NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Performance Data Reporting

Data Reporting Instructions – Section IV

Module 09 - GADS Data Reporting Workshops

RELIABILITY | ACCOUNTABILITY




GADS Performance Submittal to NERC

- GADS performance records are submitted to OATI thru a text file.
- A number of entries are required on your software's performance entry screen.
- Other data are automatically known by the software because of the unit chosen for data entry.
- Performance data from the data entry screen and other unique unit data is placed in the text file that is submitted to NERC
- A map of the text file is shown at the end of this presentation for help in troubleshooting errors in the OATI submittal.

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Why Report Performance Data?

- Performance data provides information, in a summarized format, pertaining to overall unit operation during a particular month in a given year
- This data is used to calculate unit performance and verify the event and performance data
- Performance data is required for all unit types and sizes reported to the GADS program
  - Monthly installed capacity
  - Monthly generation
  - Monthly startups
  - Monthly unit time information
  - Monthly fuels

Unit Identification

- Required Fields
  - Record Code
    - The 05 uniquely identifies the data as a performance data file record
    - This is provided by your software
  - Utility (Company) Code
    - Three character alpha-numeric code identifying the reporting organization
    - Assigned by OATI for NERC
    - This is provided by your software when a plant and unit are selected for data entry
    - A plant reporter may never know this number

Unit Identification (cont.)

- Required Fields
  - Unit Code
    - Three-digit code identifying the unit reported
    - Code distinguishes one unit from another in a utility
    - Code range is restricted by the unit type
    - This is provided by your software when a plant and unit are selected for data entry
    - A plant reporter may never know this number
- Combination of utility and unit codes uniquely identifies a unit in the GADS database
  - Example: 238111 Utility=238, Unit=111

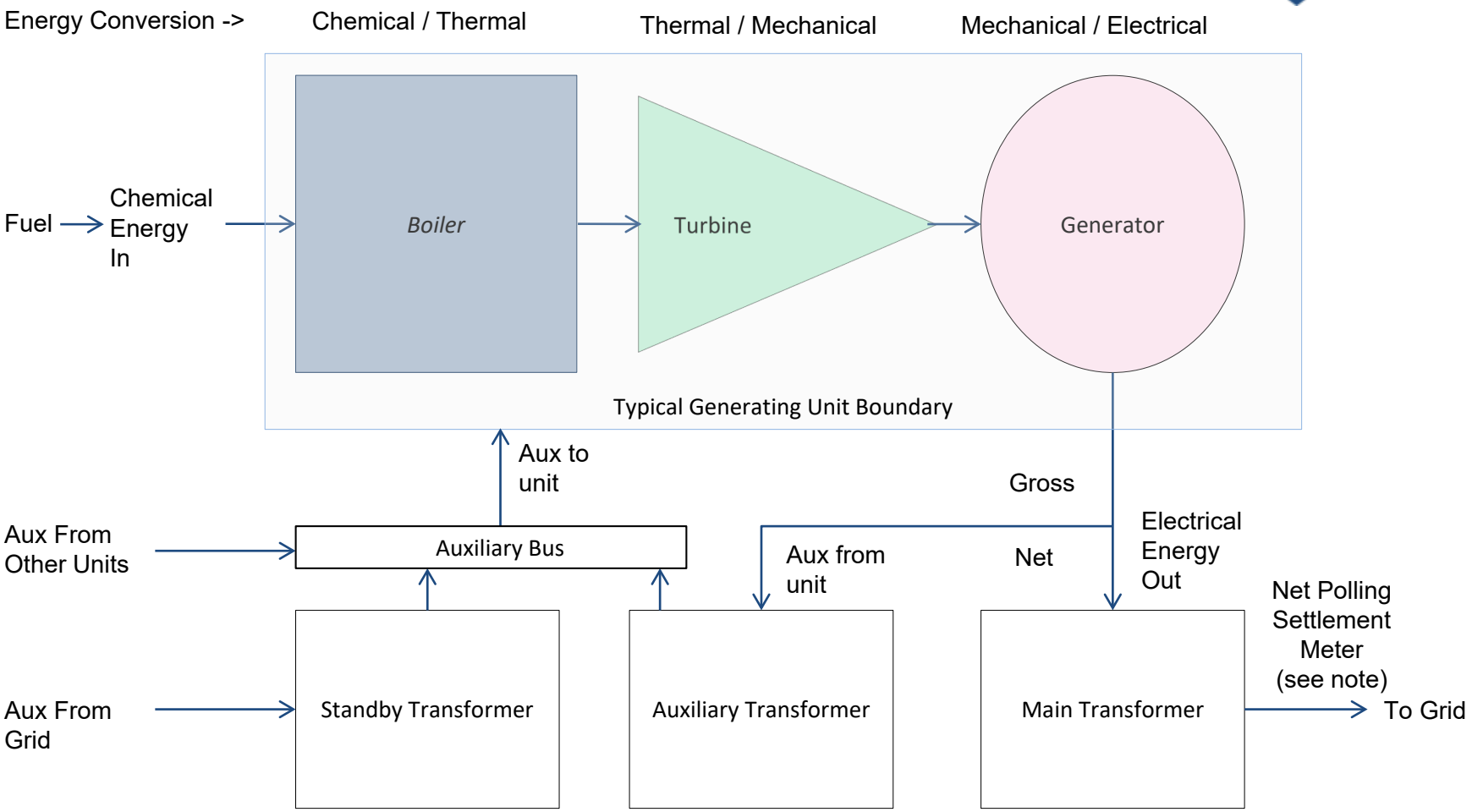
Unit Identification (cont.)

- Required Fields
  - Year
    - The year of the performance record
    - May be a default in your software or a part of data entry
  - Report Period
    - The month (01, 02, ...12)
- Voluntary Fields
  - Report Revision Code
    - Original Reports (0)
    - Additions or corrections (1, 2,…9)
    - Even if just one record is revised resubmit all of the records for the revised time period

Unit Generation Performance

- Data provided is used to calculate performance statistics
- Both gross and net capacity values are requested
  - Net values are preferred but only reporting gross data is acceptable
  - Reporting (either) gross and (or) net data depends on how the unit is electrically metered.
- If a unit is metered on a single basis but the other value can be estimated do so and enter the estimated value in the appropriate field
- Understand how your unit is wired as most units are wired to provide a variety of feeds for auxiliary power that need to be accounted for as shown in the next slide

How Is Your Unit Wired Up?



Note: A Net Polling Settlement meter runs both ways and accounts for grid auxiliary power; it has two sets of numbers associated with it: 1) Adjusted for grid auxiliary power, and 2) Unadjusted which just shows the power out of the high side of the main transformer.

Gross Capacity/Generation

- Gross Maximum Capacity - GMC (voluntary)
  - Maximum sustainable capacity (no derates)
  - Proven by testing
  - Capacity not affected by equipment unless permanently modified
- Gross Dependable Capacity - GDC (voluntary)
  - Level sustained during period without equipment, operating or regulatory restrictions
- Gross Actual Generation - GAG (voluntary)
  - Power generated before auxiliaries

You are encouraged to report Gross numbers

Gross Dependable Capacity

- GDC is the gross power level that the unit can sustain during a given period if there are no equipment, operating, or regulatory restrictions
- By definition, therefore, the GDC is the GMC modified for ambient losses

GDC = GMC – Ambient Losses

- Ambient losses refer to outside, weather-related losses, on the unit, and are not related to the equipment
  - For example, a gas turbine generating unit will not perform as well during the summer due to increased inlet air temperatures

Gross Actual Generation

- The actual number of gross electrical megawatt Hours (MWH) generated by the unit during the month
- If both Service Hours and Gross Actual Generation are reported, then GMC or GDC must also be reported
- If both service hours and a gross capacity value are reported, Gross Actual Generation must also be reported
- GAG will always be zero or positive

Net Capacity/Generation

- Net Maximum Capacity - NMC (required)
  - GMC less any capacity utilized for unit's station services
  - Capacity not affected by equipment unless permanently modified
- Net Dependable Capacity - NDC (required)
  - GDC less any capacity utilized for that unit's station services
- Net Actual Generation - NAG (required)
  - Power generated after auxiliaries
  - Can be negative if more aux than gross
  - Both online and offline auxiliaries effect NAG
- A unit's station service varies with load
  - Use the station service load at GMC to compute NMC and NDC

Net Dependable Capacity

- NDC is the net power level that the unit can sustain during a given period if there are no equipment, operating, or regulatory restrictions
- By definition, therefore, the NDC is the NMC modified for ambient losses

NDC = NMC – Ambient Losses

- Ambient losses refer to outside, weather-related losses, on the unit, and are not related to the equipment
  - For example, a generating unit equipped with a condenser may underperform when cooling water temperatures rise in the summer because the condenser back pressure goes up with cooling water temperature

Net Actual Generation

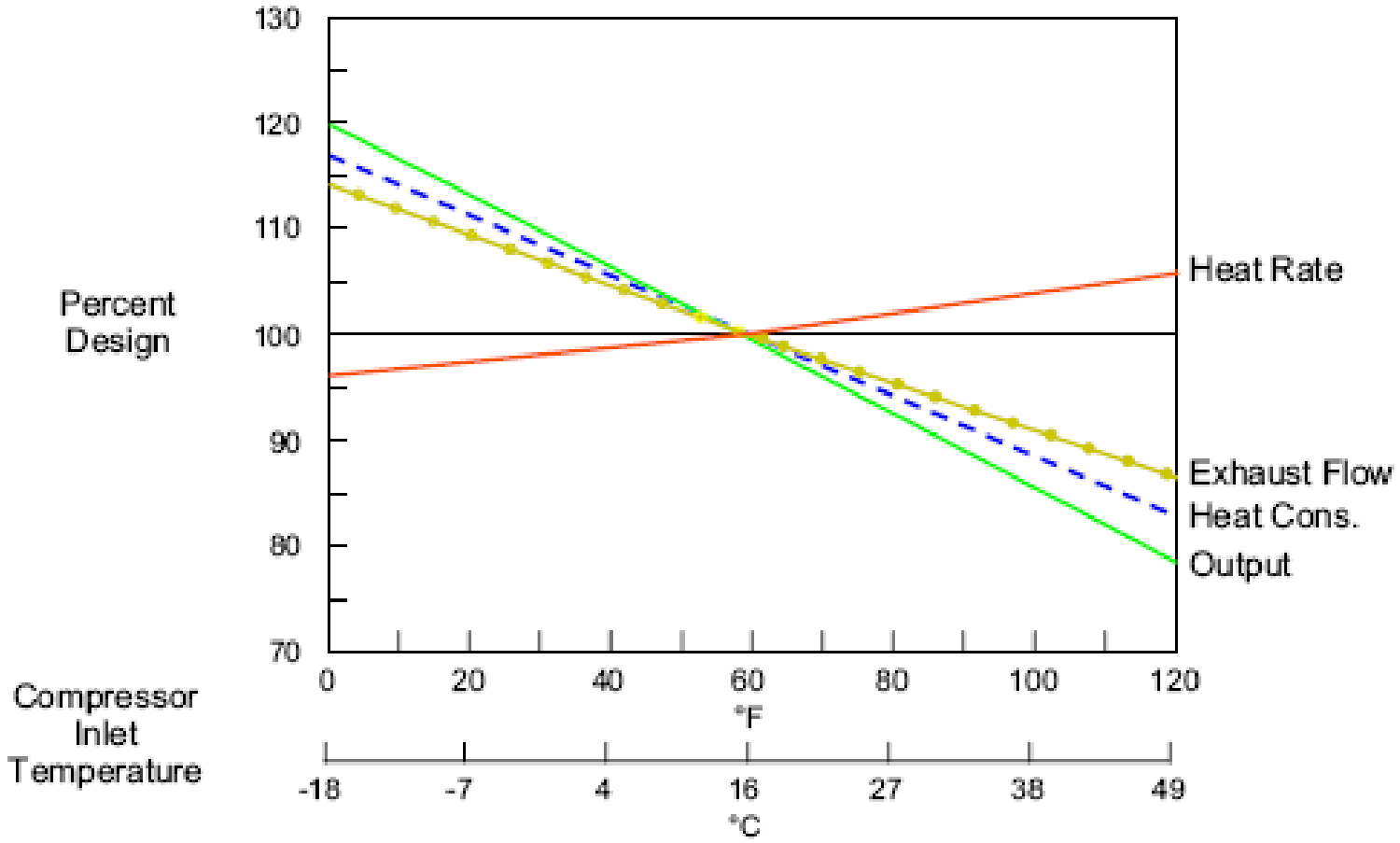
- The actual number of net electrical megawatt Hours (MWH) generated by the unit during the month
- If both Service Hours and Net Actual Generation are reported, then NMC or NDC must also be reported
- If both service hours and a net capacity value are reported, Net Actual Generation must also be reported
- Negative NAG
  - Can be reported and will be accepted
  - NAG = GAG - Station Service
    - If a unit is offline long enough during a month Station Service can be larger than GAG and NAG will be negative
  - Place a minus (“-”) sign in front of the NAG number

```
058251012017010 10000 10000        0  9400  9400   -230374  0  0                                    01
058251012017010    0    0    0    0    0    074400     0    07440074400    0                       02
058251012017010WH      0     0  0  0 0                                GG      0     0  0  0 0        03
```

Gas Turbine/Jet Engine Capacities

- Gas Turbine/Jet Engine capacities do not remain as constant as fossil/nuclear units
- The International Organization of Standardization (ISO) standard for the unit at Standard Temperature and Pressure (STP) should be the GMC/NMC measure
- Output less than the ISO number is the unit GDC/NDC
- Average capacity number for the month is reported to GADS

Effect of Ambient Temperature



Missing Data Calculations

- Capacities and generation that are not reported (GAC, GAG, GDC, GMC, NAC, NDC, NMC, or NAG) will be estimated by webE-GADS as follows:
  - Missing NMC = Reported NDC — Set equal
  - Missing GAG = Reported NAG * (1 + CEF) — Estimated using CEF
  - Missing NAC = Reported GAC / (1 + CEF) — Estimated using CEF

Missing Data Calculations (cont.)

- Capacities are needed to edit and calculate unit performance
- If you don't like the capacities or generation numbers estimated by GADS, then provide the actual numbers
- GADS will not overwrite existing numbers
- Three good reasons to submit all performance data
  - Submitting both gross and net values of all of your performance data will virtually eliminate most problems with the GADS edits
  - Adopt a no holes data submission policy because NERC will estimate a value for any hole in the data you send them and when they do that the story that NERC reports on your units may not always match the story that your company report on your units
  - Submitting your GADS data is like most anything else - the more you put into it, the more you get back

Problem

- Problem: You report the Net Available Capacity (NAC) only on a derate of one of your units. After submitting your data, webE-GADS estimates the GAC, and then error checks the result and finds that the estimated GAC > GMC, which it also estimated, since you only reported NMC. All of your submitted data is correct but you can't resolve the error caused by the estimates.
- Question: What should you have done?
  A. Lower the NAC value just enough until it accepts it
  B. Add the actual GMC value and resubmit your data
  C. Report all of the capacity and generation data
- Answer: C. Report all of the capacity and generation data
- Explanation: webE-GADS will estimate values you don't report and then use them in high level data checks which can domino

Unit Loading Characteristic

- Unit Loading Characteristic (voluntary)
  - Describes how the unit was operated or loaded during the month
  - If the unit was off-line during the entire period select a unit loading characteristic that describes how the unit typically would have been loaded had it been on-line
  - Unit Loading Characteristic is seldom changed on most units

Code	Description
1	Base loaded with minor load-following at night and on weekends
2	Periodic startups with daily load-following and reduced load nightly
3	Weekly startup with daily load-following and reduced load nightly
4	Daily startup with daily load-following and taken off-line nightly
5	Startup chiefly to meet daily peaks
6	Other (provide a verbal description)
7	Seasonal Operation (winter or summer only)

Attempted and Actual Unit Starts

- Required fields
  - Attempted Unit Starts
    - Count of failed attempts to synchronize the unit to the grid
    - Repeated failures for the same cause without attempted corrective actions are considered a single start
    - Repeated initiations of the starting sequence without accomplishing corrective repairs are counted as a single attempt
    - For each repair, report 1 attempted start
  - Actual Unit Starts
    - Count of successful attempts to synchronize the unit to the grid

Attempted and Actual Unit Starts (cont.)

- If starts are not tracked, then:
  - Leave the Actual/Attempted Start fields Blank
  - GADS will estimate both Attempted/Actual Starts based on event data using the formula

Attempted Unit Starts = Actual Unit Starts + Start-Up Failures

  - Where
    - Actual Unit Starts is a count of the transitions between offline/online unit states
    - Start-Up Failures is a count of SF events
- The GADS program also accepts zero (0) in the Attempted Unit Starts field if the Actual Unit Starts = 0

Problem

- Problem: GT5 always seems to require some extra effort to start up. An operator has just pressed the start button for the fourth time without success. The electricians repair a loose relay connection and the unit finally starts up on the fifth try.
- Question: How many attempted starts did GT5 experience?
  A. 5
  B. 2
  C. 3
- Answer: C. 2
- Explanation: The first four attempts count as one because no repairs were attempted. The unit was repaired after the fourth attempt, so the final startup counts as one, for a total of 2.

Unit Time Information

- Required fields
  - Service Hours (SH)
    - Sum of hours synchronized to system
  - Reserve Shutdown Hours (RSH)
    - Sum of hours on reserve shutdown (RS)
  - Pumping Hours
    - Sum of hours the hydro turbine/generator operated as a pump/motor
  - Synchronous Condensing Hours
    - Sum of hours the generator operated in synchronous mode
    - Applies to hydro, pumped storage, gas turbine, and jet engines
    - Synchronous condensing is when the generator field is controlled by a voltage regulator to either generate or absorb reactive power as needed to adjust grid voltage, or to improve power factor

Unit Time Information (cont.)

- Required fields
  - Available Hours (AH)
    - Sum of SH + RSH + Pumping Hours + Synchronous Condensing Hours
  - Planned Outage Hours (POH)
    - Sum of hours on planned outage (PO)
  - Forced Outage Hours (FOH)
    - Sum of hours on forced outage (U1, U2, U3, SF)
  - Maintenance Outage Hours (MOH)
    - Sum of hours on maintenance outage (MO)
  - Extensions of Scheduled Outage Hours
    - Sum of hours on maintenance or planned extension (ME, PE)

Unit Time Information (cont.)

- Required fields
  - Unavailable Hours (UAH)
    - Sum of POH + FOH + MOH + ME + PE hours
  - Period Hours or Active (PH)
    - Sum of Available + Unavailable Hours
    - Usually equal to the hours in the month
      - There are two exceptions
        - Unit goes commercial
        - Unit becomes inactive – IR, MB, or RU
  - Inactive Hours (IH)
    - Sum of IR + MB + RU hours
- All hours should be adjusted for Daylight Savings Time (DST) if your unit is in a time zone that uses it

Problem

- Problem: Unit 3 is online at 500 MW during the month of March until 03/15/19 2400 (3/16/19 0000) when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What is the Net Actual Generation for the month?
  A. 179,500 MWH
  B. 184,000 MWH
  C. 180,000 MWH
- Answer: A. 179,500 MWH
- Explanation: NAG = SH x 500 MW = [(15 days x 24 hours/day) – 1 hour for DST] x 500 MW = 359 hours x 500 MW = 179,500 MWH

Problem

- Problem: Unit 3 is online at 500 MW during the month of March until 03/15/19 2400 (3/16/19 0000) when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What are the available hours for the month?
  A. 359 hours
  B. 503 hours
  C. 431 hours
- Answer: B. 503 hours
- Explanation: Available Hours = SH + RSH = [(15 x 24) – 1] + 6 x 24 = (360 – 1) + 144 = 503 hours, part of which occurred during DST

Problem

- Problem: Unit 3 is online at 500 MW during the month of March until 03/15/19 2400 (3/16/19 0000) when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What are the forced outage hours for the month?
  A. 72 hours
  B. 359 hours
  C. 167 hours
- Answer: A. 72 hours
- Explanation: Forced outage hours = 3 days x 24 hours/day = 72 hours, all of which occurred after DST

Problem

- Problem: Unit 3 is online at 500 MW during the month of March until 03/15/19 2400 (3/16/19 0000) when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What are the planned outage hours for the month?
  A. 72 hours
  B. 359 hours
  C. 168 hours
- Answer: C. 168 hours
- Explanation: Planned outage hours = 1 week x 7 days/week x 24 hours/day = 168 hours, all of which occurred after DST

Problem

- Problem: Unit 3 is online at 500 MW during the month of April until 04/16/19 0000 when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What are the reserve shutdown hours for the month?
  A. 72 hours
  B. 120 hours
  C. 144 hours
  D. Answer: B. 120 hours
- Explanation: Reserve shutdown hours = 30 days in April – 15 days (SH) – 7 days (PO) – 3 days (FO) = 30 – 25 = 5 days x 24 hours/day = 120 hours

Problem

- Problem: Unit 3 is online at 500 MW during the month of March until 3/16/19 0000 when it comes down for a week long planned outage. They find a problem and go on a forced outage for three days after the end of the planned outage then go on reserve shutdown the rest of the month.
- Question: What are the unavailable hours for the month?
  A. 450 hours
  B. 240 hours
  C. 144 hours
- Answer: B. 240 hours
- Explanation: Unavailable hours = (7 days (PO) + 3 days (FO)) x 24 hours/day = 10 days x 24 hours/day = 240 hours, all of which happened after DST

Fuels

- One to four fuels can be reported
- The primary fuel has the most thermal BTU
  - If a unit burns coal and uses gas or oil for startup and/or flame stabilization in that order in terms of BTU then
    - Primary fuel = coal
    - Secondary fuel = gas
    - Tertiary fuel = oil
- Primary fuel is not required for hydro/pumped storage units
- Primary fuel is required for all other units, whether operated or not
  - Always provide the primary fuel type
  - Set all numeric fields to zero for each fuel type not burned
    - This eliminates guess work when analyzing the data because both the volume and heating values are needed to calculate the thermal BTU

Fuels (cont.)

- Required
  - Fuel Code – identifies the type of fuel being burned
- Voluntary
  - Quantity Burned - Tons, MCF, Barrels
  - Average Heat Content - Btu/ft3, Btu/lb., Btu/gal reduced by a factor
    - Tons – 1,000, Barrels – 1,000, Cubic Feet – 1,000,000
  - % Ash - nearest 0.1% by weight
  - % Moisture - nearest 0.1% by weight
  - % Sulfur - nearest 0.1% by weight
  - % Alkalis - nearest 0.1% by weight
  - Grindability Index
    - Coal units only
  - % Vanadium and Phosphorous
    - Oil units only
  - Ash Softening Temperature - ^{o}F under reducing atmosphere conditions

Fuel Codes

Code	Description	Code	Description
BM	Biomass	PC	Petroleum Coke
CC	Coal	PR	Propane
LI	Lignite	SL	Sludge Gas
PE	Peat	GE	Geothermal
WD	Wood	NU	Nuclear
OO	Oil	WM	Wind
DI	Distillate oil (No. 2)	SO	Solar
KE	Kerosene	WH	Waste Heat
JP	JP4 or JP5	OS	Other – Solid (Tons)
WA	Water	OL	Other – Liquid (BBL)
GG	Gas	OG	Other – Gas (Cu. Ft.)

05 Performance Data File

- The 05 performance data file has six (6) sections

  A - Unit identification
  B - Unit generation performance
  C - Unit starting characteristics
  D - Unit time information
  E - Primary/Secondary fuel
  F - Tertiary/Quaternary fuel

05 Performance Data File Format

One (1) Month Of Performance Data on One (1) Unit = 4 Records Max

Record Code ↙ ↘ Record Number

05	Section A - Unit Identification, col 1 - 15	Section B - Unit Generation Performance, col 16 - 57	Section C - Unit Starting Characteristics, col 58 - 125	01
05	Section A - Unit Identification, col 1 - 15	Section D - Unit Time Information, col 16 - 125		02
05	Section A - Unit Identification, col 1 - 15	Section E - Primary Fuel, col 16 - 69	Section E - Secondary Fuel, col 70 - 125	03
05	Section A - Unit Identification, col 1 - 15	Section F - Tertiary Fuel, col 16 - 69	Section F - Quaternary Fuel, col 70 - 125	04

- Section A - 6 data fields
- Section B - 6 data fields
- Section C - 5 data fields
- Section D - 13 data fields
- Section E - 9 data fields for each fuel plus Record Number
- Section F - 9 data fields for each fuel plus Record Number

05 Performance Data File

- Only the 05 performance data file format is accepted by webE-GADS
  - To see if your program is using the correct format
    - Open the performance file with Notepad
    - If the first two digits of the file are 05 you have the right file format
    - If the first two digits of the file are 95 then update your software

```
052381112017010     0     0 62181000 85000 85000 581977002  0  0                                                    01
05238111201701074400    0    0    074400    0    0    0    0    074400    0                                        02
052381112017010CC  22646 12559100 6926                                  GG      0  1036  0  0 0                  03
052381112017010DI      0     0  0  0 0                                          0     0  0  0 0                  04
```

- All performance data files must be text files and have the file extension “txt” or it will not upload to webE-GADS
- Data is due 45 days after the end of each quarter
- Monthly or year-to-date data is accepted by webE-GADS
  - Strongly recommend year-to-date submittals as it is the best way to capture changes

Unit Identification

05 Performance Data File: Section A - Unit Identification, Record 01

Data Field	Columns	05					
Record Code	01-02						
Utility (Company) Code	03-05						
Unit Code	06-08						
Year	09-12						
Report Period	13-14						
Report Revision Code	15						

Required
Voluntary
Blank

- Section A is used to identify the unit
  - For which utility-unit is the performance data being reported?
- There are six (6) data fields per record as shown above

Unit Generation Performance

05 Performance Data File: Section B - Unit Generation Performance, Record 01

Data Field	Columns
Gross Maximum Capacity	16-21
Gross Dependable Capacity	22-27
Gross Actual Generation	28-36
Net Maximum Capacity	37-42
Net Dependable Capacity	43-48
Net Actual Generation	49-57

Required
Voluntary
Blank

- Section B is used to report the unit's generation performance
  - What was the installed capacity on this unit for the month?
  - What was the actual generation on this unit for the month?
- There are six (6) data fields per record as shown above

Unit Starting Characteristics

05 Performance Data File: Section C - Unit Starting Characteristics, Record 01

Data Field	Columns	01
Unit Loading Characteristic	58	
Attempted Unit Starts	59-61	
Actual Unit Starts	62-64	
Blank Columns	65-98	
Verbal Description	99-123	
Record Number	123-124	

Required
Voluntary
Blank

- Section C is used to report the unit's starting performance
  - What was the starting performance of the unit for the month?
- There are five (5) data fields per record as shown above
  - Verbal Description (for Unit Loading Characteristic = Other)
  - Record Number
    - 01 uniquely identifies it as the first record in the performance data file

Unit Time Information

05 Performance Data File: Section D - Unit Time Information, Record 02

Data Field	Columns	02
Unit Service Hours	16-20	
Reserve Shutdown Hours	21-25	
Pumping Hours	26-30	
Synchronous Condensing Hours	31-35	
Available Hours	36-40	
Planned Outage Hours	41-45	
Forced Outage Hours	46-50	
Maintenance Outage Hours	51-55	
Extensions of Scheduled Outages	56-60	
Unavailable Hours	61-65	
Period Hours	66-70	
Inactive Hours	71-75	
Blank Columns	76-123	
Record Number	124-125	

Required
Voluntary
Blank

- Section D is used to report the unit time information
  - What is the unit time information on the unit for the month?
    - Sums of hours for various states on the unit during the month
- There are thirteen (13) data fields per record as shown above

Fuels

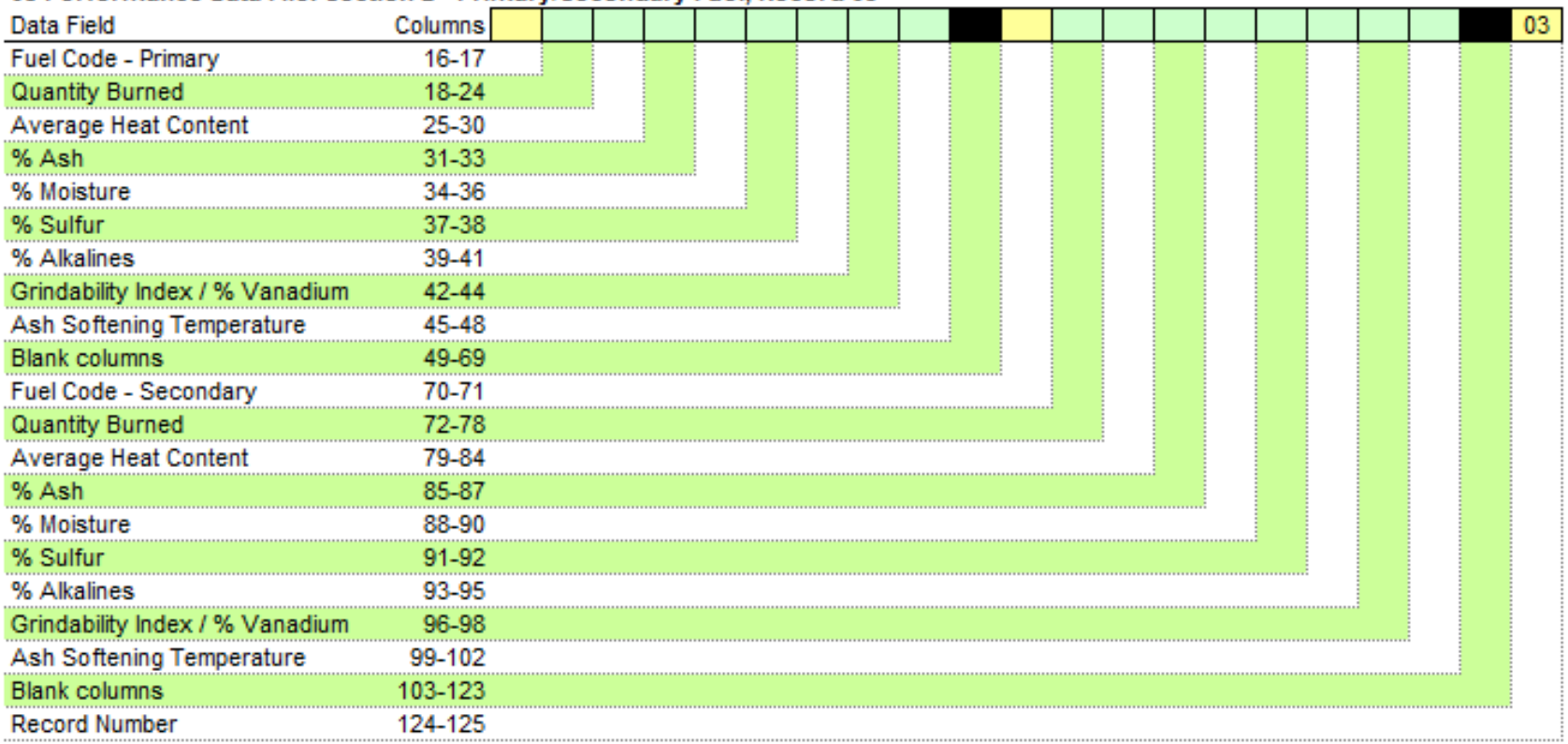
Section E - Primary fuel, col 16 - 69	Section E - Secondary fuel, col 70 - 125	03
Section F - Tertiary fuel, col 16 - 69	Section F - Quaternary fuel, col 70 - 125	04

- Sections E and F are used to report the fuels burned in the unit for the month
  - What type of fuels were burned for the month?
  - How much of each fuel was burned for the month?
- There are nine (9) data fields per fuel plus Record Number as shown on the next slide

Fuels (cont.)

05 Performance Data File: Section E - Primary/Secondary Fuel, Record 03

Data Field	Columns
Fuel Code - Primary	16-17
Quantity Burned	18-24
Average Heat Content	25-30
% Ash	31-33
% Moisture	34-36
% Sulfur	37-38
% Alkalines	39-41
Grindability Index / % Vanadium	42-44
Ash Softening Temperature	45-48
Blank columns	49-69
Fuel Code - Secondary	70-71
Quantity Burned	72-78
Average Heat Content	79-84
% Ash	85-87
% Moisture	88-90
% Sulfur	91-92
% Alkalines	93-95
Grindability Index / % Vanadium	96-98
Ash Softening Temperature	99-102
Blank columns	103-123
Record Number	124-125



Questions and Answers