

RULE 1109.1 PLAN CALCULATIONS

Rule 1109.1 establishes NO_x and CO concentration limits for units located at petroleum refineries and facilities with related operations. The NO_x concentration limits are specified in Table 1 and Table 2 of the rule. Table 1 NO_x concentration limits represent Best Available Retrofit Control Technology (BARCT), and Table 2 conditional NO_x limits for units where it was not cost-effective to retrofit to meet Table 1 limits. The rule provides five alternative implementation compliance schedule (I-Plan) options and two alternative compliance options (B-Plan and B-Cap). The B-Plan is a compliance plan that allows an owner or operator to select “Alternative BARCT NO_x Limits” that will achieve emission reductions that are greater in the aggregate than the mass emission reductions that would be achieved based on the NO_x concentration limits in Rule 1109.1 Table 1 or Table 2. The B-Cap is a compliance plan that establishes a facility mass emission cap for all units subject to the B-Cap that, in the aggregate, is less than the emissions that would be achieved if the facility complied with the Rule 1109.1 Table 1 and Table 2 NO_x limits. These alternative compliance options were developed to address the complexity of operations at facilities where achieving the NO_x concentration limits may be more challenging for some units because new pollution control equipment must be integrated on existing units that are limited in plot space.

This document summarizes the calculations used to demonstrate compliance with the plans. A [guidance document](#) was released in May 2022, which provides detailed information and examples of how the emissions calculations are used in demonstrating compliance with the compliance plans.

SUMMARY OF EMISSIONS CALCULATIONS

Plan Requirement	Equation or Description
Baseline Unit Emissions (B_U)	Individual Unit annual emissions in tons per year as specified in “Baseline and Representative NOx Concentration” document
Representative NOx Concentration (R_{NOx})	Individual Unit representative NOx concentration as specified in the in “Baseline and Representative NOx Concentration” document in ppmv
Baseline Facility Emissions (B_F)	Sum of the Baseline Unit Emissions for all units included in I-Plan in tons per year
BARCT Equivalent Mass Emission	Sum of the unit BARCT Equivalent Mass Emissions for all units included in plan
BARCT B-Cap Annual Emission (B-Cap only)	Sum of the unit BARCT B-Cap Annual Emissions for all units included in plan
Emission Reduction Strategy	May include decommissioned units, unit replacement, and throughput or capacity reductions
Unit Remaining Emissions ($E_{Remaining}$)	$E_{Remaining} = (T_1 \text{ or } T_2/R_{NOx}) \times B_U$
Final Phase Facility Target	Sum of Unit Remaining Emissions for all units included in I-Plan
Total Facility Emission Reductions (ER_{total})	$ER_{Total} = B_F - P_F$
Phase I Target	$P_I = ER_{total} \times (PT_I/100)$
Phase II Target	$P_{II} = ER_{total} \times (PT_{II}/100)$
Phase III Target (if applicable)	$P_{III} = ER_{total} \times (PT_{III}/100)$
Unit BARCT Equivalent Mass Emission (E_B)	$E_B = ((T_A \text{ or } T_1 \text{ or } T_2)/R_{NOx}) \times B_U$
Unit BARCT B-Cap Annual Emission (B-Cap Only) (E_{BCap})	$E_B = ((T_A \text{ or } T_1 \text{ or } T_2 \text{ or } T_5)/R_{NOx}) \times B_U -$ (Emission Reduction Strategy)

Where:

- T_1 = Table 1 NOx Limit for Category (ppmv)
- T_2 = Table 2 NOx Limit for Category (ppmv)
- T_5 = Table 5 Maximum NOx Limit for B-Cap
- T_A = Alternative NOx Limit for Category (ppmv)
- PT_I = Phase I Percent Reduction Target
- PT_{II} = Phase II Percent Reduction Target
- PT_{III} = Phase III Percent Reduction Target
- P_I = Phase I Emission Target (tons per year)
- P_{II} = Phase II Emission Target (tons per year)
- P_{III} = Phase III Emission Target (tons per year)