Detailed Design Document

Title: DAI – Cold Day Classifier v1.0 (CR016)

Prepared by: ChatGPT (GPT-5 Thinking)

Issue Date: 2025-11-05

Design Reference: CR016 – Cold-Day Planning via Adjusted Minimum Temperature; DAI + RBC HLD v1.1

Governance Mode: Protected Architecture Mode v5.9 • Two-Phase Code-Change Gate v2.2

Linked Change/Defect: CR016

1. Functional Overview

The DAI – Cold Day Classifier v1.0 determines whether today should be treated as a Cold Day for planning (i.e., plan for 100% SoC in cheap windows). It calculates Adjusted Minimum Temperature (°C) for the current day using:
- Forecast low (°C) from weather.get_forecasts (daily → hourly fallback)
- RBC Temperature Bias (°C) from input_number.rbc_temp_bias_c
Classifier writes:
- input_number.rbc_adjusted_min_temp_c (Adjusted Min °C)
- Sets / clears input_boolean.dai_cold_day_flag based on comparison with input_number.dai_cold_temp_threshold_c
- Reason string → input_text.dai_cold_day_reason
No inverter writes are performed here. Output is consumed by the Grid Charge Controller and dashboards.

2. Entity Map

Role	Entity ID	Notes
Forecast provider	weather.met_office_monmouth	Met Office weather entity (service-based forecast).
RBC temperature bias (°C)	input_number.rbc_temp_bias_c	Produced nightly by the RBC Temperature Bias Producer.
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	Comparison threshold set by user.

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	After 06:00:00	Guarded re-run on HA restarts to avoid stale state.

4. Logic Flow

1. Fetch Forecast (daily, fallback hourly)
2. Extract Today's Low (°C)
3. Apply RBC Bias (Adjusted Min = Forecast + Bias)
4. Write outputs (Adjusted Min, Flag, Reason)
5. Logbook entry for audit

Non-happy path: Skip if no forecast data available.

5. Guards and Safety

- No inverter writes; helpers only
- Visual-Editor-safe actions
- Idempotent daily behaviour
- Restart guard active (after 06:00 only)
- Works with daily or hourly forecast sources

6. Acceptance Test Matrix

AT-1 Daily nominal: Forecast & Bias present → writes correct values
AT-2 Daily→Hourly fallback: hourly data used if daily low missing
AT-3 No forecast: logs skip message
AT-4 Restart guard: executes once after 06:00

AT-5 Boundary: equality triggers ON flag

7. Compliance Checklist

- Entity Name = ID alignment verified
- Visual-Editor-safe
- No inverter writes
- Master-only rule respected (N/A)
- No YAML anchors or python
- HA-restart safe
- Change refs present: CR016; HLD v1.1

8. Change History

Version	Date	Author	Summary
v1.0	2025-11-05	ChatGPT (GPT-5)	Initial release per CR016: Adjusted Min classification using Met Office forecast, RBC bias, and threshold.