ELCC Accreditation Methodology:
Update on Sensitivity Analyses

ELCCSTF

May 22, 2025

ELCC Sensitivity Analyses

- This presentation provides ELCC sensitivity analyses that were requested by stakeholders and/or initiated by PJM to help inform the discussion and development of accreditation proposals at the ELCCSTF
- All values are presented for informational purposes only

List of Sensitivity Analyses

ELCC Sensitivity Runs		Review Results
Base Case	2026/27 BRA ELCC run that also includes the DR modeling and accreditation reforms recently accepted by FERC in Docket No. ER25-1525	Today (May 22nd meeting)
1	Remove 1993/94 from historical weather period	Today
2	Extend historical weather period back to 1970s *	Today
3	Remove WSE and 2014 Polar Vortex performance	Today
4	Alternative approach to better align load scenarios and temp. / performance **(new)**	Today
5	Incorporate thermal winter capability above CIRs	Today
6	Combine sensitivities 1 and 3 (No 1993/94 or WSE/PV1)	Today
7	Combine sensitivities 4 and 5 (Improved temp/load alignment and WICAP)	Today
8	Combine sensitivities 3 and 5 (WICAP with no WSE/PV1)	Today
9+	Performance Weighting sensitivities with est. 2025 winter performance data	May 30th

Sensitivity based on run done during CIFP stakeholder process

Base Case

- 26/27 BRA Case run during the first quarter of 2025
- Plus DR changes recently accepted by FERC in Docket No. ER25-1525
  - No limited DR Performance Window
  - Changes to DR winter performance shape

Base Case

ELCC Class	Base (%)
10-hr Storage	78
4-hr Storage	56
6-hr Storage	65
8-hr Storage	69
Coal	83
Demand Response	88
Diesel Utility	91
Fixed-Tilt Solar	10
Gas Combined Cycle	75
Gas Combustion Turbine	62
Gas Combustion Turbine Dual	78
Hydro Intermittent	38
Landfill Intermittent	51
Nuclear	95
Offshore Wind	67
Onshore Wind	39
Steam	74
Tracking Solar	13

Metric	Base
FPR	0.9335
IRM (%)	18.8
LOLH Winter %	78.2
Avg. AUCAP Factor	0.7858

1. Removing DY 1993/94 Load Scenarios ("No93")

- The load scenarios associated with weather from DY 1993/94 were removed from the model
- Weather data starts on June 1st 1994
- Weather bins were recalculated

1. Removing DY 1993/94 ("No93")

ELCC Class	Base (%)	No93 (%)	Difference (%)
10-hr Storage	78	83	5
4-hr Storage	56	67	11
6-hr Storage	65	74	9
8-hr Storage	69	76	7
Coal	83	83	0
Demand Response	88	94	6
Diesel Utility	91	92	1
Fixed-Tilt Solar	10	12	2
Gas Combined Cycle	75	79	4
Gas Combustion Turbine	62	71	9
Gas Combustion Turbine Dual	78	83	5
Hydro Intermittent	38	38	0
Landfill Intermittent	51	51	0
Nuclear	95	95	0
Offshore Wind	67	52	-15
Onshore Wind	39	32	-7
Steam	74	77	3
Tracking Solar	13	17	4

Metric	Base	No93	Diff
FPR	0.9335	0.9542	0.0207
IRM (%)	18.8	17.9	-0.9
LOLH Winter %	78.2	57.8	-20.4
Avg. AUCAP Factor	0.7858	0.8093	0.0235

- Decrease in overall system risk (IRM drops and system is less tight)
- Majority of LOLH remains in the winter season (load scenarios with more risk are from 2014/15)
- Class ratings increase for all classes except wind classes

2. Weather history back to 1970s

- During the CIFP stakeholder process, sensitivity analyses was run using an extended weather history back to 1973 and compared to the base case at that time
- The following shows the relative shift in seasonal risk for different loss-of-load metrics that were provided when this analysis was run:

	CIFP Base Case (Back to 1993)	Weather History Back to 1973	Diff
LOLE Winter Share (%)	31%	42%	**+11% Winter**
LOLH Winter Share (%)	49%	57%	**+8% Winter**
EUE Winter Share (%)	64%	71%	**+7% Winter**

3. Removing Forced Outages from PV1 and WSE (“NoPV1WSE”)

- The forced outage data from Polar Vortex 1 (PV1) and Winter Storm Elliott (WSE) were removed from the model
  - PV1 was defined as including 3 days Jan 6 – Jan 8, 2014
  - WSE was defined as including 4 days Dec 23 – Dec 26, 2022
- After removing those days from the respective bin, the rest of the bin was left unmodified. This means that the probability of drawing performance from other days in the bin increased, after the removal of the days

3. Removing Forced Outages from PV1 and WSE (“NoPV1WSE”)

ELCC Class	Base (%)	NoPV1WSE (%)	Difference (%)
10-hr Storage	78	97	19
4-hr Storage	56	92	36
6-hr Storage	65	97	32
8-hr Storage	69	93	24
Coal	83	88	5
Demand Response	88	106	18
Diesel Utility	91	96	5
Fixed-Tilt Solar	10	20	10
Gas Combined Cycle	75	94	19
Gas Combustion Turbine	62	92	30
Gas Combustion Turbine Dual	78	94	16
Hydro Intermittent	38	37	-1
Landfill Intermittent	51	57	6
Nuclear	95	96	1
Offshore Wind	67	30	-37
Onshore Wind	39	15	-24
Steam	74	88	14
Tracking Solar	13	28	15

Metric	Base	NoPV1WSE	Diff
FPR	0.9335	1.0522	0.1187
IRM (%)	18.8	17.2	-1.6
LOLH Winter %	78.2	20.3	-57.9
Avg. AUCAP Factor	0.7858	0.8978	0.112

- Decrease in overall system risk (IRM drops and system is less tight)
- Majority of LOLH is in the summer season
- Class ratings significantly increase and are consistent with a system with majority of risk in summer

4. Improve Alignment of Load Scenarios with Temperature Bins (“Align”)

Currently, to identify the **temperature bin** from which to sample resource performance, we use the target forecast date (e.g., June 2) *combined* with the delivery year of the scenario under consideration (e.g., 1993 in the case of A1993, B1993, or C1993). We then find the bin that contains the resulting date. Therefore,

June 2, 2026 under **A1993** ➡ June 2, 1993 ➡ Bin containing June 2, 1993
June 2, 2026 under **B1993** ➡ June 2, 1993 ➡ Bin containing June 2, 1993
June 2, 2026 under **C1993** ➡ June 2, 1993 ➡ Bin containing June 2, 1993
June 2, 2026 under **M2023** ➡ June 2, 2023 ➡ Bin containing June 2, 2023

Target Forecast Day 26/27	A1993	B1993	C1993	….	….	….	M2023
June 1, 2026	140,000	139,500	138,000	….	….	….	145,000
June 2, 2026	137,000	134,000	136,000	….	….	….	140,000
….	….	….	….	….	….	….	….
May 31, 2027	133,000	134,000	132,000	….	….	….	135,000

4. Improve Alignment of Load Scenarios with Temperature Bins ("Align")

However, the actual weather that is used to calculate the forecasted loads in the weather scenarios is as shown below. PJM is proposing to better align each forecasted load with the temperature bin that contains the weather that was used to calculate the forecasted load per the following example:

June 2, 2026 under A1993 ➡ June 2, 1993 ➡ Bin containing June 2, 1993
June 2, 2026 under B1993 ➡ June 3, 1993 ➡ Bin containing ~~June 2~~June 3, 1993
June 2, 2026 under C1993 ➡ June 4, 1993 ➡ Bin containing ~~June 2~~June 4, 1993
June 2, 2026 under M2023 ➡ May 27, 2023 ➡ Bin containing ~~June 2~~ May 27, 2023

Target Forecast Day 26/27	A1993	B1993	C1993	….	…..	….	M2023
June 1, 2026	June 1, 1993	June 2, 1993	June 3, 1993	….	….	….	May 26, 2023
June 2, 2026	June 2, 1993	June 3, 1993	June 4, 1993	….	….	….	May 27, 2023
….	….	….	….	….	….	….	….
May 31, 2027	May 31, 1994	June 1, 1994	June 2, 1994	….	….	….	May 25, 2024

Improve Alignment of Load Scenarios with Temperature Bins ("Align")

Current Approach to identify temperature Bin

Target Forecast Day 26/27	A1993	B1993	C1993	….	…..	….	M2023
June 1, 2026	June 1, 1993	June 1, 1993	June 1, 1993	….	….	….	June 1, 2023
June 2, 2026	June 2, 1993	June 2, 1993	June 2, 1993	….	….	….	June 2, 2023
….	….	….	….	….	….	….	….
May 31, 2027	May 31, 1994	May 31, 1994	May 31, 1994	….	….	….	May 31, 2024

Proposed Approach to identify temperature Bin (aligned with development of PJM Load Forecast)

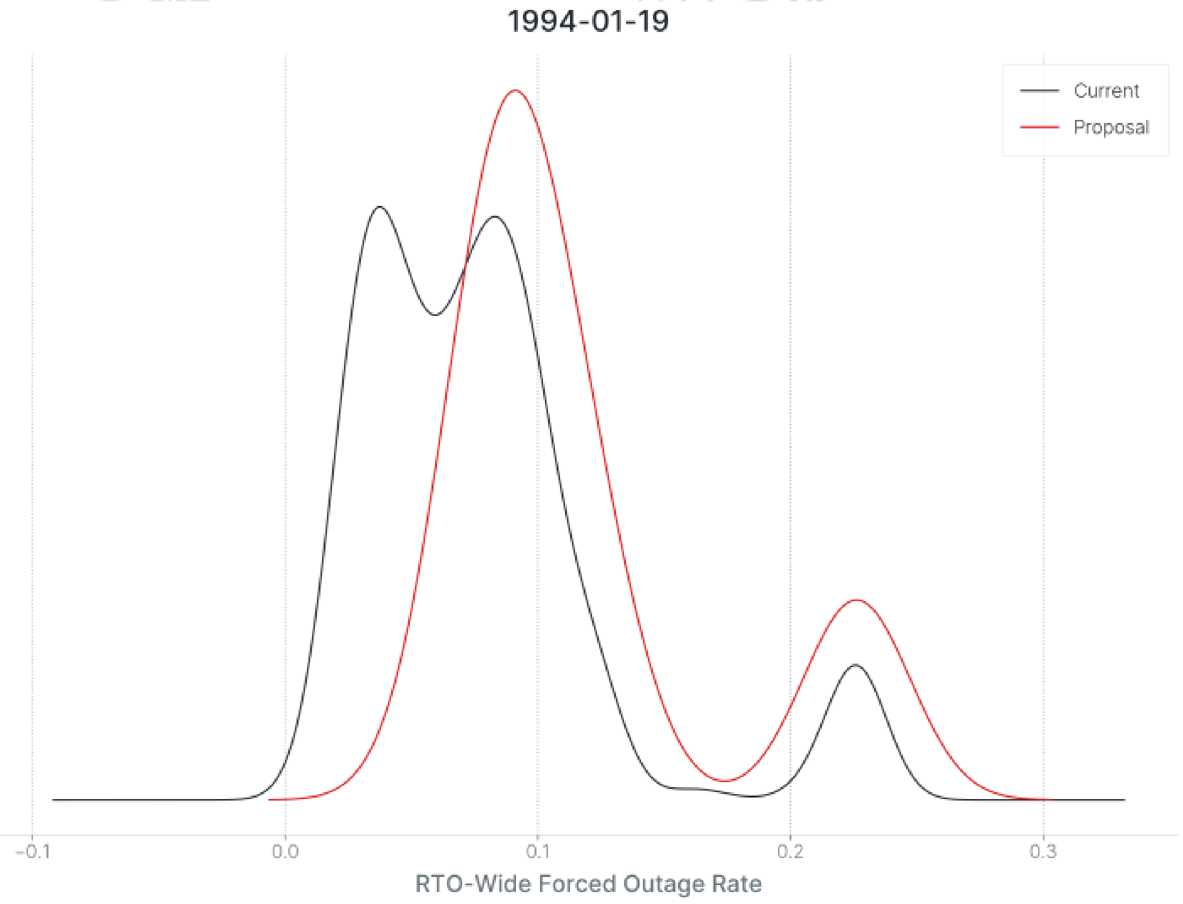
Target Forecast Day 26/27	A1993	B1993	C1993	….	…..	….	M2023
June 1, 2026	June 1, 1993	June 2, 1993	June 3, 1993	….	….	….	May 26, 2023
June 2, 2026	June 2, 1993	June 3, 1993	June 4, 1993	….	….	….	May 27, 2023
….	….	….	….	….	….	….	….
May 31, 2027	May 31, 1994	June 1, 1994	June 2, 1994	….	….	….	May 25, 2024

4. Improve Alignment of Load Scenarios with Temperature Bins ("Align")

- The graph shows the current forced outage distribution for one of the coldest days in the model (Jan 19, 1994) vs how the distribution would look like under the PJM proposal

- Each distribution was plotted using the 1,300 sampled forced outage values associated with Jan 19, 1994
  - 13 weather scenarios (A through M) x 100 performance draws = 1,300

- For Jan 19, 1994, the current implementation samples higher forced outage levels less frequently than under the proposed implementation



4. Improve Alignment of Load Scenarios with Temperature Bins ("Align")

ELCC Class	Base (%)	Align (%)	Difference (%)
10-hr Storage	78	80	2
4-hr Storage	56	57	1
6-hr Storage	65	67	2
8-hr Storage	69	70	1
Coal	83	82	-1
Demand Response	88	85	-3
Diesel Utility	91	90	-1
Fixed-Tilt Solar	10	6	-4
Gas Combined Cycle	75	69	-6
Gas Combustion Turbine	62	50	-12
Gas Combustion Turbine Dual	78	74	-4
Hydro Intermittent	38	38	0
Landfill Intermittent	51	49	-2
Nuclear	95	95	0
Offshore Wind	67	82	15
Onshore Wind	39	49	10
Steam	74	71	-3
Tracking Solar	13	7	-6

Metric	Base	Align	Diff
FPR	0.9335	0.9234	-0.0101
IRM (%)	18.8	22.1	3.3
LOLH Winter %	78.2	96.2	18.0
Avg. AUCAP Factor	0.7858	0.7563	-0.0295

- Significant increase in overall system risk (IRM increases and system is tight)
- Almost all of LOLH is in the winter season
- Class ratings decrease for majority of classes

5. Additional Winter Capability Overview

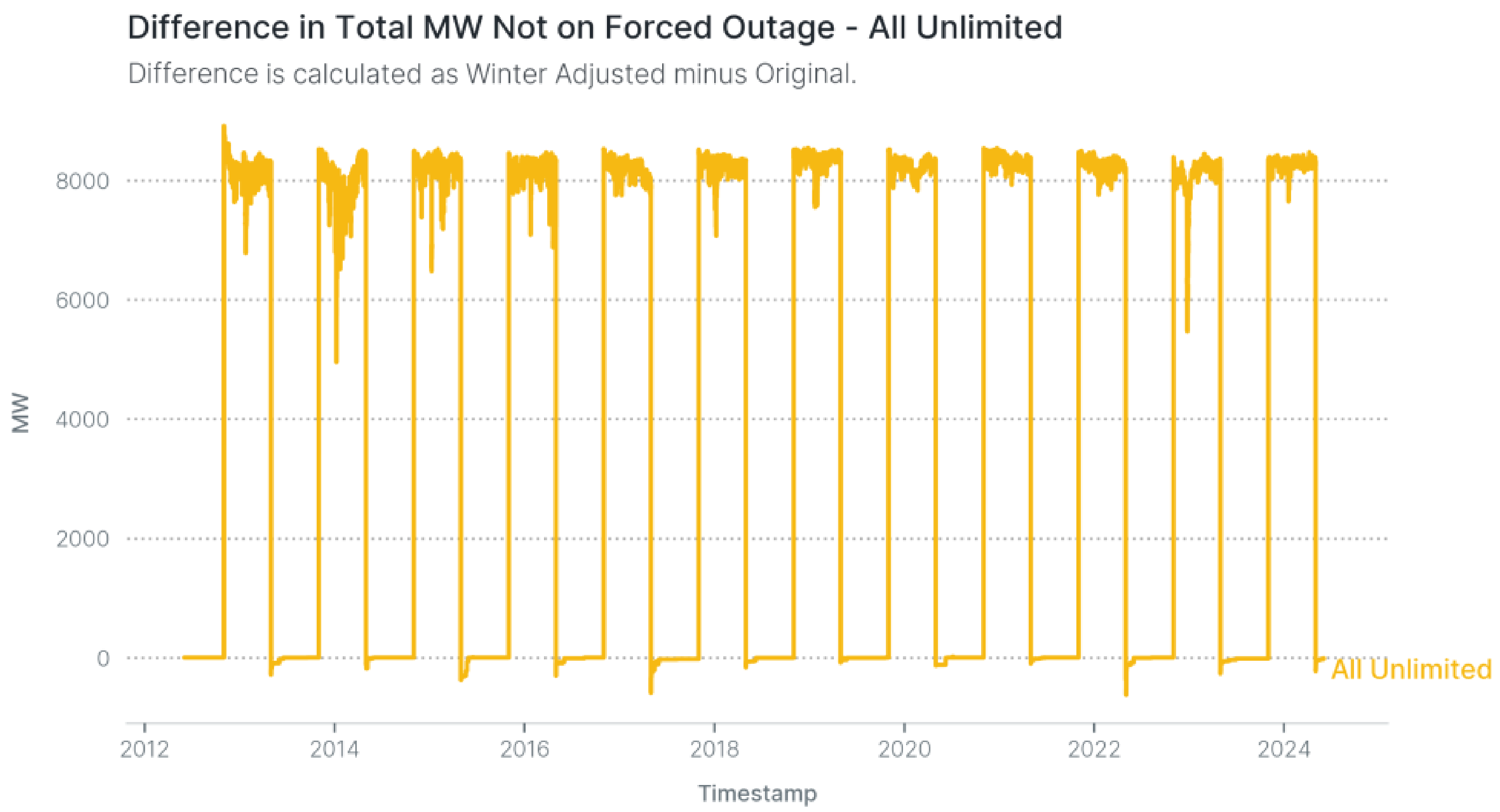
To recognize additional output above a summer based ICAP, PJM estimated a "Winter ICAP" for Unlimited Resources equal to:

- Max Winter Net Capability Test submitted since 22/23 DY, capped at MFO
- Winter ICAP was assumed to be fully deliverable

ELCC Class	Summer ICAP	Winter ICAP	Delta
Nuclear	32,144	33,592	1,448
Coal	35,779	36,441	662
Gas CC (Single and Dual Fuel)	57,664	60,766	3,102
Gas CT	11,030	11,955	925
Gas CT Dual Fuel	13,158	15,099	1,941
Diesel	329	332	3
Steam	10,004	10,189	185
Other Thermal	3,041	3,336	295
	163,149	171,710	8,561

5. Reflect higher Winter output for Unlimited Resources ("WICAP")

Winter Months include November through April



5. Reflect higher Winter output for Unlimited Resources (“WICAP”)

ELCC Class	Base (%)	WICAP (%)	Difference (%)
10-hr Storage	78	91	13
4-hr Storage	56	77	21
6-hr Storage	65	84	19
8-hr Storage	69	84	15
Coal	83	86	3
Demand Response	88	98	10
Diesel Utility	91	93	2
Fixed-Tilt Solar	10	14	4
Gas Combined Cycle	75	84	9
Gas Combustion Turbine	62	76	14
Gas Combustion Turbine Dual	78	90	12
Hydro Intermittent	38	38	0
Landfill Intermittent	51	54	3
Nuclear	95	98	3
Offshore Wind	67	50	-17
Onshore Wind	39	28	-11
Steam	74	80	6
Tracking Solar	13	20	7

Metric	Base	WICAP	Diff
FPR	0.9335	1.0003	0.0668
IRM (%)	18.8	17.7	-1.1
LOLH Winter %	78.2	45.2	-33.0
Avg. AUCAP Factor	0.7858	0.8499	0.0641

- Decrease in overall system risk (IRM drops and system is less tight)
- LOLH is almost evenly split between winter and summer
- Class ratings increase for all classes except wind classes

6. Removing Forced Outages from PV1 and WSE and removing DY 1993/94 (“NoPV1WSE & No93”)

ELCC Class	Base (%)	NoPV1WSE + No93 (%)	Difference (%)
10-hr Storage	78	97	19
4-hr Storage	56	90	34
6-hr Storage	65	96	31
8-hr Storage	69	93	24
Coal	83	88	5
Demand Response	88	108	20
Diesel Utility	91	96	5
Fixed-Tilt Solar	10	23	13
Gas Combined Cycle	75	95	20
Gas Combustion Turbine	62	95	33
Gas Combustion Turbine Dual	78	96	18
Hydro Intermittent	38	36	-2
Landfill Intermittent	51	59	8
Nuclear	95	97	2
Offshore Wind	67	23	-44
Onshore Wind	39	12	-27
Steam	74	89	15
Tracking Solar	13	32	19

Metric	Base	NoPV1WSE + No93	Diff
FPR	0.9335	1.0586	0.1251
IRM (%)	18.8	16.7	-2.1
LOLH Winter %	78.2	7.2	-71.0
Avg. AUCAP Factor	0.7858	0.9071	0.1213

- Decrease in overall system risk (IRM drops and system is less tight)
- Large majority of LOLH is in the summer season
- Class ratings significantly increase and are consistent with a system with majority of risk in summer

7. “WICAP & Align”

ELCC Class	Base (%)	WICAP + Align (%)	Difference (%)
10-hr Storage	78	87	9
4-hr Storage	56	73	17
6-hr Storage	65	80	15
8-hr Storage	69	80	11
Coal	83	84	1
Demand Response	88	90	2
Diesel Utility	91	91	0
Fixed-Tilt Solar	10	9	-1
Gas Combined Cycle	75	76	1
Gas Combustion Turbine	62	60	-2
Gas Combustion Turbine Dual	78	86	8
Hydro Intermittent	38	37	-1
Landfill Intermittent	51	50	-1
Nuclear	95	98	3
Offshore Wind	67	73	6
Onshore Wind	39	42	3
Steam	74	75	1
Tracking Solar	13	12	-1

Metric	Base	WICAP + Align	Diff
FPR	0.9335	0.9667	0.0332
IRM (%)	18.8	19.8	1.0
LOLH Winter %	78.2	75.3	-2.9
Avg. AUCAP Factor	0.7858	0.8069	0.0211

- Increase in overall system risk (IRM increases and system is tighter)
- Majority of LOLH remains in the winter season
- Class ratings increase significantly for storage and Gas CT Dual
- Impact of “Align” is stronger than impact of “WICAP”

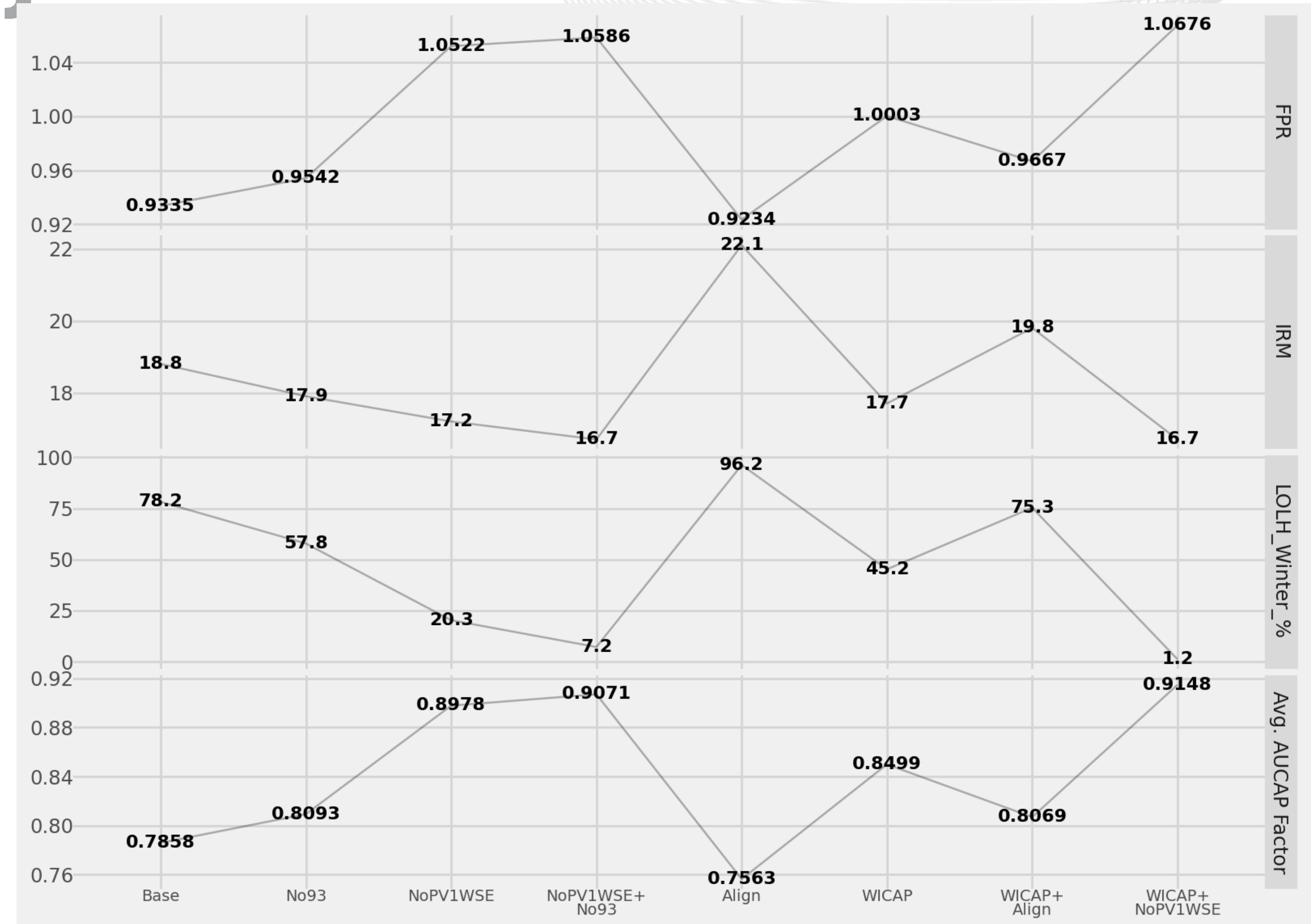
8. "WICAP & NoPV1WSE"

ELCC Class	Base (%)	WICAP + NoPV1WSE (%)	Difference (%)
10-hr Storage	78	97	19
4-hr Storage	56	89	33
6-hr Storage	65	97	32
8-hr Storage	69	93	24
Coal	83	89	6
Demand Response	88	109	21
Diesel Utility	91	97	6
Fixed-Tilt Solar	10	25	15
Gas Combined Cycle	75	96	21
Gas Combustion Turbine	62	96	34
Gas Combustion Turbine Dual	78	96	18
Hydro Intermittent	38	37	-1
Landfill Intermittent	51	59	8
Nuclear	95	97	2
Offshore Wind	67	22	-45
Onshore Wind	39	11	-28
Steam	74	89	15
Tracking Solar	13	35	22

Metric	Base	WICAP + NoPV1WSE	Diff
FPR	0.9335	1.0676	0.1341
IRM (%)	18.8	16.7	-2.1
LOLH Winter %	78.2	1.2	-77.0
Avg. AUCAP Factor	0.7858	0.9148	0.129

- Decrease in overall system risk (IRM drops and system is less tight)
- Almost of LOLH is in the summer season
- Significant class ratings increases (except for wind)

Comparison of All Sensitivity Results

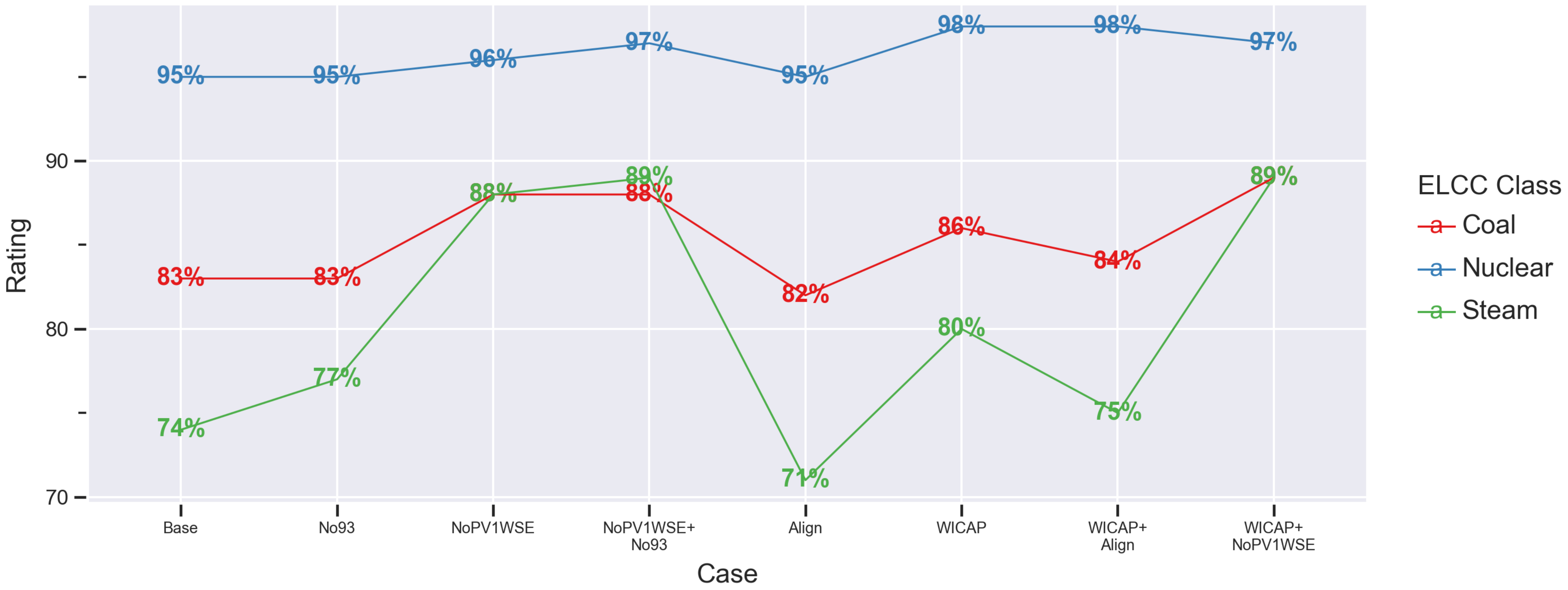


- Removing PV1 and WSE forced outages eliminates the majority of winter risk (even when paired with the "Align" sensitivity)
- The "Align" sensitivity increases winter risk and overall risk. However, this increase is mitigated when coupled with the "WICAP" sensitivity
- Removing 1993/94 reduces risk and winter risk but less so than previously estimated

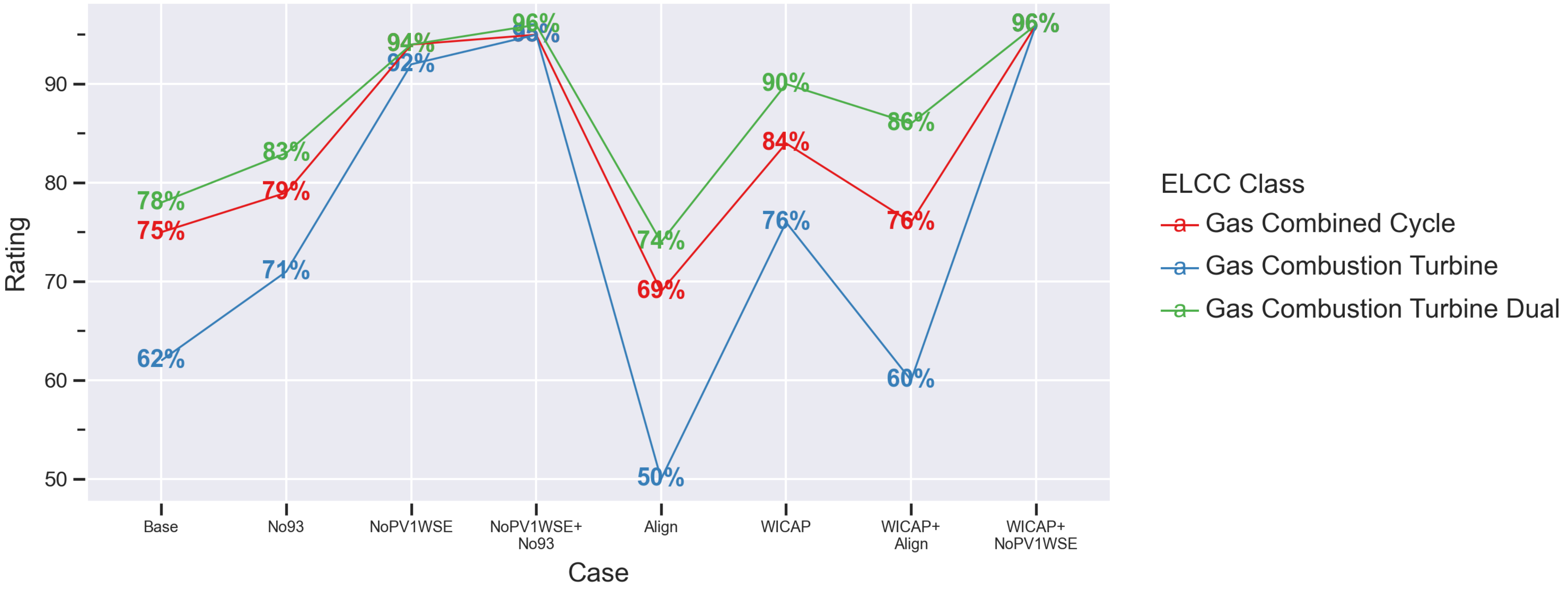
Note that the above graph does not include the "Extend historical weather back to 1970s" sensitivity. Based on previous analysis, the results of such sensitivity would show a higher FPR, IRM and LOLH Winter Share than those shown above as well as a lower Avg. AUCAP Factor.

Appendix

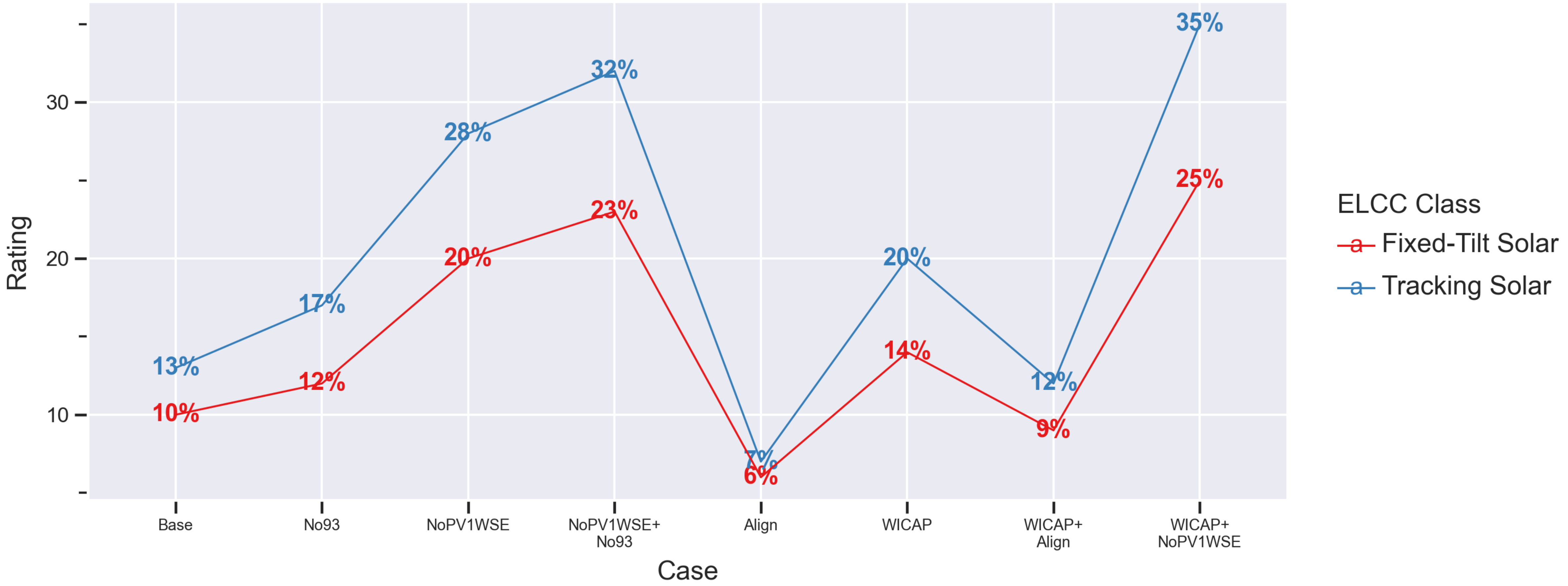
ELCC Class Ratings - Sensitivities



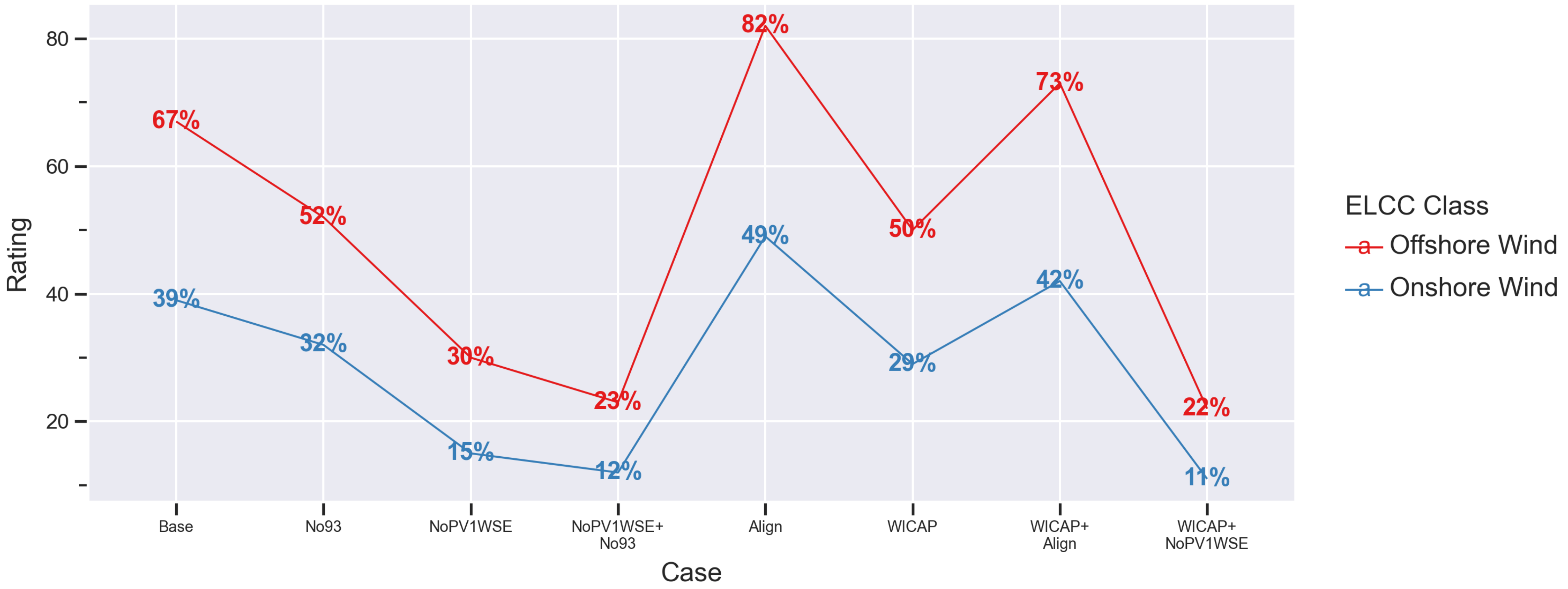
ELCC Class Ratings - Sensitivities



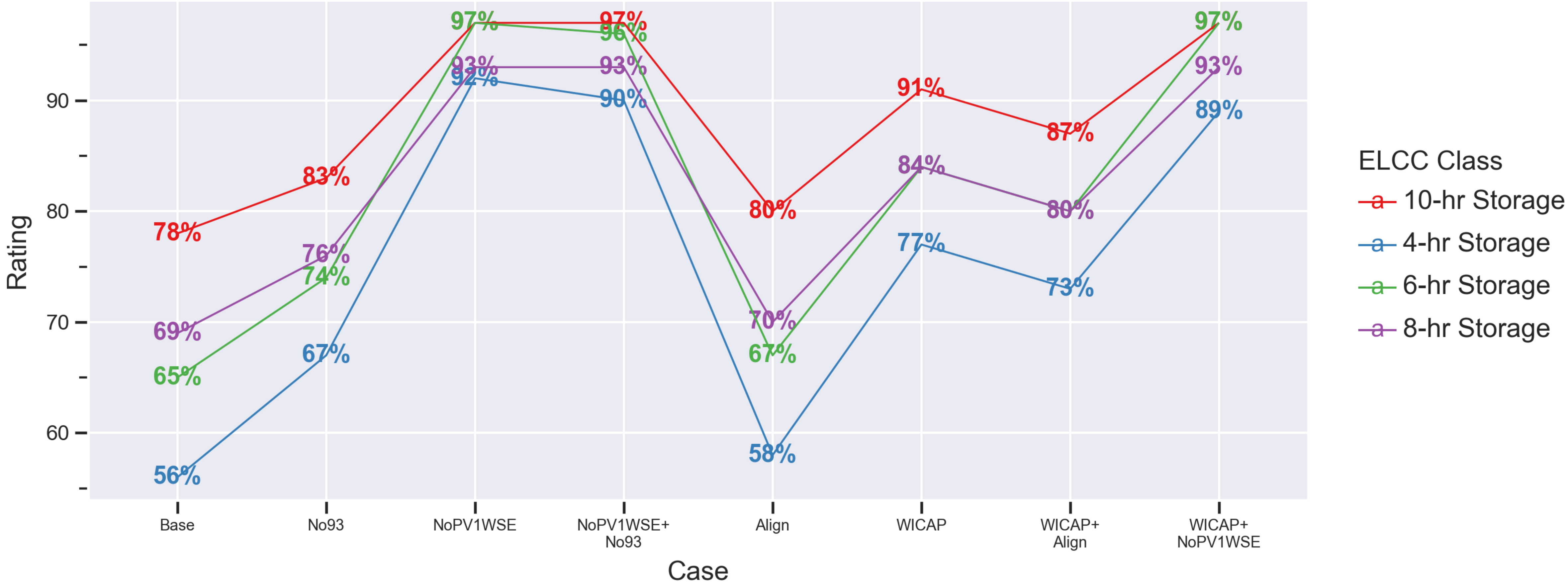
ELCC Class Ratings - Sensitivities



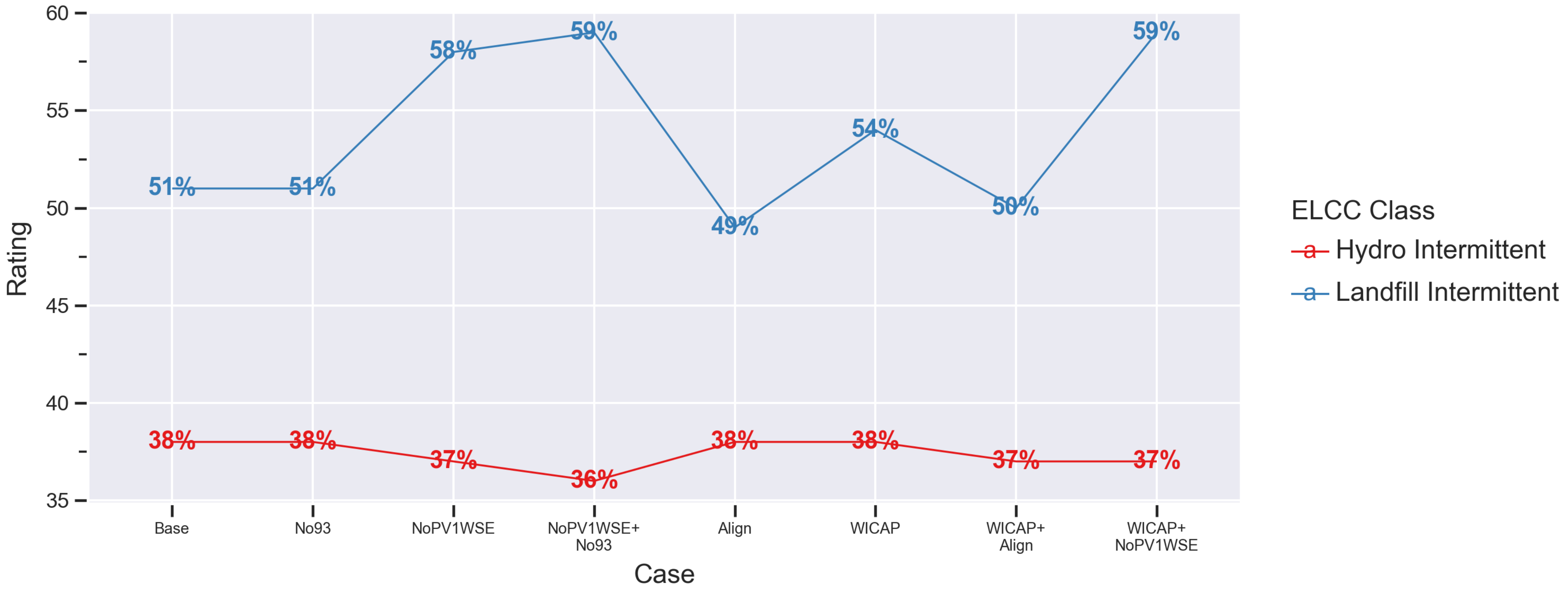
ELCC Class Ratings - Sensitivities



ELCC Class Ratings - Sensitivities



ELCC Class Ratings - Sensitivities



ELCC Class Ratings - Sensitivities