

EPA v6 Summer 2021 Reference Case Parsed File User Guide

IPM output files report aggregated results for "model" plants (i.e., aggregates of generating units with similar operating characteristics). Parsed files approximate the IPM results at the generating unit level. This document defines the column headers found in EPA v6 Summer 2021 Reference Case parsed files.

"Parsed" data, representing model projections disaggregated to the unit level, will often differ from the corresponding variables (e.g., pollutant emission rates) reported for each unit in the NEEDS database, because the model may select different fuels, add new pollution control technologies, or revise the operation of particular units in response to future economic and regulatory conditions. (EPA uses detailed information about rail and barge links for coal, and availability for natural gas to constrain the model's choices of available fuels at each unit (see IPM Documentation, Chapters 7 and 8 <https://www.epa.gov/airmarkets/power-sector-modeling>)

EPA's application of IPM can result in differences between historic (observed) and future (simulated) values for the following parameters affecting EGU emissions:

- Post-combustion pollution control technologies installed (for SO₂, NO_x, HCl, Hg, PM, and CO₂)
- Combustion control technologies installed (for NO_x)
- Fuel type(s) combusted
- Generation produced
- Heat rate (the model may only change a unit's heat rate if the heat rate improvement retrofit option is made available in that analysis)

Some apparent differences in input (NEEDS) and output (parsed) data are related to EPA's approach to using each type of input data in the modeling process. For example, while NEEDS reports unit-level SO₂ permit rates (where known), EPA uses that input parameter as an upper-bound constraint to prevent the model from making decisions that would exceed that emission rate. However, the model may select combinations of fuels and pollution control technologies that result in projected SO₂ emission rates that are lower than the indicated SO₂ permit rates for the unit in question. This approach preserves the model's flexibility to select the most economic type of coal available for each unit based on the fuel's simulated market price, sulfur content, and the environmental regulations applicable to the unit. The model's decisions on fuel selection and pollution control configuration for each unit can be reviewed in the parsed file; the associated emission rate for the unit can be calculated by dividing the emission mass by the heat input in the parsed file.

For example, at the Walter Scott Jr Energy Center plant in Iowa, unit 3 (Unique ID: 1082_B_3) has a SO₂ permit rate of 0.4 lbs/mmBtu in NEEDS. The annual SO₂ rate projected by the model can be calculated by dividing the annual SO₂ emissions by the heat input, both in the parsed file. This results in a projected 2023 SO₂ emission rate of 0.08 lbs/mmBtu, which is lower than the permit rate listed in NEEDS.

Unlike for SO₂, where the model is determining future emission rates based on a suite of fuel and pollution control technology choices that are available inside the model, EPA's methodology for making EGU NO_x projections is based on an interpretation of each unit's historical NO_x emission rate data combined with potential pollution control configurations. From this data analysis, EPA quantifies four potential future NO_x emission rates for each unit, from which the model selects one future NO_x rate depending on the conditions represented in the future-year scenario for each analysis. These four potential NO_x rates for each unit are listed in NEEDS and are derived from unit-specific reported emission data combined with assumptions about pollution control technology performance, as described in Attachment 3-1 and Figure 3-4 in the IPM Documentation, available at www.epa.gov/powersectormodeling. As explained in the modeling documentation, the projected NO_x rate for a given unit (reported in the parsed file for a given IPM analysis) will either be one of the four potential NO_x rates shown for that unit in the corresponding input file (NEEDS), or it may be a yet lower emission rate if the model chose to add a new post-combustion control technology to that unit (which will also be indicated in the parsed file).

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
UniqueID	A	-----	The unique identifier assigned to a boiler or generator within a plant. It consists of the Plant ID (or ORIS Code), an indication of whether the unit is a boiler ("B"), generator ("G"), or committed unit ("C"), and the Unit ID. For example, for the Unique ID "113_B_1", "113" is the Plant ID, "B" indicates that this unit is a boiler, and "1" indicates that the ID of the boiler is 1.	-----
RegionName	B	-----	The electricity grid region the unit is located in.	-----
StateName	C	-----	These four fields identify the geographic location of the unit. The State Code is the FIPS State Code, and the County Code is the FIPS County Code. New units have blanks in these columns, while committed units have zeros. Federal information processing standards (FIPS) codes are a standardized set of numeric or alphabetic codes issued by the National Institute of Standards and Technology (NIST) to ensure uniform identification of geographic entities through all federal government agencies.	-----
StateCode	D	-----		-----
CountyName	E	-----		-----
CountyCode	F	-----		-----
ORISCode	G	-----	A unique identifier assigned to each power plant in NEEDS. While the ORIS code is unique for each plant, all generating units within a plant will typically have the same ORIS code. For committed units (i.e., those not currently operating, but firmly anticipated to be operational in the future), the entry in this field might be a dummy ORIS code assigned as a placeholder unique ID to the committed plant. (Note: ORIS originally referred to the Office of Regulatory Information Systems in the Department of Energy (DOE) Energy Information Administration (EIA) which was responsible for assigning unique identification codes to utility power plants.)	-----
UnitID	H	-----	The identifier assigned to each unit/boiler in a given plant.	-----
PlantName	I	-----	The plant's name.	-----
HeatRate	J	-----	The unit's heat rate.	-----
OnLineYear	K	-----	For existing units, this is the year the unit came on line. For committed units, this is the year the unit is projected to come on line	-----
RetirementYear	L	-----	The year a unit is planned to be retired. For units without a firm retirement year, this field has a value of 9999	-----

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
PlantType	M	-----	The type of electric generating unit, usually defined by the "prime mover" and/or fuels burned. "Prime mover" refers to the machine (e.g., engine, turbine, water wheel) that drives an electric generator or the device that converts energy to electricity directly (e.g., photovoltaic solar and fuel cell(s)).	Biomass Coal Steam Combined Cycle Combustion Turbine Fossil Waste Fuel Cell Geothermal Hydro IGCC Landfill Gas Municipal Solid Waste Non-Fossil Waste Nuclear O/G Steam Pumped Storage Solar Tires Wind

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
Firing	N	-----	This field, which applies only to boilers, indicates the burner type and configuration (e.g., cell, cyclone, FBC (fluidized bed combustion), stoker/SPR, tangential, or vertical). A blank appears in instances where the firing characteristics of a boiler are unknown or the unit is a not a boiler.	<p>Cell: boilers that combine 2-3 standard burners into a compact, vertical assembly installed on the furnace wall; multiple cells utilized within a furnace.</p> <p>Cyclone: A special type of burner for coals with low fusion point ashes. Combustion occurs within the horizontal burner generating high temperatures which turn the ash into molten slag. The term "wet bottom" furnace often accompanies the cyclone burner.</p> <p>FBC: "fluidized bed combustion" where solid fuels are suspended on upward-blowing jets of air, resulting in a turbulent mixing of gas and solids and a tumbling action which provides especially effective chemical reactions and heat transfer during the combustion process.</p> <p>Stoker/SPR: stoker boilers where lump coal is fed continuously onto a moving grate or chain which moves the coal into the combustion zone in which air is drawn through the grate and ignition takes place. The carbon gradually burns off, leaving ash which drops off at the end into a receptacle, from which it is removed for disposal.</p> <p>Tangential (also referred to as "corner firing"): burners located along furnace corners in multiples of 4. Burner angle is off-set working in conjunction with the opposing corner burner to create a vertical, circular swirling combustion zone within the furnace.</p> <p>Turbo (wall fired burner): Burner design for pet coke and low volatile bituminous coals (Riley trademark name: "Turbo Furnace"). Hour glass shaped furnace with rectangular shaped burners angled downwards.</p> <p>Vertical: standard furnace (assume wall fired)</p> <p>Wall: standard burner / furnace design used today. Circular burners located on the front and rear furnace walls at multiple elevations.</p>
Bottom	O	-----	This field, which applies only to boilers, indicates whether the bottom of the combustion chamber is "wet" (i.e., ash is removed from the furnace in a molten state) or "dry" (i.e., the boiler has a furnace bottom temperature below the ash melting point and the bottom ash is removed as a solid). A blank appears in instances where the bottom characteristics of a boiler were not known or the unit was not a boiler.	<p>Dry</p> <p>Wet</p>

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EMFControls	P	-----	<p>This field shows the combination of SO2 scrubbers, NOx post-combustion controls, and particulate matter controls that already exist at a unit. The entries in this column are compiled from the "NOx Post-CombControl," "Wet/DryScrubber" and "Particulate Matter Type" fields. Together with the entry in the "Firing" and "Modeled Fuels" fields, the entries in this field are used for the assignment of the Emission Modification Factors (EMFs) for mercury. The EMFs enable the model to capture mercury emission reductions that are a function of the rank of coal burned (bituminous, subbituminous and lignite), the specific burner type, and the configuration of SO2, NOx, and particulate matter control devices. Consolidating the controls that impact mercury reductions into this field helps to insure that the correct EMFs are assigned to each unit. Note that EMFs are metric of the extent of mercury emission reduction achieved by these non-mercury controls, and do not include the presence or impact of mercury-specific controls (e.g., ACI).</p>	-----																																																										
NOxControl	Q	-----	<p>This field indicates the NOx combustion controls which are in existence at a generating unit after the model is run. Combustion controls reduce NOx emissions during the combustion process generally by regulating flame characteristics such as temperature and fuel-air mixing.</p>	<table border="1"> <tr><td>AA</td><td>Advanced Overfire Air</td></tr> <tr><td>BF</td><td>Biased Firing (alternate burners)</td></tr> <tr><td>BOOS</td><td>Burners-Out-Of-Service</td></tr> <tr><td>CM</td><td>Combustion Modification/Fuel Reburning</td></tr> <tr><td>CO</td><td>Combustion Optimization</td></tr> <tr><td>DLNB</td><td>Dry Low NOx Burners</td></tr> <tr><td>FR</td><td>Flue Gas Recirculation</td></tr> <tr><td>FU</td><td>Fuel Reburning</td></tr> <tr><td>H2O</td><td>Water Injection</td></tr> <tr><td>LA</td><td>Low Excess Air</td></tr> <tr><td>LN</td><td>Low NOx Burner</td></tr> <tr><td>LNB</td><td>Low NOx Burner Technology (Dry Bottom only)</td></tr> <tr><td>LNBO</td><td>Low NOx Burner Technology w/ Overfire Air</td></tr> <tr><td>LNC1</td><td>coupled OFA</td></tr> <tr><td>LNC2</td><td>Separated OFA</td></tr> <tr><td>LNC3</td><td>coupled/Separated OFA</td></tr> <tr><td>LNCB</td><td>Low NOx Cell Burner</td></tr> <tr><td>LNF</td><td>Low NOx Furnace</td></tr> <tr><td>MR</td><td>Methane Reburn</td></tr> <tr><td>N2</td><td>Nitrogen</td></tr> <tr><td>NDI</td><td>Nitrogen Diluent Injection</td></tr> <tr><td>NGR</td><td>Natural Gas Reburn</td></tr> <tr><td>NH3</td><td>Ammonia Injection</td></tr> <tr><td>OFA</td><td>Overfire Air</td></tr> <tr><td>other</td><td>Other</td></tr> <tr><td>ROFA</td><td>Rotating Overfire Air</td></tr> <tr><td>SC</td><td>Slagging</td></tr> <tr><td>SOFA</td><td>Stationary Overfire Air</td></tr> <tr><td>STC</td><td>Staged Combustion</td></tr> </table>	AA	Advanced Overfire Air	BF	Biased Firing (alternate burners)	BOOS	Burners-Out-Of-Service	CM	Combustion Modification/Fuel Reburning	CO	Combustion Optimization	DLNB	Dry Low NOx Burners	FR	Flue Gas Recirculation	FU	Fuel Reburning	H2O	Water Injection	LA	Low Excess Air	LN	Low NOx Burner	LNB	Low NOx Burner Technology (Dry Bottom only)	LNBO	Low NOx Burner Technology w/ Overfire Air	LNC1	coupled OFA	LNC2	Separated OFA	LNC3	coupled/Separated OFA	LNCB	Low NOx Cell Burner	LNF	Low NOx Furnace	MR	Methane Reburn	N2	Nitrogen	NDI	Nitrogen Diluent Injection	NGR	Natural Gas Reburn	NH3	Ammonia Injection	OFA	Overfire Air	other	Other	ROFA	Rotating Overfire Air	SC	Slagging	SOFA	Stationary Overfire Air	STC	Staged Combustion
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Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values	
				STM	Steam Injection
				WIR	Underfire Air

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
SO2Control	R	-----	This field indicates the SO2 controls which are in existence at a generating unit before the model is run. SO2 controls reduce SO2 emissions by using chemical processes to remove SO2 from the post-combustion emission stream.	Dry Scrubber Wet Scrubber Reagent Injection
FossilUnit	S	-----	Indicates whether a unit is fossil-fuel fired	Fossil Non-Fossil
BGCI	T	-----	Indicates where a unit is an existing boiler, and existing generator, or a committed unit that is not currently in operation	B - Boiler G - Generator C - Committed
Year	U	-----	The model run year from which the parsed results were derived.	-----
FuelType	V	-----	This field indicates the type of fuel used by the unit.	Biomass Coal Fwaste Geothermal Hydro LF Gas MSW Natural Gas Non-Fossil Nuclear Oil Pet. Coke Solar Waste Coal Wind

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
RetrofitSO2NOxControls	W	-----	Summarizes all of the control technologies that a unit has put on. The retrofits are cumulative to the year for which the run is parsed. For instance, if the parsed file is for 2023, it will include all retrofits projected by the model for the unit through 2023.	CC Early Retirement
				Coal Early Retirement
				CT Early Retirement
				Mercury Control
				Mercury Control / Coal Early Retirement
				O/G Early Retirement
				SCR
				SCR - O/G Steam
				Scrubber
				Scrubber / Mercury Control
				Scrubber / SCR
				Scrubber / SNCR
				SNCR
FuelUseWinter	X	TBtu	Projected fuel consumed (TBtu) at the unit in January, February, and December during the year for which the run was parsed.	-----
FuelUseWintShld	Y	TBtu	Projected fuel consumed (TBtu) at the unit in March, April, October, and November during the year for which the run was parsed.	
FuelUseSummer	Z	TBtu	Projected fuel consumed (TBtu) at the unit in May - September during the year for which the run was parsed.	-----
FuelUseTotal	AA	TBtu	Projected fuel consumed (TBtu) at the unit during the year for which the run was parsed.	-----
BITFuelUseWinter	AB	TBtu	These nine columns give the projected coal consumption (TBtu), by coal rank, during the summer months (May - September), winter months (December, January and February) and winter shoulder months (March, April, October and November), and the entire year for which the run was parsed.	-----
BITFuelUseWintShld	AC	TBtu		
BITFuelUseSummer	AD	TBtu		-----
BITFuelUseTotal	AE	TBtu		-----
SUBFuelWinter	AF	TBtu		-----
SUBFuelWintShld	AG	TBtu		
SUBFuelSummer	AH	TBtu		-----
SUBFuelTotal	AI	TBtu		-----
LIGFuelWinter	AJ	TBtu		-----
LIGFuelWintShld	AK	TBtu		
LIGFuelSummer	AL	TBtu		-----
LIGFuelTotal	AM	TBtu		-----
GWhWinter	AN	GWh		Projected generation (GWh) produced by the unit in January, February, and December during the year for which the run was parsed.
GWhWintShld	AO	GWh	Projected generation (GWh) produced by the unit in March, April, October, and November during the year for which the run was parsed.	
GWhSummer	AP	GWh	Projected generation (GWh) produced by the unit in May - September during the year for which the run was parsed.	-----
GWhTotal	AQ	GWh	Projected generation (GWh) produced by the unit during the year for which the run was parsed.	-----
CO2Winter	AR	Mtons (thousands short tons)	Projected winter (January, February, and December) CO ₂ emissions (MTons) during the year for which the run was parsed.	-----

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
CO2WintShld	AS	Mtons (thousands short tons)	Projected winter shoulder (March, April, October, and November) CO ₂ emissions (MTons) during the year for which the run was parsed.	
CO2Summer	AT	Mtons (thousands short tons)	Projected summer (May - September) CO ₂ emissions (MTons) during the year for which the run was parsed.	-----
CO2Total	AU	Mtons (thousands short tons)	Projected annual CO ₂ emissions (MTons) during the year for which the run was parsed.	-----
MERWinter	AV	Tons (short tons)	Projected winter (January, February, and December) mercury emissions (tons) during the year for which the run was parsed.	-----
MERWintShld	AW	Tons (short tons)	Projected winter shoulder (March, April, October, and November) mercury emissions (tons) during the year for which the run was parsed.	
MERSummer	AX	Tons (short tons)	Projected summer (May - September) mercury emissions (tons) during the year for which the run was parsed.	-----
MERTotal	AY	Tons (short tons)	Projected annual mercury emissions (tons) during the year for which the run was parsed.	-----
NOXWinter	AZ	Mtons (thousands short tons)	Projected winter (January, February, and December) NO _x emissions (MTons) during the year for which the run was parsed.	-----
NOXWintShld	BA	Mtons (thousands short tons)	Projected winter shoulder (March, April, October, and November) NO _x emissions (MTons) during the year for which the run was parsed.	
NOXSummer	BB	Mtons (thousands short tons)	Projected summer (May - September) NO _x emissions (MTons) during the year for which the run was parsed.	-----
NOXTotal	BC	Mtons (thousands short tons)	Projected annual NO _x emissions (MTons) during the year for which the run was parsed.	-----
SO2Winter	BD	Mtons (thousands short tons)	Projected winter (January, February, and December) SO ₂ emissions (MTons) during the year for which the run was parsed.	-----
SO2WintShld	BE	Mtons (thousands short tons)	Projected winter shoulder (March, April, October, and November) SO ₂ emissions (MTons) during the year for which the run was parsed.	
SO2Summer	BF	Mtons (thousands short tons)	Projected summer (May - September) SO ₂ emissions (MTons) during the year for which the run was parsed.	-----
SO2Total	BG	Mtons (thousands short tons)	Projected annual SO ₂ emissions (MTons) during the year for which the run was parsed.	-----
HCLWinter	BH	Mtons (thousands short tons)	Projected winter (January, February, and December) HCl emissions (MTons) during the year for which the run was parsed.	-----
HCLWintShld	BI	Mtons (thousands short tons)	Projected winter shoulder (March, April, October, and November) HCl emissions (MTons) during the year for which the run was parsed.	
HCLSummer	BJ	Mtons (thousands short tons)	Projected summer (May - September) HCl emissions (MTons) during the year for which the run was parsed.	-----
HCLTotal	BK	Mtons (thousands short tons)	Projected annual HCl emissions (MTons) during the year for which the run was parsed.	-----
FOMCost	BL	Million US\$ / yr	Fixed operation and maintenance (O&M) cost for the unit during the year for which the run was parsed	-----
VOMCostWinter	BM	Million US\$ / yr	Variable operation and maintenance (O&M) cost for the unit for the winter months (January, February, and December) during the year for which the run was parsed	-----

Field Name	Column	Unit of Measure	Definition	Key to Recurring Column Values
VOMCostWintShld	BN	Million US\$ / yr	Variable operation and maintenance (O&M) cost for the unit for the winter shoulder months (March, April, October, and November) during the year for which the run was parsed	
VOMCostSummer	BO	Million US\$ / yr	Variable operation and maintenance (O&M) cost for the unit for the summer months (May - September) during the year for which the run was parsed	-----
VOMCostTotal	BP	Million US\$ / yr	Variable operation and maintenance (O&M) cost for the unit during the year for which the run was parsed	-----
FuelCostWinter	BQ	Million US\$ / yr	Fuel cost for the unit for the winter months (January, February, and December) during the year for which the run was parsed	-----
FuelCostWintShld	BR	Million US\$ / yr	Fuel cost for the unit for the winter shoulder months (March, April, October, and November) during the year for which the run was parsed	
FuelCostSummer	BS	Million US\$ / yr	Fuel cost for the unit for the summer months (May - September) during the year for which the run was parsed	-----
FuelCostTotal	BT	Million US\$ / yr	Fuel cost for the unit during the year for which the run was parsed	-----
CapitalCost	BU	Million US\$ / yr	Annualized capital cost expenditures (i.e. added controls for existing units and new power plant builds) during the year for which the run was parsed	-----
Capacity	BV	MW	The net summer dependable capacity (in megawatts) of the unit available for generation for sale to the grid. Net summer dependable capacity is the maximum capacity that the unit can sustain over the summer peak demand period reduced by the capacity required for station services or auxiliary equipment.	-----
Post Combustion Control and Heat Rate Improvement	BW	-----	Summary of the SO ₂ , NO _x , and Mercury post-combustion controls installed at the unit during the run year, as well as any heat rate improvements made to the unit	-----
Post Combustion Control (Scrubber: Wet/Dry)	BX	-----	Indicates if the unit has a Wet or Dry Scrubber.	-----
Baghouse Retrofit (in conjunction with either dry FGD, ACI+Toxecon, and/or DSI)	BY	-----	For some plant configurations, a baghouse is required for some retrofits (deals with meeting PM standard as cobenefit, so other PM controls not needed)	ACI with Toxecon
				Dry Scrubber
				Dry Scrubber / ACI with Toxecon
				DSI