



United States
Environmental Protection Agency
Office of Air and Radiation, Office of Transportation and Air Quality

Manufacturer Averaging, Banking, and Trading Report for Locomotives

Last Revision: August 2018 Version Number: 2.2.1

Manufacturer Data Submission Template -- INSTRUCTIONS

I. About

A major component of the Locomotive final rule is the averaging, banking and trading (ABT) program for NO_x , $\text{NO}_x + \text{HC}$, and PM (40 CFR §92.301 through §92.310 and 40 CFR §1033.701 through §1033.745). Manufacturers must track the implementation of these provisions based on the model year, engine type (line-haul or switch), Tier, and the NO_x and PM levels to which the engine family is certified. In order to help streamline and standardize the process by which manufacturers submit information related to credits under the ABT program, EPA has created an Excel-based template to assist manufacturers with the organization, presentation, and submittal of their data.

II. General Information

Before entering data, it is important to ensure that the Excel file is set up to automatically calculate the data. To ensure that the data are calculated immediately upon entry, go to the Tools menu and select Options. In the window that appears, select the Calculations tab. In this tab, the option "Automatic" should be selected. In Excel 2007, this is found by clicking the Microsoft Office Button, then clicking the Excel Options button. Select the Formulas category and verify that the "Automatic" radio button is selected under the Calculation Options: Workbook Calculation section.

Also, note that the drag and drop option should not be used to copy or move data entered in the worksheet since doing so will change how the cells are referenced in the formulas and may lead to erroneous calculations. In order to prevent this from occurring inadvertently, go to the Tools menu and select Options. In the window that appears, select the "Edit" tab and remove the check mark from the "Allow cell drag and drop" box. In Excel 2007, this option is found by clicking the Microsoft Office Button, then clicking the Excel Options button. Select the Advanced category and remove the check mark from the "Enable fill handle and cell drag-and-drop" box under the "Editing options" section.

International users should ensure that the settings for number handling are consistent with the template. If your system is currently set up to use a comma for the decimal separator and a period for the thousands separator, you must temporarily modify the settings for number handling to avoid errors within the automatic calculations. To modify these settings, go to the Tools menu and select Options. In the window that appears, select the International tab. Within this tab, remove the check mark within the "Use system separators" box in the section at the top entitled "Number handling." At this point, you may insert a period as the decimal separator and a comma as the thousands separator. In Excel 2007, this option is found by clicking the Microsoft Office button, then clicking the Excel Options button. Select the Advanced category and remove the check mark from the "Use system separators" box under the "Editing options" section. At this point, you may insert a period as the Decimal separator and a comma as the Thousands separator.

These worksheets are protected and as a result, you may navigate around the unlocked (i.e., data entry) cells using the arrow keys on your keyboard. However, to view the entire spreadsheet including the calculated cells and the credit totals below the data entry rows, you should navigate using the scroll bars at the bottom and right side of the worksheet. Using the scroll bars will allow you to view cells that cannot be selected.

III. Reporting Template

The Excel file contains six worksheets: "Current MY Credit Calc," "Current MY Credit Calc- MANUAL," "Field Descriptions," "Power Rating Calc," "Proration Factors," and "Credit Summary."

- **Current MY Credit Calc:** This worksheet contains 16 fields, which apply to all of the information required to track credit balances for the Locomotive averaging sets. The first eleven columns (with the exception of the third column) are the fields that require data entry or input from the manufacturer. The next four columns (as well as the third column, "Remanufactured? (Yes/No)") are preset or calculated values based on the data entered and cannot be modified manually. The "Messages" field is automatically populated with a brief note if the data entered are either inconsistent with certain requirements or subject to limitations (e.g., if the FEL entered exceeds the FEL cap). There is one additional column, the "Comments" field, to the right of these calculated fields which allows for the entry of any additional comments or notes that may apply to the data or credit calculation associated with the engine family.
- **Current MY Credit Calc-MANUAL:** This worksheet contains the same fields and format as the Current MY Credit Calc worksheet, but does not incorporate automatic calculations or preset values for any of the data needed to calculate a credit balance. This worksheet should be used only when there are unique circumstances that the automatic calculations in the Current MY Credit Calc worksheet are unable to process accurately. In this worksheet, with the exception of the 'Credit Balance' column, all 15 columns allow for data entry or input from the user. The totals in the summary section below the data entry cells are also automatically calculated. The totals entered in this worksheet will be automatically reflected in the Credit Summary sheet totals for NO_x , $\text{NO}_x + \text{HC}$, and PM.
- **Field Descriptions:** This worksheet contains detailed notes on each of the 16 fields in the first two worksheets, including a description of the required data or information, how the data should be entered, the existence of any drop-down menus, and any other information that would be relevant to that field (including whether the field is a calculated value based on preceding entries in the spreadsheet).
- **Power Rating Calc:** This worksheet allows for the calculation of production-weighted average power for locomotive engines. The first four columns are the fields that require data entry or input from the manufacturer. The last two columns are preset or calculated values based on the data entered and cannot be modified manually.
- **Proration Factors:** This worksheet provides three tables containing the proration factors for locomotive engines certified under 40 CFR Part 92 or 1033. This worksheet allows the user to look up the applicable proration factor based on the applicable Part (92 or 1033) and Engine Type (Switch or Line-Haul) that corresponds to the age. Age is the number of years from the date of manufacture to the date the remanufacture is completed (rounded to the next highest year). Note that for replacement or repower engines, the proration factor should be determined based on the age of the locomotive chassis, not the age of the engine.
- **Credit Summary:** This worksheet provides an overall summary of the NO_x , $\text{NO}_x + \text{HC}$, and PM credits that have been calculated from the first two worksheets, categorized by the applicable 40 CFR Part. There is also a table that allows the manufacturer to enter in credit trades and credits from previous model years so that these credits can be properly applied and compared to current model year credits. This worksheet allows the manufacturer to outline how credits will be used to document compliance with the NO_x , $\text{NO}_x + \text{HC}$, and PM standards.

IV. Entering Data for the Current Model Year

Step 1: Using the third worksheet ("Field Descriptions") as a guide, enter in the appropriate information for each data element in the first 11 columns of the "Current MY Credit Calc" worksheet (with the exception of the third column, "Remanufactured?"). The next three columns for the proration factor, the applicable standard, and the credit balance are automatically populated based on the information and data entered

All credit balances are divided into six averaging sets: NO_x Line-Haul, NO_x Switch, PM Line-Haul, PM Switch, Tier 4 $\text{NO}_x + \text{HC}$ Line-Haul, and Tier 4 $\text{NO}_x + \text{HC}$ Switch. Each engine family (or portion of each engine family) that is subject to a specific standard or averaging set, should have its own separate line item entry. Some fields

have drop-down menus that provide specific choices. Note that as stated above, a brief note will appear in the "Messages" column if the data entered are either inconsistent with certain requirements or subject to limitations (e.g., if the FEL entered exceeds the FEL cap). If necessary, any relevant observations or information may be entered into the "Comments" field.

Step 2: If necessary, the "Power Rating Calc" worksheet can be used to calculate the production-weighted average power for each engine family. The average power value corresponding to the final configuration for a particular engine family is the power value used in the emission credit calculation. Enter in the appropriate information for each data element in the first four columns. The last two columns for cumulative production volume and average power in kW are automatically calculated based on the data entered in the first four columns.

Note that any extra rows that do not contain any data, can be left blank. If additional rows are needed, please contact EPA for a revised form and specify how many entries/rows will be required.

V. Summary of NO_x, NO_x + HC, and PM Credits

The "Credit Summary" worksheet contains a summary of all NO_x, NO_x + HC, and PM credits (banked, traded, transferred, and current model year credits) and allows for the application of these credits to current model year balances. As with the "Current MY Credit Calc" and "Current MY Credit Calc - MANUAL" worksheets, all credit balances are divided into six averaging sets: NO_x Line-Haul, NO_x Switch, Tier 4 NO_x + HC Line-Haul, Tier 4 NO_x + HC Switch, and PM Line-Haul, PM Switch. The initial step requires the entry of carryover (banked), traded, or transferred credit balances. The application and averaging of these existing credits with current model year credits is summarized in the second step below. In this worksheet, any cells that are highlighted in color are automatically populated based on information in the "Current MY Credit Calc" or "Current MY Credit Calc - MANUAL" worksheets or from the application of credits within the "Credit Summary" worksheet.

Step 1: Credit Balances Before Averaging: Enter any carryover (banked), traded, and/or transferred credit balances. Note that current model year credits are automatically populated in this summary sheet based on data entered and calculated within the "Current MY Credit Calc" or "Current MY Credit Calc - MANUAL" worksheets.

Step 2: Credit Usage and Averaging: Using the existing balances (as included in the "Credit Balances before Averaging" section), indicate the number of traded credits, banked credits, transferred credits. Ensure that credits are applied within the corresponding averaging set.

The "Credit Balances after Averaging" section of the worksheet is automatically populated with the credit balances based on the application of credits within the "Credit Usage and Averaging" section. The final credit totals include current MY, banked, traded, and transferred credit balances after averaging.

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Field Descriptions for Current MY Credit Calc Worksheet

Field	Description
Engine Family	Enter the 12-character engine family name or test group name.
Applicable 40 CFR Part	Select whether the engine family is certified under 40 CFR Part 92 or Part 1033.
Remanufactured? (Y/N)	This field will be automatically populated with "Y" or "N" if the Industry Sector Code (i.e., the fifth character within the engine family name) is "K" or "G", respectively. Note that with respect to the NOx standard, the percentage of freshly manufactured engine families (on a production basis) that are using credits (i.e., with a NOx FEL greater than the standard) cannot exceed 50 percent in 2007 and later.
Age	Age is the number of years from the date of original manufacture to the date the remanufacture is completed (rounded to the next higher year). Note that for replacement or repower engines, the proration factor should be determined based on the age of the locomotive chassis, not the age of the engine.
Pollutant	Select the applicable Pollutant (NO _x , HC+NO _x , or PM) from the drop-down menu.
Tier	Select the applicable Tier of standards (Tier 0, 1, 2, 3 or 4) from the drop-down menu.
Engine Class Type	Select the type of cycle-weighted standards that apply to the engine family (or the subset participating in ABT for which credits are being calculated). Please select either Line-haul cycle or Switch cycle from the drop-down menu.
Power Rating (hp)	Enter the sales-weighted average horsepower of the engine family (or subset of the engine family for which credits are being calculated). This value is necessary for credit calculations if useful life is listed in miles and can be calculated using the Power Rating Calc worksheet. See 40 CFR §92.305(b) and §1033.705(c).
Useful Life (MW-hrs)	Enter the sales-weighted average useful life in MW-hrs, based on the sales-weighted average horsepower (hp) of the engine family (or subset of the engine family for which credits are being calculated). If useful life is in miles or years, convert to MW-hrs. See the methods for conversion at 40 CFR §92.305(b) and §1033.705(c).
Production	Enter the number of locomotives or locomotive engines participating in the ABT program within the given engine family during the calendar year (or the number of locomotives or locomotive engines in the subset of the engine family for which credits are being calculated).
FEL (g/bhp-hr)	Enter the applicable family emission limit (FEL) for the engine family (or subset participating in ABT) in grams per brake horsepower-hour (g/bhp-hr). The number of significant digits for the FEL should be consistent with the standard.
Proration Factor (Fp)	This field will be automatically calculated based on the Applicable 40 CFR Part, Engine Class Type and Age. This is an estimate of the fraction of a locomotive's service life that remains as a function of age. See Proration Factors worksheet for complete list of relevant factors for both line haul and switch engines. The proration factor is 1.00 for all locomotives that meet the definition of freshly manufactured.
Standard (g/kW-hr)	This is a predetermined value based on the Tier and engine type.
Credit Balance	This is a calculated value based on the preceding data. Credits for each engine family are calculated as follows: Credits = (Standard - FEL) x (Useful Life in MW-hrs) x (Production) x (Proration Factor) x (10 ⁻³ kW-Mg/MW-g)
Messages	If a row of data contains an error, the Messages column will display an error message. Otherwise, if applicable, the column will indicate which additional standards the engine family must meet.
Comments	This field may be used to enter in any additional information regarding special circumstances or characteristics associated with the engine family name or credit calculations. This field is for informational purposes only and would not affect credit calculations or compliance determinations. The information entered may be used to distinguish between multiple entries for a split engine family, identify issues that EPA should be aware of as the data are evaluated, or track characteristics of the engine family name for internal purposes (e.g., identifying configurations, sub-configurations, model names/numbers, etc.).

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Proration Factors for Locomotive Engines Certified under 40 CFR Part 92 or 1033

Part 92 Switch and Line-Haul	
Table D305-1 to §92.305 - Proration Factors (F_p)	
Age ¹	Proration Factor
1	0.964
2	0.929
3	0.893
4	0.857
5	0.821
6	0.786
7	0.750
8	0.714
9	0.679
10	0.643
11	0.607
12	0.571
13	0.548
14	0.524
15	0.500
16	0.476
17	0.452
18	0.429
19	0.405
20	0.381
21	0.357
22	0.333
23	0.310
24	0.286
25	0.268
26	0.250
27	0.232
28	0.214
29	0.196
30	0.179
31	0.161
32 +	0.143

Part 1033 Line-Haul	
Table 1 to §1033.705 - Proration Factors (F_p)	
Age ¹	Proration Factor
1	0.96
2	0.92
3	0.88
4	0.84
5	0.81
6	0.77
7	0.73
8	0.69
9	0.65
10	0.61
11	0.57
12	0.54
13	0.50
14	0.47
15	0.43
16	0.40
17	0.36
18	0.33
19	0.30
20 +	0.27

Part 1033 Switch	
Table 2 to §1033.705 - Proration Factors (F_p)	
Age ¹	Proration Factor
1	0.98
2	0.96
3	0.94
4	0.92
5	0.90
6	0.88
7	0.86
8	0.84
9	0.82
10	0.80
11	0.78
12	0.76
13	0.74
14	0.72
15	0.70
16	0.68
17	0.66
18	0.64
19	0.62
20	0.60
21	0.58
22	0.56
23	0.54
24	0.52
25	0.50
26	0.48
27	0.46
28	0.44
29	0.42
30	0.40
31	0.38
32	0.36
33	0.34
34	0.32
35	0.30
36	0.28
37	0.26
38	0.24
39	0.22
40 +	0.20

NOTES:

- Age is the number of years from the date of original manufacture to the date the remanufacture is completed (rounded to the next higher year). Note that for replacement or repower engines, the proration factor should be determined based on the age of the locomotive chassis, not the age of the engine.
- The proration factor is 1.00 for all locomotives that meet the definition of freshly manufactured.
- The minimum proration factor for remanufactured locomotives that meet the definition of refurbished but not freshly manufactured is 0.60.
- For Part 1033 line haul locomotives more than 20 years old, use the proration factor for 20 year old locomotives. For Part 1033 switch locomotives more than 40 years old, use the proration factor for 40 year old locomotives. For Part 92 locomotives more than 32 years old, use the proration factor for 32 year old locomotives.

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Credit Summary for the Part 92 and 1033 Locomotive ABT Programs

MODEL YEAR:	
Manufacturer:	

		Part 1033						Part 92				Credit Usage and Averaging							
		NO _x		NO _x +HC		PM		NO _x		PM		# Credits	FROM:				TO (Current MY Balance):		
		Line-Haul	Switch	Line-Haul	Switch	Line-Haul	Switch	Line-Haul	Switch	Line-Haul	Switch		CFR Part	Averaging Set	Credit Type	Tier	CFR Part	Averaging Set	Tier
Credit Balances before Averaging:																			
Current MY	Tier 0	0	0			0	0	0	0	0	0								
	Tier 1	0	0			0	0	0	0	0	0								
	Tier 2	0	0			0	0	0	0	0	0								
	Tier 3	0	0			0	0												
	Tier 4	0	0	0	0	0	0												
Banked	Tier 0																		
	Tier 1																		
	Tier 2																		
	Tier 3																		
	Tier 4																		
Traded	Tier 0																		
	Tier 1																		
	Tier 2																		
	Tier 3																		
	Tier 4																		
Transferred	Tier 0																		
	Tier 1																		
	Tier 2																		
	Tier 3																		
	Tier 4																		
Credit Balances after Averaging:																			
Current MY	Tier 0	0	0			0	0	0	0	0	0								
	Tier 1	0	0			0	0	0	0	0	0								
	Tier 2	0	0			0	0	0	0	0	0								
	Tier 3	0	0			0	0												
	Tier 4	0	0	0	0	0	0												
Banked	Tier 0	0	0			0	0	0	0	0	0								
	Tier 1	0	0			0	0	0	0	0	0								
	Tier 2	0	0			0	0	0	0	0	0								
	Tier 3	0	0			0	0												

	Tier 4	0	0			0	0													
Traded	Tier 0	0	0			0	0	0	0	0	0									
	Tier 1	0	0			0	0	0	0	0	0									
	Tier 2	0	0			0	0	0	0	0	0									
	Tier 3	0	0			0	0													
	Tier 4	0	0			0	0													
Transferred	Tier 0	0	0			0	0	0	0	0	0									
	Tier 1	0	0			0	0	0	0	0	0									
	Tier 2	0	0			0	0	0	0	0	0									
	Tier 3	0	0			0	0													
	Tier 4	0	0			0	0													

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