DAI – Grid Charge Controller v6.3 (DR003) – Detailed Design

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Design Reference: DAI + RBC Framework v5.8.7 (Section 5.6 CR013 and §8.2 Grid Charge Controller)
Governance: Protected Architecture Mode v5.9 • Two-Phase Code-Change Gate v2.2 • Meta-Patch M1 active
Linked Defect Report: DR003 – Grid Charge Controller Boolean Integration Defect

1. Functional Overview

This automation controls the Solax Master inverter's nightly charge target (SoC) planning and execution based on the RBC demand forecast, Octopus tariff, and environmental conditions. Version 6.3 fixes the Boolean integration defect where the automation previously ignored the Auto/Manual Evening Buffer mode. It now dynamically selects between the Auto helper (`input_number.dai_evening_buffer_auto_suggest_pct`) and the Manual helper (`input_number.dai_evening_buffer_pct`) according to `input_boolean.dai_evening_buffer_auto`.

2. Entity Map

Entity ID	Purpose / Description	Direction
input_boolean.dai_evening_buffer_auto	Auto/Manual selector for buffer control	Read
input_number.dai_evening_buffer_auto_suggest_pct	Auto-learned evening buffer percentage	Read
input_number.dai_evening_buffer_pct	Manual evening buffer percentage	Read
input_number.dai_target_soc_planned_pct	Planned SoC target (computed value)	Write
number.solax_house_selfuse_nightcharge_upper_soc	Master inverter SoC limit	Write

input_text.dai_night_planner_reason	Log output helper	Write
input_number.rbc_adjusted_demand_next_horizon_kwh	Next-horizon adjusted demand forecast	Read
input_select.octopus_import_tariff	Active import tariff	Read
sensor.ashp_hot_water_outside_temperature	Ambient temperature sensor	Read
input_number.total_battery_capacity_kwh	Total battery capacity (kWh)	Read

3. Trigger Matrix

Trigger ID	Type / Time	Purpose
t_tick_1min	time_pattern /1	Minute tick for evaluation
t_inwindow_25	:25 past each hour	In-window confirmation write
t_inwindow_55	:55 past each hour	In-window top-up write
t_tariff_change	state	Tariff swap detection
t_ha_start	homeassistant.start	Restart recovery
t_horizon_change	state	Forecast update recalculation
t_temp_change	state	Temperature-driven clamp recalculation
t_prewindow_cosy_night	21:55	Cosy pre-window
t_prewindow_cosy_morning	03:55	Cosy pre-window morning
t_prewindow_cosy_day	12:55	Cosy pre-window day
t_prewindow_flux	01:55	Flux pre-window

4. Logic Flow

1. Read tariff, forecast, capacity, and environmental inputs.

2. Evaluate `input_boolean.dai_evening_buffer_auto` to determine Auto vs Manual buffer input.

3. Compute usable energy and horizon demand percentages.

4. Derive target SoC using Base + Effective Buffers, clamped between 10–100 %.

5. Apply temperature override (force 100 % when below cold threshold).

6. Execute writes to target helpers and inverter within time and deadband gates.

7. Logbook entries generated for both summary and debug conditions.

5. Guards and Safety

• Master-only inverter writes enforced.

• Session override disables writes during active sessions.

• Deadband ≥ 1 % prevents redundant inverter writes.

• Cold-weather override ensures full SoC before low-temperature periods.

• All triggers carry unique IDs; includes default branch.

6. Acceptance Test Matrix

Test ID	Scenario	Expected Result
T1	Auto buffer ON	Automation reads from Auto helper and logs correctly.
T2	Auto buffer OFF	Automation reads Manual helper and logs correctly.
T3	Cold ambient ≤ threshold	Target SoC = 100 %.
T4	Trigger t_inwindow_25 or t_inwindow_55	Inverter SoC updated if write gate satisfied.
T5	Deadband < 1 %	No inverter write performed.

7. Compliance Checklist

✅ Visual-Editor-safe syntax validated (service, target, data).

✅ Master-only writes confirmed.

✅ Unique trigger IDs and default choose branch verified.

✅ Boolean buffer selection logic added per DR003.

✅ Two-Phase Code-Change Gate v2.2 compliance confirmed.

8. Change History

Version	Date	Summary
v6.3	2025-11-01	DR003 – Boolean integration fix (Auto/Manual buffer logic).
v6.2	2025-10-30	DR012c – YAML integrity restoration and buffer/log patch re-apply.
v6.1a	2025-10-25	DR012b – Buffer formula fix and log alignment.
v6.1	2025-10-24	CR012a – Write gate and pre-window restoration.
v6.0.2	2025-10-22	Display-only log fix.
v6.0	2025-10-20	CR011 – Horizon alignment and tariff branches.