Reporting Functions (Draft #4)

Report 19.1: "If any hour showed a demand generation deficit, print out a useful report showing where, when, how much, and for new generic unit creation, data on those units"

In situations where an ERTAC region and fuel/unit type bin have future year hours in which not enough capacity exists to satisfy demand, the report should contain the following information:

- ERTAC region
- ERTAC fuel/unit type bin
- Calendar hour
- Hierarchy hour
- Future year estimate of generation needed(MW-hrs)
- Future year estimate of generation available (MW-hrs)
- Future year estimate of generation that is lacking (needed-available, MW-hrs)
- Future year estimate of generation available after creation of generic unit(s) by program (MW-hrs)
- Data on generic unit(s) created by program to satisfy the lack:
  - ERTAC Region
  - ERTAC Fuel/Unit type bin
  - Unit size
  - Unit location (plant name of facility where the new unit is located)
  - Unit location (ORIS of plant)
  - Unit ID (NewUnit#)
  - Unit lat/long (also from facility where the new unit is located)

Example reports:

Report Name: Demand_Generation_Deficit

ERTAC Region	ERTAC Fuel/Unit Type Bin	Calendar Hour	Hierarchy Hour	Generation Needed (MW-hrs)	Generation Available (MW-hrs)	Lacking (MW-hrs)	Available after new unit creation
VAPC	Coal	3,651	1	12,232	11,500	732	12,700
VAPC	Coal	3,652	2	12,000	11,500	500	12,700
VAPC	Coal	4,000	3	11,900	11,500	400	12,700

Report Name: Generic_Units_Created

ERTAC Region	ERTAC Fuel/Unit Type Bin	New Unit Size (MW)	ORIS Location	Unit ID	Unit Location	Unit Latitude	Unit Longitude
VAPC	Coal	600	3797	NewUnit1	Chesterfield Power Station	37.374248	-77.405904
VAPC	Coal	600	7213	NewUnit2	Clover Power Station	36.86846	-78.7065

Report 19.5: "Print out a useful generation report by unit for stakeholder review"

After reviewing various report requirements, this report is nearly identical to Report 23.5Y1. Report 23.5Y1 should suffice for our needs.

Report 23Y1: "Print out a useful report detailing all reserve capacity needed."

Respecting the reserve capacity requirements is necessary for a SIP quality output. This report will be helpful to ensure that reserve capacity requirements are met, and where they are not met, this report will help identify the need for additional future capacity. This report will contain all hours of the future year, and should be sorted by fail/pass in the flag column showing which hours failed the reserve capacity requirements (fails should be first, then in hierarchy hour order). This will be a fairly lengthy report.

- ERTAC Region
- Calendar hour
- Hierarchy hour
- Pass/fail flag to show which hours did not meet the reserve capacity requirements
- Hourly amount needed for reserve capacity (MW-hrs)
- Hourly amount available for reserve capacity (MW-hrs)
- Hourly deficit, which will contain a number only if there is a deficit. (needed-available, MW-hrs)

Report Name: Reserve_Capacity_Needed

ERTAC Region	Calendar hour	Hierarchy hour	Pass/fail for reserve capacity requirements	Reserve capacity needed	Amount available	Deficit (MW-hrs)
VAPC	4,502	1	F	750	400	350
VAPC	4,503	2	F	750	402	348
VACP	5,203	3	F	750	500	250
VACP	4,504	4	P	750	751	
…						
WRCA	800	1	F	500	400	100
WRCA	801	2	P	450	475	
…						

Report 23.5Y1: "Output a database of hourly generation/heat input data for each unit as well as a summary table of unit generation and heat input (base year versus future year)"

After reviewing the descriptions of this database and the database described in Report 28 (the hourly diagnostic file), the database in Report 28 will cover all that is needed for this database. This database is not necessary.

The second part of this process is a summary table of base year and future year unit generation and heat input by unit. It would contain all units, including the new generic units developed and placed by the program. Being able to review the amount of generation created in the base year and the amount of generation estimated to be produced in the future year by each unit will help stakeholders better understand how emissions are estimated. This information will allow stakeholders to provide better feedback to the staff preparing the model as well as the ultimate SIP. Report will contain a line item for all units.

- ORIS ID/Unit ID
- Facility Name
- State

- ERTAC Region
- Unit's ERTAC Fuel/Unit Type Bin
- Max hourly heat input (mmbtu) (max_ERTAC_heat_input_hourly_summer)
- Calculated heat rate (btu/KW-hr)
- Maximum estimated generation capacity for that unit (max_ERTAC_heat_input_hourly_ summer divided by heat rate)
- # of hours where the unit operated at the max hourly heat input
- Utilization fraction for that unit
- Base year annual generation for that unit (MW-hrs)
- Base year heat input for that unit (mmbtu)
- Base year hours operated
- Future year annual generation for that unit (MW-hrs)
- Future year heat input for that unit (mmbtu)
- Future year hours operated

Each unit would have its data summed annually.

Report Name: Unit_Level_Activity

Example report (Base Year = 2007, Future Year = 2017)

ORIS	Unit ID	Facility	State	ERTAC Region	Fuel/Unit Type Bin	Maximum hourly heat input (mmbtu)	Calculated heat rate (btu/kw-hr)	Generation capacity (MW)	# of hours in FY where unit operated at max hourly	Utilization fraction	Base year generation (MW-hrs)	Base year heat input (mmbtu)	Base year hours op'd	Future year generation (MW-hrs)	Future year heat input (mmbtu)	Future year hours op'd
3797	5	Chesterfield Power Station	VA	VAPC	Coal	3,700	10,100	356	20	0.9	1,559,280	16,372,440	8,220	1,871,136	17,191,062	8,300
3797	**8A	Chesterfield Power Station	VA	VAPC	Combined Cycle Gas	2,200	9,872	239	22	0.6	837,456	6,973,496	4,001	1,256,184	10,457,188	6,007
3797	New Unit 1	Chesterfield Power Station	VA	VAPC	Coal	6,000	9,800	600	23	0.9	n/a	n/a	n/a	3,679,200	36,056,560	7,231
3796	3	Bremo Power Station	VA	VAPC	Coal	904	11,300	80	0	0.9	75,000	847,500	6532	0	0	0
3806	3	Bremo Power Station	VA	VAPC	Boiler-Gas	912	12,000			0.18	0	0	0	4,167	50,000	300

(Note that both the shutdown #3 unit at Bremo is listed, with the coal data, and the "new" #3 unit at Bremo, that burns natural gas in the future year, is listed)
(The hours operated value is figured by summing the number of hours with a non-zero heat input in either the base or the future year.)

Report 27.5B: "Send up a flag that more control was needed and print out a useful report detailing generic controls"

This report will be helpful to explain what additional controls were generated by the model and why.

- State or region cap (tons/year or OS)
- Cap type/pollutant
- Cap amount
- Year applicable
- State or region emissions prior to all program-generated control (tons/year or OS)
- State or regional emissions after all program-generated control (tons/year or OS)
- Cap Comments, noting the source of the cap

For each state or region where program generated controls were required for either an annual or an OS cap, include the following for each unit that was assigned some type of program-generated control:

- ORIS
- Facility name
- Unit ID (may not always be available)
- Maximum estimated generation capacity (MW) (max_ertac_heat_input_hourly_summer/heat rate)
- Unit age
- ERTAC Region
- ERTAC Fuel/unit type bin
- Pollutant
- Base year emission rate (lbs/mmbtu)
- Future year emission rate (lbs/mmbtu)
- Annual or OS base year emissions (tons/year or tons/OS)
- Annual or OS future year emissions (tons/year or tons/OS)

Example Report

Report Name: Cap_Analysis:

State/Region Cap	Cap type/Pollutant	Cap amount	Year Applicable	FY Emissions, no program generated control	FY Emissions, all program generated control	Cap Comments, if any
NC	Annual SO_2	161,520	2012	140,000	129,333	CSAPR assurance level
NC	Annual SO_2	130,000	2013	140,000	129,333	Clean Smokestacks Act level
NE Coalition OS NO_X	OS NO_X	3,400	2015	3,100	n/a	I made this up completely as an example.

Report Name: Unit_Generic_Controls

ORIS	Facility Name	Unit ID	Generation Capacity (MW)	Unit Age	ERTAC Region	ERTAC Fuel/Unit Type bin	Pollutant	Base year emissions rate (lbs/mmbtu)	Future year emissions rate (lbs/mmbtu)	Base year emissions (tons/yr or OS)	Future year emissions (tons/yr or OS)
2706	Asheville	1	500	42	VAPC	Coal	Annual SO_2	3.0	0.2	11,470	803

This report will contain data for each unit for which generic control was applied to meet a particular cap.

Report 28: "Print out a useful report for the SIPs and output a database (ORL, NIF or similar) that can be used for AQ modeling purposes. Reports need significant detail to allow review of the results from application of transport and other state caps."

This is a two part discussion. First is a useful report for SIP purposes. This report is actually a series of high level reports to show that areas modeled using a regional air quality model do meet cap requirements and also meet future grid demands regarding power and reserve capacity.

Report Name: Capacity_and_FY_ Demand:

For each ERTAC region and fuel/unit type bin, show that the future year demand was met. Compare it to the base year.

- ERTAC Region
- ERTAC Fuel/Unit type bin
- Annual base year generation
- Annual base year heat input
- Annual future year generation
- Annual future year heat input
- Sum of new generation created for that ERTAC Region and ERTAC fuel/unit type bin

Region	Bin	Annual BY gen (MW-hrs)	Annual BY HI (mmbtu)	Annual FY gen (MW-hrs)	Annual FY HI (mmbtu)	Sum of new generation created (MW)
VAPC	Coal	10,000,230	150×10^9	16,000,000	320×10^9	1,200
VAPC	Oil	6,700	100,023	4,000	80,000	n/a

Report Name: Capacity_and_FY_Reserve:

For each ERTAC region, show the reserve requirements by providing the hour for each region with the largest difference between the reserve capacity needed and the available reserve capacity. If reserve requirements are always met, indicate so in the chart.

- ERTAC Region
- Reserve capacity requirements met all year? (y/n)
- Maximum amount of reserve capacity needed (MW)

Region	Reserve capacity met?	Max amount needed (MW)
VAPC	Y	n/a
WRCA	N	100
RFCP	N	400

Report Name: State_Caps

For each state, show that any caps that are applicable are met. For every state cap specified in the "State Total Listing", there should be one listing in this table.

- State
- Cap Pollutant
- Cap (TPY or T/OS)
- Year Cap is applicable
- FY emissions for that state
- Comments (to indicate what the origin of the cap is)

State	Cap Pollutant	Cap (TPY or T/OS)	Cap Year	FY Emissions	Comments
VA	Annual SO_2	83,568	2012	67,002	CSAPR assurance level
VA	OS NO_X	17,487	2012	17,400	CSAPR assurance level
NC	Annual SO_2	250,000	2009	170,289	Clean Smokestacks Act level

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Report Name: Group_Caps

For each group, show that any caps that are applicable are met. For every group cap specified in the "Group Total Listing", there should be one listing in this table.

- Group
- Cap Pollutant
- Cap (TPY or T/OS)
- Year Cap is applicable
- FY emissions for that group
- Comments (to indicate what the origin of the cap)

Group	Cap Pollutant	Cap (TPY or T/OS)	Cap Year	FY Emissions	Comments
CSAPR Group 1 Annual SO_2	Annual SO_2	4,400,400	2012	4,300,000	CSAPR assurance level sum for group 1 states
NE Coalition OS NO_X	OS NO_X	3,400	2015	3,100	I made this up completely as an example.

Report Name: Hourly_Diagnostic_File

Second is the database for AQ modeling and other evaluations. Mark has named it the "hourly diagnostic file", which I think is a good name. This database will be used for further processing and eventually will be input into either SMOKE or CONCEPT. This database will have a record for each hour, for each unit. It will be a big file. The structure should look just like the CAMD hourly data files in the base year, with the exception that the data will be for the future year and will include all new units, new controls. It will also have a few additional columns that are not included in CAMD.

- State
- ORIS
- Unit ID
- Operating hours
- Hierarchy hours
- Flag (Y/N): Did the hour hit the hourly heat input limitation for that unit?
- Flag (Y/N): Has the cumulative heat input to that point in the year hit an annual cap (utilization fraction) for that unit?
- Cumulative heat input assigned to that unit at that hour in the year (running total of mmbtu)
- Cumulative generation assigned to that unit at that hour in the year (running total of MW-hrs)
- Gross Load for that hour (MW-hr)
- Heat_input (mmbtu)
- SO_2_mass (lbs/hr)
- SO_2_rate (lbs/mmbtu)
- NO_X_rate (lbs/mmbtu)
- NO_X_mass (lbs/hr)

State	ORIS	UNIT ID	Operating Hour	Hierarchy Hour	Did the hour hit the hourly heat input limitation for the unit?	Has the cumulative heat input hit an annual cap?	Cumulative HI (mmbtu)	Cumulative Gen (MW-hrs)	Gross Load (MW-hr)	Heat Input (mmbtu)	SO_2_mass (lb/hr)	SO_2_rate (lbs/mmbtu)	NO_X_rate (lbs/mmbtu)	NO_X_mass (lbs/hr)
VA	3797	NewUnit1	4,500	1	Y	N	5,880	600	600	5,880	588	0.1	0.06	352.8
VA	3797	NewUnit1	4,501	2	Y	N	11,760	1,200	600	5,880	588	0.1	0.06	352.8
…														
VA	3797	NewUnit1	2,002	4,002	N	N	Lots	Lots	403	3,949	395	0.1	0.06	237
…														
VA	3797	NewUnit1	700	8,400	N	Y	4,635,792	4,730,400	0	0	0	0	0	0
VA	3797	NewUnit1	705	8,401	N	Y	4,635,792	4,730,400	0	0	0	0	0	0
…														
VA	3797	5	4,500	1	Y	N	3,750	360	360	3,750	300	0.08	0.056	210
VA	3797	5	4,501	2	Y	N	7,500	720	360	3,750	338	0.09	0.043	161
VA	3797	5	4,502	3	Y	N	11,350	1,080	360	3,750	263	0.07	0.04	150
…														