



PCDS Meeting

November 29, 2023

WECC Staff

Path Rating Review

2023 Path Catalog Comparison to 2034 HS1 Topology

Transfer Limit Updates:

Potential Transfer Limit Adjustments	Updates shown in Gold w/ White Text									
	2023 Path Catalog Transfer Limits (MW)				In Place Transfer Limits (MW)					
	Min		Max		Min		Max		Direction	
Interface Name	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Min	Max
P14 Idaho to Northwest	(1,340)	(1,340)	2,400	2,300	(2,250)	(2,250)	3,400	3,400	West to East	East to West
P17 Borah West	(1,600)	(1,600)	2,557	2,557	(4,450)	(4,450)	N/A	N/A	West to East	East to West
P19 Bridger West	(1,250)	(1,250)	2,400	2,400	N/A	N/A	4,100	4,100	West to East	East to West
P20 Path C	(1,600)	(1,600)	1,250	1,250	(2,250)	(2,250)	2,250	2,250	North to South	South to North
P29 Intermountain-Gonder 230 kV	(250)	(250)	N/A	N/A	(241)	(241)	241	241	East to West	West to East
P46 West of Colorado River (WOR)	(11,200)	(11,200)	11,200	11,200	(13,400)	(13,400)	13,400	13,400	Undefined	Undefined
P49 East of Colorado River (EOR)	(10,100)	(10,100)	N/A	N/A	(10,200)	(10,200)	10,200	10,200	East to West	West to East
P71 South of Allston	(1,480)	(1,480)	3,100	3,100	(1,480)	(1,170)	3,100	2,725	South to North	North to South
P82 TotBeast	N/A	N/A	2,465	2,465	N/A	N/A	3,515	3,515	East to West	West to East
P25 PacifiCorp/PG&E 115 kV Interconnection*	(45)	(45)	100	80	(45)	(45)	100	80	South to North	North to South
*Only update for P25 is October shows Summer limit. Needs to be updated to winter limit.										

Path Rating Review

Path/Line Additions:

Paths/Lines Found in Catalog, not in Dataset (Proposed Additions)						
Path/Interface Name	WECC Path Catalog Name	Line or Entire Path?	Bus 1 Name	Bus 2 Name	Bus1 #	Bus2 #
P05 West of Cascades-South	Jones Canyon-Santiam 230 kV	Line	JONESCYN	TUMBL_CREEK+	47814	41079
P06 West of Hatwai	N. Lewiston (AVA)-Tucannon River (BPA) 115 kV	Line	N LEWIST	TUCANN R	48253	41400
P08 Montana to Northwest	Mill Creek-Anaconda (BPA) 230 kV line	Line	MILL CREEK	ANACONDA	621001	621000
P15 Midway-LosBanos	Los Banos-Midway 500 kV line	Line	LOSBANOS	DIABLOCNYNSS	30050	30057
P18 Montana-Idaho	Dillon Salmon - Big Grassy 161 kV	Line	DILLONSALMON	DELL VEC	621004	621053
P20 Path C	Threemile Knoll 138*/345 kV transformer	Line	3MIKNOLL	3MIKNOLL	65384	65291
P20 Path C	Threemile Knoll 138*/115 kV transformer	Line	3MIKNOLL	3MIKNOLL	65921	65286
P36 TOT 3	Cheyenne-Owl Creek 115 kV	Line	CHEYENNE	OWL_CRK	73043	73597
P38 TOT 4B	Casper-Midwest 230 kV	Line	CASPERPP	MIDWEST	65300	65955
P38 TOT 4B	Spence-Thermopolis 230 kV	Line	SPENCE	BADWATER	66410	65095
P39 TOT 5	Hopkins-Malta 230 kV	Line	HOPKINS	HAGERMAN_TP	70232	70111
P41 Sylmar to SCE	230/220 kV Transformer Bank E	Entire Path	SYLMAR	SYLMAR220	26094	26098
	230/220 kV Transformer Bank F		SYLMAR	SYLMAR220	26094	26098
	230/220 kV Transformer Bank G		SYLMAR	SYLMAR220	26094	26098
P49 East of Colorado River	Perkins - Mead 500 kV line	Line	PERKINS	FMITS-01	15034	14020
P79 TOT 2B2	Sigurd-Glen Canyon 230 kV line	Entire Path	SIGURD	SIGURDPS	66345	66355
P87 West of McNary	Jones Canyon-Santiam 230 kV line	Line	JONESCYN	TUMBL_CREEK+	47814	40939

Path Rating Review

Path/Line Removals:

Paths/Lines Not Found in 2023 Catalog (Proposed Removals)					
Path/Interface Name	Line or Entire Path?	Bus 1 Name	Bus 2 Name	Bus1 #	Bus2 #
P05 West of Cascades-South	Line	ALFALFA+	NBONVL E	40039	40141
P14 Idaho to Northwest	Line	HEMLON12	LONGHORN	60158	40325
P19 Bridger West	Line	ANPOPC&1	ANTICLIN	67811	67826
P47 Southern New Mexico (NM1)	Line	WESTMESA	ARR___PS	10369	11014
P48 Northern New Mexico (NM2)	Line	WESTMESA	ARR___PS	10369	11014
P73 North of John Day	Entire Path	ROCK CK	WAUTOMA	41401	41138
		PAUL	RAVER	40821	40869
		ASHE	ASHE R1	40061	40062
		MCNARY	SACJWA#	40723	40917
		ASHE	SLATT	40061	40989
		KNIGHT	WAUTOMA	41450	41138
P82 TotBeast	Line	HEMLON12	LONGHORN	60158	40325

Approval Item

- Make the presented edits to the Path Information as is pending transmission updates and ratings in Phases 2 and 3 (If projects are in 2034 HS)
 - Approved

Path Rating Process-Posted for Review Path Re-Ratings (Annual Progress Report)

Path 15 Midway – Los Banos	Existing: N-S 2,000-3,265 MW	
	Proposed: To N-S 3,700-4,600 MW	
	2023 Path Rating Catalog	The transfer limit ranges from 2,000-3,265 MW from north-to-south The transfer limit ranges from 4,800-5,400 MW from south-to-north
Path 26 Northern- Southern California	Existing: S-N 3,000 MW	
	Proposed: S-N 4,400 MW	
	2023 Path Rating Catalog	North-to-South: 4,000 MW South-to-North: 3,000 MW
Path 42 IID-SCE	Existing: 750 MW	
	Proposed: 1,200 MW	
	2023 Path Rating Catalog	Transfer Limit East-to-West: 750 MW West-to-East: Not rated

Path Re-Ratings

Path 46 West of Colorado River (WOR)

Existing: 11,200 MW

Proposed: 13,300 MW (With the North Gila-Imperial Valley #2 (NGIV#2), a project currently in Phase 2 of the WECC Path Rating Process, the non-simultaneous rating of Path 46 to 13,500 MW)

2023 Path Rating Catalog

11,200 MW

Path 61 Lugo-Victorville 500 kV line

Existing: 2,400 MW (Victorville-Lugo)

Proposed: 2,900 MW (Victorville-Lugo)

2023 Path Rating Catalog

Transfer Limit Victorville-Lugo: 2,400 MW

Lugo-Victorville: 900 MW

Path 66 California – Oregon Intertie COI

Existing: N-S 4,800 MW

Proposed: N-S 5,100 MW

2023 Path Rating Catalog

4,800 MW north-to-south

3,675 MW south-to-north

Path Re-Ratings

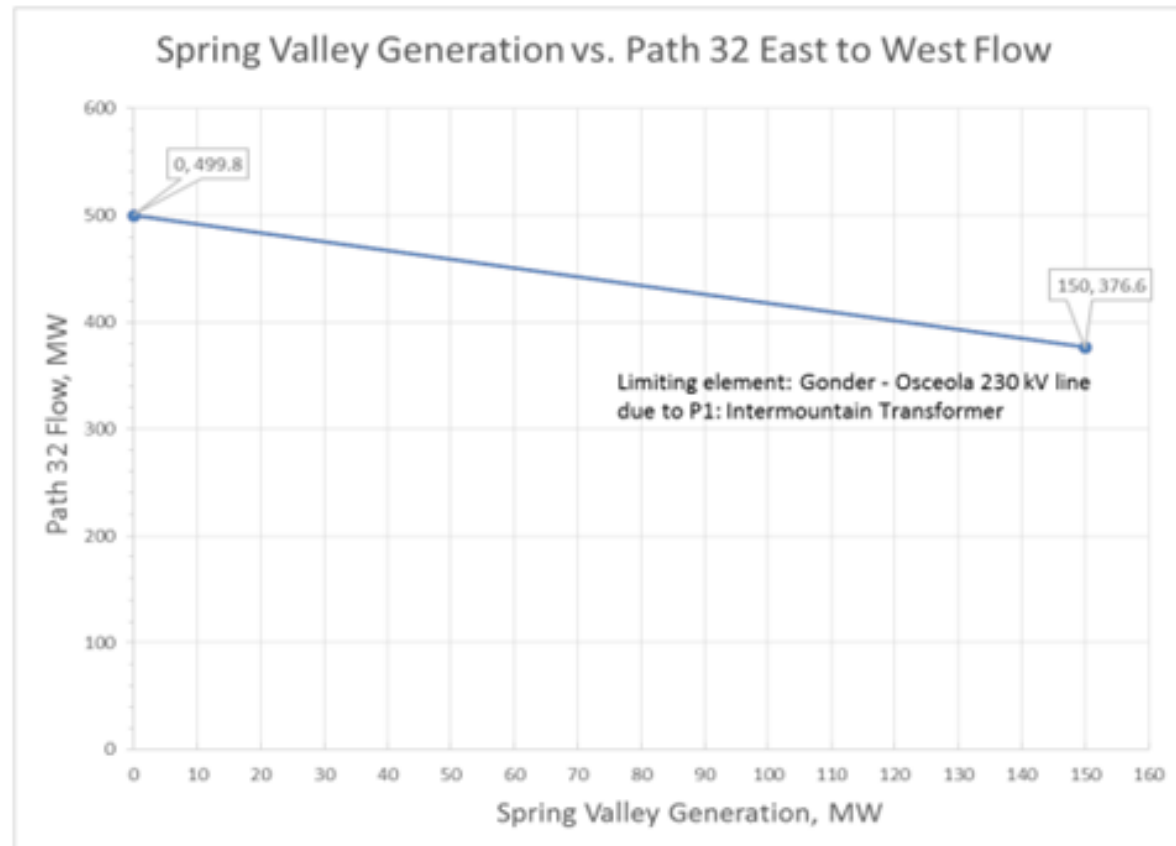
- Path 71 (BPA said to use this rating)
 - Proposed: 3,100 MW for N-S Path limit for SOA
 - 2023 Path Rating Catalog
 - Transfer Limit The North-to-South Transfer limit varies between 2,725 MW to 3,100 MW
 - The South-to-North Transfer limit varies between 1,170 MW to 1,480 MW

Path Rating and Nomogram Results

- Paths Re-ratings include—(Use proposed path ratings Yes/No):
 - 15 (No), 26 (No), 42 (Yes, 1,115 MW), 46, 61, 66 (No), 71 (Yes)
- Paths with mentioned nomograms include (Use Yes/No):
 - Path 15, 17 (No), 19 (No), 20 (No), 28, 29, 32 (Yes), 65, 66 (No), 76 (No), 80, 81, 84 (No), 85 (No)

Path 32 Nomogram

Spring Valley Generation	Path 32 Flow
150	376.6
0	499.8



Approval Items

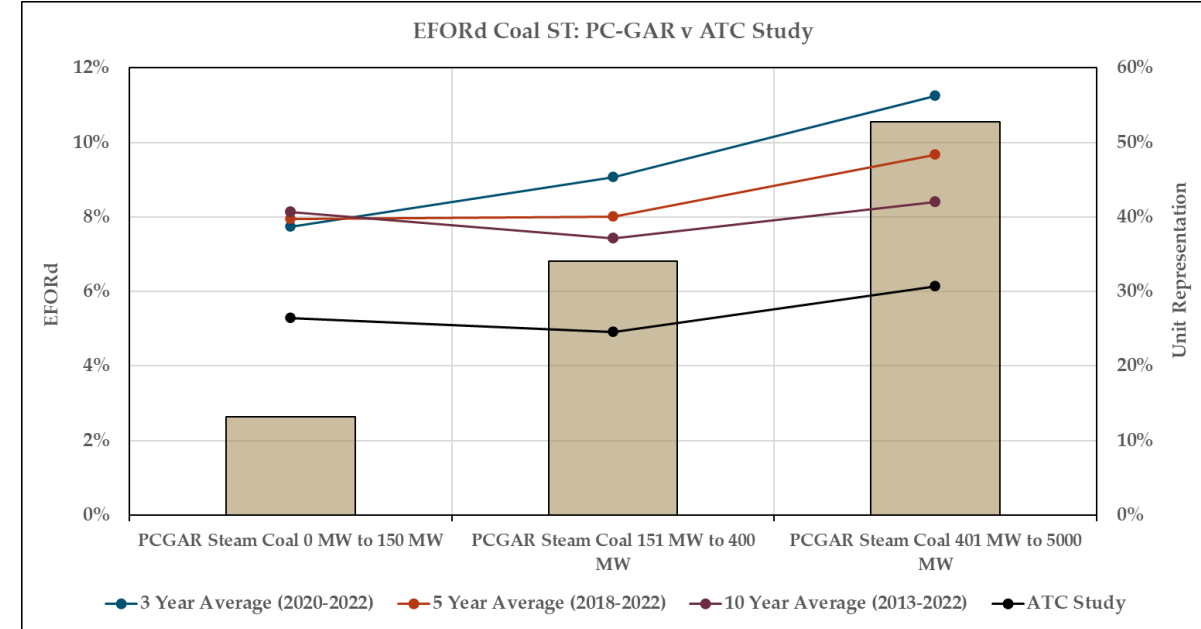
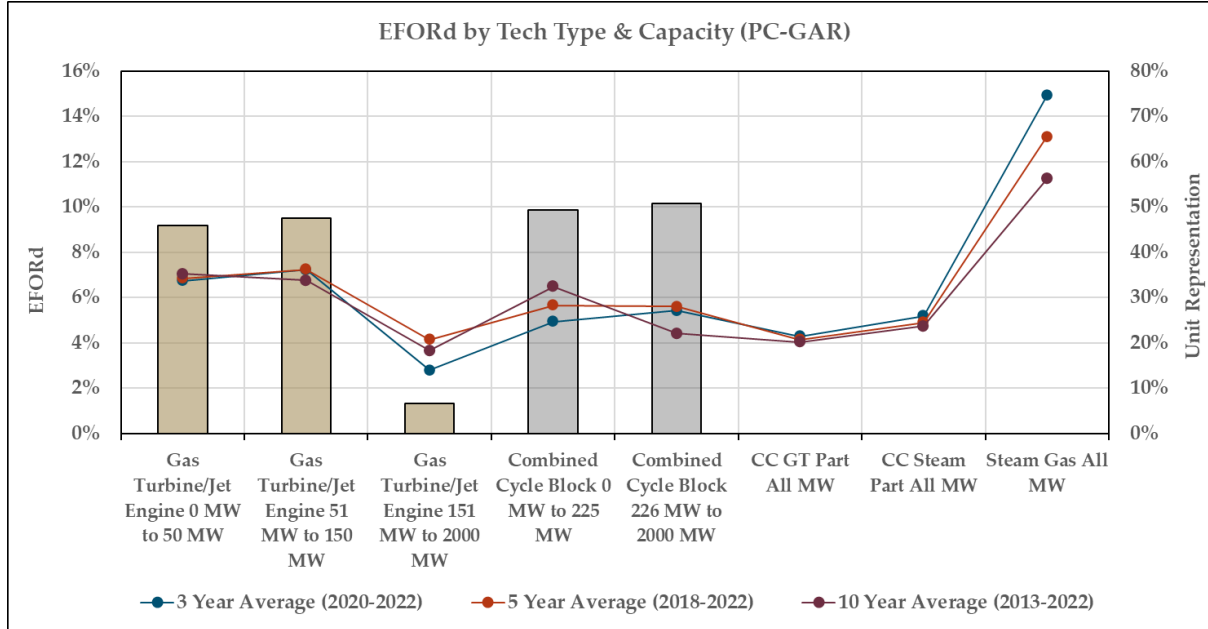
- Make the presented edits to the Path Re-ratings
 - Path 42 (1,115 MW) and path 71 (3,100 MW)
 - Pending any other feedback from other path contacts
 - Approved pending any other feedback from other path contacts
- Implement nomogram for path 32, pending any other feedback from other path contacts
 - Approved pending any other feedback from other path contacts

Area / Region Name	2026 ADS (\$/MWh)	2028 ADS (\$/MWh)	2021 OASIS Wheeling Rates (\$/MWh) On Peak\Off Peak	2030 ADS V 2.0 Rates (\$/MWh)	2032 ADS Rates (\$/MWh)	2034 ADS Rates (\$/MWh)	Source
AB_AESO	2.14	2.34	1.22	1.22	1.22	1.18	https://www.aeso.ca/rules-standards-and-tariff/tariff/iso-tariff/
BC_BCHA	7.11	9.92	Im \$9 \ Ex \$3	3.00	Im \$9 \ Ex \$3	9.71/3	OATT Schedule 01 – 23rd Revision (Effective: April 1, 2023) (bchydro.com)
BS_IPCO	2.67	2.91	6.12 \ 3.42	3.42	6.37 \ 3.56	3.51	Microsoft Word - IPCO Current Transmission Rates 10-26-23 (oati.com)
BS_PACE	3.08	3.83	7.77 \ 3.70	3.70	9.00 \ 4.29	8.92/4.25	Rate Table 20230601.xlsx (oati.com)
CA_BANC	2.53	2.76	9.18 \ 3.35	3.35	9.18 \ 3.91	9.18/4.77	Microsoft Word - SMUDTariffFinal2011Update.docx (oati.com)
CA_CFE	2.31	2.52	4.80	4.80	Not Found	4.80	Actualización de cargos por servicios de transmisión para energías renovables y cogeneración eficiente: CRE - Energía Hoy (energiahoy.com)
CA_CISO	10.98	13.05	13.59	13.59	13.81	14.45	WheelingAccessRatesEffectiveJun06132023R7.pdf (caiso.com)
CA_IID	3.32	3.62	6.83/3.82	3.82	6.83 \ 3.82	6.83 \ 3.82	https://demo.oasis.oati.com/woa/docs/TANC/TANCdocs/TANC_Trans_Rates_09-18-2020.pdf
CA_LDWP	5.84	6.37	8.47 \ 4.022	4.02	8.47 \ 4.022	8.47 \ 4.022	http://www.oasis.oati.com/woa/docs/LDWP/LDWPdocs/LADWP_OATT_CLEAN_VERSION_for_Minor_Tariff_Change_(REVISED_Govt_1_Person_Use_Certificate)_7-24-20.pdf
CA_TIDC	2.53	2.53	5.95	Not used, Part of BANC+	Not Used, didn't look	Not Used 12.42	TANC OATT Effective July 1 2022 - FINAL - Full Document (D0488236x8DF41).pdf (oati.com)
NW_AVA	2.53	2.76	3.80	Not used, NW connections only	7.93	7.93/3.43	OATT 10-10-2023.pdf (oati.com)
NW_BPAT	1.91	2.08	4.41	4.41	4.74	4.74	2024-Final-Proposal-Transmission-Rate-Schedules-and-GRSPsFERC-approved.pdf (bpa.gov)
NW_NWMT	4.74	5.17	5.58 \ 5.58	5.58	5.58 \ 5.58	5.42	http://www.oasis.oati.com/NWMT/
NW_PACW	3.08	3.08	7.77 \ 3.70	3.70	9.00 \ 4.29	8.92/4.25	Rate Table 20230601.xlsx (oati.com)
NW_PGE	2.53	2.76	2.35	Not used, NW connections only	1.257 \ 0.718	1.60	PGE_OATT_06282023-v5.pdf (oati.com)
RM_PSCO	3.09	3.37	9.37 \ 5.37	5.37	9.875 \ 5.650	1.58	Open Access Same Time Information System & Open Access Transmission Tariff Transmission Xcel Energy
RM_WACM	7.98	5.43	3.98	3.98	4.06	3.59	WestConnect-Rate-Conversion-Table-Oct-2023.pdf (wapa.gov)
SW_AZPS	3.95	4.31	7.78 \ 4.35	4.35	7.48 \ 4.18	7.16/4	2023 Effective Formula Rates 20230601.pdf (oati.com)
SW_EPE	4.16	4.53	5.705 \ 3.326	3.33	5.55 \ 3.170	5.42/3.1	2023 Transmission Rate Summary.pdf (oati.com)
SW_NVE	6.96	7.59	5.94 \ 3.33	3.33	5.94 \ 3.33	0.01/0	NVE OASIS Tariff Rates Summary - Effective 03-11-2022.pdf (oati.com)
SW_PNM	4.16	4.53	7.19 \ 7.19	7.19	8.595 \ 8.595	8.03	2023 OATT Service Rates Table Effective 06-1-23 posted 05-01-23.pdf (oati.com)
SW_SRP	2.02	2.52	7.06 \ 4.02	4.02	6.17 \ 3.51	6.17/3.51	Summary Changes Rates 2015 v3.pdf (oati.com)
SW_TEPC	3.57	3.89	6.875 \ 3.93	3.93	6.458 \ 3.690	2.68	OATI OASIS
SW_WALC	1.91	2.08	2.36	2.36	2.32	2.44	WestConnect-Rate-Conversion-Table-Oct-2023.pdf (wapa.gov)

Approval Item

- Make the presented edits to the Wheeling Rates
 - NW, no wheeling internal to NW
 - Show table in model next time what we have vs. the new rates, and approve

EFORd Comparisons



Takeaways:

- The three-, five-, and 10-year EFORd averages appear to be relatively similar for GTs and CCs.
- Steam turbine gas units show a slight correlation between increasing EFORd and reporting timeframe reduction.

- The American Transmission Company (ATC) CEMs Data ranging from 2002–2015 appears to consistently be less than the EFORd being calculated via GADs data by PC-GAR regardless of reporting timeframe. Re-evaluation of ATC data relevancy is recommended.

Approval Item

- Model EFORd as follows:
 - Gas—TBD next time
 - Coal—TBD next time



Appendix

EFORd Comparison Data Tables:

EFORd Comparison by Time Period		Max Capacity Bandwidths		Metrics		
Time Period	Technology Type	Capacity From	Capacity To	# of Units	# of Utilities	EFORd (%)
3 Year Average (2020-2022)	Gas Turbine/Jet Engine	0	50	210	56	6.74
	Gas Turbine/Jet Engine	51	150	217	47	7.22
	Gas Turbine/Jet Engine	151	2,000	30	14	2.79
	Combined Cycle Block	0	225	33	14	4.94
	Combined Cycle Block	226	2,000	34	14	5.43
	CC GT Part	All	All	272	66	4.28
	CC Steam Part	All	All	137	63	5.18
	Steam Gas	All	All	85	30	14.93
5 Year Average (2018-2022)	Gas Turbine/Jet Engine	0	50	215	57	6.84
	Gas Turbine/Jet Engine	51	150	238	49	7.24
	Gas Turbine/Jet Engine	151	2,000	30	14	4.14
	Combined Cycle Block	0	225	33	14	5.66
	Combined Cycle Block	226	2,000	40	16	5.61
	CC GT Part	All	All	277	68	4.14
	CC Steam Part	All	All	140	65	4.90
	Steam Gas	All	All	106	32	13.10
10 Year Average (2013-2022)	Gas Turbine/Jet Engine	0	50	241	62	7.05
	Gas Turbine/Jet Engine	51	150	266	56	6.76
	Gas Turbine/Jet Engine	151	2,000	44	16	3.66
	Combined Cycle Block	0	225	39	17	6.48
	Combined Cycle Block	226	2,000	57	19	4.41
	CC GT Part	All	All	309	77	4.03
	CC Steam Part	All	All	155	72	4.74
	Steam Gas	All	All	154	39	11.25

Coal Steam Unit EFORd Comparison by Time Period: PC-GAR v ATC	Max Capacity Bandwidths		Metrics		
Time Period	Capacity From	Capacity To	# of Units	# of Utilities	EFORd (%)
PC-GAR: 3 Year Average (2020-2022)	0	150	11	8	7.74
	151	400	30	17	9.06
	401	5,000	44	18	11.25
PC-GAR: 5 Year Average (2018-2022)	0	150	12	8	7.94
	151	400	31	17	8.00
	401	5,000	48	19	9.68
PC-GAR: 10 Year Average (2013-2022)	0	150	22	11	8.14
	151	400	42	18	7.42
	401	5,000	51	21	8.40
American Transmission Company Coal Outage Rates: CEMS Data (2002-	0	150	NA	NA	5.29
	151	400	NA	NA	4.91
	401	5,000	NA	NA	6.13

Where: FOHD = $f \times \text{FOH}$

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.

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

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

56. Equivalent Forced Outage Rate – EFOR

$$\text{EFOR} = \frac{\Sigma (\text{FOH} + \text{EFDH})}{\Sigma (\text{FOH} + \text{SH} + \text{Synchronous Condensing Hours} + \text{Pumping Hours} + \text{EFDHRS})} \times 100\%$$

57. Equivalent Forced Outage Rate demand – EFORd (See Notes 1 and 2 at the end of this section.)

$$\text{EFORd} = \frac{\Sigma (\text{FOHD} + \text{EFDHd})}{\Sigma (\text{SH} + \text{FOHD})} \times 100\%$$