Detailed Design Document

Title	DAI – Cold Day Classifier v1.3 (DR005)
Prepared by	ChatGPT (GPT-5 Thinking)
Issue Date	2025-11-08
Design Reference	CR016 – Cold-Day Planning via Adjusted Minimum Temperature; DAI + RBC HLD v1.3 (§9.3)
Governance Mode	Protected Architecture Mode v5.9 • Two-Phase Code-Change Gate v2.2
Linked Change/Defect	CR016, DR005 (forecast indexing & helper-first fix)
Environment	Home Assistant Core 2025.10.2 • Supervisor 2025.10.0 • Frontend 20251001.2

1. Functional Overview

The DAI – Cold Day Classifier determines whether the current day should be treated as a Cold Day for planning (i.e., plan for 100% SoC in cheap windows). At 06:10 (or after HA restart > 06:00), it computes the Adjusted Minimum Temperature (°C) using:

• Forecast low (°C) – primary source is the stored estimate written nightly by the Temperature Bias Producer; fallback to met.no provider via weather.get_forecasts (daily[0] templow with hourly fallback).

• Temperature Bias (°C) – input_number.rbc_temp_bias_c (RBC – Temperature Bias Producer).

Classifier writes:

• input_number.rbc_adjusted_min_temp_c (Adjusted Min °C)

• input_boolean.dai_cold_day_flag (True when Adjusted Min ≤ threshold)

• input_text.dai_cold_day_reason (human-readable reason)

No inverter writes are performed. Output is consumed by the Grid Charge Controller.

2. Entity Map

Role	Entity ID	Notes
Forecast provider (fallback)	weather.forecast_brenchley	met.no daily/hourly

		provider used only if helper missing; parsed via ['forecast'] lists (daily[0] templow).
Stored Estimate Low (°C) – primary	input_number.rbc_temperature_estimate_low_c	Written nightly @23:40 by RBC – Temperature Bias Producer.
Actual Min (°C)	sensor.rbc_outside_temperature_today_min_degc	Statistics helper (min of outside temperature).
Temperature Bias (°C)	input_number.rbc_temp_bias_c	RBC-maintained bias value.
Adjusted Min (°C) – OUT	input_number.rbc_adjusted_min_temp_c	Classifier write target.
Cold Day flag – OUT	input_boolean.dai_cold_day_flag	ON = plan 100% in cheap windows.
Reason text – OUT	input_text.dai_cold_day_reason	Human-readable reason; aids traceability.
Threshold (°C) – IN	input_number.dai_cold_temp_threshold_c	User-configurable threshold.

3. Trigger Matrix

ID	Trigger	Time/Condition	Purpose
t_0610	Time	06:10:00	Daily classification run after early-morning forecast stabilises.
t_ha_start_guarded	Home Assistant start	> 06:00:00	Guarded re-run on HA restarts to avoid stale state.

4. Logic Flow

1) Source selection: Use stored Estimate helper if numeric; else read met.no daily[0] templow (fallback: hourly min for tomorrow).
2) Compute Adjusted Min (°C) = Estimate + Bias, rounded to 0.1 °C.
3) Write outputs: Adjusted Min; set/unset Cold-Day flag based on threshold; update reason text.
4) Logbook entry: records estimate, adjusted value, and decision.
Non-happy path: If no estimate obtained, log 'skipped' with reason; do not toggle flag.

5. Guards and Safety

- No inverter writes; helpers only.
- Visual-Editor-safe actions; quoted times.
- Idempotent daily behaviour; explicit default branch.
- Restart guard active (after 06:00 only).
- Helper-first prevents provider timing gaps at 06:10.
- Master-only SolaX write rule respected (N/A here).

6. Acceptance Test Matrix

ID	Test	Expected Result
AT-1	Daily nominal: helper estimate + bias present	Writes Adjusted Min within ±2 min; reason updated; logbook shows 'Helper-first OK'.
AT-2	Helper missing → met.no daily[0] templow available	Classifier writes Adjusted Min using provider; logbook reflects provider path.
AT-3	Daily→Hourly fallback (no daily templow)	Uses hourly min for tomorrow; writes Adjusted Min; log notes fallback.
AT-4	No estimate available (helper+provider unavailable)	Logs 'skipped' with reason; no output changes.
AT-5	Boundary: adjusted equals threshold	Flag set ON when Adjusted Min == threshold (inclusive).
AT-6	Restart path after 06:00	Single execution; idempotent outputs; log shows start guard path.

7. Compliance Checklist

✓ Entity Name = ID alignment verified

✓ Visual-Editor-safe; quoted times

✓ No inverter writes (Master-only rule respected by design)

✓ All triggers have IDs; default branch present

✓ Design-Doc refs: CR016, HLD v1.3 (§9.3)

✓ DR005 alignment: helper-first + ['forecast'] indexing

8. Change History

Version	Date	Author	Summary
v1.0	2025-11-05	ChatGPT (GPT-5)	Initial release per

			CR016: Adjusted Min classification using forecast low + bias and threshold logic.
v1.2	2025-11-08	ChatGPT (GPT-5)	DR005 – PARAM-ONLY: met.no payload indexing fix (['forecast'] for daily/hourly).
v1.3	2025-11-08	ChatGPT (GPT-5)	DR005 – PARAM-ONLY: helper-first source selection; simplified met.no read via daily[0] templow; no logic change.

End of Document – v1.3