Functionally Unavailable Capacity

Mark Younger

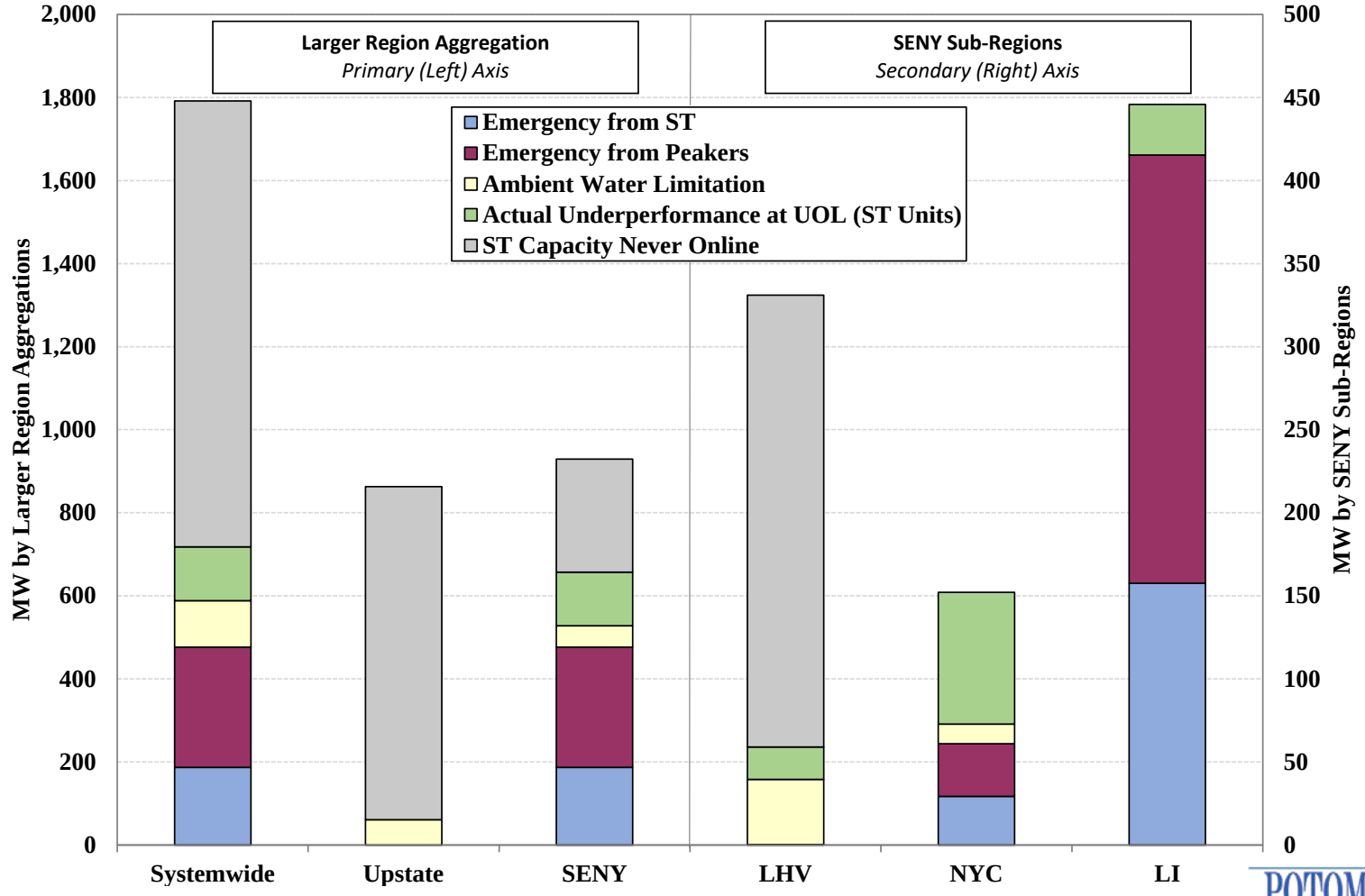
Hudson Energy Economics, LLC

3/1/2023

Functionally Unavailable Capacity

- The MMU has identified Functionally Unavailable capacity as an issue in the State of the Market Report
  - Emergency Capacity
  - Ambient Water Limitation (and Humidity)
  - Actual Underperformance at UOL
  - Capacity Never Online
- These issues are important and should be addressed as quickly as possible. Failure to address Functionally Unavailable capacity is a risk to NYISO reliability.
- While the MMU has described these as Capacity Accreditation issues, I believe they are really a combination of DMNC rating issues and the need to represent unavailable capacity in the resource adequacy modeling

Unavailable Capacity from Steam, Nuclear, and Peakers on Highest Load Days

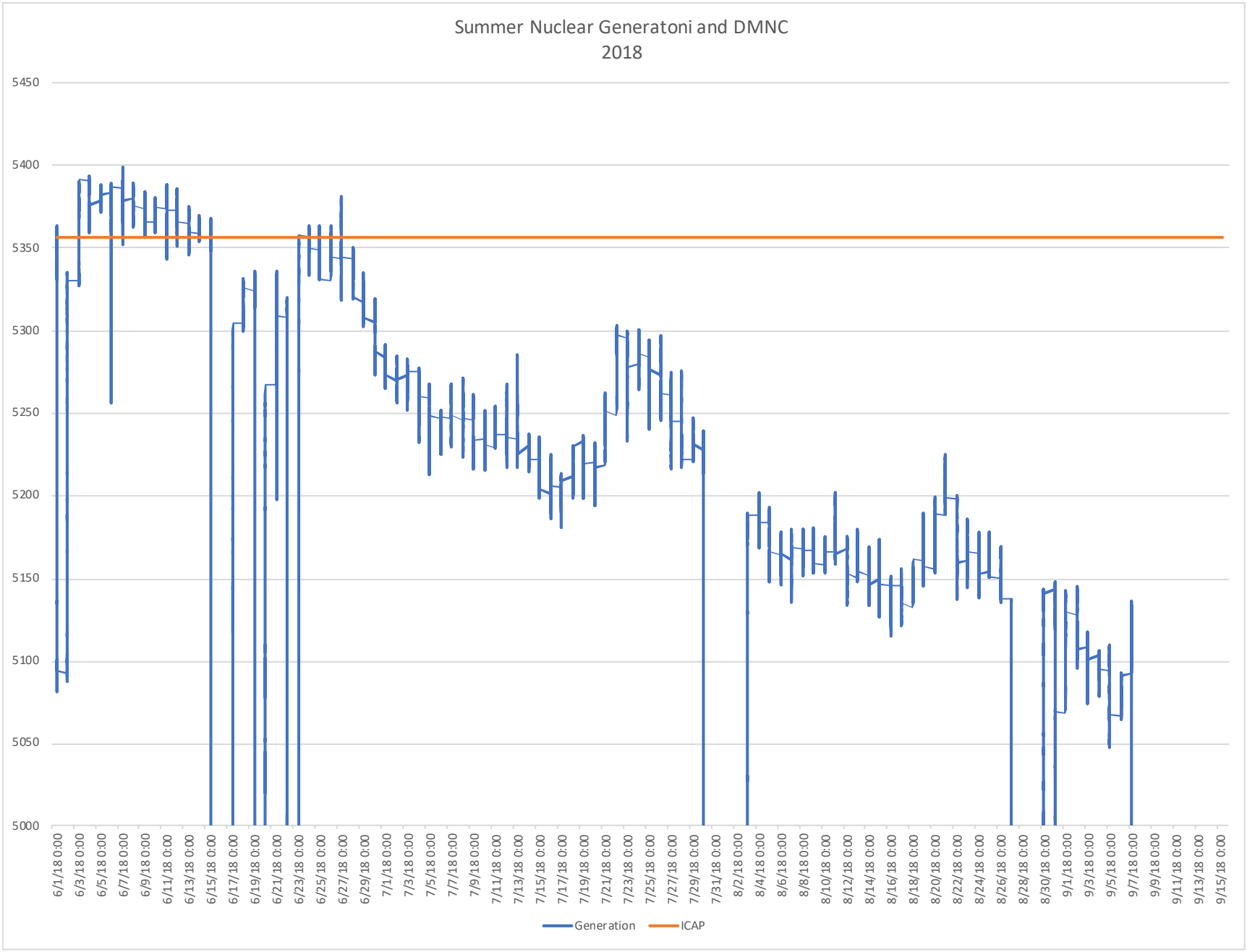


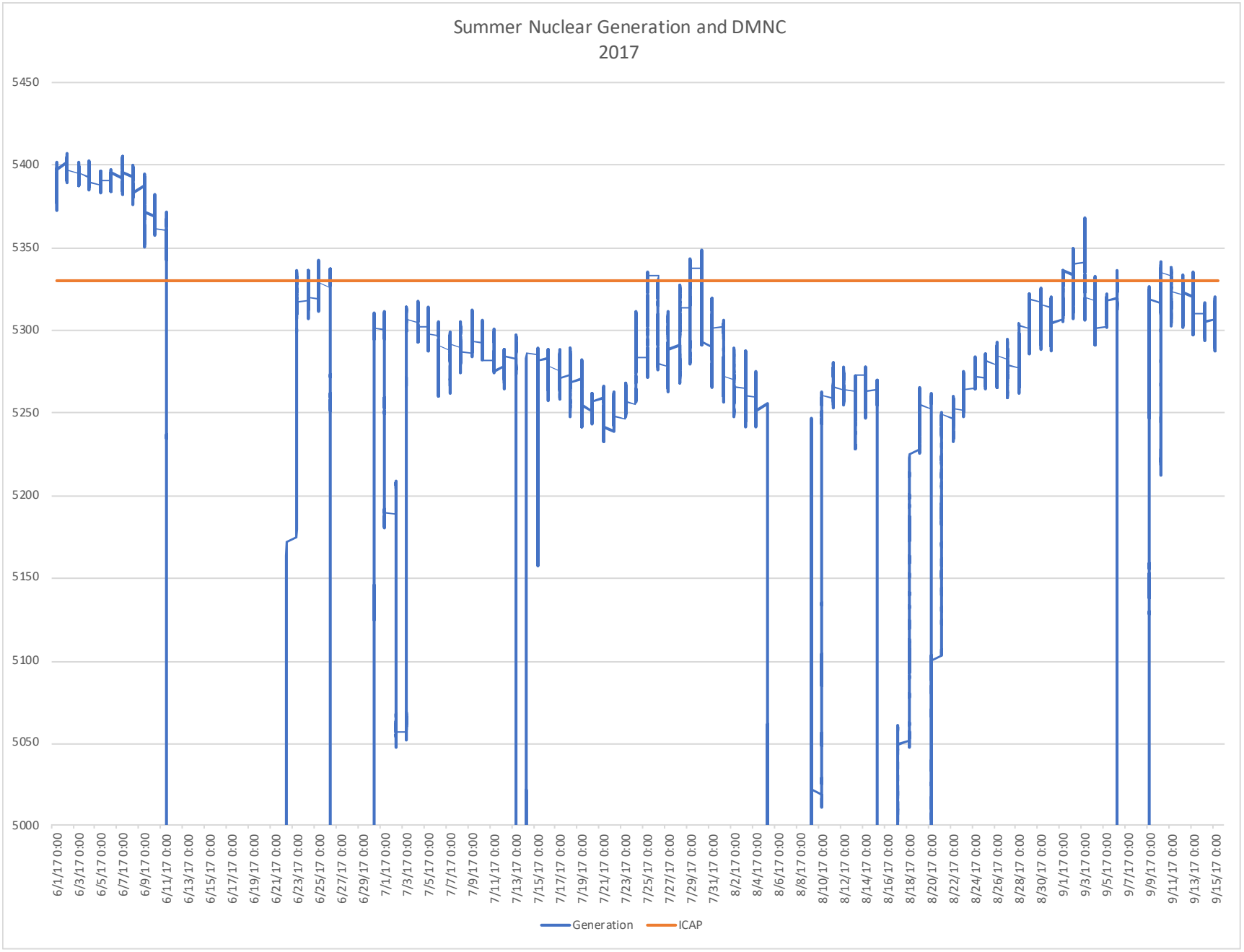
Notes: For chart description, see slide 118.

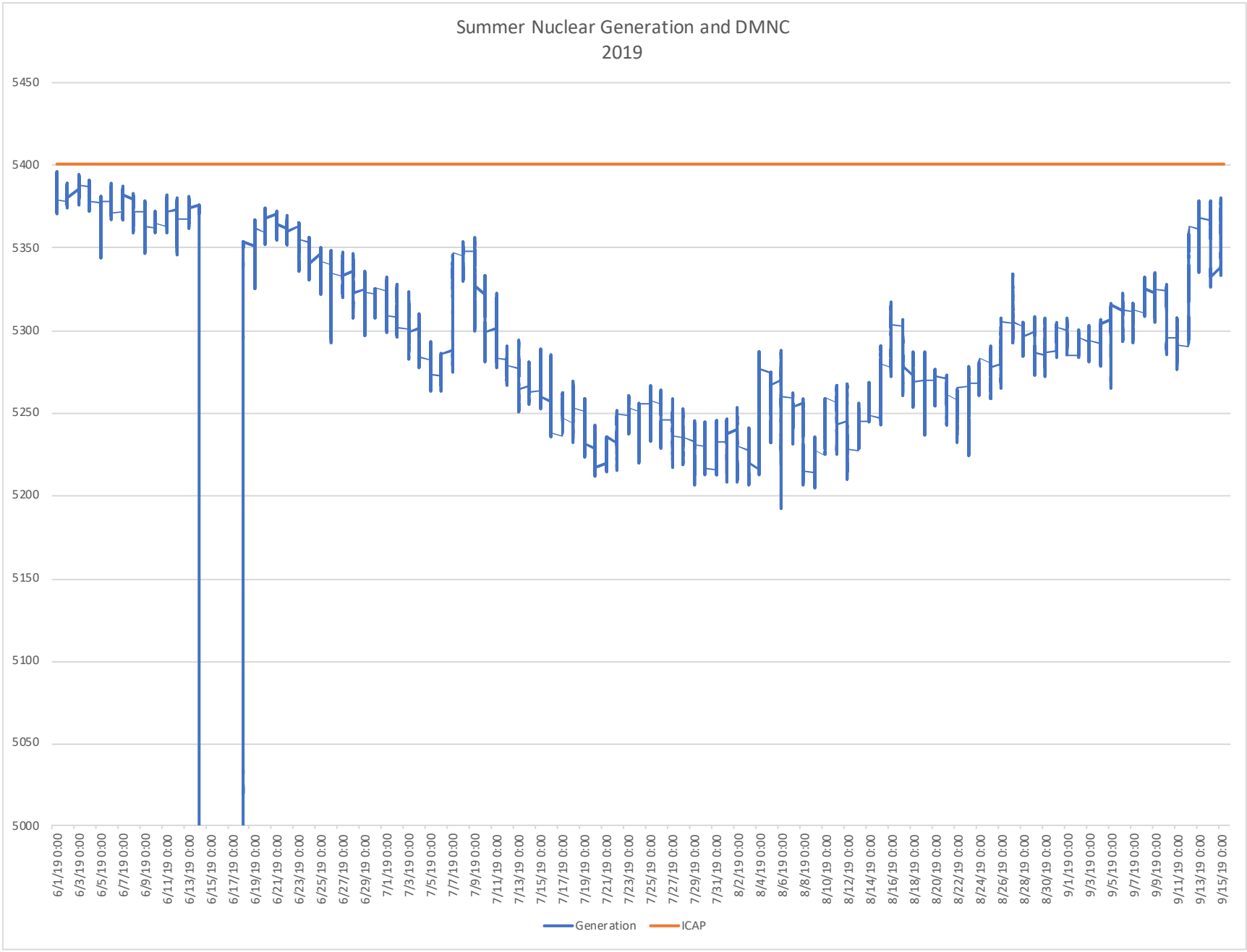
POTOMAC ECONOMICS

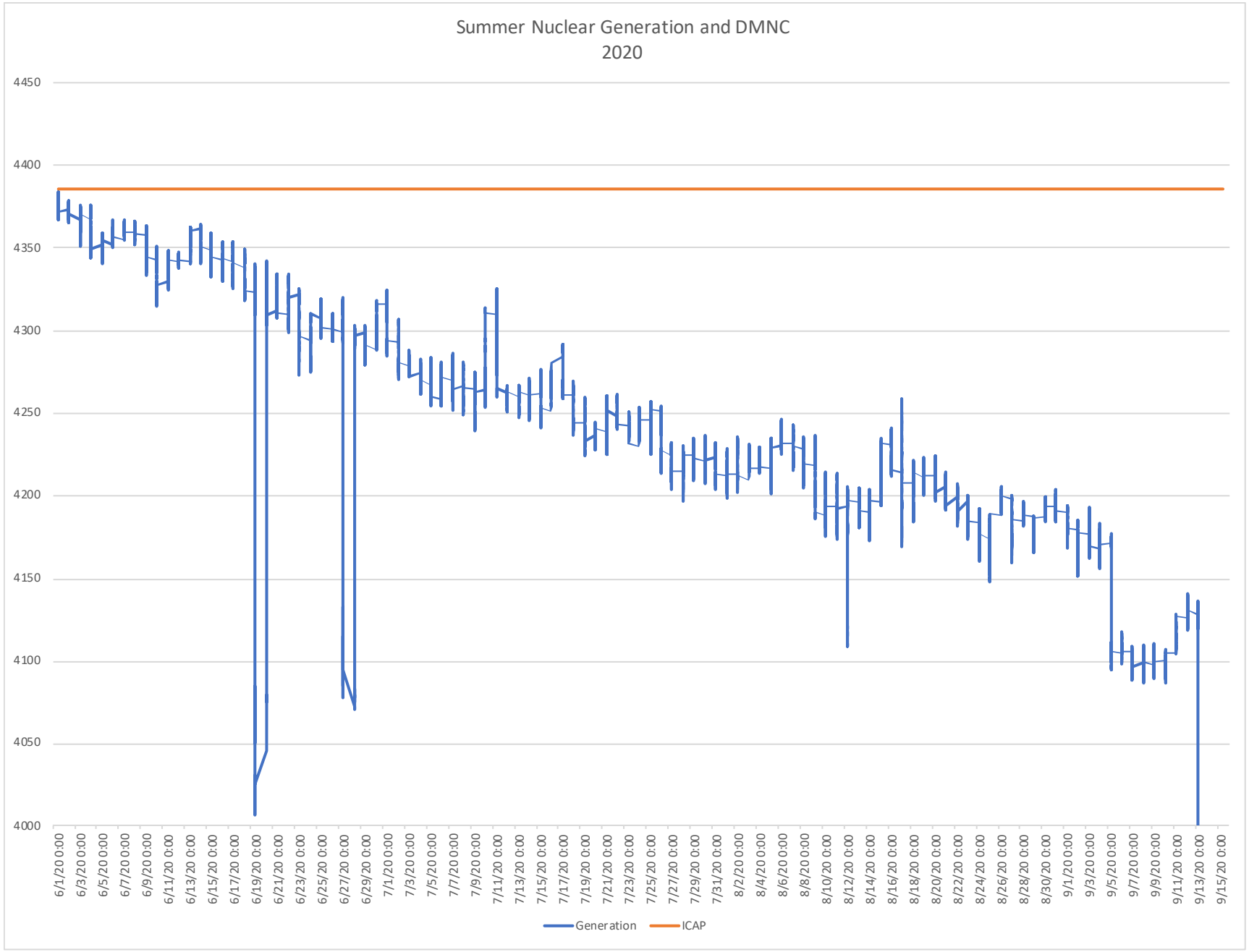
Nuclear Functionally Unavailable Capacity

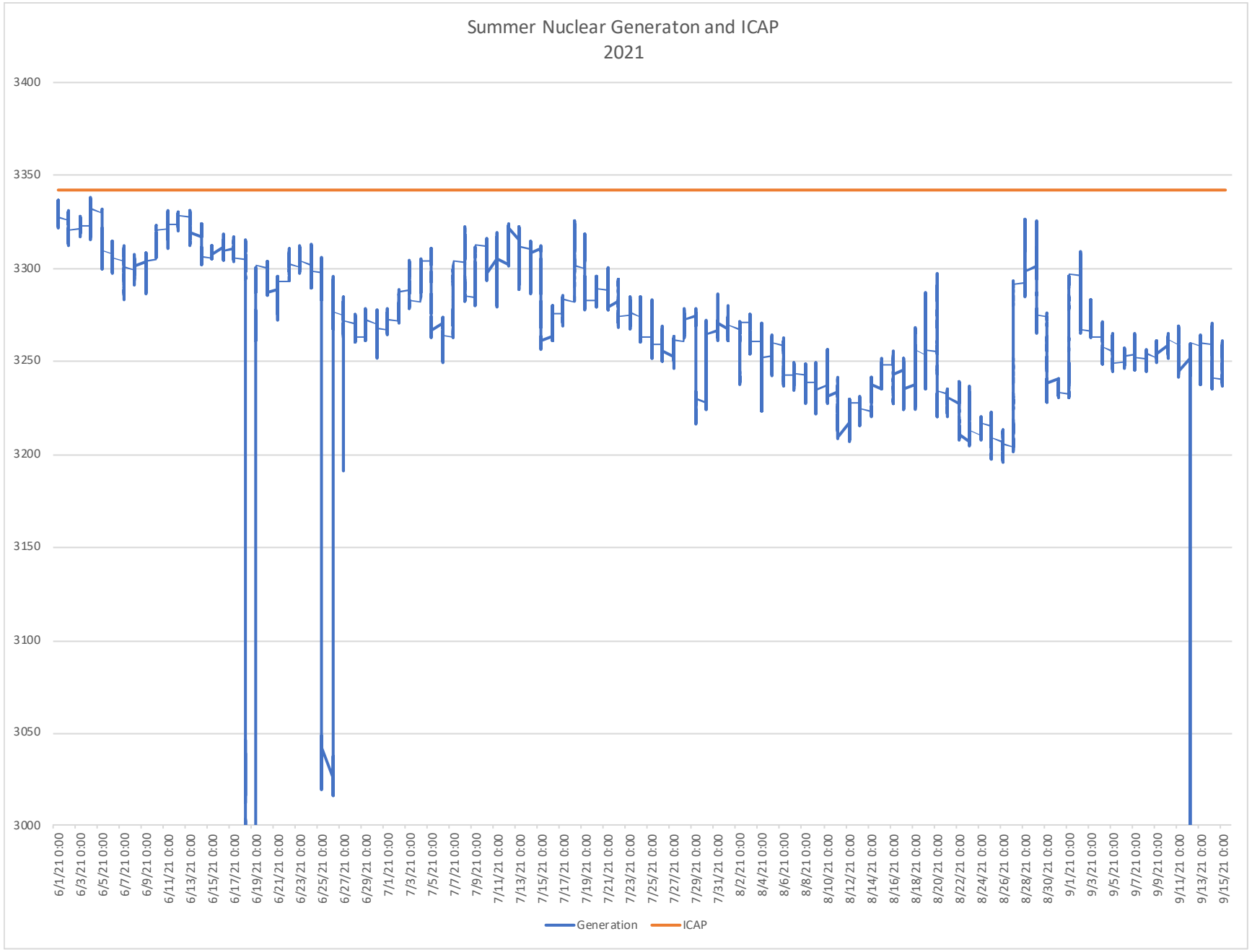
- Much of this deck focuses on nuclear underperformance because public data is readily available
- The Resource Adequacy Modeling used by the NYISO assumes that any generator that is not forced out (fully or partially) will operate at its DMNC rating (if needed)
- The nuclear data shows that much of the time the units are not operating at their DMNC ratings

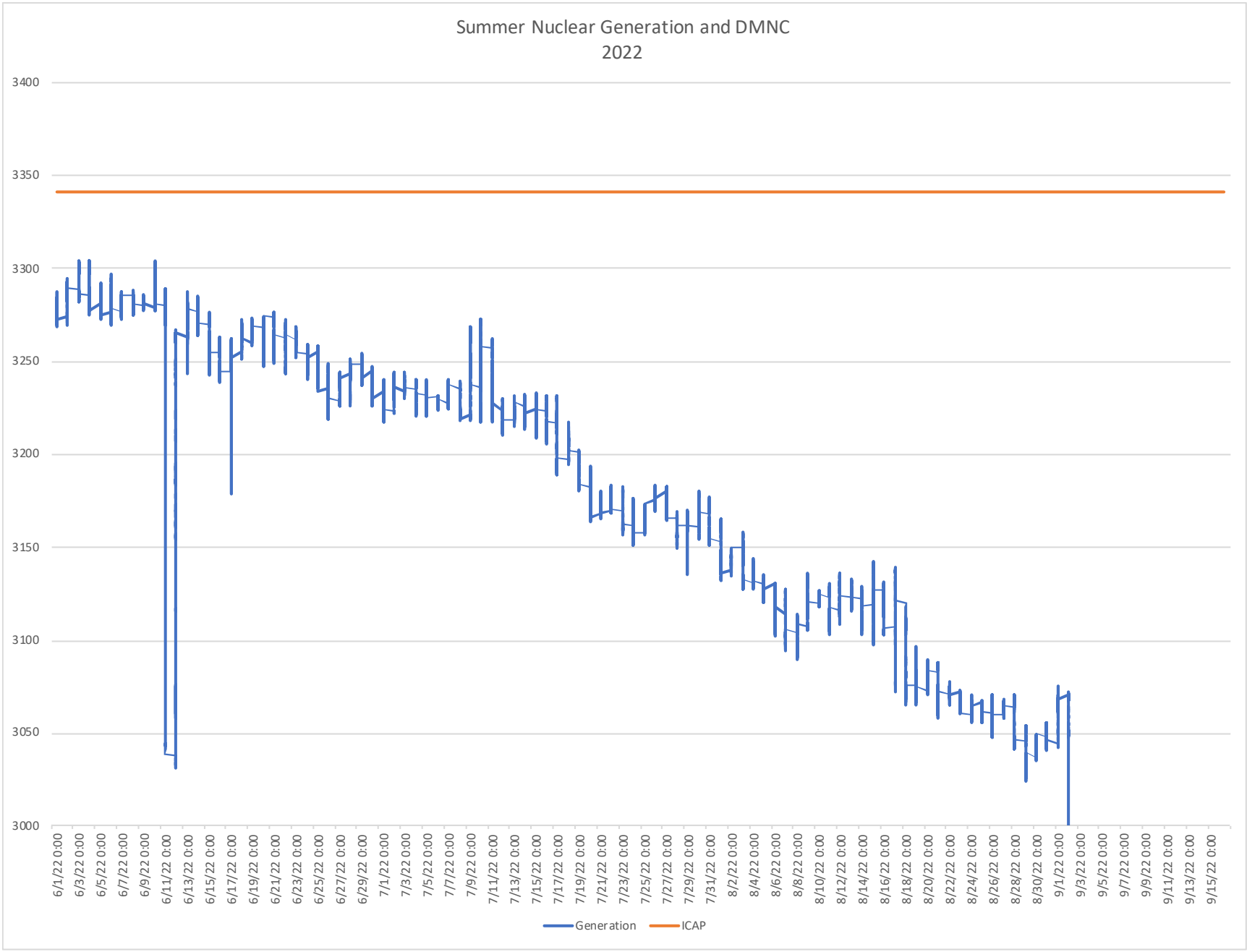

Summer Nuclear Generatoni and DMNC
2018
5450
5400
5350
5300
5250
5200
5150
5100
5050
5000
6/1/18 0:00
6/3/18 0:00
6/5/18 0:00
6/7/18 0:00
6/9/18 0:00
6/11/18 0:00
6/13/18 0:00
6/15/18 0:00
6/17/18 0:00
6/19/18 0:00
6/21/18 0:00
6/23/18 0:00
6/25/18 0:00
6/27/18 0:00
6/29/18 0:00
7/1/18 0:00
7/3/18 0:00
7/5/18 0:00
7/7/18 0:00
7/9/18 0:00
7/11/18 0:00
7/13/18 0:00
7/15/18 0:00
7/17/18 0:00
7/19/18 0:00
7/21/18 0:00
7/23/18 0:00
7/25/18 0:00
7/27/18 0:00
7/29/18 0:00
7/31/18 0:00
8/2/18 0:00
8/4/18 0:00
8/6/18 0:00
8/8/18 0:00
8/10/18 0:00
8/12/18 0:00
8/14/18 0:00
8/16/18 0:00
8/18/18 0:00
8/20/18 0:00
8/22/18 0:00
8/24/18 0:00
8/26/18 0:00
8/28/18 0:00
8/30/18 0:00
9/1/18 0:00
9/3/18 0:00
9/5/18 0:00
9/7/18 0:00
9/9/18 0:00
9/11/18 0:00
9/13/18 0:00
9/15/18 0:00
Generation
ICAP


Summer Nuclear Generation and DMNC
2017
5450
5400
5350
5300
5250
5200
5150
5100
5050
5000
6/1/17 0:00
6/3/17 0:00
6/5/17 0:00
6/7/17 0:00
6/9/17 0:00
6/11/17 0:00
6/13/17 0:00
6/15/17 0:00
6/17/17 0:00
6/19/17 0:00
6/21/17 0:00
6/23/17 0:00
6/25/17 0:00
6/27/17 0:00
6/29/17 0:00
7/1/17 0:00
7/3/17 0:00
7/5/17 0:00
7/7/17 0:00
7/9/17 0:00
7/11/17 0:00
7/13/17 0:00
7/15/17 0:00
7/17/17 0:00
7/19/17 0:00
7/21/17 0:00
7/23/17 0:00
7/25/17 0:00
7/27/17 0:00
7/29/17 0:00
7/31/17 0:00
8/2/17 0:00
8/4/17 0:00
8/6/17 0:00
8/8/17 0:00
8/10/17 0:00
8/12/17 0:00
8/14/17 0:00
8/16/17 0:00
8/18/17 0:00
8/20/17 0:00
8/22/17 0:00
8/24/17 0:00
8/26/17 0:00
8/28/17 0:00
8/30/17 0:00
9/1/17 0:00
9/3/17 0:00
9/5/17 0:00
9/7/17 0:00
9/9/17 0:00
9/11/17 0:00
9/13/17 0:00
9/15/17 0:00
Generation
ICAP


Summer Nuclear Generation and DMNC
2019
5450
5400
5350
5300
5250
5200
5150
5100
5050
5000
6/1/19 0:00
6/3/19 0:00
6/5/19 0:00
6/7/19 0:00
6/9/19 0:00
6/11/19 0:00
6/13/19 0:00
6/15/19 0:00
6/17/19 0:00
6/19/19 0:00
6/21/19 0:00
6/23/19 0:00
6/25/19 0:00
6/27/19 0:00
6/29/19 0:00
7/1/19 0:00
7/3/19 0:00
7/5/19 0:00
7/7/19 0:00
7/9/19 0:00
7/11/19 0:00
7/13/19 0:00
7/15/19 0:00
7/17/19 0:00
7/19/19 0:00
7/21/19 0:00
7/23/19 0:00
7/25/19 0:00
7/27/19 0:00
7/29/19 0:00
7/31/19 0:00
8/2/19 0:00
8/4/19 0:00
8/6/19 0:00
8/8/19 0:00
8/10/19 0:00
8/12/19 0:00
8/14/19 0:00
8/16/19 0:00
8/18/19 0:00
8/20/19 0:00
8/22/19 0:00
8/24/19 0:00
8/26/19 0:00
8/28/19 0:00
8/30/19 0:00
9/1/19 0:00
9/3/19 0:00
9/5/19 0:00
9/7/19 0:00
9/9/19 0:00
9/11/19 0:00
9/13/19 0:00
9/15/19 0:00
Generation
ICAP


Summer Nuclear Generation and DMNC
2020
4450
4400
4350
4300
4250
4200
4150
4100
4050
4000
6/1/20 0:00
6/3/20 0:00
6/5/20 0:00
6/7/20 0:00
6/9/20 0:00
6/11/20 0:00
6/13/20 0:00
6/15/20 0:00
6/17/20 0:00
6/19/20 0:00
6/21/20 0:00
6/23/20 0:00
6/25/20 0:00
6/27/20 0:00
6/29/20 0:00
7/1/20 0:00
7/3/20 0:00
7/5/20 0:00
7/7/20 0:00
7/9/20 0:00
7/11/20 0:00
7/13/20 0:00
7/15/20 0:00
7/17/20 0:00
7/19/20 0:00
7/21/20 0:00
7/23/20 0:00
7/25/20 0:00
7/27/20 0:00
7/29/20 0:00
7/31/20 0:00
8/2/20 0:00
8/4/20 0:00
8/6/20 0:00
8/8/20 0:00
8/10/20 0:00
8/12/20 0:00
8/14/20 0:00
8/16/20 0:00
8/18/20 0:00
8/20/20 0:00
8/22/20 0:00
8/24/20 0:00
8/26/20 0:00
8/28/20 0:00
8/30/20 0:00
9/1/20 0:00
9/3/20 0:00
9/5/20 0:00
9/7/20 0:00
9/9/20 0:00
9/11/20 0:00
9/13/20 0:00
9/15/20 0:00
Generation
ICAP

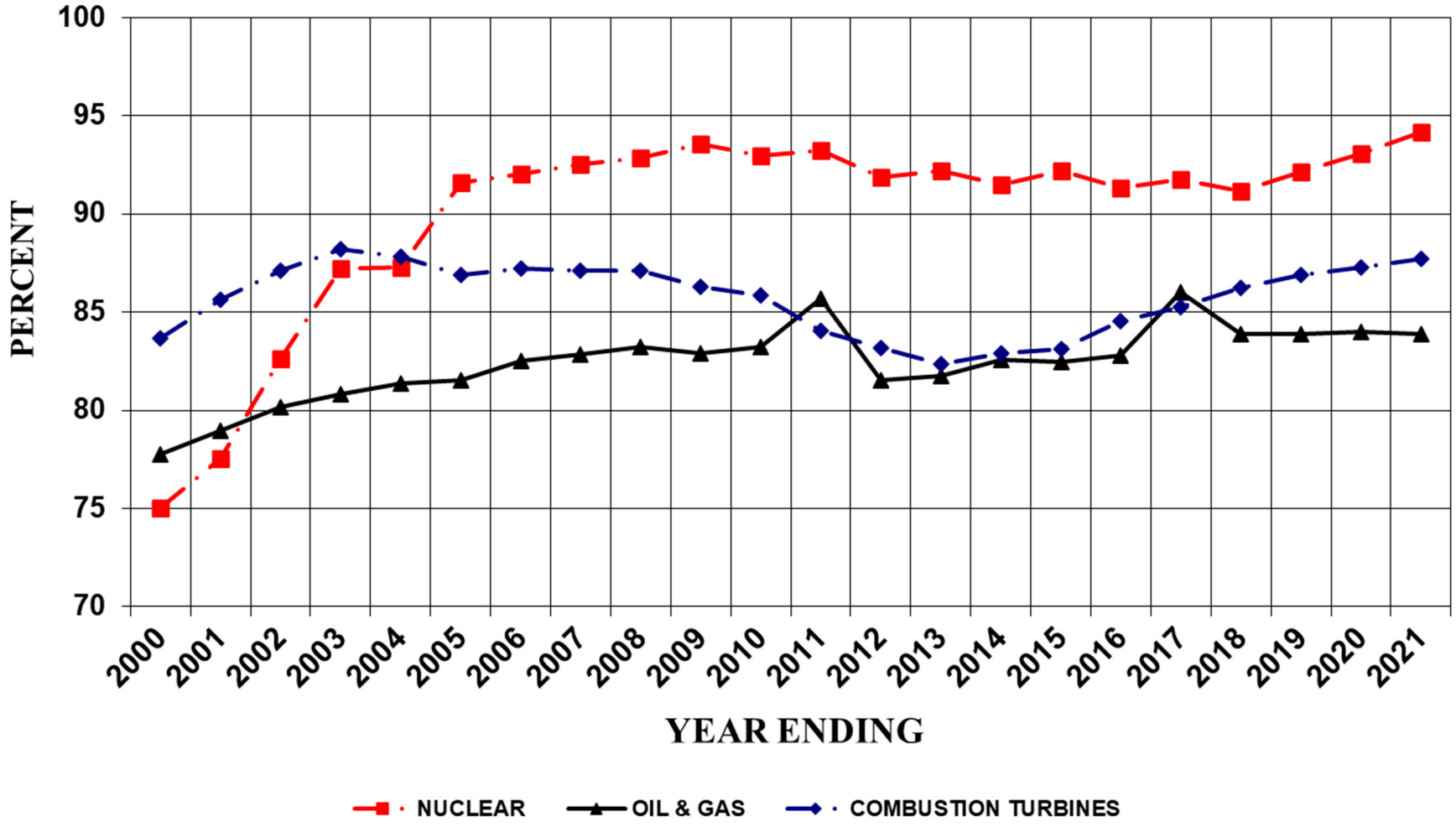

Summer Nuclear Generaton and ICAP
2021
3400
3350
3300
3250
3200
3150
3100
3050
3000
6/1/21 0:00
6/3/21 0:00
6/5/21 0:00
6/7/21 0:00
6/9/21 0:00
6/11/21 0:00
6/13/21 0:00
6/15/21 0:00
6/17/21 0:00
6/19/21 0:00
6/21/21 0:00
6/23/21 0:00
6/25/21 0:00
6/27/21 0:00
6/29/21 0:00
7/1/21 0:00
7/3/21 0:00
7/5/21 0:00
7/7/21 0:00
7/9/21 0:00
7/11/21 0:00
7/13/21 0:00
7/15/21 0:00
7/17/21 0:00
7/19/21 0:00
7/21/21 0:00
7/23/21 0:00
7/25/21 0:00
7/27/21 0:00
7/29/21 0:00
7/31/21 0:00
8/2/21 0:00
8/4/21 0:00
8/6/21 0:00
8/8/21 0:00
8/10/21 0:00
8/12/21 0:00
8/14/21 0:00
8/16/21 0:00
8/18/21 0:00
8/20/21 0:00
8/22/21 0:00
8/24/21 0:00
8/26/21 0:00
8/28/21 0:00
8/30/21 0:00
9/1/21 0:00
9/3/21 0:00
9/5/21 0:00
9/7/21 0:00
9/9/21 0:00
9/11/21 0:00
9/13/21 0:00
9/15/21 0:00
Generation
ICAP

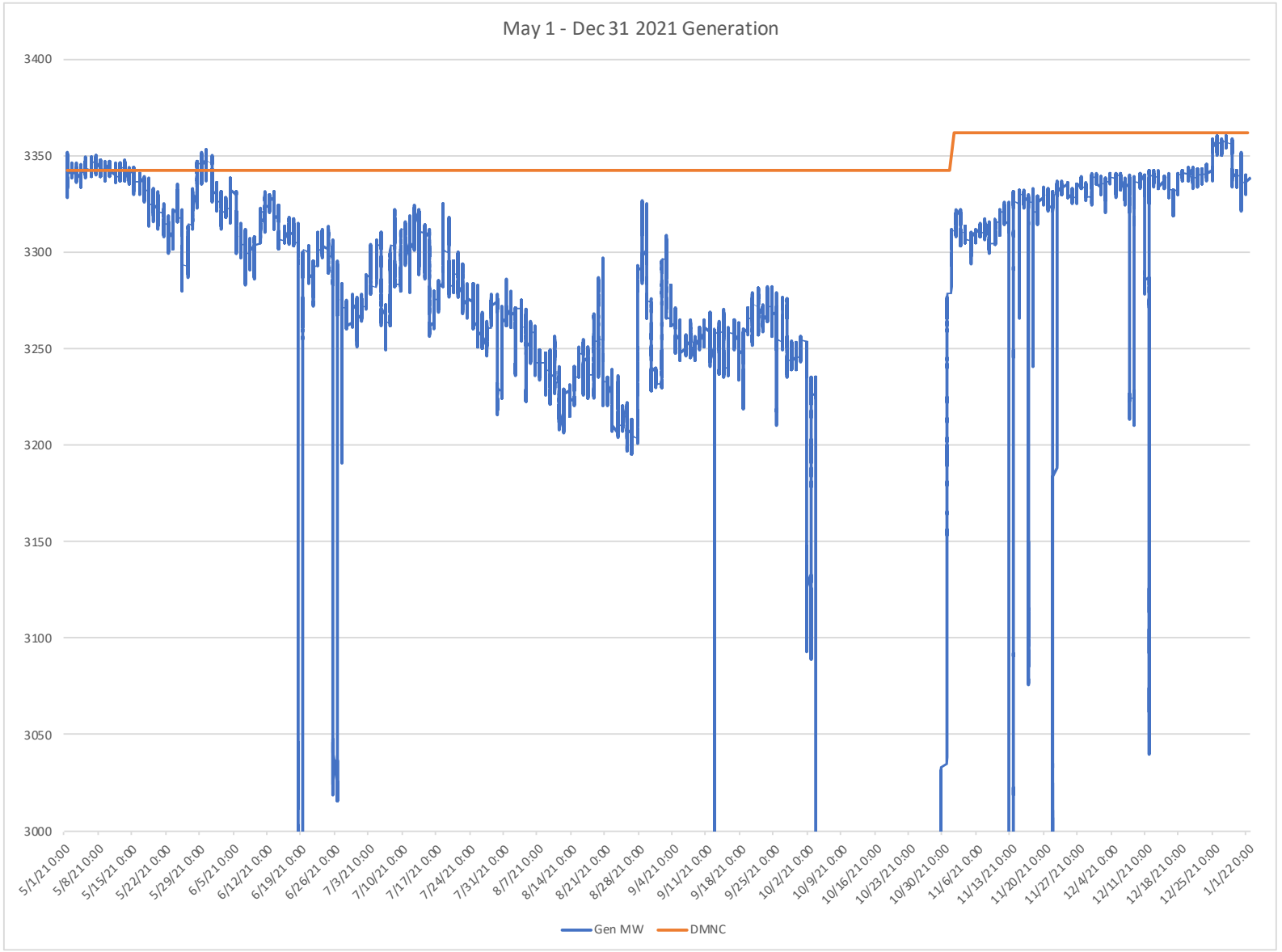

Summer Nuclear Generation and DMNC
2022
3400
3350
3300
3250
3200
3150
3100
3050
3000
6/1/22 0:00
6/3/22 0:00
6/5/22 0:00
6/7/22 0:00
6/9/22 0:00
6/11/22 0:00
6/13/22 0:00
6/15/22 0:00
6/17/22 0:00
6/19/22 0:00
6/21/22 0:00
6/23/22 0:00
6/25/22 0:00
6/27/22 0:00
6/29/22 0:00
7/1/22 0:00
7/3/22 0:00
7/5/22 0:00
7/7/22 0:00
7/9/22 0:00
7/11/22 0:00
7/13/22 0:00
7/15/22 0:00
7/17/22 0:00
7/19/22 0:00
7/21/22 0:00
7/23/22 0:00
7/25/22 0:00
7/27/22 0:00
7/29/22 0:00
7/31/22 0:00
8/2/22 0:00
8/4/22 0:00
8/6/22 0:00
8/8/22 0:00
8/10/22 0:00
8/12/22 0:00
8/14/22 0:00
8/16/22 0:00
8/18/22 0:00
8/20/22 0:00
8/22/22 0:00
8/24/22 0:00
8/26/22 0:00
8/28/22 0:00
8/30/22 0:00
9/1/22 0:00
9/3/22 0:00
9/5/22 0:00
9/7/22 0:00
9/9/22 0:00
9/11/22 0:00
9/13/22 0:00
9/15/22 0:00
Generation
ICAP

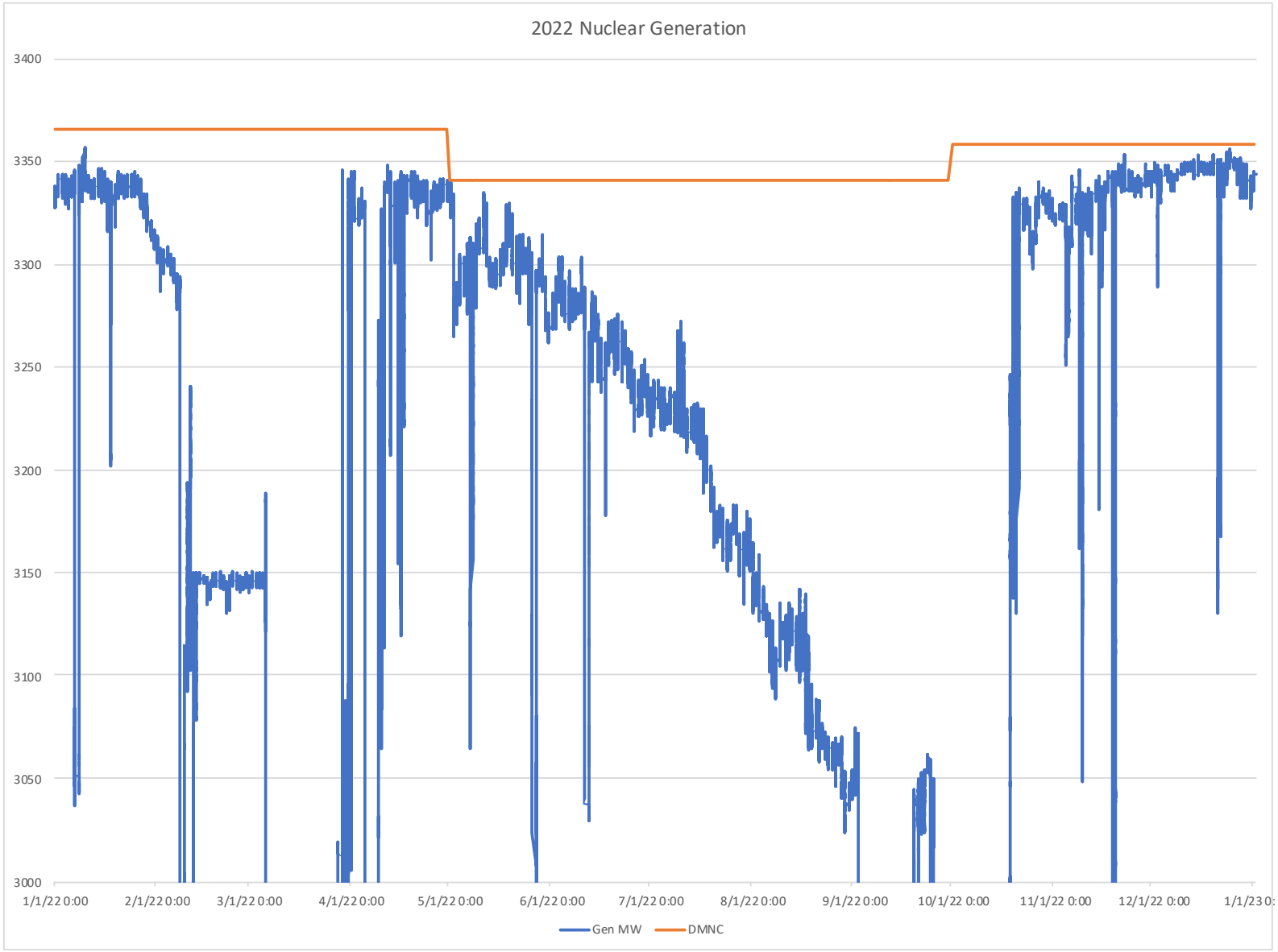
Nuclear Performance

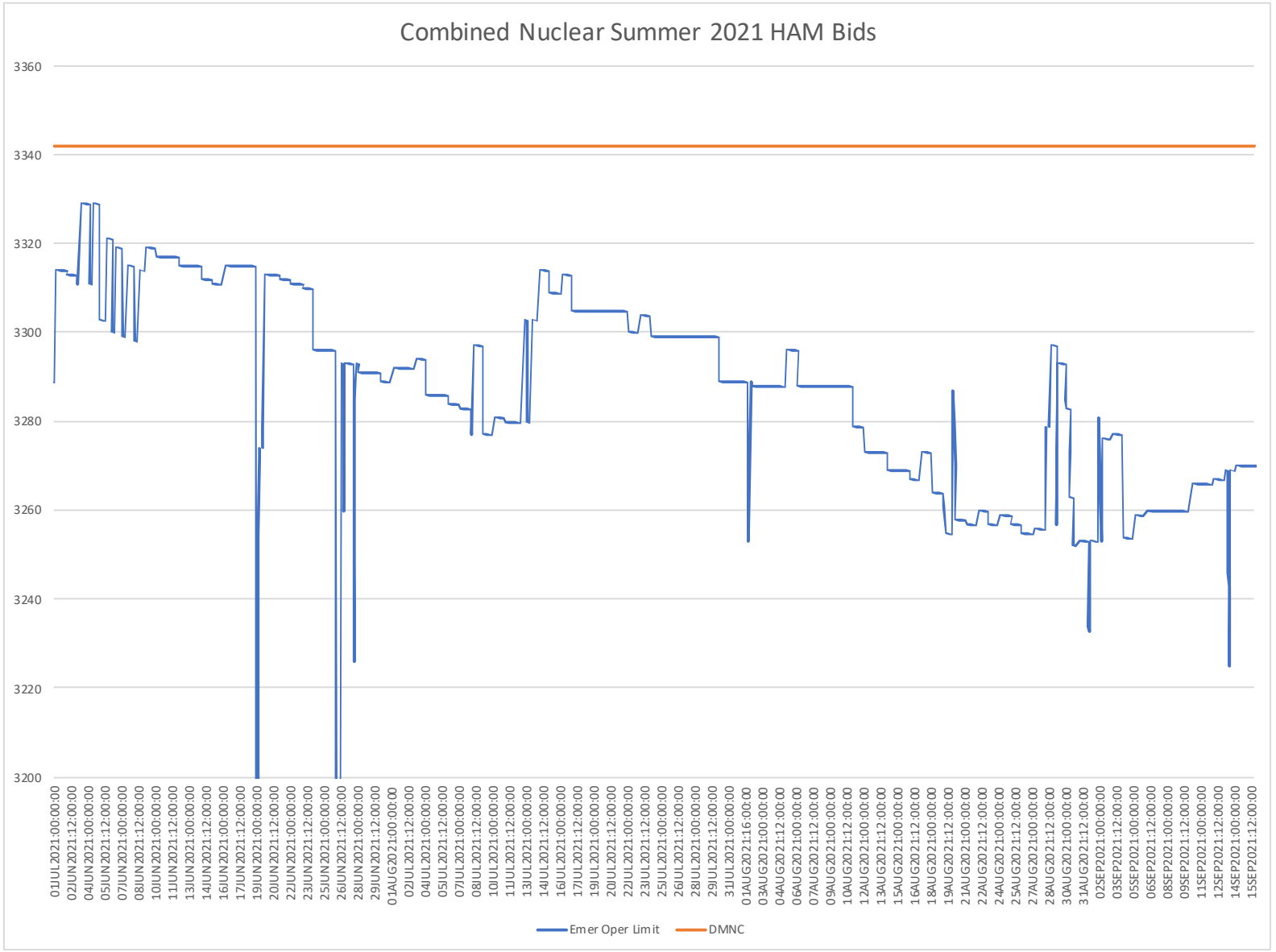
- The Nuclear units frequently fall short of their combined DMNC ratings
- The EFORd Ratings that are presented as the assumptions for the IRM study and used in the RNA and STAR studies are high enough that it does not appear that these partial shortfalls are being treated as partial derates in the EFORd calculation
- Regardless, even if they are incorporated into the EFORd calculation, the shortfall is larger during the critical summer months and this is a threat to reliability
- The NYISO/NYSRC should look at a combination of revising the DMNC rating for the nuclear units to represent peak period operation and making a change to the IRM modeling similar to the summer maintenance treatment to represent the failure of the nuclear units to operate at full DMNC ratings.

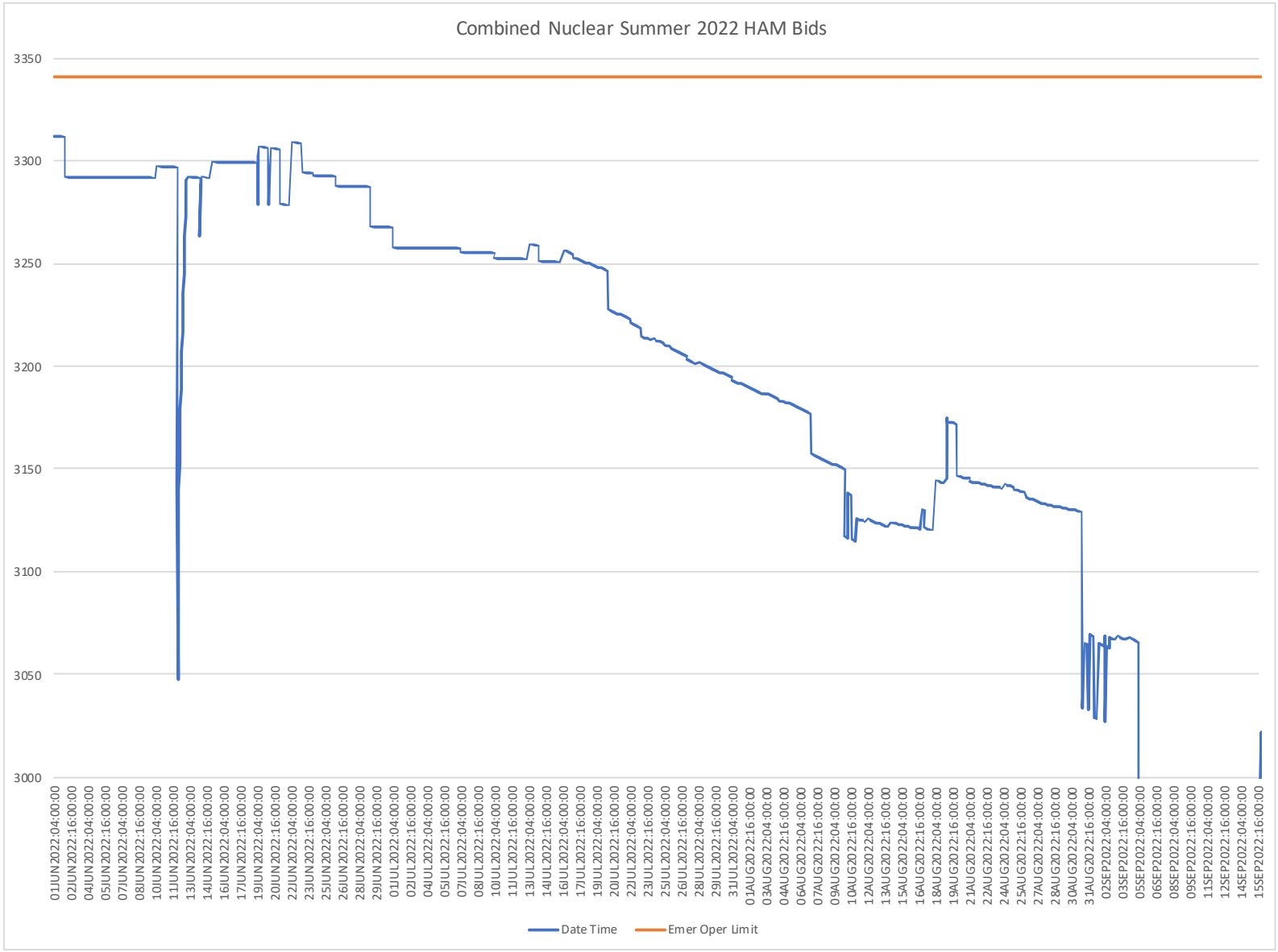
Figure A.7 NYCA Five-Year Weighted Average Availability




May 1 - Dec 31 2021 Generation
3400
3350
3300
3250
3200
3150
3100
3050
3000
5/1/21 0:00
5/8/21 0:00
5/15/21 0:00
5/22/21 0:00
5/29/21 0:00
6/5/21 0:00
6/12/21 0:00
6/19/21 0:00
6/26/21 0:00
7/3/21 0:00
7/10/21 0:00
7/17/21 0:00
7/24/21 0:00
7/31/21 0:00
8/7/21 0:00
8/14/21 0:00
8/21/21 0:00
8/28/21 0:00
9/4/21 0:00
9/11/21 0:00
9/18/21 0:00
9/25/21 0:00
10/2/21 0:00
10/9/21 0:00
10/16/21 0:00
10/23/21 0:00
10/30/21 0:00
11/6/21 0:00
11/13/21 0:00
11/20/21 0:00
11/27/21 0:00
12/4/21 0:00
12/11/21 0:00
12/18/21 0:00
12/25/21 0:00
1/1/22 0:00
Gen MW
DMNC


2022 Nuclear Generation
3400
3350
3300
3250
3200
3150
3100
3050
3000
1/1/22 0:00
2/1/22 0:00
3/1/22 0:00
4/1/22 0:00
5/1/22 0:00
6/1/22 0:00
7/1/22 0:00
8/1/22 0:00
9/1/22 0:00
10/1/22 0:00
11/1/22 0:00
12/1/22 0:00
Gen MW
DMNC


Combined Nuclear Summer 2021 HAM Bids
3360
3340
3320
3300
3280
3260
3240
3220
3200
01JUL2021:00:00:00
02JUN2021:12:00:00
04JUN2021:00:00:00
05JUN2021:12:00:00
07JUN2021:00:00:00
08JUN2021:12:00:00
10JUN2021:00:00:00
11JUN2021:12:00:00
13JUN2021:00:00:00
14JUN2021:12:00:00
16JUN2021:00:00:00
17JUN2021:12:00:00
19JUN2021:00:00:00
20JUN2021:12:00:00
22JUN2021:00:00:00
23JUN2021:12:00:00
25JUN2021:00:00:00
26JUN2021:12:00:00
28JUN2021:00:00:00
29JUN2021:12:00:00
01AUG2021:00:00:00
02JUL2021:12:00:00
04JUL2021:00:00:00
05JUL2021:12:00:00
07JUL2021:00:00:00
08JUL2021:12:00:00
10JUL2021:00:00:00
11JUL2021:12:00:00
13JUL2021:00:00:00
14JUL2021:12:00:00
16JUL2021:00:00:00
17JUL2021:12:00:00
19JUL2021:00:00:00
20JUL2021:12:00:00
22JUL2021:00:00:00
23JUL2021:12:00:00
25JUL2021:00:00:00
26JUL2021:12:00:00
28JUL2021:00:00:00
29JUL2021:12:00:00
31JUL2021:00:00:00
01AUG2021:16:00:00
03AUG2021:00:00:00
04AUG2021:12:00:00
06AUG2021:00:00:00
07AUG2021:12:00:00
09AUG2021:00:00:00
10AUG2021:12:00:00
12AUG2021:00:00:00
13AUG2021:12:00:00
15AUG2021:00:00:00
16AUG2021:12:00:00
18AUG2021:00:00:00
19AUG2021:12:00:00
21AUG2021:00:00:00
22AUG2021:12:00:00
24AUG2021:00:00:00
25AUG2021:12:00:00
27AUG2021:00:00:00
28AUG2021:12:00:00
30AUG2021:00:00:00
31AUG2021:12:00:00
02SEP2021:00:00:00
03SEP2021:12:00:00
05SEP2021:00:00:00
06SEP2021:12:00:00
08SEP2021:00:00:00
09SEP2021:12:00:00
11SEP2021:00:00:00
12SEP2021:12:00:00
14SEP2021:00:00:00
15SEP2021:12:00:00
Emer Oper Limit
DMNC


Combined Nuclear Summer 2022 HAM Bids
3350
3300
3250
3200
3150
3100
3050
3000
01JUN2022:04:00:00
02JUN2022:16:00:00
04JUN2022:04:00:00
05JUN2022:16:00:00
07JUN2022:04:00:00
08JUN2022:16:00:00
10JUN2022:04:00:00
11JUN2022:16:00:00
13JUN2022:04:00:00
14JUN2022:16:00:00
16JUN2022:04:00:00
17JUN2022:16:00:00
19JUN2022:04:00:00
20JUN2022:16:00:00
22JUN2022:04:00:00
23JUN2022:16:00:00
25JUN2022:04:00:00
26JUN2022:16:00:00
28JUN2022:04:00:00
29JUN2022:16:00:00
01JUL2022:04:00:00
02JUL2022:16:00:00
04JUL2022:04:00:00
05JUL2022:16:00:00
07JUL2022:04:00:00
08JUL2022:16:00:00
10JUL2022:04:00:00
11JUL2022:16:00:00
13JUL2022:04:00:00
14JUL2022:16:00:00
16JUL2022:04:00:00
17JUL2022:16:00:00
19JUL2022:04:00:00
20JUL2022:16:00:00
22JUL2022:04:00:00
23JUL2022:16:00:00
25JUL2022:04:00:00
26JUL2022:16:00:00
28JUL2022:04:00:00
29JUL2022:16:00:00
31JUL2022:04:00:00
01AUG2022:16:00:00
03AUG2022:04:00:00
04AUG2022:16:00:00
06AUG2022:04:00:00
07AUG2022:16:00:00
09AUG2022:04:00:00
10AUG2022:16:00:00
12AUG2022:04:00:00
13AUG2022:16:00:00
15AUG2022:04:00:00
16AUG2022:16:00:00
18AUG2022:04:00:00
19AUG2022:16:00:00
21AUG2022:04:00:00
22AUG2022:16:00:00
24AUG2022:04:00:00
25AUG2022:16:00:00
27AUG2022:04:00:00
28AUG2022:16:00:00
30AUG2022:04:00:00
31AUG2022:16:00:00
02SEP2022:04:00:00
03SEP2022:16:00:00
05SEP2022:04:00:00
06SEP2022:16:00:00
08SEP2022:04:00:00
09SEP2022:16:00:00
11SEP2022:04:00:00
12SEP2022:16:00:00
14SEP2022:04:00:00
15SEP2022:16:00:00
Date Time
Emer Oper Limit

2021 Operation on Summer Hot Weather Afternoons (HB14 - HB20)

	DMNC	Peak Day HAM Emergency Operating Limit Bids	Peak Day Actual Operation	Combined Heat Wave* HAM Emergency Operating Limit Bids	Combined Heat Wave* Operation
Nine Mile #2	1288.9	1265.0		1268.8	
Ginna	579.6	578.0		572.9	
Nine Mile #1	630.6	608.0		610.9	
Fitzpatrick	842.9	840.0		833.6	
Total Nuclear	3342	3291.0	3266.1	3286.2	3251.8

* NYISO Hot Weather Operation Presentation Identifies June 6-9; June 27-30; August 9 - 13; and August 25-27 as Hot Weather Operating Days

2022 Operation on Summer Hot Weather Afternoons (HB14 - HB20)

	DMNC	Peak Day HAM Emergency Operating Limit Bids	Peak Day Actual Operation	Combined Heat Wave* HAM Emergency Operating Limit Bids	Combined Heat Wave* Operation
Nine Mile #2	1285.1	1254.0		1257.1	
Ginna	580.2	572.2		567.9	
Nine Mile #1	621.9	609.0		605.6	
Fitzpatrick	854	791.4		751.5	
Total Nuclear	3341.2	3226.6	3170.8	3182.1	3148.8

* NYISO Hot Weather Operation Presentation Identifies July 17-24 and August 3-9 as Hot Weather Operating Days

Other MMU Identified Issues

- Summer DMNC ratings should represent capacity levels that the NYISO can expect during peak conditions
- The NYISO has always recognized this by having temperature dependent units DMNC ratings based on peak temperature conditions.
  - The MMU has also identified humidity and water temperatures as potential issues.
  - humidity and ambient water temperature impacts should be captured in setting the DMNCs for units.
  - Aggregate derates that cannot be captured in DMNC setting should be represented in the resource adequacy modeling as unavailable capacity

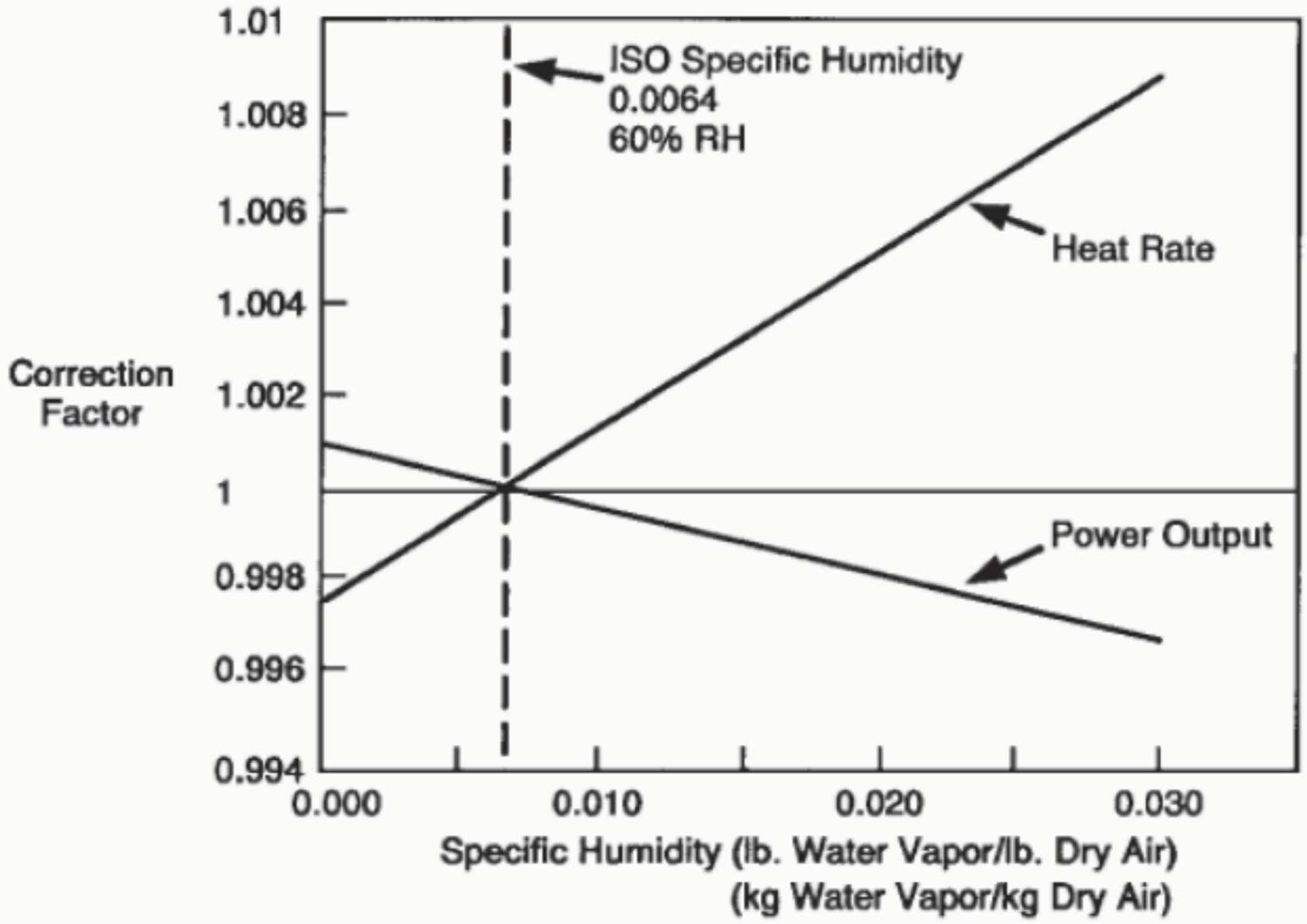


Figure 11. Humidity effect curve

Emergency Supply Unavailable to the NYISO

- The MMU has identified approximately 470 MW of emergency supply that has extremely limited availability
- The NYISO should reconsider whether this emergency supply should count as capacity
- The D in DMNC is an abbreviation for Dependable
  - Some of the Emergency supply has significantly increased forced outage risk.
  - In Summer 2021, I have been told that the NYISO did not use this type of capacity on Long Island even though the operating condition on Long Island was quite extreme because using the UOLe capacity risked an increased risk of losing the entire unit.
  - Operating range with such increased outage risk should not be treated capacity because the operators will be hesitant to use it for fear the system will become riskier due to the increased outage risk.
  - This is not Dependable capacity.

Resource Outage Modeling Does Not Accurately Represent the Risk of Emergency Capacity

- The riskiness of these units is not represented correctly in the IRM/Resource Adequacy studies because they do not incorporate the higher outage risk of the UOLe capacity.
- If these units are going to be able to continue to claim the emergency rating as capacity then there needs to be a correction to the unit's outage risk in Resource Adequacy Modeling