SPP Performance Based Accreditation for Generation Capacity

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KANSAS POWER POOL

Highlights

- **Background**
- **NERC GADS**
  - North American Electric Reliability Corporation Generation Availability Data System
- **EFORd**
- **Current proposals and implementation**

Background of Initiative

- **There is growing concern about SPP's current thermal generation accreditation practices**
  - Solar and Wind units are analyzed and accredited based on performance relative to peak hours
  - Thermal units are awarded accredited generation capacity based on testing every five years at temperatures within 10 degrees of design conditions
    - There is no consideration of the reliability or availability of the unit, merely that it passes the test every 5 years.
- **Recent events have highlighted this concern**
  - Retirements of thermal units
  - 2021 Winter Storm Uri events
  - Shortages of available generation during summer and shoulder months due to outages
  - Extended maintenance outages
- **Other electric markets in the Midwest and Northeast have addressed this issue by integrating generation performance and availability into accreditation**
  - These markets also have a capacity market and market participants sell and buy capacity in that market

Background of Initiative (cont)

- **SPP's groups working on performance based accreditation**
  - Improved Resource Availability Task Force (IRATF)
    - This is a commission led task force looking at ways to increase generation avability
    - Members include state commissioners and SPP members
  - Supply Adequacy Working Group (SAWG)
  - Operating Reliability Working Group (ORWG)
  - Generation Testing Task Force (GTTF)
- **There is broad consensus that the metrics to measure availability of conventional resources would be based on generation statistics**
- **NERC GADS is already in place for larger generation plants and NERC jurisdictional utilities to collect operating statistics for most conventional generating plants**

NERC GADS

- **GADS consists of very detailed generation reporting requirements**
  - This is data originally developed by the electric industry itself under guidance of the Edison Electric Institute (EEI) in the early 1960s
  - GADS superseded the EEI data in 1982.
  - Today GADS is required for generating units subject to the NERC and 20 MW or larger
- **GADS reporting requirements**
  - Latest version (January 1, 2022) is 1130 pages long
  - It can be downloaded in pdf format at https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/2022_GADS_DRI.pdf

NERC GADS (continued)

- **Types of GADS statistics you may be familiar with already**
  - Capacity Factor (CF)
    - This is the MWH produced by a unit over a given period of time (usually a year) divided by the amount of energy the unit could have produced if it operated at 100 percent capability over the entire time period.
    - Example, a generating unit that has a capability of 1 MW produced 4,380 MWH over a period of 1 year (8,760 hours) CF = 4,380 / (8,760 hours * 1 MW) = 50%
  - Other common GADS statistics
    - Availability Factor (AF) - % of hours the unit was available to generate
    - Equivalent Availability Factor (AEF) - % of hours the unit was available to produce its rated capacity
    - Forced Outage Rate – Forced Outage Hours divided by hours the unit was in service and available (does not include planned outages or outages the were not the responsibility of the generator).

NERC GADS (continued)

- **GADS statistics used to determine reliability –debate was between 2 factors**
  - Equivalent Forced Outage Factor (EFOF)
    - Forced outage hours + Equivalent forced derate hours over the hours of a specified period (usually a year)
    - Equivalent forced derate hours are hours the unit was forced to derate
      - Equivalent forced derate example – unit limited to 50% for 10 hours is the same as 5 forced outage hours
  - Equivalent Forced Outage Rate demand (EFORd)
    - This is a more complicated statistic to compile
    - EFORd attempts to track the hours a unit would have operated had it not been available due to a forced outage
      - For example, even if you needed the unit, it would not operate if out for planned maintenance – this would not be a “demand” period that you were out because of a forced outage.

EFORd

$$\mathbf{EFORd} = \frac{\mathbf{FOHd + EFDHd}}{\mathbf{SH + FOHd}} \mathbf{x\ 100\%}$$

Where: FOHd = f x FOH
EFDHd = (EFDH – EFDHRS) if reserve shutdown events reported, or
= (fp x EFDH) if no reserve shutdown events reported – an approximation.
fp = (SH/AH)

NOTE: FOHd is the number of hours a unit was in a U1, U2, U3, or SF AND the unit would have operated had it been available. FOHd can be determined directly if periods of demand are recorded. Demand can be defined as the traditional demand for the generating unit for economic or reliable operation of the system, or it can be any other user-defined condition, such as specific weather condition, load level, or energy price. When FOHd is determined directly from recorded periods of demand, service hours (SH) in the above equation should include only those under the specified demand condition. If periods of demand are not recorded, FOHd may be estimated using the demand factor f. The demand factor is applicable to traditional demand for economic or reliable system operation.

$$f = \left(\frac{1}{r} + \frac{1}{T}\right) / \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D}\right)$$

r=Average forced outage deration = (FOH) / (# of FO occurrences)
D=Average demand time = (SH) / (# of unit actual starts)
T=Average reserve shutdown time = (RSH) / (# of unit attempted starts)

Equations Considered

Equation 1	$$EFOF' = \frac{FOH + EFDH}{PH'}$$ $$PH' = PH - MOH - POH - EMDH - EPDH$$
Equation 2	For resources with at least 100 Service Hours per season: $$EFORd = \frac{FOHd + EFDHd}{SH + FOHd}$$ For resources less than 100 Service Hours per season: $$EFORd' = \frac{FOHd + EFDHd}{SH' + FOHd}$$ $$SH' = \left[\left(\frac{Actual\ Starts}{Attempted\ Starts}\right) * \left(\frac{Months\ of\ Operation}{4} * 100 - SH\right)\right] + SH$$

Why was EFORd Adopted?

- **The concern is that there are a lot of units that don't operate very often**
  - How do you know it will actually work if it doesn't run often?
  - SPP compiled the following analysis based on the different equations

Weighted Average by Technology and fuel type for the summer season	Max Capacity (MW)	EFORd	EFORd'	EFOF	EFOF'
Coal	21,131	8.0%	7.9%	7.2%	7.5%
Nuclear	1,980	1.2%	1.2%	1.1%	1.3%
Gas (0-100 MW)	7,189	9.0%	7.1%	5.2%	5.5%
Gas (101+ MW)	11,983	11.1%	10.9%	7.8%	8.9%
Combined Cycles	9,441	3.3%	3.1%	2.8%	2.9%
Petroleum	1,053	12.0%	3.0%	2.4%	2.6%
Hydro	3,093	2.1%	1.9%	1.6%	1.7%

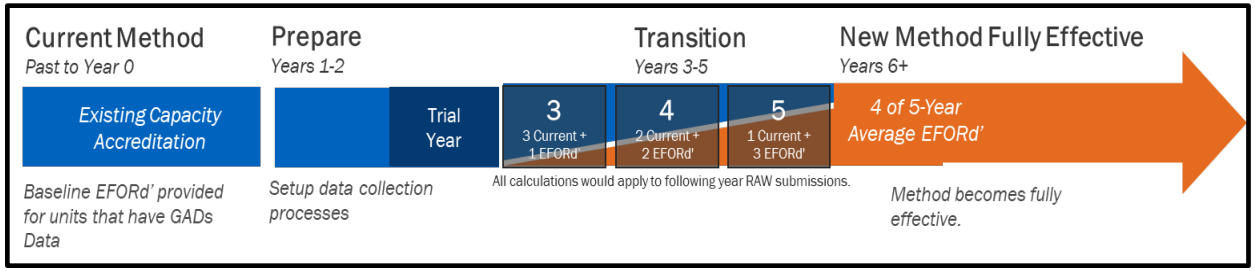
How will EFORd work?

- **Basically, each unit, even our small DNR units, will track EFORd'**
- **The resulting EFORd' number will be used to adjust the capacity we can use to meet our reserve margin**
- **For example, suppose we have a generator that has performed a capability test at 3 MW, but has an EFORd' of 10%.**
  - Today we would count that as 3 MW of capacity
  - With the move toward using EFORd' as a performance adjustment that will change as follows
  - New Accredited capacity = 3 MW * (1 – 10%) = 2.7 MW.

What is the recommended timetable and implementation

- **The IRATF proposal was to collect data for the first two years – 2022 and 2023**
- **The worst year out of five would be disallowed**
  - If you have a unit with a major outage in one year you can exclude that from your EFORd' calculation
- **A five year rolling average EFORd' is to be used to adjust capacity values**
- **The change would then be implemented over several years.**

Proposed Timetable



Year	Period		Accreditation
2022	Prepare	Set up outage collection process Collect data	Current If problems w/ collection process, will need a default value to use.
2023	Prepare	Collect data	Current
2024	Transition	Collect data	[3 * Current (2023) + 1 * PBA (1 of 2, 2022-23)] / 4
2025	Transition	Collect data	[2 * Current (2024) + 2 * PBA (2 of 3, 2022-24)] / 4
2026	Transition	Collect data	[1 * Current (2025) + 3 * PBA (3 of 4, 2022-25)] / 4
2027	New Method	Collect data	PBA, best 4 of 5 (2022-26)

Next Steps

- **The SPP MOPC approved the change with one caveat – to delay implementation for one year and collect data for 2022 – 2024**
  - The board will ultimately decide whether to accept MOPC's modification
  - Data collection is officially to start June 2022
- **SPP Staff has agreed to provide training for utilities (such as municipals) that have not collected GADS data before**
- **They have also provided a simplified spreadsheet for use.**
- **We will be working with our cities to get the training and spread sheet out for use**
  - We believe we can help recreate data for the summer of 2022

- **Questions?**