOx rate for the relevant plant type and 0.006 lbs/MMBtu, which is the lowest NOx rate for a combined cycle unit, the CARB rate was not adopted.
3. If the unit’s NEI NOx rate was below the default NOx rate based on 2017 ETS NOx rate for the relevant plant type and above 0.006 lbs/MMBtu, which is the lowest NOx rate for a combined cycle unit, the CARB rate was adopted.

The state and national-level default NOx rates were regenerated after accounting for the units that were now assigned NOx rates from NEI and CARB. These revised default NOx rates were compared with Reasonably Available Control Technology (RACT) rates in the states of Connecticut, Pennsylvania, and New York. If the newly generated default NOx rates were higher than the RACT rates, the newly generated default rates were overridden by the RACT rates. Table 1 summarizes how the defaults were assigned before and after this update. For the units with defaults NOx rates in NEEDS v6 (rev: 05-31-2018), Table 2 compares the average NOx rate by plant type before and after this update.

In addition, this update reviewed the NEEDS to 2017 ETS mapping for some units that were online around 2016-2017, and assigned the actual 2016/2017 ETS NOx rates wherever available.

Table 1 NOx Rate Default Assignment Change after Update

|  |  |  |
| --- | --- | --- |
| **Default NOx Rate Source for**  **NEEDS v6 (rev: 05-31-2018)** | **Default NOx Rate Source for**  **NEEDS v6 (rev: 09-14-2018)** | **Count of NEEDS v6 Active Units** |
| Units with no NOx Emissions\* | 2014 NEI NOx Emissions and Fuel Use | 11 |
| Units with no NOx Emissions\* | 210 |
| National-Level Default NOx Rate | 2014 NEI NOx Emissions and Fuel Use | 350 |
| 2016 CARB NOx Emissions and 2016 EIA Form 923 Fuel Use | 239 |
| 2016 ETS NOx Rate | 2 |
| 2017 ETS NOx Rate | 3 |
| National-Level Default NOx Rate | 2,904 |
| New York RACT rate | 16 |
| Pennsylvania RACT rate | 19 |
| State-Level Default NOx Rate | 1,466 |
| State-Level Default NOx Rate | 2014 NEI NOx Emissions and Fuel Use | 31 |
| 2016 CARB NOx Emissions and 2016 EIA Form 923 Fuel Use | 1 |
| 2016 ETS NOx Rate | 1 |
| National-Level Default NOx Rate | 5 |
| State-Level Default NOx Rate | 127 |

\*These are non-fossil waste units also shown in Table 2.

Table 2 Comparison of Average NOx Rates for Units Assigned with Default NOx Rates by Plant Type

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **NEEDS v6 (rev: 05-31-2018)** | | | | **NEEDS v6 (rev: 09-14-2018)** | | | |
| **Plant Type** | **M1** | **M2** | **M3** | **M4** | **M1** | **M2** | **M3** | **M4** |
| IC Engine | 0.86 | 0.86 | 0.86 | 0.86 | 1.85 | 1.84 | 1.85 | 1.84 |
| Combustion Turbine | 0.49 | 0.49 | 0.49 | 0.49 | 0.34 | 0.33 | 0.34 | 0.33 |
| Combined Cycle | 0.11 | 0.11 | 0.11 | 0.11 | 0.06 | 0.06 | 0.06 | 0.06 |
| O/G Steam | 0.17 | 0.17 | 0.17 | 0.17 | 0.16 | 0.16 | 0.16 | 0.16 |
| Biomass | 0.20 | 0.20 | 0.20 | 0.20 | 0.17 | 0.17 | 0.17 | 0.17 |
| Coal Steam | 0.29 | 0.27 | 0.27 | 0.25 | 0.47 | 0.46 | 0.44 | 0.44 |
| Landfill Gas | 0.37 | 0.37 | 0.37 | 0.37 | 0.22 | 0.22 | 0.22 | 0.22 |
| Municipal Solid Waste | 0.41 | 0.36 | 0.41 | 0.36 | 0.36 | 0.31 | 0.36 | 0.31 |
| Non-Fossil Waste | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 |
| Fossil Waste | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Tires | 0.10 | 0.10 | 0.10 | 0.10 | 0.29 | 0.29 | 0.29 | 0.29 |

1. In order to estimate emission rates, both NOx emission and heat input data are required. [↑](#footnote-ref-1)
2. If the fuel use was given in physical units, ICF converted them to MMBtu based on EIA 860 fuel heat content values or other research. [↑](#footnote-ref-2)