2020-2021 NYCA IRM Requirement Study

Preliminary Base Case (PBC) Model Assumptions

Assumption Matrix

Draft V 1.0

~~January 29~~April 30, 2019

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Load Parameters

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2018 Gold Book NYCA: 32,857MW NYC: 11,474 MW LI: 5,323 MW G-J: 15,815 MW	2019 Gold Book NYCA: 32,202MW[1] NYC: 11,651 MW LI: 5,134 MW G-J: 15,911 MW	Most recent Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases		
2	Peak Load Forecast (Final Base Case)	October 2018 Fcst. NYCA: 32,488 MW NYC: 11,585 MW LI: 5,346 MW G-J: 15,831 MW	October 2019 Fcst. NYCA: xxxxxMW NYC: yyyyy MW LI: zzzz MW G-J: rrrrr MW	Forecast based on examination of 2019 weather normalized peaks. Top three external Area peak days aligned with NYCA		
3	Load Shape (Multiple Load Shape)	Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007	Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007	ICS Recommendation		
4	Load Forecast Uncertainty (LFU)- Summer	Zonal Model to reflect current data with input from Con Ed and LIPA. (Attachment A)	Zonal Model to reflect current data with input from Con Ed and LIPA. (Attachment A)	Based on TO and NYISO data and analyses.		
5	LFU Winter	No update	Updated See (Attachment A1)	Existing Winter LFU may no longer be representative.		

*(-) indicates a reduction in IRM while (+) indicates an increase. Range: Low < 0.5%, Medium 0.5% - 1%, High > 1%, Minimal indicates there may be some movement but within 0 to +/- 0.1%.

[1] The loads associated with the BTM-NG program need to be added to these values, see attachment B-4.

Generation Parameters

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	Existing Generating Unit Capacities	2018 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2019 Gold Book values. Use min (DMNC vs. CRIS) capacity value	Latest Gold Book publication		
2	Proposed New Units (Non-Renewable) and re-ratings	MW 11.1 MW of new non- wind resources, plus 209.3 MW of project related re-ratings. (Attachment B1)	MW ddd MW of new non- wind resources, plus eee MW of project related re-ratings. (Attachment B1)	Latest Gold Book publication, NYISO interconnection queue, and generator notifications		
3	Retirements, Mothballed units, and ICAP ineligible units	0 MW of retirements, 399.2 MW of unit deactivations, and 389.4 MW of IIFO and IR (Attachment B2)	fff MW of retirements, ggg MW of unit deactivations, and hhh MW of IIFO and IR[2] (Attachment B2)	Latest Gold Book publication and generator notifications		
4	Forced and Partial Outage Rates	Five-year (2013-2017) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachment C)	Five-year (2014-2018) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachment C)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period		
5	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Based on schedules received by the NYISO and adjusted for history	Updated schedules		

[2] ICAP Ineligible Forced Outage (IIFO) and inactive Reserve (IR)

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
6	Summer Maintenance	Nominal 50 MWs – divided equally between zones J and K	Nominal iii MWs – divided equally between zones J and K	Review of most recent data		
7	Combustion Turbine Derates	Derate based on temperature correction curves provided	Derate based on temperature correction curves provided	Operational history indicates the derates are in-line with manufacturer's curves		
8	Existing and Proposed New Wind Units	158.3 MW of Wind Capacity additions totaling 1891.7 MW of qualifying wind (Attachment B3)	jjj MW of Wind Capacity additions totaling kkkk MW of qualifying wind (Attachment B3)	ICAP units based on RPS agreements, interconnection queue, and ICS input.		
9	Wind Shape	Actual hourly plant output over the period 2013-2017. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2014-2018. New units will use zonal hourly averages or nearby units.	Program randomly selects a wind shape of hourly production from the most recent five-year period for each model iteration.		
10	Solar Resources (Grid connected)	Total of 31.5 MW of qualifying Solar Capacity. (Attachment B3)	Total of ll MW of qualifying Solar Capacity. (Attachment B3)	ICAP Resources connected to Bulk Electric System		
11	Solar Shape	Actual hourly plant output over the period 2013-2017. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2014-2018. New units will use zonal hourly averages or nearby units.	Program randomly selects a solar shape of hourly production from the most recent five-year period for each model iteration.		

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
12	BTM- NG Program	Addition of Greenidge 4 to BTM NG program. 104.3 MW unit. Forecast load adjustment of 11.6 MW (Attachment B4)	Addition of ------- to BTM NG program. ---- MW unit. Forecast load adjustment of --- MW (Attachment B4)	Both the generation of the participating resources and the full host loads are modeled.		
13	Small Hydro Resources	Actual hourly plant output over the period 2013-2017.	Actual hourly plant output over the period 2014-2018.	Program randomly selects a Hydro shape of hourly production from the most recent five-year period for each model iteration.		
14	Large Hydro	Probabilistic Model based on 5 years of GADS data (2013-2017)	Probabilistic Model based on 5 years of GADS data (2014-2018)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period		
15	Land Fill Gas	Actual hourly plant output over the period 2013-2017.	Actual hourly plant output over the period 2014-2018.	Program randomly selects a LFG shape of hourly production from the most recent five-year period for each model iteration.		
16	New ESR (Energy Storage Resources)	None Modeled	10 MW of battery storage scheduled	Sensitivities on simplified model and GE software enhancement		

Transactions – Imports and Exports

	#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
	1	Capacity Purchases	Existing Rights: PJM – 1080 MW HQ – 1110 MW All contracts model as equivalent contracts	Existing Rights: PJM – 1080 MW HQ – 1110 MW All contracts model as equivalent contracts	Grandfathered Rights, ETCNL, and other awarded long-term rights.		
	2	Capacity Sales	Long Term firm sales Summer 279.3 MW	Long Term firm sales Summer hhh MW	These are long term federal contracts.		
	3	FCM Sales from a Locality[3]	No Sales modeled within study period	No Sales modeled within study period	White Paper, NYISO recommendation, and ICS discussions		
	4	Wheels through NYCA	None Modeled	300 MW HQ to NE equivalent contract		Y	
	~~4~~5	New UDRs (Unforced capacity Deliverability Rights)	No new UDR projects	No new UDR projects	Existing UDR elections are made by August 1st and will be incorporated into the model.		
	~~5~~6	New EDRs (External Deliverability Rights)	None	0 MWs for 2020 Study			

[3] Final FCM sales that will materialize are unknowable at the time of the IRM study. To reflect the impact these sales have on reliability, the NYISO applies a Locality Exchange Factor in the market.

Topology

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	Interface Limits	Update provided to TPAS with updated VFT return path. B and C lines out of service for base case. Par 33 from Ontario out of service. (Attachment E)	(Attachment E)	Based on the most recent NYISO studies and processes, such as Operating Study, Operations Engineering Voltage Studies, Comprehensive System Planning Process, and additional analysis including interregional planning initiatives.		
2	New Transmission	None Identified		Based on TO provided models and NYISO's review.		
3	AC Cable Forced Outage Rates	All existing Cable EFORs will be updated for NYC and LI to reflect most recent five-year history (2013-2017)	All existing Cable EFORs will be updated for NYC and LI to reflect most recent five-year history (2014-2018)	TO provided transition rates with NYISO review.		
4	UDR Line Unavailability	Five year history of forced outages (2013-2017)	Five year history of forced outages (2014-2018)	NYISO/TO review.		

Emergency Operating Procedures

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	Special Case Resources	July 2018 –1309 MW based on registrations and modeled as 903 MW of effective capacity. Monthly variation based on historical experience*	July 2018 –kkkk MW based on registrations and modeled as mmm MW of effective capacity. Monthly variation based on historical experience*	SCRs sold for the program discounted to historic availability. Summer values calculated from July 2019 registrations. Performance calculation updated per ICS presentations on SCR performance. (Attachment F)		
2	Other EOPs	713.4 MW of non-SCR/non-EDRP resources (Attachment D)	nnn MW of non-SCR/non-EDRP resources (Attachment D)	Based on TO information, measured data, and NYISO forecasts.		
3	EOP Structure	10 EOP Steps Modeled	12 EOP Steps Modeled	Add one to separate EA from 10 min reserve. Add 2nd as placeholder for Policy 5, Appendix C		

* The number of SCR calls is limited to 5/month when calculating LOLE based on all 8,760 hours.

External Control Areas

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	PJM	Load and Capacity data provided by PJM/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by PJM/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.		
2	ISONE, Quebec, IESO	Load and Capacity data provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.		
5	Reserve Sharing	All NPCC Control Areas indicate that they will initially share reserves equally among all members and then among non-members	All NPCC Control Areas indicate that they will initially share reserves equally among all members and then among non-members	Per NPCC CP-8 WG.		
6	Emergency Assistance	Statewide Limit of 3,500 MW of emergency assistance allowed from neighbors.	Statewide Limit of 3,500 MW of emergency assistance allowed from neighbors.	White paper on Modelling of Emergency Assistance for NYCA in IRM studies		

Miscellaneous

#	Parameter	2019 Model Assumptions	2019 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	MARS Model Version	Version 3.22.6	Version pp.p	Per benchmark testing and ICS recommendation. 3.23.417 available for testing		
2	Environmental Initiatives	No estimated impacts based on review of existing rules and retirement trends		Review of existing regulations and rules.		

Attachment A

NYCA Summer Load Forecast Uncertainty Model

2019 and 2020 Summer LFU Models

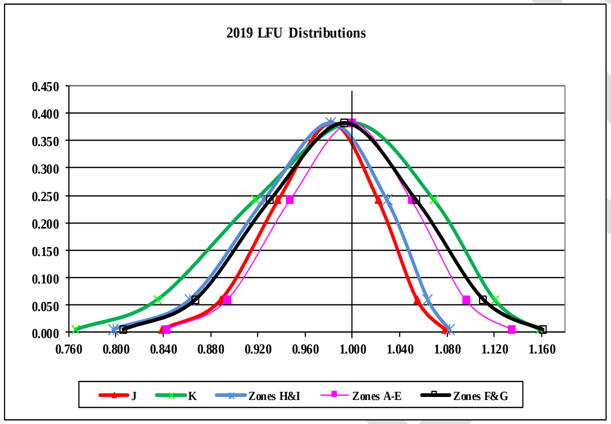
2019 Model is Unchanged from 2018- tbd

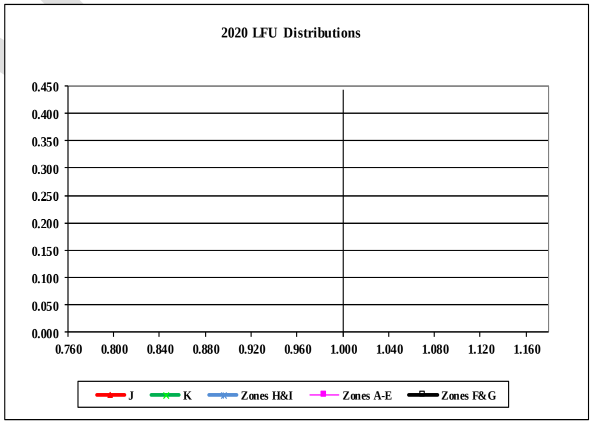
2019 Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.8431	0.8067	0.7978	0.8388	0.7659
2	0.0606	0.8944	0.8674	0.8624	0.8887	0.8351
3	0.2417	0.9474	0.9303	0.9249	0.9371	0.9175
4	0.3830	1.0000	0.9933	0.9817	0.9821	1.0000
5	0.2417	1.0502	1.0541	1.0293	1.0219	1.0695
6	0.0606	1.0959	1.1107	1.0639	1.0547	1.1206
7	0.0062	1.1351	1.1608	1.0822	1.0786	1.1586

2020 Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062					
2	0.0606					
3	0.2417					
4	0.3830					
5	0.2417					
6	0.0606					
7	0.0062					





Attachment A1

NYCA Winter Load Forecast Uncertainty Model

Previous and 2020 Winter LFU Models

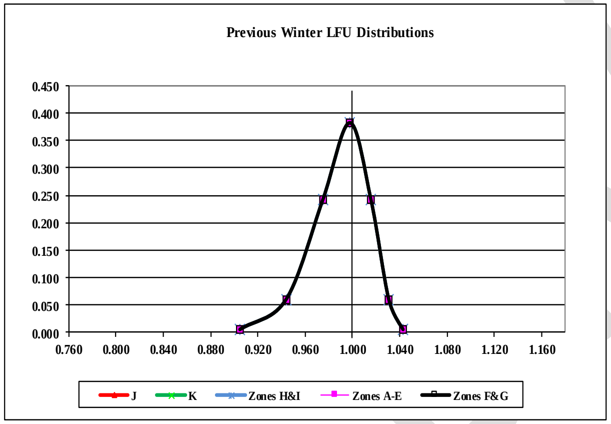
2019 Model is Unchanged from 2018- tbd

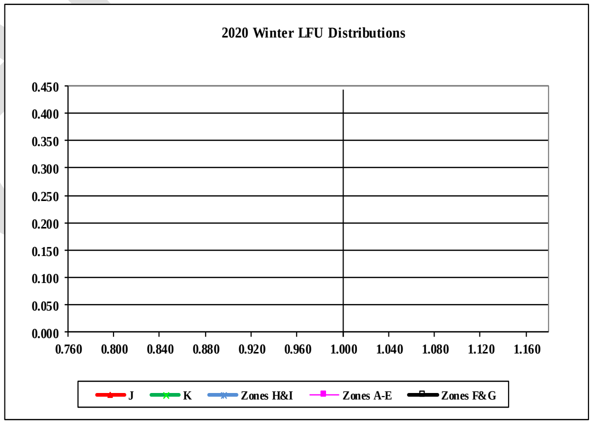
Previous Winter Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.9050	0.9050	0.9050	0.9050	0.9050
2	0.0606	0.9440	0.9440	0.9440	0.9440	0.9440
3	0.2417	0.9750	0.9750	0.9750	0.9750	0.9750
4	0.3830	0.9980	0.9980	0.9980	0.9980	0.9980
5	0.2417	1.0160	1.0160	1.0160	1.0160	1.0160
6	0.0606	1.0310	1.0310	1.0310	1.0310	1.0310
7	0.0062	1.0430	1.0430	1.0430	1.0430	1.0430

2020 Winter Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062					
2	0.0606					
3	0.2417					
4	0.3830					
5	0.2417					
6	0.0606					
7	0.0062					





Attachment B1

New Non-Intermittent Units and Unit Re-ratings[4]

B1 - Proposed Non-Intermittant Units and Unit Re-ratings (summer ratings)					
Project or Generator Name	**Zone**	**2019 MARS Model (MW)**	**2019 Gold Book (MW)**	**New or Incremental (MW)**	**2020 MARS Model (MW)**
New Units					
Cricket Valley Energy Center, LLC	G	0	1,020.0	1,020.0	1,020.0
AEP-Ogdensburg	E	0	79.0	79.0	79.0
Total New Units		0	1,099.0	1,099.0	1,099.0
Existing Unit Re-ratings					
RG&E Station 2	**B**	6.5	6.5	2.5	9.0
Linden Cogen Uprate	J	790.8	790.8	234.4	Next Row
Linden Cogen Uprate	J	790.8	790.8	31.9	1057.1
Total Unit Rerates				268.8	
Total New Units + Re-rates				1367.8	

[4] Unit re-ratings are for generation facilities that have undergone uprate projects.

Attachment B2

Retiring and Ineligible Generating Units

Attachment B2 -Announced Unit Retirements, Deactivations, and ICAP Ineligible Forced Outage (IIFO) since 2019 IRM Study			
Generator Name	**Zone**	**CRIS (MW)**	**CRIS adusted value from 2019 Gold Book (MW)**
Retirements		0.0	**0.0**
Monroe Livingston	B	2.4	2.4
Steuben County LF	C	3.2	3.2
Auburn - State St.	C	5.8	1.7
Indian Point 2	H	1026.5	1016.1
Deactivations		0.0	**1023.4**
GILBOA__1	F	290.7	290.7
HUDSON AVE_GT_4	J	13.9	0.0
ICAP Ineligible		**304.6**	**290.7**
Total Removals		**304.6**	**1314.1**

Attachment B3

New Intermittent[5] Resources

B3 - New Intermittent Resources				
Wind Resouce	**Zone**	**CRIS (MW)**	**Summer Capability (MW)**	**CRIS adusted value from 2019 Gold Book (MW)**
New Wind Units				
Galloo Island Wind	C	108.9	110.4	108.9
Ball Hill Wind	A	100.0	100.0	100.0
Total New Wind				**208.9**
New (bulk power) Solar Units				
Riverhead Solar Farm, LLC	K	20.0	20.0	20.0
Total New Solar				**20.0**
Other Intermittent				
Total New Intermittent				**228.9**

[5] Distributed solar resource impacts are accounted for in the load forecast.

Attachment B4

Resources in the Behind the Meter
Net Generation Program (BTM-NG)

Attachment B4 -Units in the Behind the Meter Net Generation Program*			
Generator Name	**Zone**	**Resource Value (MW)[1]**	**Peak Load Adjustment (MW)[2]**
Existing:			
Stonybrook	K	39.8	38.9
Greenidge 4[3]	C	104.3	11.6
New:			
xxxxxx	V	yy	zz
Total BTM Gen		aaa	bbb

* The IRM study independently models the generation and load components of BTM:NG Resources

1. Based on adjusted DMGC value
2. Based on ACHL.
3. ~~2.~~ Greenidge values will be updated for PBC

Attachment C

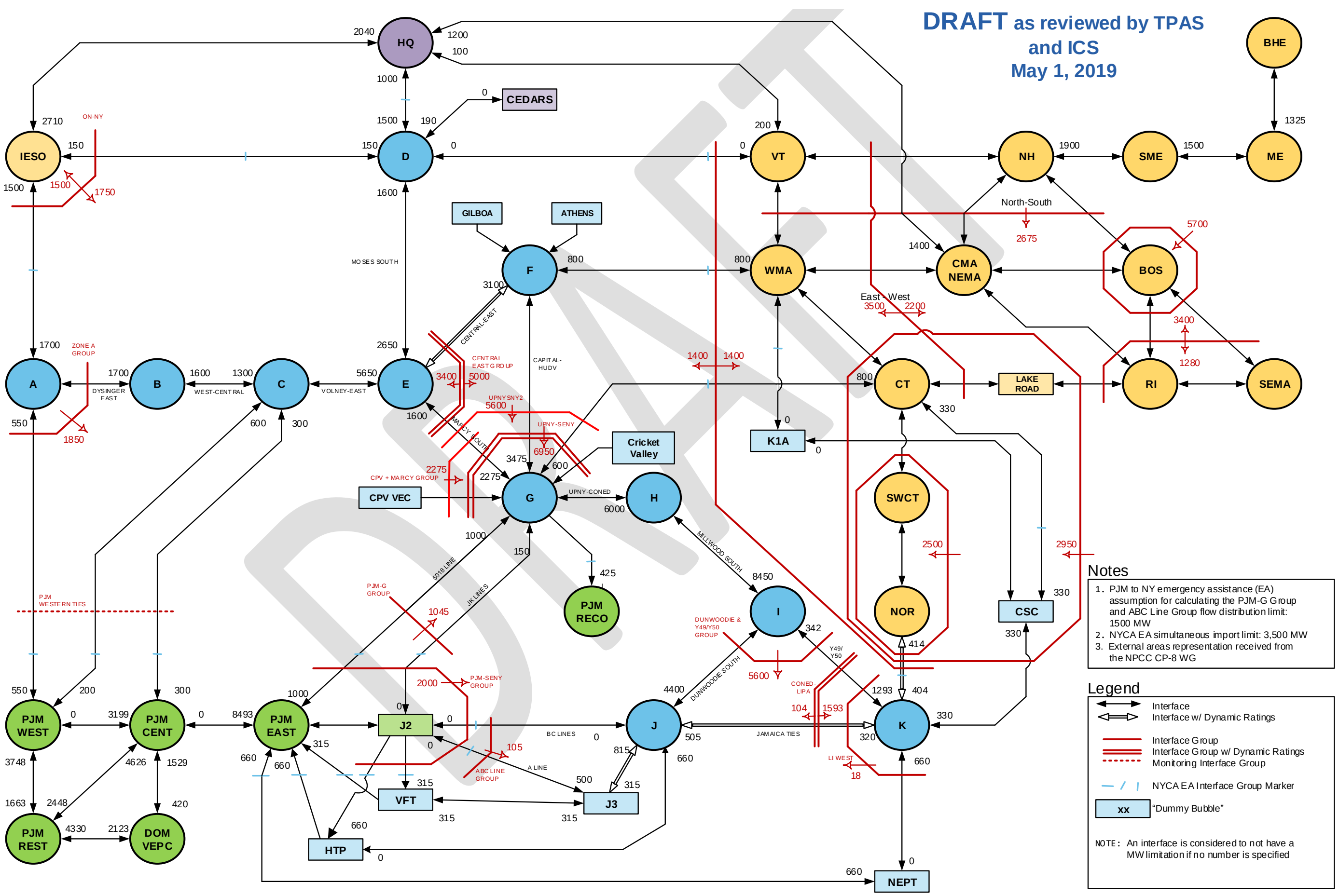
NYCA Five Year Derating Factors

Attachment D

Emergency Operating Procedures

Attachment E - IRM Topology

2020 IRM Topology (Summer Limits)



Attachment F

SCR Determinations

Assumption Matrix History

Date	Ver	Preliminary Base Case	Date	Ver	Final Base Case
1/29/19	V0.0	Preliminary assumptions without attachments.			
4/3/19	V0.1	Adds winter LFU update, removes EDRP in model-			
4/30/19	V1.0	Added GB forecast, added attachments A-B4,E. Added row for energy storage resources			