

Supplementary forecast-information sensitivity results

This supplementary file contains detailed forecast-information results referenced from the main manuscript.

Supplementary Table S2. Campaign forecast metrics on the control-consumed support

Horizon	Forecast	MAE (MW)	nMAE (%)	RMSE (MW)	Recall (%)	Missed (%)	Precision (%)	F1	Near-cap MAE (MW)
24 h	Diurnal	35.513	15.440	54.014	68.557	31.443	67.925	0.682	41.615
24 h	History-CatBoost	35.931	15.622	53.217	71.096	28.904	67.012	0.690	36.015
24 h	Weather-CatBoost	33.706	14.655	50.293	72.662	27.338	69.683	0.711	34.824
72 h	Diurnal	35.519	15.443	53.950	68.199	31.801	67.890	0.680	42.243
72 h	History-CatBoost	35.710	15.526	53.445	72.782	27.218	66.135	0.693	39.678
72 h	Weather-CatBoost	34.534	15.015	51.772	73.144	26.856	67.316	0.701	38.775

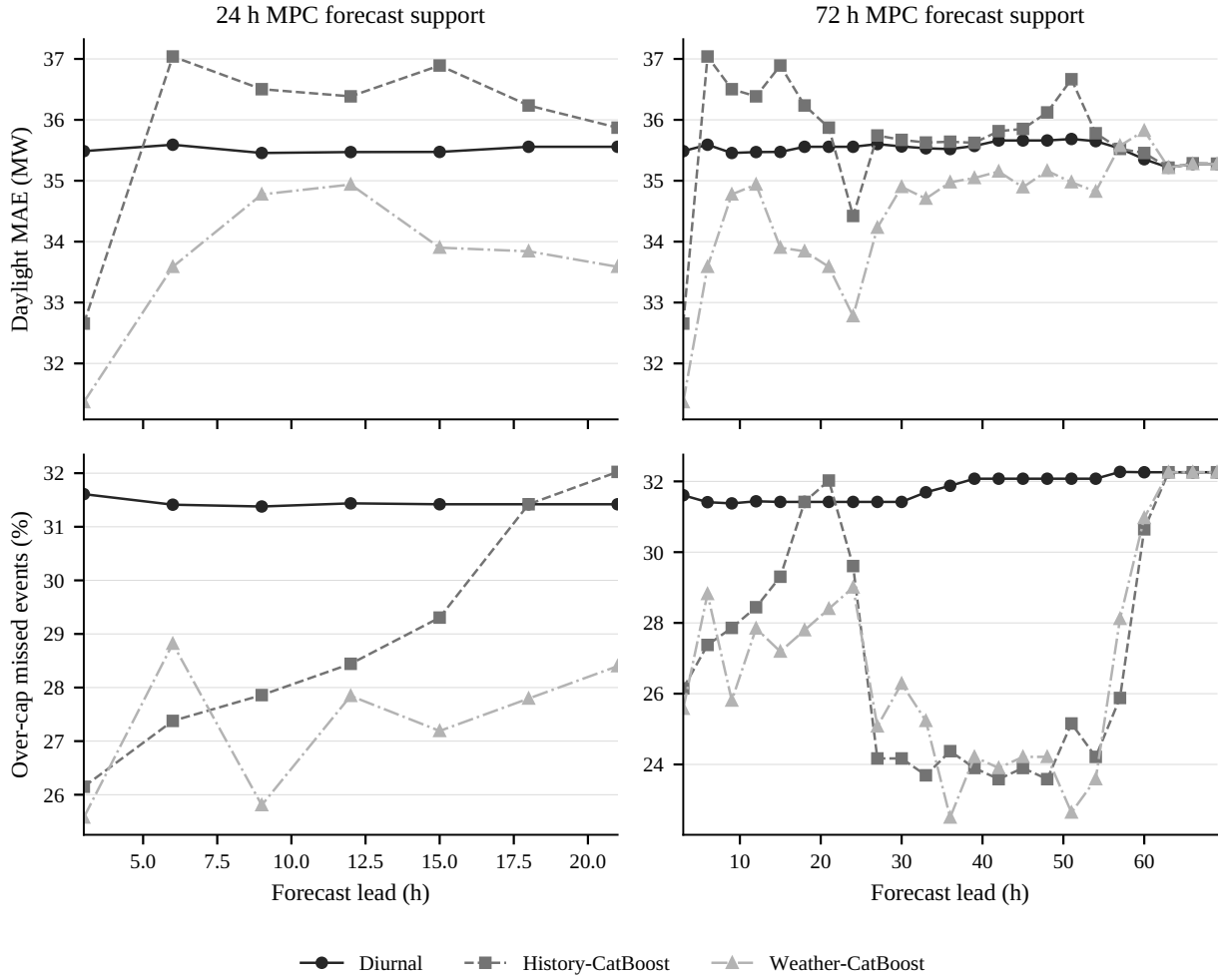
Lower values are better for MAE, RMSE, and missed-event rate; higher values are better for recall, precision, and F1. Direct NWP coverage for Weather-CatBoost is 100% over the 24 h support and 89.172% over the 72 h support. On direct-NWP rows at 72 h, daylight MAE is 33.816 MW and missed-event rate is 25.680%.

Supplementary Table S3. Paired weather-information effects

Quantity	24 h	72 h
Daylight-MAE benefit, mean monthly (MW)	2.314	1.197
Daylight-MAE 95% interval (MW)	[1.339, 3.217]	[0.799, 1.563]
Curtailement benefit, annual (MWh)	-288.601	+99.699
Curtailement benefit, mean monthly (MWh)	-24.050	+8.308
Curtailement benefit 95% interval (MWh)	[-63.713, 2.950]	[-14.229, 43.776]
Weather wins/ties/losses (months)	2 / 5 / 5	4 / 6 / 2

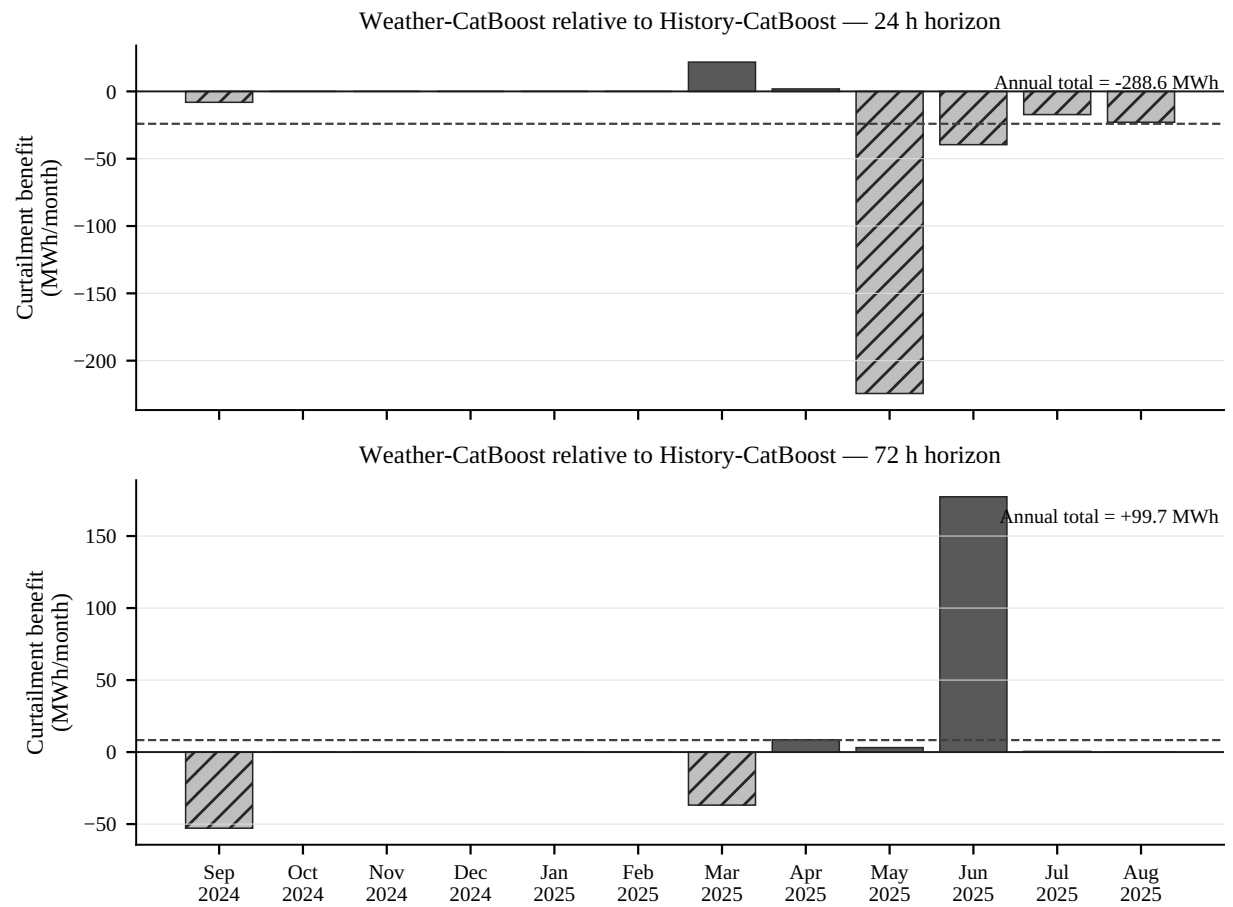
Positive benefits favor Weather-CatBoost. Intervals are 95% circular moving-block bootstrap intervals of mean monthly paired benefit (12 folds; 3-month blocks; 10,000 replicates).

Supplementary Fig. S1. Leadwise forecast diagnostics



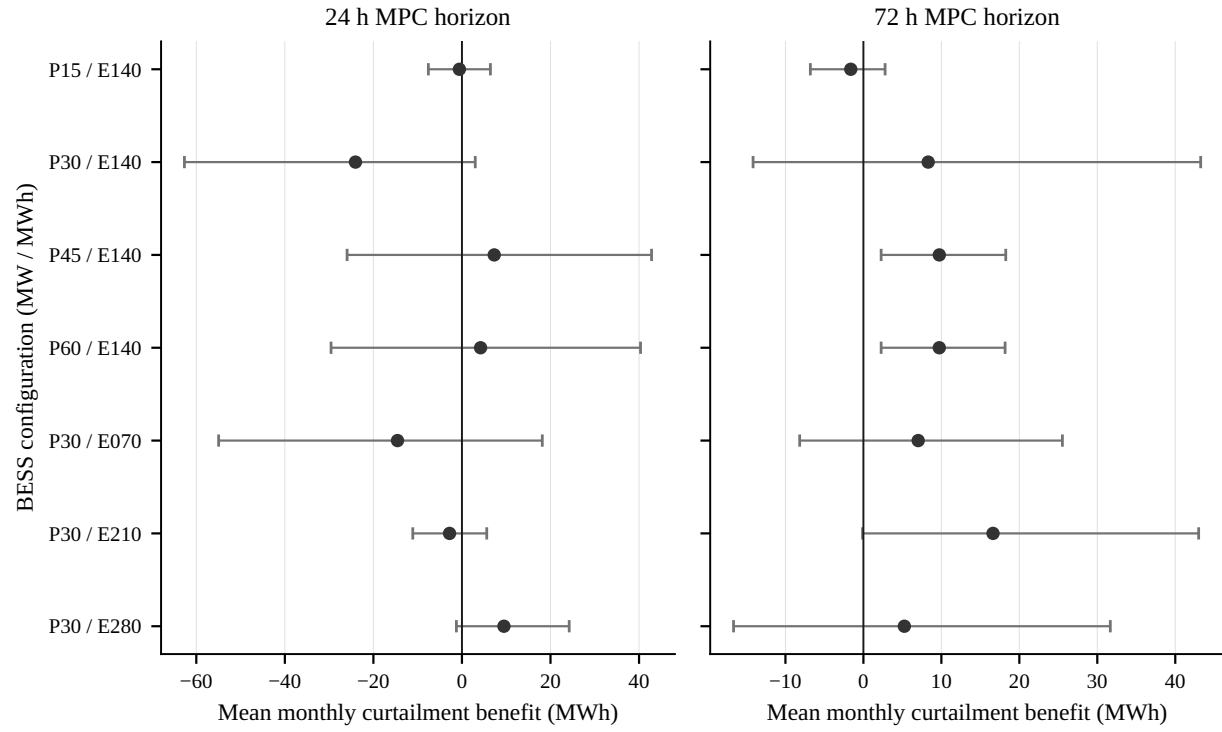
Leadwise daylight MAE and over-cap missed-event rate for the three deployable forecast streams. The 24 h controller consumes leads 3–21 h, and the 72 h controller consumes leads 3–69 h.

Supplementary Fig. S2. Monthly weather-information curtailment effect



Monthly curtailment benefit of Weather-CatBoost relative to History-CatBoost. Positive values indicate lower curtailment with weather information; dashed lines show mean monthly effects.

Supplementary Fig. S3. BESS sensitivity of weather-information value



Mean monthly curtailment benefit of Weather-CatBoost relative to History-CatBoost across independent BESS power and energy variations. Error bars are 95% circular moving-block bootstrap intervals.