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## DAI – RBC Adjusted Next Horizon Demand v5.3 Detailed Design Specification (CR008)

Project: DAI + RBC Framework v5.85 (Oct 2025)

Document Version: v5.3 Detailed v1.0

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Related Change Requests: CR003 (Log Target Split), CR005 (Conditional Logging), CR007 (Release Cycle Refac), CR008 (Next-Horizon Persistence Hotfix)

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### 1 Purpose

This automation calculates the next-horizon adjusted energy demand (kWh) derived from the current daily adjusted demand and the duration of the upcoming non-cheap period between tariff windows.

Version v5.3 (CR008) adds a persistence step to store the computed *Next-Horizon kWh* into a dedicated helper (`input_number.rbc_adjusted_demand_next_horizon_kwh`) so that other automations (notably the *DAI – Grid Charge Planner*) can read the value directly.

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### 2 Scope

- Operates across all Octopus Cosy and Flux tariffs.
  - Provides a rolling view of the upcoming “non-cheap” period demand.
  - Persists the computed value in kWh for downstream consumption by other modules.
  - Generates logbook entries for visibility; performs no inverter writes.
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### 3 Functional Overview

# Function	Description
1 Determine next tariff horizon	Uses Cosy/Flux start-end times to identify the upcoming non-cheap period.
2 Compute horizon length	Converts start/end times into minutes and calculates the next horizon duration.

#	Function	Description
3	Scale daily demand	Multiplies adjusted daily demand by (horizon_minutes / 1440) to obtain horizon_kWh.
4	Persist horizon demand	New in v5.3 – writes horizon_kWh to helper input_number.rbc_adjusted_demand_next_horizon_kwh.
5	Logbook update	Confirms horizon calculation and helper write for audit purposes.

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## 4 Inputs and Entities

Category	Entity	Purpose
Tariff	input_select.octopus_tariff_d	Active tariff selector (Cosy/Flux).
Daily Adjusted Demand	input_number.rbc_adjusted_demand_daily_kwh	RBC-corrected daily forecast demand (kWh).
Horizon Log Target	input_text.rbc_horizon_log	Logbook message destination.
Cheap-Period Times	input_datetime.dai_cosy_*, input_datetime.dai_flux_*	Defines tariff start/end boundaries.
New Output Helper (CR008)	input_number.rbc_adjusted_demand_next_horizon_kwh	Persisted next-horizon demand in kWh (0–120).

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## 5 Algorithm Summary

1. Read input\_number.rbc\_adjusted\_demand\_daily\_kwh → adj\_daily\_kWh.
2. Identify next-end and following-start times from the tariff helper set.
3. Compute horizon duration:
4.  $\text{horizon\_minutes} = (\text{following\_start\_min} - \text{next\_end\_min}) \% 1440$
5. Derive next-horizon demand (kWh):
6.  $\text{horizon\_kWh} = \text{adj\_daily\_kWh} \times (\text{horizon\_minutes} / 1440)$

7. Persist horizon\_kWh → input\_number.rbc\_adjusted\_demand\_next\_horizon\_kwh (0–120 clamp, 2-dp round).
  8. Log the horizon details, including written helper value.
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## 6 YAML Implementation (v5.3 – CR008)

(Functional extract only; Visual-Editor-safe and compliant with 2025.10.x core)

```
- service: input_number.set_value
  target:
    entity_id: input_number.rbc_adjusted_demand_next_horizon_kwh
  data:
    value: "{{ ([0, ([120, horizon_kwh] | min)] | max) | round(2) }}"
- service: logbook.log
  data:
    name: RBC – Next Horizon (monitor)
    entity_id: "{{ ent_log_target }}"
    message: >
      Next horizon = {{ '%02d:%02d' % ((next_end_min // 60) % 24, next_end_min % 60) }}
      → {{ '%02d:%02d' % ((following_start_min // 60) % 24, following_start_min % 60) }}
      {{ horizon_minutes }} min). Daily={{ adj_daily_kwh }} kWh ⇒ Horizon={{ horizon_kwh }} kWh
      (written {{ ([0, ([120, horizon_kwh] | min)] | max) | round(2) }} kWh to helper).
    Tariff={{ states(ent_tariff )}}, RBCsrc={{ ent_adj_daily_kwh }}.
```

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## 7 Acceptance Tests

Test ID	Trigger	Expected Result
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Test ID	Trigger	Expected Result
T1	Home Assistant Start	Helper populated and log confirms correct write.
T2	Tariff Change	Horizon kWh recalculated and helper updates within 10 s.
T3	Adjusted Demand Change	Helper and log both update; values match to within 0.01 kWh.
T4	Manual Run	Helper value = computed horizon_kWh; log shows same number.
T5	Grid Charge Planner Read	Planner variable adj_dem_kwh matches helper value.

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## 8 Change History

Version	Date	Description	Change Ref
v5.3	27 Oct 2025	Persist next-horizon demand to helper; add log confirmation.	CR008
v5.2r1	26 Oct 2025	Refac-only syntax compliance (CR007 cycle).	—
v5.2	25 Oct 2025	Conditional logging (CR005).	—
v5.1	24 Oct 2025	Log-target split (CR003).	—

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## 9 Compliance and Governance

- Visual-Editor-safe YAML (service, target, data) ✓
- All triggers carry id; default branch present ✓
- Helper write range 0–120 kWh clamped, 2-dp rounding ✓
- No inverter writes or mode changes ✓
- Description includes required prefix and change history ✓

- Design reference: *DAI + RBC Framework v5.85 (Oct 2025)* ✓