NEEDS v.5.15 User Guide, August 2015

The National Electric Energy Data System (NEEDS) is the database of existing and planned-committed units which are modeled in the EPA Base Case v.5.15. Units that are currently operational in the electric industry are termed as "existing" units. Units that are not currently operating but are firmly anticipated to be operational in the future, and have either broken ground (initiated construction) or secured financing are termed "planned-committed".

It is important to note that the NEEDS database only describes the configuration of the fleet for the model's first projection year; NEEDS may not include representation of retrofits or retirements that may be expected to occur (e.g., pursuant to a finalized enforcement action, as described in the next paragraph) by a date subsequent to the first projection year. One advantage of this approach is that the model retains the flexibility to select the least-cost response of affected units to those future-year requirements, instead of requiring the analyst to presuppose a particular response (as would be necessary for representation in NEEDS). For example, some enforcement actions allow affected facilities to select from different combinations of retrofits and retirements across multiple units by specified deadlines occurring in the future modeling horizon. Under this modeling approach, the NEEDS database would show the "starting point" conditions of the affected units (i.e., their expected configuration as of the end of 2015) and the model would be given a separate constraint describing subsequent operating requirements affecting those units (i.e., an enforcement action's terms requiring retrofits or retirements by a future year such as 2020).

The modeling constraints affecting future unit behavior that are imposed as run specifications include federal and state environmental regulations, enforcement action settlements and consent decrees, and energy efficiency and renewable portfolio standards. The specific constraints included in the IPM v.5.15 platform are described in section 3.9 of the IPM Documentation with updates for the v.5.15 platform described in the Incremental Documentation, available at www.epa.gov/powersectormodeling. These constraints, as inputs to the model, also appear in the System Summary Report (Excel file) on the "All Constraints" worksheet for any given IPM analysis; the constraints included for EPA's Base Case Using IPM v.5.15 are reported on this worksheet in the model input/output files posted on EPA's power sector modeling website, www.epa.gov/powersectormodeling.

NEEDS is maintained in spreadsheet format. Below is a guide to the fields found in NEEDS.

Field Name	Column	Definition	Key to Recurring Column Values
Plant Name	A	The plant's name.	———
UniqueID_Final	B	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.	———
ORIS Plant Code	C	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.)	———
Boiler/Generator/Committed Unit	D	An indicator of whether the unit is a boiler, generator, or committed unit. Committed units are those with a future expected in-service date (see "On Line Year")	B = Boiler G = Generator C = Committed Unit
Unit ID	E	The identifier assigned to each unit (boiler and/or generator) in a given plant.	———
CAMD Database UnitID	F	Unit-level identifier assigned by EPA's Clean Air Markets Division (CAMD) business system. Unlike other identification codes (e.g., ORIS codes), which are subject to change, once assigned to a unit, the CAMD Database Unit ID does not change. Used primarily for internal tracking purposes at EPA.	———
PlantType	G	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
Combustion Turbine/IC Engine	H	Clarifies the engine type for units with "Combustion Turbine" plant type. An Internal Combustion (IC) Engine is a reciprocating engine which uses pistons to extract energy from a fluid to perform work. A Combustion Turbine is a stand-alone turbine combusting fuel to drive a generator (a combined cycle less the Heat Recovery Steam Generator (HRSG)).	Combustion Turbine IC Engine

Region Name	I	The region, used in the EPA Base Case v.5.15 using the Integrated Planning Model (IPM), where the generating unit is located. IPM regions are defined to enable IPM to accurately represent the operation and structure of U.S. and Canada electric power system. IPM regions are generally subdivisions of the 8 North American Electric Reliability Council (NERC) regions and aggregations of the electricity grid's contiguous control areas.	See Appendix or Figure 3-1 and Table 3-1 of the IPM Documentation for a map and description of the IPM regions
State Name	J	These five 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 for county codes. 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	———
State Code	K		———
County	L		———
County Code	M		———
FIPS5	N		———
Capacity (MW)	O	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.	———
Heat Rate (Btu/kWh)	P	The net heat input (in Btu) required to generate 1 kilowatt hour of electricity. It is a measure of a generating unit's efficiency. See Section 3.8 in the Documentation for EPA Base Case v.5.13 for more details	———
On Line Year	Q	The year in which the unit is commissioned.	———
Retirement Year	R	The year in which the unit is to be decommissioned. ("9999" indicates that the unit has not been retired.)	———
Firing	S	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.	**Cell:** boilers that combine 2-3 standard burners into a compact, vertical assembly installed on the furnace wall; multiple cells utilized within a furnace. **Cyclone:** A special type of burner for coals with low fusion point ashes. Combustion occurs within the horizontal burner generating high temps which turn the ash into molten slag. The term "wet bottom" furnace often accompanies the cyclone burner. **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. **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. **Tangential (also referred to as "corner firing"):** burners located along furnace corners in multiples of 4. Burner angle is off-set working conjunction with the opposing corner burner to create a vertical, circular swirling combustion zone within the furnace. **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. **Vertical:** standard furnace (assume wall fired) **Wall:** standard burner / furnace design used today. Circular burners located on the front and rear furnace walls at multiple elevations.
Bottom	T	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.	Dry Wet
Cogen?	U	This field indicates whether a unit is a cogenerator. A unit is considered a cogenerator if it produces electricity and another form of useful thermal energy (such as heat or steam), used for industrial, commercial, heating, or cooling purposes.	Y (Yes) N (No)

Modeled Fuels	V	The fuels that can be combusted or used by the unit.	Biomass Bituminous Distillate Fuel Oil Fossil Waste Geothermal Hydro Landfill Gas Lignite MSW Natural Gas Non-Fossil Waste Nuclear Fuel Petroleum Coke Pumped Storage Residual Fuel Oil Solar Subbituminous Tires Waste Coal Wind
Wet/DryScrubber	W	This field indicates if a unit has an SO2 scrubber, and, if so, whether it is a wet or dry scrubber. Also known as flue gas desulfurization (FGD) systems, SO2 scrubbers use chemical and physical absorption to remove SO2 from the flue gas. Wet scrubbers use a liquid sorbent to remove SO2 and the flue gas leaving the absorber is moisture saturated. With dry scrubbers the flue gas leaving the absorber is not saturated. For circulating fluidized bed units (as shown in the "Firing" field), this field indicates whether reagent injection is used for SO2 control. Reagent injection involves adding finely crushed limestone to the fluidized bed. During combustion, the limestone is reduced to lime, the sulfur in the fuel is oxidized to form SO2, and, in the presence of excess oxygen, the SO2 reacts with the lime particles to form calcium sulfate, which can be removed with the bottom ash or collected with the fly ash by a downstream particulate matter (PM) control device.	Dry Scrubber Wet Scrubber Reagent Injection
Scrubber_Online_Year	X	The first year of operation of an existing or committed SO_2 scrubber	———
Scrubber Efficiency	Y	The removal efficiency of the SO_2 scrubber.	———
Scrubber Efficiency_MATS	Z	The removal efficiency of the SO2 scrubber assuming an upgrade to pre-existing scrubbers that do not meet the MATS HCl removal requirement, assuming this is the most cost effective approach for meeting the limit	———
NOx Comb Control	AA	This field indicates the NO_X combustion controls employed by a generating unit. Combustion controls reduce NO_X emissions during the combustion process generally by regulating flame characteristics such as temperature and fuel-air mixing.	**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** Low NOx Burner Technology w/ Closed-coupled OFA **LNC2** Low NOx Burner Technology w/ Separated OFA **LNC3** Low NOx Burner Technology w/ Closed-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 O**ther** Other **ROFA** Rotating Overfire Air **SC** Slagging **SOFA** Stationary Overfire Air **STC** Staged Combustion **STM** Steam Injection
NOx Post-Comb Control	AB	This column indicates the post-combustion NO_X emission controls at a generating unit. There are two NO_X post-combustion control options: Selective Catalytic Reduction (SCR) or Selective Non-Catalytic Reduction (SNCR). Post-combustion controls operate downstream of the combustion process and remove NOx emissions from the flue gas.	**SCR** Selective Catalytic Reduction **SNCR** Selective Noncatalytic Reduction
SCR_Online_Year	AC	The first year of operation of an existing or committed SCR	———

SNCR_Online_Year	AD	The first year of operation of an existing or committed SNCR	———
PM Control	AE	This field indicates the presence of particulate matter (PM) controls	**B** Baghouse **C** Cyclone **ESPH** Hot side electrostatic precipitator **ESPC** Cold side electrostatic precipitator **WS** Wet PM Scrubber
PM Control_MATS	AF	This field indicates existing PM controls and, if necessary, exogenously determined control upgrades to comply with filterable PM limits. These upgrade may be one of 3 ESP upgrades or a fabric filter. See Section 5.6 in Documentation for EPA Base Case v.5.13 Using the Integrated Planning Model	———
FlueGasConditioning_Flag	AG	Indicates if the unit has flue gas conditioning	———
Mercury_Controls	AH	Dedicated Mercury emission controls in existence at a generating unit	ACI (Activated Carbon Injection)
ACI_Online_Year	AI	The first year of operation of an existing or committed ACI	———
Mercury_Controls Efficiency_MATS	AJ	The removal efficiency of the mercury control device.	———
SO2 Permit Rate (lbs/mmBtu)	AK	The SO_2 emission rate (in lb/mmBtu) limit that applies to the unit due to federal, state or local emission regulations.	———
Mode 1 NOx Rate (lbs/mmBtu)	AL	The 4 NO_x rates in NEEDS allow modeling of any conceivable scenario involving NO_X controls. Mode 1 "Existing combustion controls, non ozone-season": Applies to units not covered by a NOx control policy. Specifically, this is typically the NOx rate with post-combustion controls shut off. For units without post-combustion controls, it's their uncontrolled NOx rate. An exception to this rule is that if the unit was operating its SCR annually in 2011,then the Mode 1 NOx rate reflects the 2011 annual average ETS NOx rate. See Section 3.9.2 of the Documentation for EPA Base Case v.5.13 for more information on NOx Rates in NEEDS	———
Mode 2 NOx Rate (lbs/mmBtu)	AM	The 4 NOx rates in NEEDS allow modeling of any conceivable scenario involving NO_X controls. Mode 3 "State-of-the-art combustion controls, non ozone-season": Represents a unit's NOx rate in months outside of the ozone-season, for units only subject to NOx limitations during the ozone season. For units with post-combustion controls, this is the NOx rate with post-combustion controls shut off. For units without post-combustion controls, it's the NOx rate with state-of-the-art combustion controls operating. See Section 3.9.2 of the Documentation for EPA Base Case v.5.13 for more information on NOx Rates in NEEDS	———
Mode 3 NOx Rate (lbs/mmBtu)	AN	The 4 NO_X rates in NEEDS allow modeling of any conceivable scenario involving NO_X controls. Mode 3 "Uncontrolled NOx Policy Rate" represents a unit's NOx rate in months outside of the ozone season, for units only subject to NOx limitations during the ozone season. For units with post-combustion controls, this is the NOx rate with post-combustion controls shut off. For units without post-combustion controls, it's the NOx rate with state-of-the-art combustion controls operating. See Section 3.9.2 of the Documentation for EPA Base Case v.5.13 for more information on NOx Rates in NEEDS	———
Mode 4 NOx Rate (lbs/mmBtu)	AO	The 4 NO_X rates in NEEDS allow modeling of any conceivable scenario involving NO_X controls. Mode 4 "State-of-the-art combustion controls, ozone-season": NOx rate applicable under a NOx policy with a first year of compliance post 2011. For SCR units, it's the NOx rate with the SCR operating. For SNCR units, it's the NOX rate with SNCR operating plus state-of-the-art combustion controls operating. For units without post-combustion controls, it's the NOx rate with state-of-the-art combustion controls operating. See Section 3.9.2 of the Documentation for EPA Base Case v.5.13 for more information on NOx Rates in NEEDS	———
Hg EMF for BIT_MATS	AP	Mercury Emission Modification Factor (EMF) when the unit combusts bituminous coal. "Mercury EMF" is defined as the percentage of fuel mercury left after accounting for the mercury removal obtained by the SO2, NOx, and particulate controls.	———
Hg EMF for SUB_MATS	AQ	Mercury Emission Modification Factor (EMF) when the unit combusts subbituminous coal.	———
Hg EMF for LIG_MATS	AR	Mercury Emission Modification Factor (EMF) when the unit combusts lignite coal.	———
HCL Removal	AS	Indicates the HCl removal efficiency based upon the exisng HCL controls such as SO2 scrubber and DSI.	———
HCL Removal_MATS	AT	The HCL removal efficiency of the SO2 scrubber assuming an upgrade to pre-existing scrubbers that do not meet the MATS HCl removal requirement, assuming this is the most cost effective approach for meeting the limit	———
DSI Unit	AU	Flag indicating if the unit has dry sorbent injection (DSI)	———
BART Affected Unit	AV	Flag indicating if the unit is subject to Best Available Retrofit Technology (BART) requirements	———
DSI Online Year	AW	The first year of operation of an existing or committed dry sobent injection (DSI) equipment	
CCS Removal	AX	The CO2 removal efficiency of the CCS control	
C2G	AY	Indicate if this unit has been/will be converted from coal to gas	

Appendix with Model Regions

EPA Base Case v.5.15 Regions

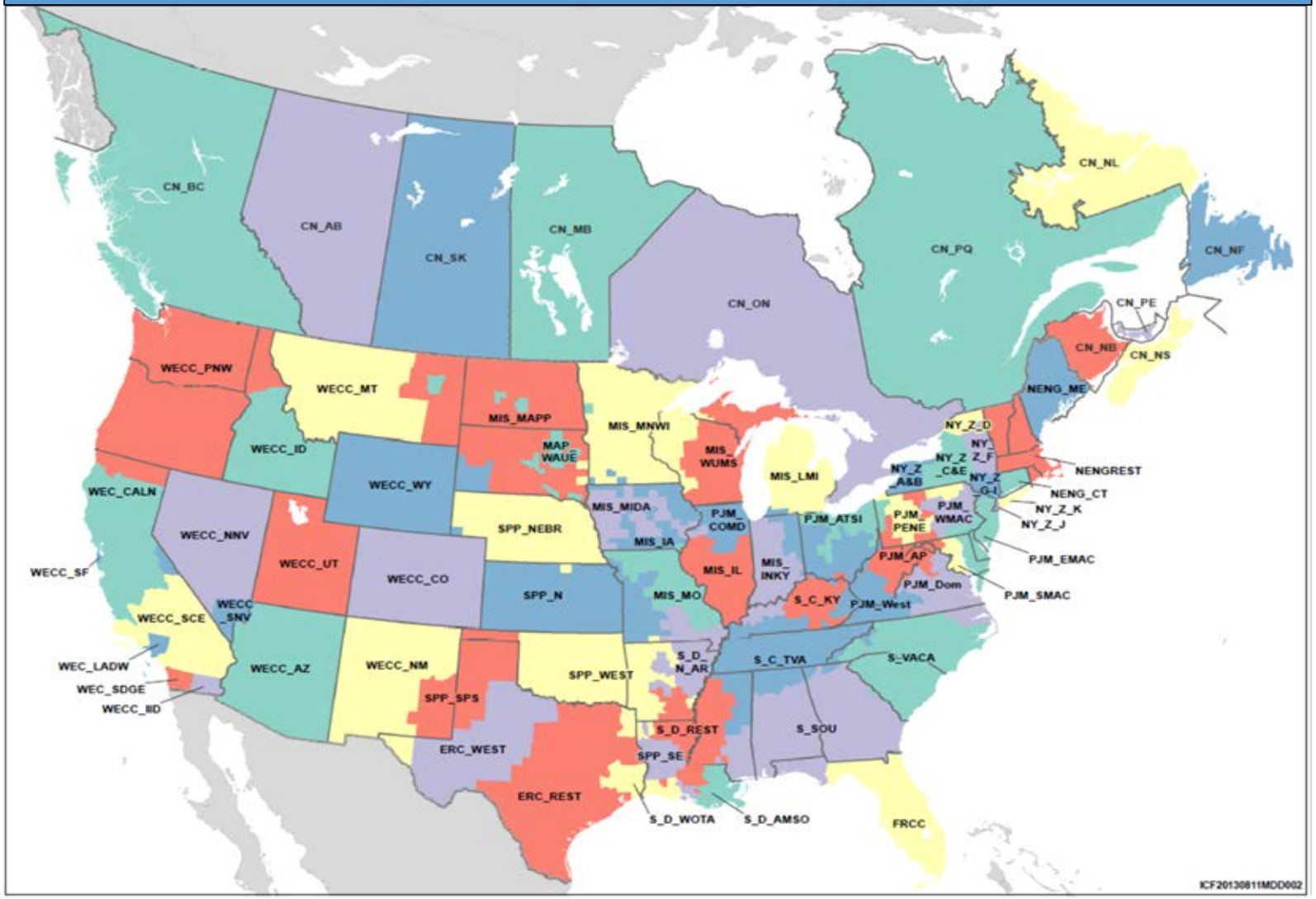

Table 3-1 Mapping of NERC Assessment Regions and NEMS Regions with EPA Base Case v.5.15 Model Regions

NERC Assessment Region	AEO 2013 NEMS Region	Model Region	Model Region Description
ERCOT	ERCT (1)	ERC_FRNT	ERCOT_Tenaska Frontier Generating Station
		ERC_GWAY	ERCOT_Tenaska Gateway Generating Station
		ERC_REST	ERCOT_Rest
		ERC_WEST	ERCOT_West
FRCC	FRCC (2)	FRCC	FRCC
MAPP	MROW (4)	MAP_WAUE	MAPP_WAUE
		MIS_MAPP	MISO_MT, SD, ND
MISO	MROE (3), RFCW (11)	MIS_WUMS	MISO_Wisconsin- Upper Michigan (WUMS)
	MROW (4)	MIS_IA	MISO_Iowa
		MIS_MIDA	MISO_Iowa-MidAmerican
		MIS_MNWI	MISO_Minnesota and Western Wisconsin
	RFCM (10)	MIS_LMI	MISO_Lower Michigan
	RFCW (11), SRCE (15)	MIS_INKY	MISO_Indiana (including parts of Kentucky)
	SRGW (13)	MIS_IL	MISO_Illinois
		MIS_MO	MISO_Missouri
ISO-NE	NEWE (5)	NENG_CT	ISONE_Connecticut
		NENG_ME	ISONE_Maine
		NENGREST	ISONE_MA, VT, NH, RI (Rest of ISO New England)
NYISO	NYCW (6)	NY_Z_J	NY_Zone J (NYC)
	NYLI (7)	NY_Z_K	NY_Zone K (LI)
	NYUP (8)	NY_Z_A&B	NY_Zones A&B
		NY_Z_C&E	NY_Zone C&E
		NY_Z_D	NY_Zones D
		NY_Z_F	NY_Zone F (Capital)
		NY_Z_G-I	NY_Zone G-I (Downstate NY)
PJM	RFCE (9)	PJM_EMAC	PJM_EMAAC
		PJM_PENE	PJM_PENELEC
		PJM_SMAC	PJM_SWMAAC
		PJM_WMAC	PJM_Western MAAC
	RFCW (11)	PJM_AP	PJM_AP
		PJM_ATSI	PJM_ATSI
		PJM_COMD	PJM_ComEd
		PJM_West	PJM West
	SRVC (16)	PJM_Dom	PJM_Dominion
SERC-E	SRVC (16)	S_VACA	SERC_VACAR
SERC-N	SRCE (15)	S_C_KY	SERC_Central_Kentucky
		S_C_TVA	SERC_Central_TVA

SERC-SE	SRSE (14)	S_SOU	SERC_Southeastern
SERC-W	SRDA (12)	S_D_AMSO	SERC_Delta_Amite South (including DSG)
		S_D_N_AR	SERC_Delta_Northern Arkansas (including AECI)
		S_D_REST	SERC_Delta_Rest of Delta (Central Arkansas)
		S_D_WOTA	SERC_Delta_WOTAB (including Western)
SPP	MROW (4)	SPP_NEBR	SPP Nebraska
	SPNO (17), SRGW (13)	SPP_N	SPP North- (Kansas, Missouri)
	SPSO (18)	SPP_KIAM	SPP_Kiamichi Energy Facility
		SPP_SE	SPP Southeast (Louisiana)
		SPP_SPS	SPP SPS (Texas Panhandle)
	SPSO (18), SRDA (12)	SPP_WEST	SPP West (Oklahoma, Arkansas, Louisiana)
Basin (BASN)	NWPP (21)	WECC_ID	WECC_Idaho
		WECC_NNV	WECC_Northern Nevada
		WECC_UT	WECC_Utah
Northern California (CALN)	CAMX (20)	WEC_CALN	WECC_Northern California (including SMUD)
		WECC_SF	WECC_San Francisco
Southern California (CALS)	AZNM (19)	WECC_IID	WECC_Imperial Irrigation District (IID)
	CAMX (20)	WEC_LADW	WECC_LADWP
		WEC_SDGE	WECC_San Diego Gas and Electric
		WECC_SCE	WECC_Southern California Edison
Northwest (NORW)	NWPP (21)	WECC_MT	WECC_Montana
		WECC_PNW	WECC_Pacific Northwest
Rockies (Rock)	NWPP (21), RMPA (22)	WECC_WY	WECC_Wyoming
	RMPA (22)	WECC_CO	WECC_Colorado
Desert Southwest (DSW)	AZNM (19)	WECC_AZ	WECC_Arizona
		WECC_NM	WECC_New Mexico
		WECC_SNV	WECC_Southern Nevada
Canada		CN_AB	Alberta
		CN_BC	British Columbia
		CN_MB	Manitoba
		CN_NB	New Brunswick
		CN_NF	Newfoundland
		CN_NL	Labrador
		CN_NS	Nova Scotia
		CN_ON	Ontario
		CN_PE	Prince Edward Island
		CN_PQ	Quebec
		CN_SK	Saskatchewan