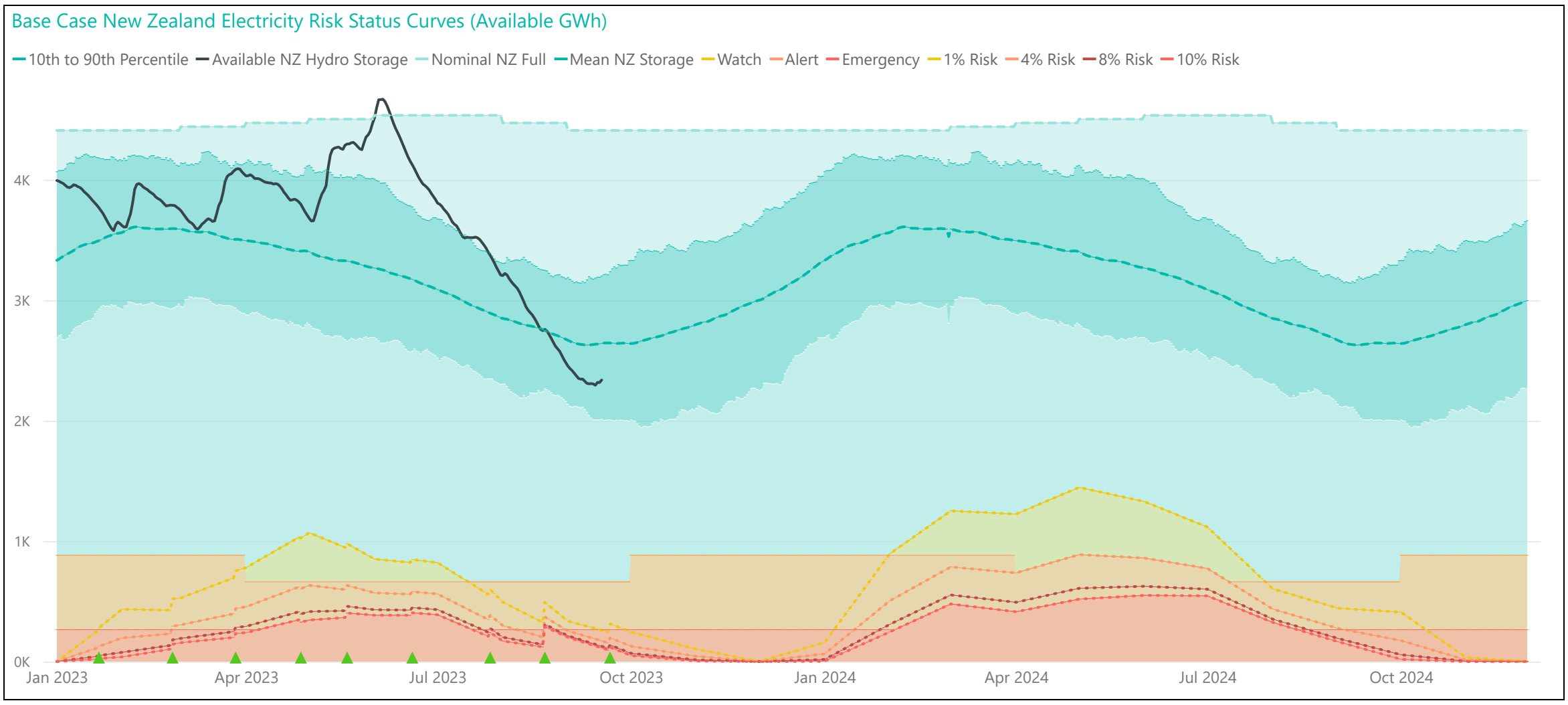
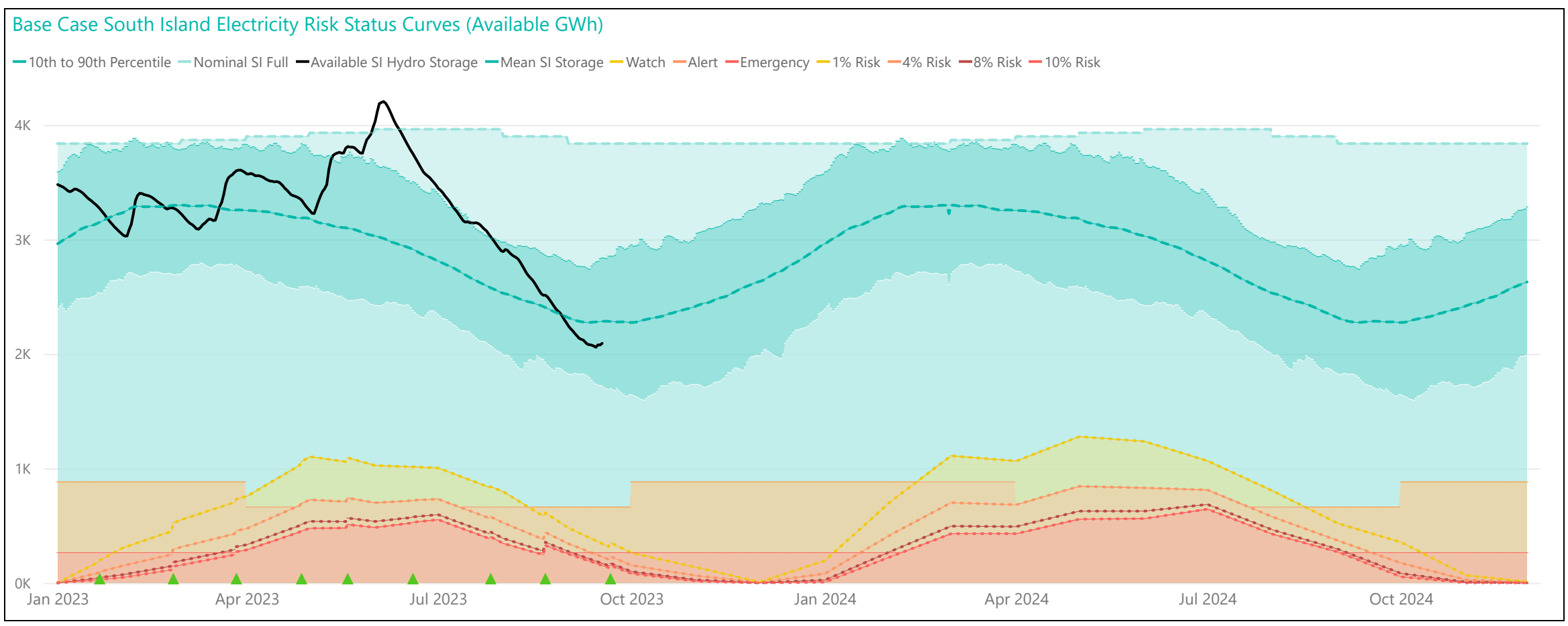
Base Case - Electricity Risk Curves ERCs

Thursday, 21 September 2023

The September 2023 ERC update was published on 15 September with the following updates:

- Updated planned generation outages. This includes the Stratford Peaker outage which is expected to be removed from service until February 2025. Note the extended Huntly Unit 5 outage was captured in previous updates.
- TCC generation availability is now modelled using estimated remaining operating hours, which could potentially provide more generation in 2024.
- TCC generation capacity reduced to 320 MW as per POCP.





Electricity Risk Curve Explanation:

Watch Curve - The maximum of the one percent risk curve and the floor and buffer
Alert Curve - The maximum of the four percent risk curve and the floor and buffer
Emergency Curve - The maximum of the 10 percent risk curve and the floor and buffer
Official Conservation Campaign Start - The Emergency Curve
Official Conservation Campaign Stop - The maximum of the eight percent risk curve and the floor and buffer

Triggers and actions of Watch/Alert/Emergency status are set only by the official base case curves (not scenario curves).

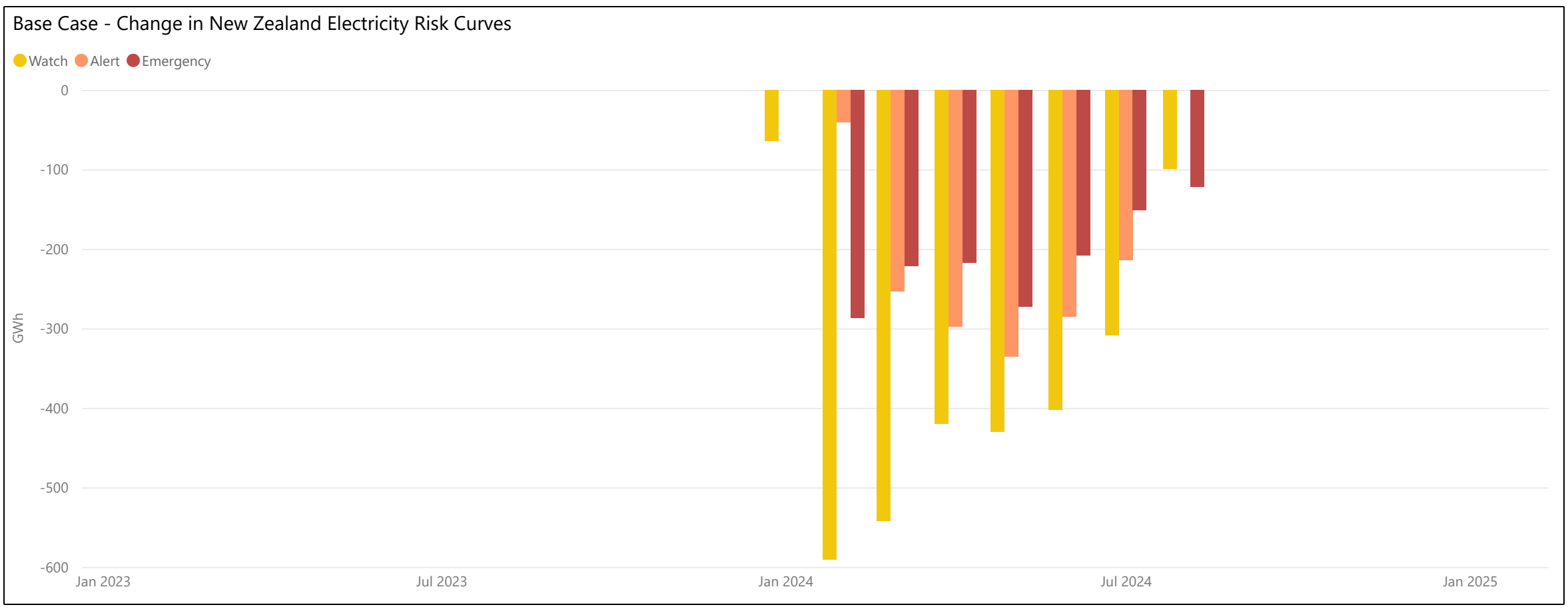
Note: The floor is equal to the amount of contingent hydro storage that is linked to the specific electricity risk curve, plus the amount of contingent hydro storage linked to electricity risk curves representing higher levels of risk of future shortage, if any. The buffer is 50 GWh.

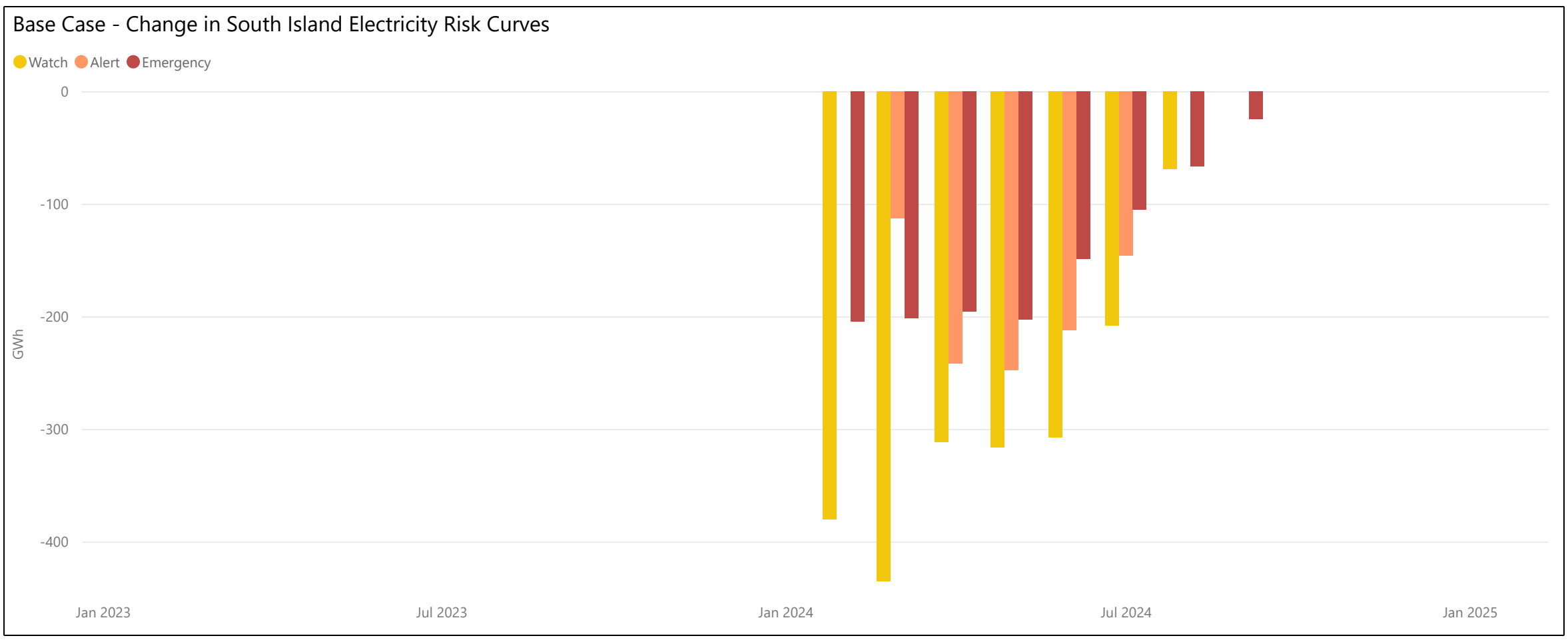
Base Case - Changes in the Electricity Risk Curves From Previous Month

Thursday, 21 September 2023

The changes to the Watch/Alert/Emergency curves compared to last month are shown below.

There is a significant decrease in the curves this month, despite the loss of the Stratford Peaker. This is due to the change in assumption regarding the running hours of TCC, as there is potential for additional availability in 2024.





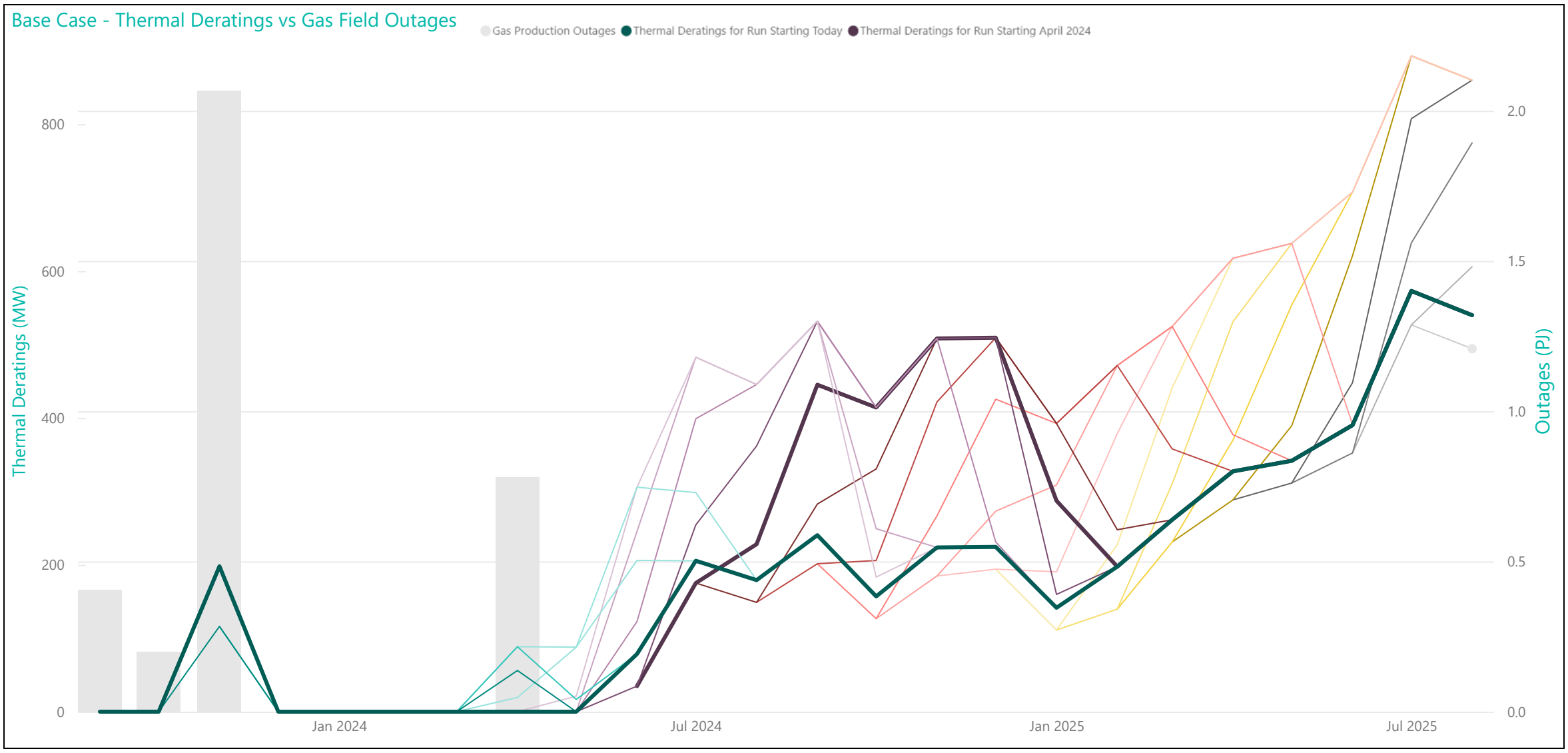
Base Case - Thermal Deratings

Thursday, 21 September 2023

The thermal deratings and key considerations for the September 2023 ERC update are below:

- The coal stockpile remains high enough to fuel a Rankine unit for ~12 months. Gas storage levels remain high enough to fuel TCC for ~3 months (ignoring draw down rates).
- The thermal deratings in November 2023 have dropped. There is still a large gas production outage, however, there are less thermal units available with the Stratford Peaker on outage, so a lower derating is applied.
- There are relatively high thermal deratings throughout most of 2024 and into 2025, however only after emergency gas storage has been depleted. Note that these deratings could change if gas production forecasts are updated or formal agreements around gas reallocation are made.
- As gas supply is constrained throughout most of 2024 and into 2025, having TCC remain due to preserved running hours does not impact the the risk curves over this period. This can be seen through an increase in deratings in later run months, over the period of TCCs remaining running hours (e.g. April 2024).

Base Case - Thermal Deratings vs Gas Field Outages



Thermal Deratings (MW) by Run Month

Run Month	2023-09	2023-10	2023-11	2023-12	2024-01	2024-02	2024-03	2024-04	2024-05	2024-06	2024-07	2024-08	2024-09	2024-10	2024-11	2024-12	2025-01	2025-02	2025-03	2025-04	2025-05	2025-06	2025-07	2025-08
2023-09	0	0	198	0	0	0	0	0	0	79	205	179												
2023-10		0	116	0	0	0	0	56	0	79	205	179	240											
2023-11			116	0	0	0	0	88	17	79	205	179	240	157										
2023-12				0	0	0	0	88	88	206	205	179	240	157	224									
2024-01					0	0	0	19	88	306	298	179	240	157	224	224								
2024-02						0	0	0	21	306	483	445	532	183	224	224	142							
2024-03							0	0	0	246	483	445	532	249	224	224	142	198						
2024-04								0	0	123	399	445	532	414	508	231	142	198	261					
2024-05									0	35	254	362	532	414	508	509	160	198	261	327				
2024-06										35	175	228	445	414	508	509	287	198	261	327	342			
2024-07											175	149	283	330	508	509	392	248	261	327	342	390		
2024-08												149	201	206	422	509	392	471	358	327	342	390	573	
2024-09													201	127	266	425	392	471	524	377	342	390	573	540
2024-10														127	185	273	309	471	524	617	638	391	573	540
2024-11															185	194	190	379	524	617	638	707	893	860
2024-12																194	111	227	441	617	638	707	893	860
2025-01																	111	140	310	531	638	707	893	860
2025-02																		140	231	370	554	707	893	860
2025-03																			231	288	389	621	893	860
2025-04																				288	311	448	807	860
2025-05																					311	352	638	774
2025-06																						352	527	606

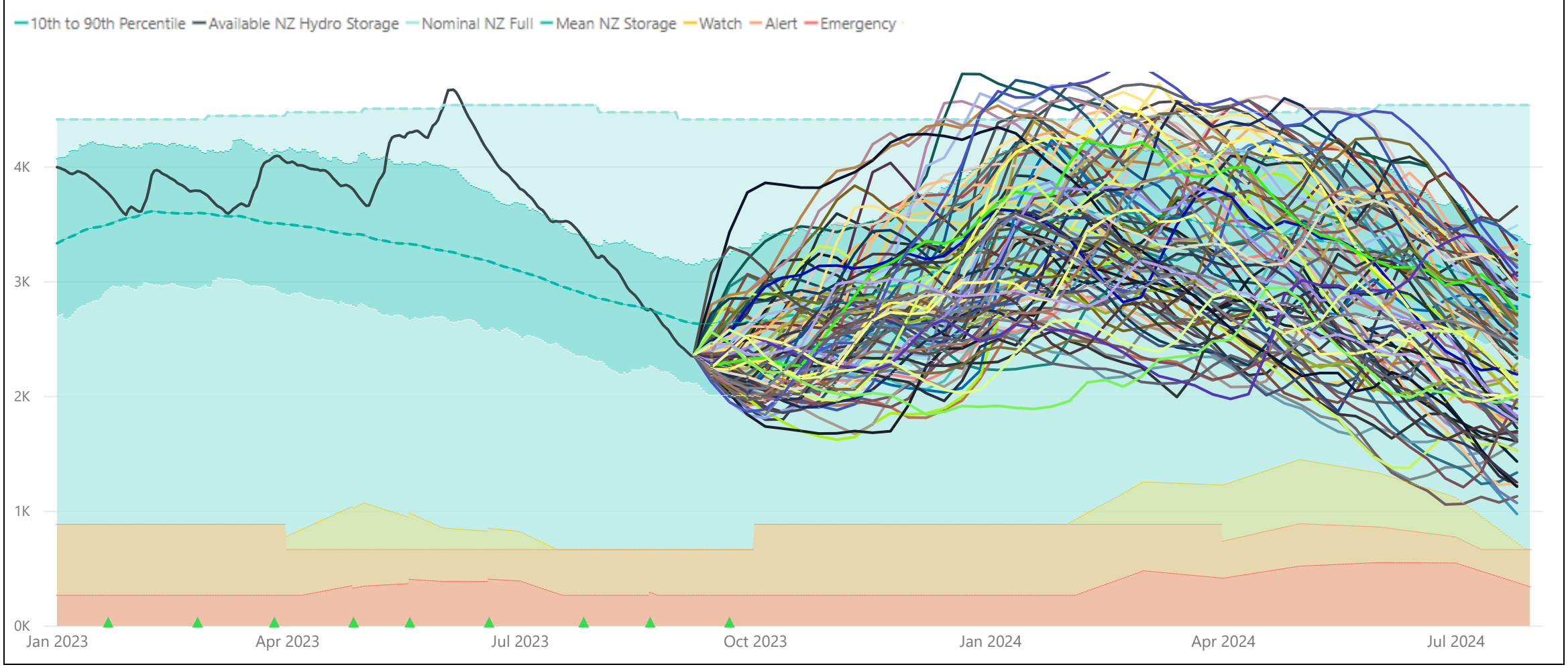
Base Case - Simulated Storage Trajectories (SSTs)

Thursday, 21 September 2023

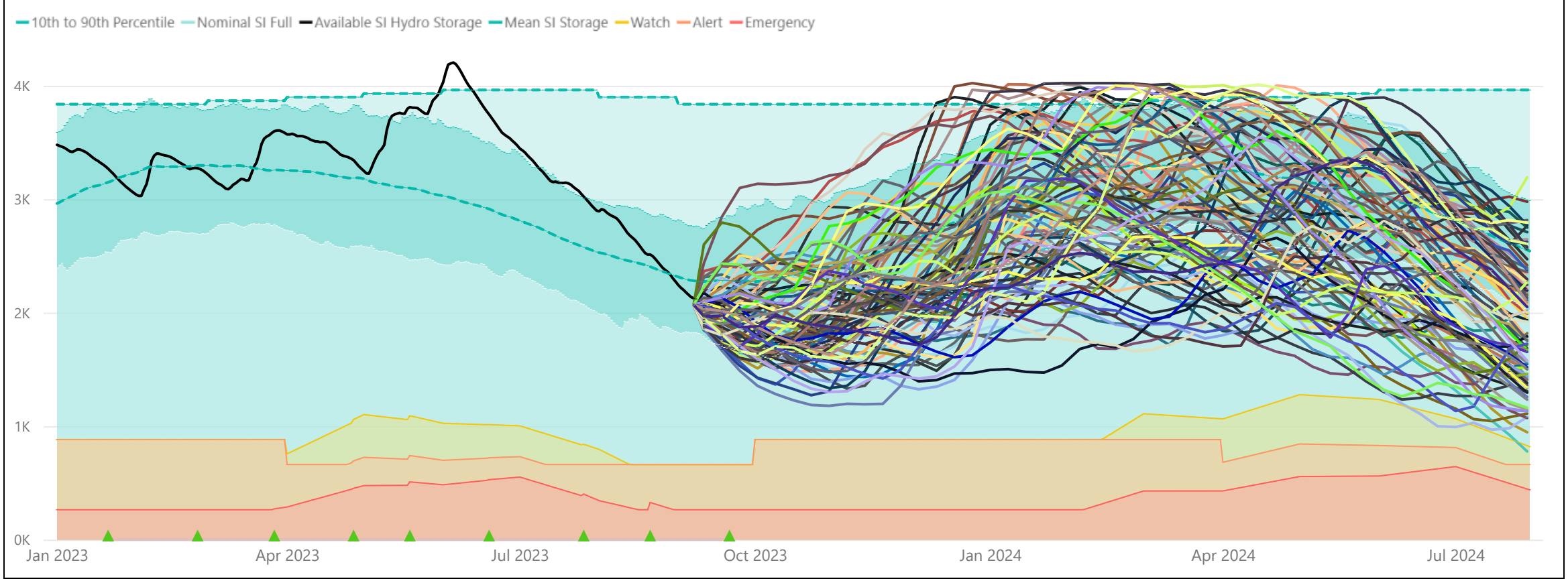
The September SST update is shown below:

- There is now a below average start storage value.
- In winter 2024, one SST crosses the NZ Watch status curve, and two SSTs cross the SI Watch Status Curve

Base Case - New Zealand SST Electricity Risk Status Curves (Available GWh)



Base Case - South Island SST Electricity Risk Status Curves (Available GWh)

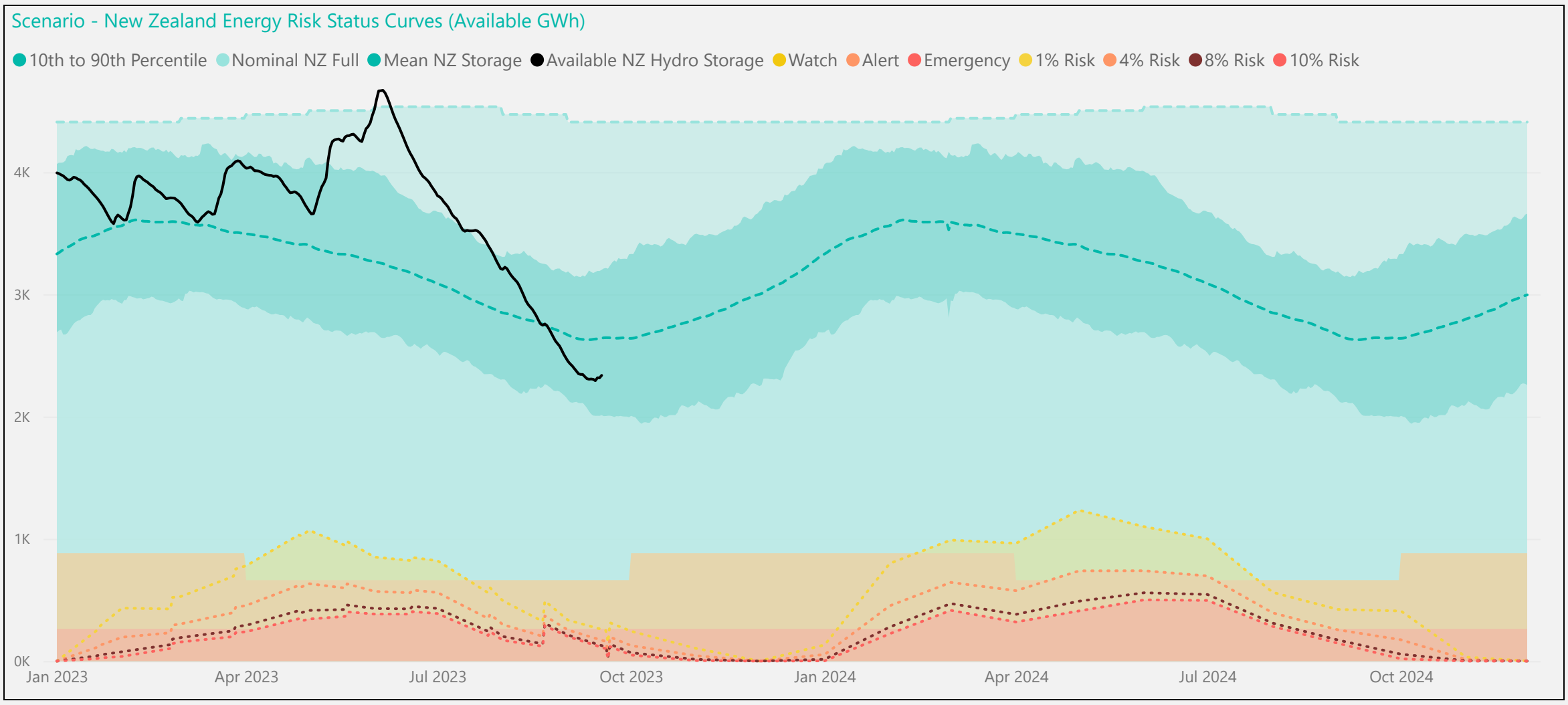


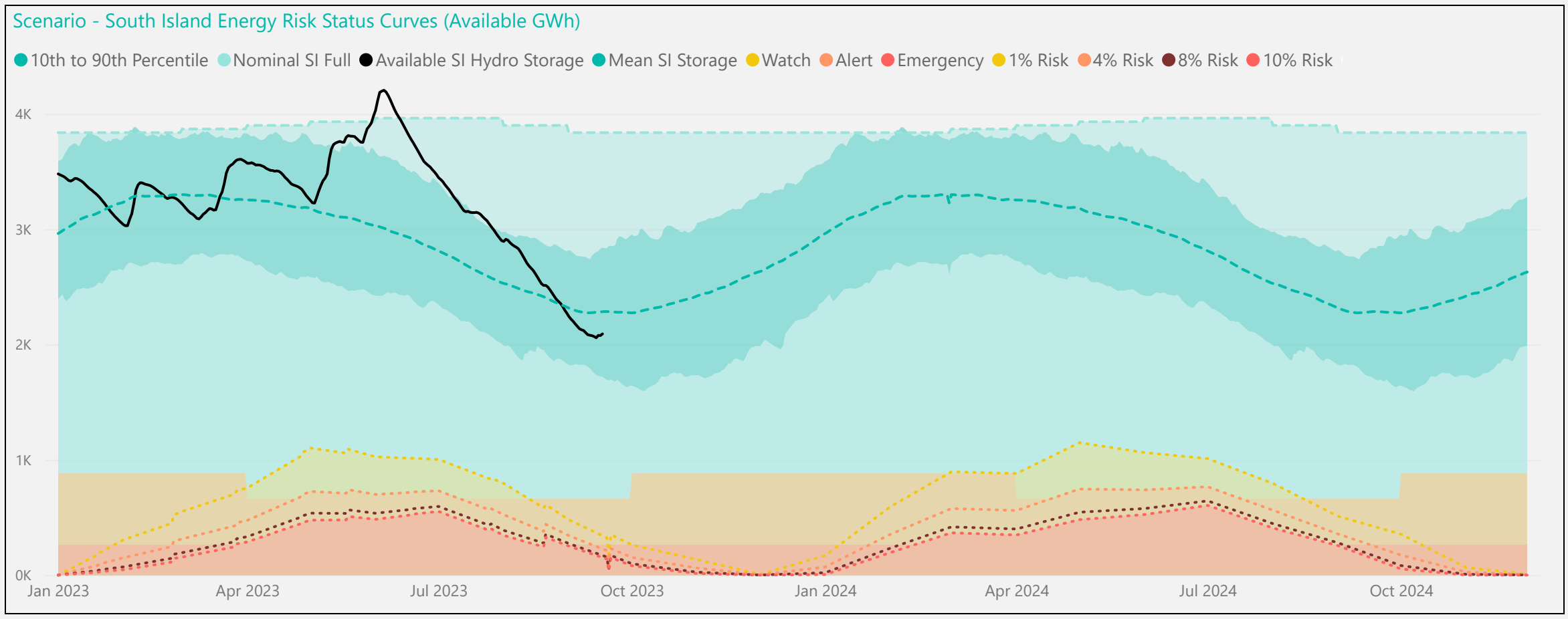
Increased Gas Reallocation Scenario - Electricity Risk Curves

Our current base case Electricity Risk Curves (ERCs) include thermal generator deratings to reflect likely constraints to gas and coal supply in the event of a security of supply dry year emergency. In the second half of 2024 there is ~450 MW or more of thermal deratings in the base case due to gas supply constraints. The base case deratings assume a baseline of ~20 TJ/day of gas demand reallocation from the petrochemical sector to electricity generation, and more if there is a formal agreement in place.

We have run a scenario which assumes a gas reallocation of ~100 TJ/day over June-August (winter) 2024 for electricity generation from the petrochemical sector, ignoring any current formal agreements. This scenario examines the impacts this additional gas availability may have on the ERCs.

The September 2023 ERC Winter 2024 Gas Reallocation Scenario is shown below.
With an additional ~80TJ/day of gas supply available (on top of the ~20 TJ/day baseline) for electricity generation over winter 2024, the New Zealand emergency curve would move down by about 108 GWh at its peak, and the watch 261 GWh. This can be seen when comparing the plots below with the base case ERCs, or by looking at the changes in curves on the next page.

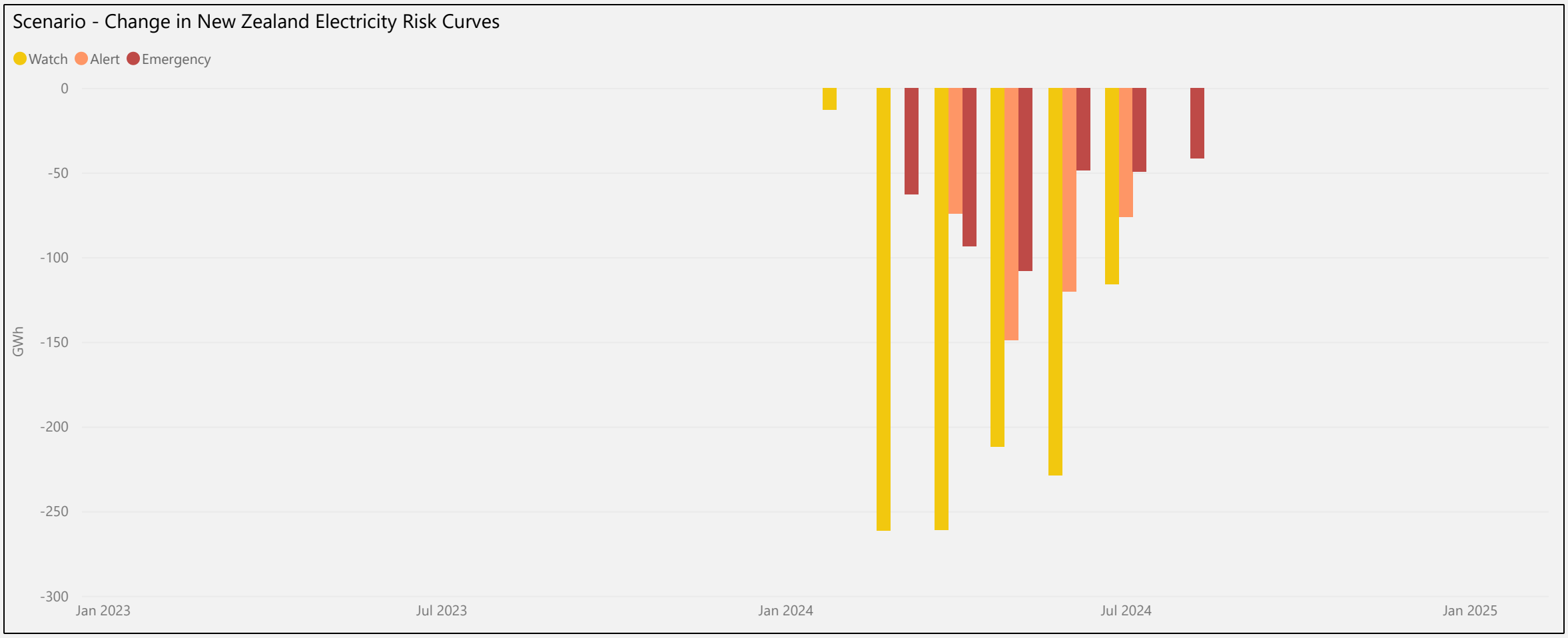


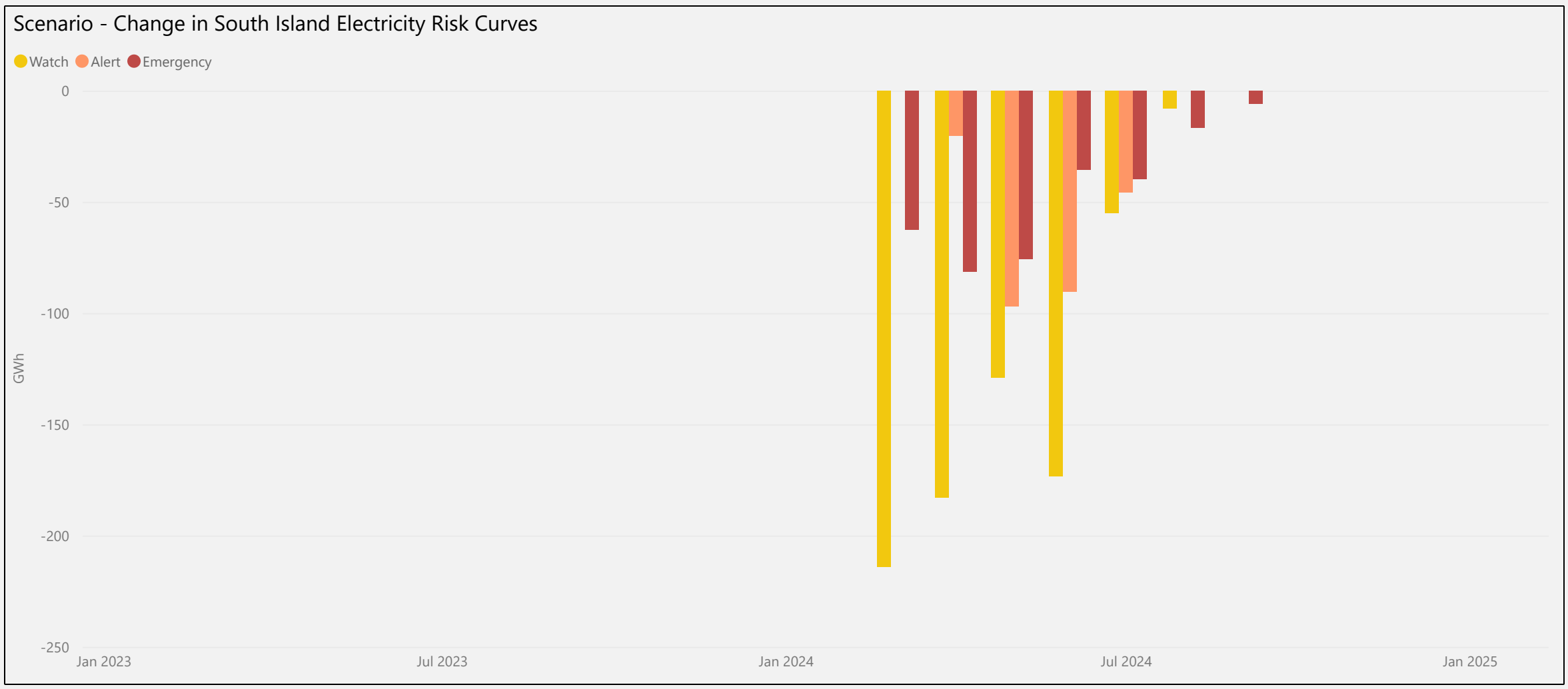


Scenario - Changes in the Electricity Risk Curves from the Base Case

The changes to the scenario Watch/Alert/Emergency curves compared to the base case are shown below.

The decrease in these curves is solely the result of the increase in assumed gas available for generation considering a ~100 TJ/day gas reallocation for electricity generation from the petrochemical sector over winter 2024. Under this scenario thermal deratings are significantly reduced over June-August 2024, bringing the curves down over the first half of 2024.



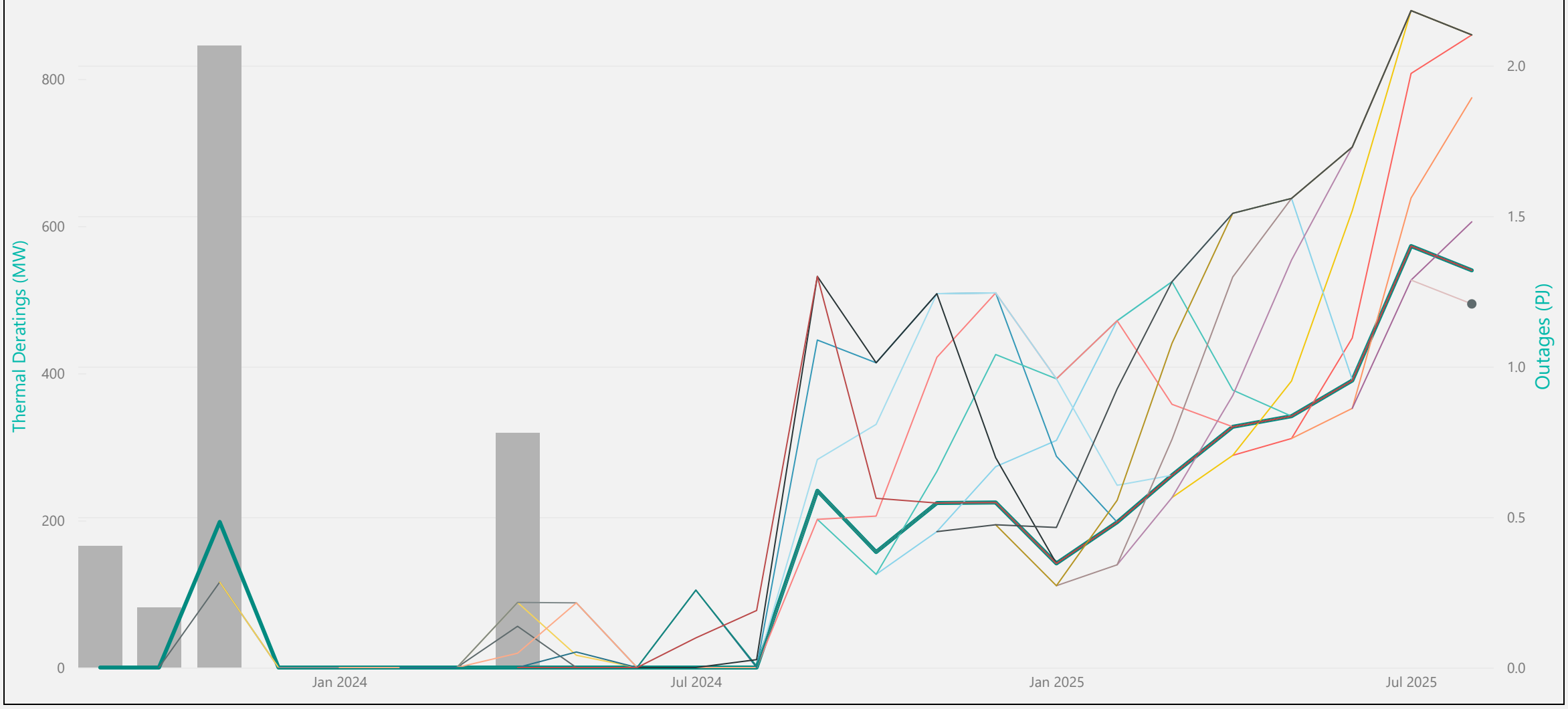


Scenario - Thermal Deratings

The thermal deratings and key considerations for the September 2023 ERC scenario are below:

- Gas supply reallocation from the petrochemical sector to electricity generation is assumed to be ~100 TJ/day, over June-August 2024, ignoring formal agreements. The deratings over this period are hence lower than the base case.
- The rest of the key considerations are the same as in the base case.

Scenario - Gas Deratings vs Gas Field Outages



	2023-09	2023-10	2023-11	2023-12	2024-01	2024-02	2024-03	2024-04	2024-05	2024-06	2024-07	2024-08	2024-09	2024-10	2024-11	2024-12	2025-01	2025-02	2025-03	2025-04	2025-05	2025-06	2025-07	2025-08
2023-09	0.00	0.00	197.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
2023-10		0.00	116.12	0.00	0.00	0.00	0.00	56.07	0.00	0.00	0.00	0.00	240.29											
2023-11			116.12	0.00	0.00	0.00	0.00	88.45	16.68	0.00	0.00	0.00	240.29	156.97										
2023-12				0.00	0.00	0.00	0.00	88.45	87.91	0.00	0.00	0.00	240.29	156.97	223.60									
2024-01					0.00	0.00	0.00	19.43	87.91	0.00	0.00	0.00	240.29	156.97	223.60	224.35								
2024-02						0.00	0.00	0.00	21.11	0.00	105.20	0.00	240.29	156.97	223.60	224.35	141.51							
2024-03							0.00	0.00	0.00	0.00	105.20	1.90	240.29	156.97	223.60	224.35	141.51	197.51						
2024-04								0.00	0.00	0.00	40.30	77.50	531.64	230.01	223.60	224.35	141.51	197.51	261.32					
2024-05									0.00	0.00	0.00	10.71	531.64	414.18	508.11	285.28	141.51	197.51	261.32	327.23				
2024-06										0.00	0.00	0.00	445.14	414.18	508.11	509.17	287.13	197.51	261.32	327.23	341.62			
2024-07											0.00	0.00	282.69	330.47	508.11	509.17	392.40	247.71	261.32	327.23	341.62	390.09		
2024-08												0.00	201.39	205.83	421.62	509.17	392.40	471.33	357.76	327.23	341.62	390.09	572.84	
2024-09													201.39	126.65	266.50	425.46	392.40	471.33	524.42	377.05	341.62	390.09	572.84	539.83
2024-10														126.65	184.71	272.98	308.69	471.33	524.42	617.33	637.61	391.14	572.84	539.83
2024-11															184.71	194.03	190.37	378.65	524.42	617.33	637.61	707.41	892.84	859.83
2024-12																194.03	111.19	227.28	440.71	617.33	637.61	707.41	892.84	859.83
2025-01																	111.19	139.62	310.19	530.83	637.61	707.41	892.84	859.83
2025-02																		139.62	231.01	369.72	553.90	707.41	892.84	859.83
2025-03																			231.01	288.33	389.45	620.91	892.84	859.83
2025-04																				288.33	311.30	447.91	807.42	859.83
2025-05																					311.30	352.24	638.18	774.41
2025-06																						352.24	526.57	605.82
2025-07																							526.57	494.21
2025-08																								494.21

Scenario - Simulated Storage Trajectories

The reduction in the risk curves due to the scenario means no SSTs cross the New Zealand Watch Status Curve. Two still cross the South Island Watch Curve.