**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 | NewUnit1 | 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 SO2 | 161,520 | 2012 | 140,000 | 129,333 | CSAPR assurance level |
| NC | Annual SO2 | 130,000 | 2013 | 140,000 | 129,333 | Clean Smokestacks Act level |
| NE Coalition OS NOX | OS NOX | 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 SO2 | 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 x 109 | 16,000,000 | 320 x 109 | 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 SO2 | 83,568 | 2012 | 67,002 | CSAPR assurance level |
| VA | OS NOX | 17,487 | 2012 | 17,400 | CSAPR assurance level |
| NC | Annual SO2 | 250,000 | 2009 | 170,289 | Clean Smokestacks Act level |

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 SO2 | Annual SO2 | 4,400,400 | 2012 | 4,300,000 | CSAPR assurance level sum for group 1 states |
| NE Coalition OS NOX | OS NOX | 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)
* SO2\_mass (lbs/hr)
* SO2\_rate (lbs/mmbtu)
* NOX\_rate (lbs/mmbtu)
* NOX\_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) | SO2\_mass  (lb/hr) | SO2\_rate (lbs/mmbtu) | NOX\_rate (lbs/mmbtu) | NOX\_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 |
| … |  |  |  |  |  |  |  |  |  |  |  |  |  |  |