

# Transmission Outage Coordination

OC

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IMM



Monitoring Analytics

# Topics

- **Effectiveness of first time submission rule**
  - **The last two rules are related to the FTR auction**
  - **FTR rules apply only for outages with duration greater than 30 days**
- **Effectiveness of rescheduling rule**
- **Transparency and effectiveness of outage selection process in the FTR model**

# First Time Submission Rules (On Time or Late)

Planned Duration (Calendar Days)	Request Submitted	Received Status
<=5	Before the first of the month one month prior to the starting month of the outage	On Time
	After or on the first of the month one month prior to the starting month of the outage	Late
> 5 & <=30	Before the first of the month six months prior to the starting month of the outage	On Time
	After or on the first of the month six months prior to the starting month of the outage	Late
>30	Before the earlier of 1) February 1, 2) the first of the month six months prior to the starting month of the outage	On Time
	After or on the earlier of 1) February 1, 2) the first of the month six months prior to the starting month of the outage	Late

# Transmission Facility Outage Requests by Received Status

Planned Duration (Days)	2020/2021				2021/2022			
	On Time	Late	Total	Percent Late	On Time	Late	Total	Percent Late
<=5	9,912	6,213	16,125	38.5%	9,607	5,580	15,187	36.7%
>5 & <=30	1,577	1,392	2,969	46.9%	1,557	1,315	2,872	45.8%
>30	632	948	1,580	60.0%	600	978	1,578	62.0%
Total	12,121	8,553	20,674	41.4%	11,764	7,873	19,637	40.1%

# Transmission Facility Outage Requests by Congestion Status

Planned Duration (Days)	2020/2021				2021/2022			
	Congestion Expected	No Congestion		Percent Congestion	Congestion Expected	No Congestion		Percent Congestion
		Expected	Total	Expected		Expected	Total	Expected
<=5	945	15,180	16,125	5.9%	918	14,269	15,187	6.0%
>5 & <=30	246	2,723	2,969	8.3%	211	2,661	2,872	7.3%
>30	105	1,475	1,580	6.6%	107	1,471	1,578	6.8%
Total	1,296	19,378	20,674	6.3%	1,236	18,401	19,637	6.3%

*“The outage **may** be denied if it jeopardizes system reliability or causes congestion requiring off-cost operations.” Manual 3, Page 63*

# PJM Congestion Status Review

- **PJM makes binary determination of congestion status in transmission facility outage review**
  - **Yes/No only**
- **No review of level of congestion by MW or dollar impact.**



# Transmission Facility Outage Requests by Processed Status

Received Status		2020/2021						2021/2022					
		Cancelled	Complete	In Process	Denied	Congestion Expected	Percent Complete	Cancelled	Complete	In Process	Denied	Congestion Expected	Percent Complete
Late	Emergency	5	63	2	1	71	88.7%	7	47	0	1	56	83.9%
	Non Emergency	33	148	9	10	203	72.9%	36	158	4	22	221	71.5%
On Time	Emergency	0	2	0	0	2	100.0%	2	6	0	0	8	75.0%
	Non Emergency	213	722	68	10	1,020	70.8%	197	623	94	24	951	65.5%
Total		251	935	79	21	1,296	72.1%	242	834	98	47	1,236	67.5%

*1.6 percent of outage requests were denied in 2020/2021 planning year and 3.8 percent were denied in 2021/2022 planning year*

# Effectiveness of Rules (On Time or Late)

- **Clear definition of on time or late rule**
- **No clear definition of congestion rule**
- **The On Time or Late status affects the priority with which PJM processes the outage request**
  1. **Emergency outage**
  2. **On time outage**
  3. **Late outage**
- **There is no clear rule that defines consequences of late outages**



# Effectiveness of Rules (Rescheduling Rule)

Revision	Original Duration		
	<=5	> 5 & <=30	>30
Entirely same month(s)	On Time	On Time	On Time
Different month, nearer to the current date	On Time if before the first of the month one month prior to the starting month of the outage	On Time if before the first of the month six months prior to the starting month of the outage	On Time if before the first of the month six months prior to the starting month of the outage
Different month, further out into the future, but same planning year	On Time if before the first of the month one month prior to the starting month of the outage	On Time if before the first of the month one month prior to the starting month of the outage	On Time if before the first of the month one month prior to the starting month of the outage
Revised Duration >5	Re-evaluate	NA	NA
Revised Duration >30	Re-evaluate	Re-evaluate	Re-evaluate
Different month, further out into the future, and different planning year	On Time if before the first of the month one month prior to the starting month of the outage	On Time if before the first of the month one month prior to the starting month of the outage	Re-evaluate
Adding equipment	May lose On Time status	May lose On Time status	May lose On Time status

*The on-time outage request **may** lose “on-time” status (Manual 3, 67)*

# Rescheduled and Cancelled Transmission Outage Requests

Planned Duration (Days)	2020/2021					2021/2022				
	Outage Requests	Approved and Rescheduled	Percent Approved and Rescheduled	Approved and Cancelled	Percent Approved and Cancelled	Outage Requests	Approved and Rescheduled	Percent Approved and Rescheduled	Approved and Cancelled	Percent Approved and Cancelled
<=5	16,125	3,552	22.0%	2,267	14.1%	15,187	3,070	20.2%	2,078	13.7%
>5 & <=30	2,969	1,688	56.9%	204	6.9%	2,872	1,500	52.2%	199	6.9%
>30	1,580	1,048	66.3%	84	5.3%	1,578	1,047	66.3%	88	5.6%
Total	20,674	6,288	30.4%	2,555	12.4%	19,637	5,617	28.6%	2,365	12.0%

# Rescheduled Transmission Outage Request Example 1

Outage Ticket ID	Planned Start Date	Planned End Date	Outage Duration	Status	Update Date Time	On-Time
JAIAAC	25OCT2021:06:00:00	06NOV2021:18:00:00	13	Submitted	10MAR2021:08:34:49	1
JAIAAC	25OCT2021:06:00:00	06NOV2021:18:00:00	13	Received	11MAR2021:14:10:05	1
JAIAAC	02NOV2021:06:00:00	16NOV2021:18:00:00	15	Revised	17AUG2021:09:30:10	1
JAIAAC	02NOV2021:06:00:00	16NOV2021:18:00:00	15	Received	18AUG2021:09:38:10	1
JAIAAC	03NOV2021:06:00:00	17NOV2021:18:00:00	15	Received	13OCT2021:17:29:38	1
JAIAAC	19JAN2022:06:00:00	23JAN2022:18:00:00	5	Revised	28OCT2021:15:18:57	1
JAIAAC	19JAN2022:06:00:00	23JAN2022:18:00:00	5	Received	29OCT2021:09:39:18	1
JAIAAC	19JAN2022:06:00:00	23JAN2022:18:00:00	5	Approved	14JAN2022:13:03:13	1
JAIAAC	19JAN2022:06:00:00	23JAN2022:18:00:00	5	Active	19JAN2022:14:24:02	1
JAIAAC	19JAN2022:06:00:00	28JAN2022:18:00:00	10	Active	20JAN2022:09:38:08	1
JAIAAC	19JAN2022:06:00:00	02FEB2022:18:00:00	15	Active	20JAN2022:09:38:23	1
JAIAAC	19JAN2022:06:00:00	28JAN2022:18:00:00	10	Completed	28JAN2022:10:23:14	1

*“Transmission Owners should avoid scheduling any outage in excess of 5 days in duration with a restoration time greater than 72 hours that may result in increased risk to system reliability during peak summer and winter periods.” Manual 3, Page 66*

# Rescheduled Transmission Outage Request Example 1

- **This example is a real outage request with a placeholder outage ticket ID.**
- **On October 28, 2021, the outage was moved from non-peak period in 2021 to peak period in 2022.**
- **The outage would have been submitted late if it had been submitted for the first time on October 28, 2021.**
- **The duration was extended after the outage was active.**

# Rescheduled Transmission Outage Request Example 2

Outage Ticket ID	Planned Start Date	Planned End Date	Outage Duration	Status	Update Date Time	On-Time
FEBCBD	29APR2019:08:00:00	23MAY2019:16:00:00	25	Submitted	12JUL2018:12:52:28	1
FEBCBD	29APR2019:08:00:00	23MAY2019:16:00:00	25	Received	13JUL2018:16:26:59	1
FEBCBD	27APR2020:08:00:00	21MAY2020:16:00:00	25	Revised	11DEC2018:15:30:14	1
FEBCBD	27APR2020:08:00:00	21MAY2020:16:00:00	25	Received	12DEC2018:12:40:06	1
FEBCBD	27APR2020:08:00:00	21MAY2020:16:00:00	25	Approved	23APR2020:13:02:30	1
FEBCBD	26APR2021:08:00:00	20MAY2021:16:00:00	25	Received	27APR2020:17:02:12	1
FEBCBD	01JUN2021:08:00:00	25JUN2021:16:00:00	25	Revised	31MAR2021:15:02:19	1
FEBCBD	01JUN2021:08:00:00	25JUN2021:16:00:00	25	Received	01APR2021:15:01:49	1
FEBCBD	01JUN2021:08:00:00	25JUN2021:16:00:00	25	Cancelled by Company	18MAY2021:08:28:32	1

# Rescheduled Transmission Outage Request Example 2

- **This example is a real outage request with a placeholder outage ticket ID**
- **The outage was included in the June 2021 FTR model**
- **The FTR auction opening date was May 11, 2021, and the closing date was May 13, 2021**
- **The outage was cancelled on May 18, 2021, after the close of the FTR auction.**
- **The reason for the cancellation was not shown in the outage audit table and PJM comments in the audit table were blank.**

# Rescheduled Transmission Outage Request

## Example 3

Outage Ticket ID	Planned Start Date	Planned End Date	Outage Duration	Status	Update Date Time	On-Time	Equipment Type
FEAAAG	13APR2020:08:00:00	06AUG2020:16:00:00	116	Submitted	23JUL2019:13:27:26	0	BRKR
FEAAAG	13APR2020:08:00:00	06AUG2020:16:00:00	116	Received	24JUL2019:14:37:24	0	BRKR
FEAAAG	10APR2020:16:30:00	06AUG2020:16:00:00	119	Revised	17MAR2020:13:03:51	0	LINE
FEAAAG	13APR2020:11:00:00	06AUG2020:16:00:00	116	Revised	01APR2020:16:03:04	0	LINE
FEAAAG	20APR2020:11:00:00	13AUG2020:16:00:00	116	Received	09APR2020:17:49:16	0	LINE
FEAAAG	20APR2020:11:00:00	13AUG2020:16:00:00	116	Approved	16APR2020:13:41:12	0	LINE
FEAAAG	20APR2020:11:00:00	13AUG2020:16:00:00	116	Active	20APR2020:12:19:59	0	LINE
FEAAAG	20APR2020:11:00:00	24SEP2020:16:00:00	158	Active	29JUL2020:10:59:21	0	LINE
FEAAAG	20APR2020:11:00:00	24OCT2020:16:00:00	188	Active	08SEP2020:14:09:38	0	LINE
FEAAAG	20APR2020:11:00:00	06NOV2020:16:00:00	201	Active	15OCT2020:13:45:27	0	LINE
FEAAAG	20APR2020:11:00:00	20NOV2020:16:00:00	215	Active	20OCT2020:12:40:04	0	LINE
FEAAAG	20APR2020:11:00:00	24NOV2020:16:00:00	219	Active	18NOV2020:13:23:02	0	LINE
FEAAAG	20APR2020:11:00:00	10DEC2020:08:00:00	235	Active	24NOV2020:16:37:28	0	LINE
FEAAAG	20APR2020:11:00:00	11DEC2020:16:00:00	236	Active	09DEC2020:08:36:22	0	LINE
FEAAAG	20APR2020:11:00:00	10DEC2020:08:00:00	235	Completed	10DEC2020:12:28:44	0	LINE

# Rescheduled Transmission Outage Request

## Example 3

- **This example is a real outage request with a placeholder outage ticket ID.**
- **The outage duration was increased from 116 days to 235 days.**
- **The duration was increased after the outage was active.**
- **The outage was submitted late, but approved and completed.**



# FTR Model SFT Test



Manual 06 Outage Language

One of the inputs to the Simultaneous Feasibility Test (SFT) is transmission outages

- Transmission line outage schedules, thermal operating limits for transmission lines, that are expected to last for 2 months or more will be included in the determination of simultaneous feasibility for the Annual FTR Auction and outages of five days or more shall be included in the determination of simultaneous feasibility for Monthly FTR Auctions as well as outages of shorter duration that are determined through PJM analysis to be likely to cause FTR revenue inadequacy if not modeled
- <https://www.pjm.com/-/media/documents/manuals/m06.ashx>

## SFT Inputs

- Network model
- Outages
- Limits
- Loop flow
- Contingencies
- Bids
- Approved rights

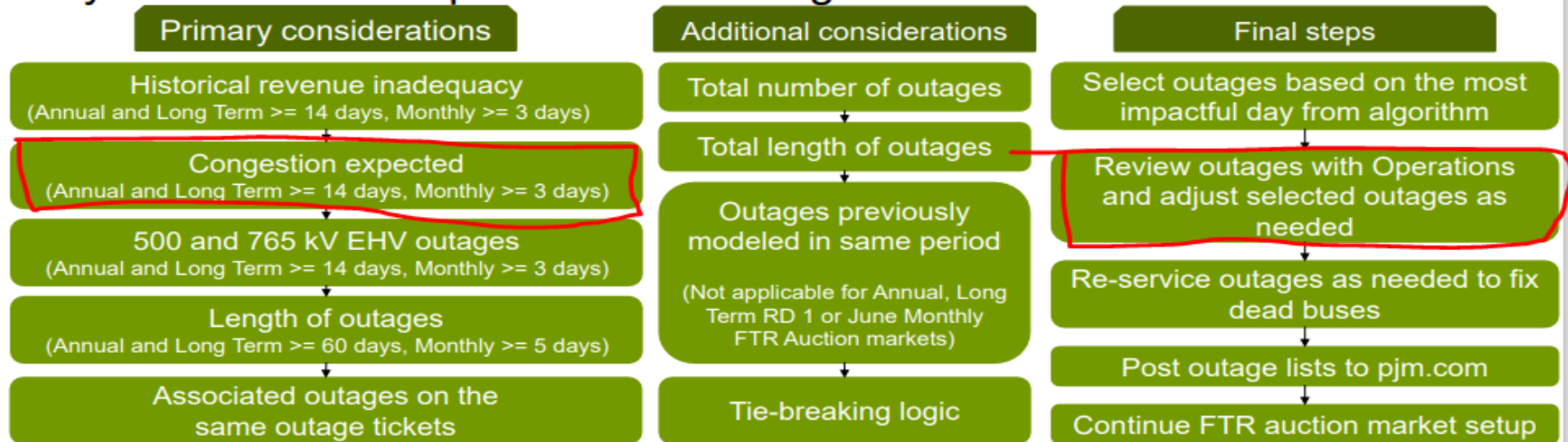


# Outage Selection Process



## Outage Selection Algorithm

For each period and cluster, an outage selection algorithm is run for every day between the start day and end days of the outages to determine the day with the most impactful set of outages



# Annual FTR Market Modeled Transmission Facility Outage Requests by Received Status

Planned Duration	2020/2021				2021/2022			
	On Time	Late	Total	Percent of Total	On Time	Late	Total	Percent of Total
<2 weeks	76	12	88	27.4%	86	13	99	27.0%
>=2 weeks & <2 months	88	13	101	31.5%	128	16	144	39.2%
>=2 months	104	28	132	41.1%	93	31	124	33.8%
Total	268	53	321	100.0%	307	60	367	100.0%

2021/2022 Total outage request = 19,637  
 Modeled =  $367/19,637 = 1.9$  Percent

# Annual FTR Market Modeled Transmission Facility Outage

Planned Duration	Processed Status	2020/2021 Outage		2021/2022 Outage	
		Requests	Percent	Requests	Percent
<2 weeks	In Progress	5	5.7%	11	11.1%
	Denied	0	0.0%	1	1.0%
	Approved	0	0.0%	0	0.0%
	Cancelled	27	30.7%	27	27.3%
	Revised	0	0.0%	0	0.0%
	Active	0	0.0%	0	0.0%
	Completed	56	63.6%	60	60.6%
	<b>Total</b>	<b>88</b>	<b>100.0%</b>	<b>99</b>	<b>100.0%</b>
≥2 weeks & <2 months	In Progress	7	6.9%	28	19.4%
	Denied	0	0.0%	1	0.7%
	Approved	1	1.0%	0	0.0%
	Cancelled	26	25.7%	29	20.1%
	Revised	0	0.0%	1	0.7%
	Active	0	0.0%	0	0.0%
	Completed	67	66.3%	85	59.0%
	<b>Total</b>	<b>101</b>	<b>100.0%</b>	<b>144</b>	<b>100.0%</b>
≥2 months	In Progress	14	10.6%	10	8.1%
	Denied	0	0.0%	0	0.0%
	Approved	0	0.0%	3	2.4%
	Cancelled	23	17.4%	25	20.2%
	Revised	0	0.0%	0	0.0%
	Active	2	1.5%	3	2.4%
	Completed	93	70.5%	83	66.9%
	<b>Total</b>	<b>132</b>	<b>100.0%</b>	<b>124</b>	<b>100.0%</b>
Total Cancelled		76	23.7%	81	22.1%
Grand Total		321		367	

# Annual FTR Market Modeled Transmission Facility Outage Requests

- **81 of 367 FTR modeled transmission outages were canceled for planning year 2021/2022.**

# Transparency and Effectiveness of FTR Auction Outage Selection Process

- **The term “impactful” is not clearly defined.**
- **Reasons for the number of included outages are not clear (only 1.9 percent of outages included).**
- **The selection process includes manual process that does not apply transparent rules.**
- **Congestion expected criterion is used without considering magnitude of the outage.**

# Conclusion

- **Transmission outage submission, review and scheduling rules should be strengthened.**
- **Consequences for violations of the rules should be defined.**
- **Transmission outage selection process for FTR model should more clearly defined and transparent**
- **Congestion costs should be calculated for both outage scheduling and outage selection for FTR model.**
- **PJM should consider rules requiring local Transmission Owner to take local control in the case of disruptive transmission outages, e.g. Northern Neck outages.**

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