

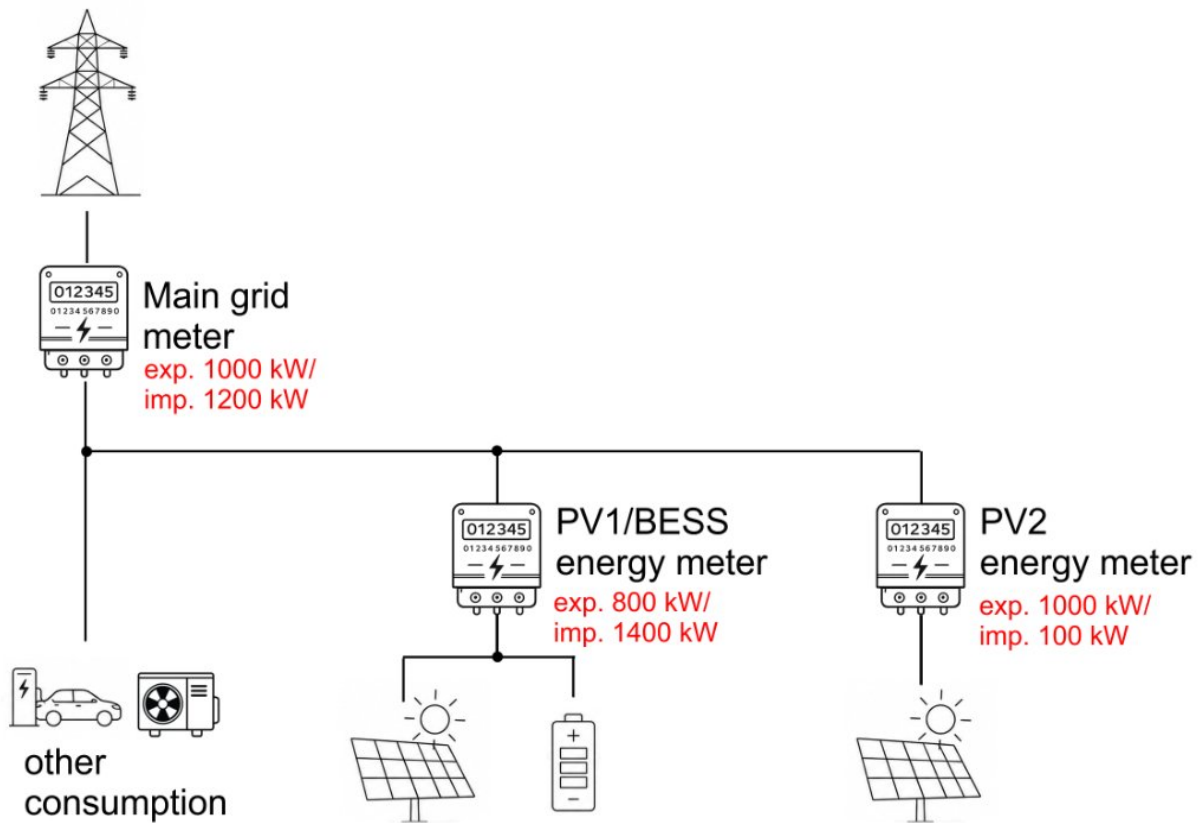
Multi-level strategies

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Multi-Level Power Regulation

Enforces grid import/export power limits at every electrical connection point of a site simultaneously — for example at each transformer or sub-meter — so that combined activity on subordinate branches cannot exceed what the upstream connection can safely carry.



An example of a multi-level regulation. Schematic showing a main grid meter feeding three subordinate branches, with or without a dedicated energy meter:

- other consumption (EV charger and HVAC),
- a PV1/BESS energy meter feeding a solar array and a battery,
- and a PV2 energy meter feeding a second solar array.

In this example, both branches have high Export/Import rating as the main connection point. If both subordinate branches operated at their full individual rating at the same time, the combined power would exceed the main connection's own 1000/1200 kW limit — which is the scenario multi-level regulation is designed to prevent.

Overview

Multi-level regulation extends the controller's power-limiting logic from a single point of measurement to every relevant level of a site's electrical hierarchy: the main grid connection and each subordinate electrical connection or energy meter beneath it. A subordinate level is commonly an energy meter with a energy subbranch, but the same mechanism applies more generally to any electrical connection or energy transformer in the hierarchy. **Each level is measured by its own meter and configured as its own Strategy**, with its own import/export limits and local optimization behavior (for example, peak shaving).

The regulation is **hierarchical**: a subordinate level can never cause the combined power at a parent level to exceed that parent's configured limit, even though each level also enforces its own local limit. This is necessary because sites are commonly built with a main connection feeding two or more smaller subordinate connections, each rated lower, close to or even higher compared to the main connection's own rating. If every subordinate level were allowed to use its full rated power at the same time, their combined power could exceed what the main connection point is actually rated for.

Exceeding a connection point's rated import/export capacity might disconnect the meter or even blow protective fuses, which in turn leads to high replacement and callout costs, extended downtime, and lost production revenue while the connection is out of service.

Prerequisites

- A site with more than one electrical level to regulate — a main grid connection plus at least one subordinate electrical connection or energy meter (commonly a transformer branch). Single-level sites do not need multi-level regulation.
- A dedicated, independently readable meter at each level that requires its own limit (main connection and each subordinate connection).
- Each level configured as its own Strategy in the controller platform.
- There can be more than two levels of strategies. It can also be a mix of regular single-level strategies with multi-level strategies. The user can fully flexibly defining the structure.
- If the AI energy manager optimization mode is used on the site, it must be assigned to the topmost (main) level strategy

How it works

1. **Each level is its own Strategy.** A Strategy is usually named after the physical asset it represents, for example a main grid energy meter or a subordinate ("PV") energy meter. Each Strategy independently measures its own level and can run its own optimization mode (for example, peak shaving or self-consumption).
2. **Limits are enforced top-down.** Every level has its own Min./Max. import and export active power limits. If the combined power at a parent level reaches its configured limit, the controller further constrains the subordinate levels beneath it — even if those subordinate levels have not yet reached their own individually configured limits.
3. **Unused capacity is redistributed dynamically.** If one branch is consuming or exporting less than its allotted share, the resulting headroom under the parent limit becomes available to other branches on the same parent, rather than being reserved statically per branch.
4. **The structure is defined by a parent Strategy referencing a child Strategy.** A subordinate Strategy is pulled into the parent Strategy's "regulated devices" list, in the same way as any other individual controllable device. Through this, the parent Strategy is instructed to control that specific subordinate/child strategy.
5. **The AI energy manager optimization mode must sit at the top level.** In case AI strategy is implemented, it must sit at the top level, because it needs visibility into the data reported by every subordinate Strategy in order to allocate power across the whole site, the AI energy manager optimization mode is always placed on the topmost-level Strategy, never on a subordinate one. Subordinate levels are usually used for peak shaving or self-consumption.

Configuration

1. First, create a **separate subordinate Strategy** for each subordinate branch, with its own Min./Max. import and export limits.
2. For each of these Strategies, open **Included items** and assign three groups: the meter used to measure that level (*Measurement devices and strategies*), the devices that Strategy is set to control (*Regulated devices and strategies*), and — optionally — other subordinate strategies available to control (*Regulated devices and strategies*).
3. Set the optimization mode (for example, self-consumption)

Example of a typical setting of a subordinate strategy

The screenshot displays the Reduxi Configurator interface. On the left, a sidebar shows the 'Devices' and 'Strategies' sections. The 'Strategies' section lists 'Energy manager - PV1/BESS branch', 'Energy manager - PV2 branch', and 'Main AI Energy manager'. The main area shows the configuration for 'Energy manager - PV1/BESS branch' under the 'Included items' tab. It features three columns: 'Devices and strategies', 'Measurement devices and strategies', and 'Regulated devices and strategies'. The 'Devices and strategies' column lists 'BESS - 800 kW', 'Main grid energy meter', 'PV 1 - 900 kW', 'PV 2 - 1200 kW', 'PV 2 branch energy meter', and 'PV1/BESS branch energy meter'. The 'Measurement devices and strategies' column lists 'PV1/BESS branch energy meter'. The 'Regulated devices and strategies' column lists 'PV 2 - 1200 kW' and 'BESS - 800 kW'. Below this, a table shows the configuration for the 'Default mode' with an event description of '/', an export limit of 800 kW, a goal of 'Self-consumption', and an import limit of 1400 kW. The 'Advanced' tab is also visible, showing a 'Save' button.

Name	Event description	Export limit	Goal	Import limit	Advanced
Default mode	/	800 kW	Self-consumption	1400 kW	

4. After defining all subordinate strategies, **create a Strategy for the main (topmost) level** and configure its Grid settings: Min./Max. import active power and Min./Max. export active power.

Limitations and important notes

- Multi-level regulation is only meaningful for sites with more than one metered level. It adds configuration overhead (a separate Strategy, meter assignment, and limit values per level) that a single-level site does not need.
- A subordinate Strategy's own Min./Max. import/export limits are enforced together with — not instead of — its parent's limit. The tighter of the two effectively governs the subordinate branch at any given moment.

Open questions/limitations

- Handling of a battery and a load sharing the same sub-meter. When a battery and a co-located load sit behind the same subordinate meter, and that meter's import/export rating is lower than the battery's own rated power, the solution might not yet be optimal. Do not treat this scenario as a documented, supported configuration until confirmed.
- Whether a schedule or forecast passed down to a subordinate Strategy accounts for the limits and expected consumption of further subordinate levels beneath it, or only reflects the level immediately above it. This is at the moment open and not fully supported.
- Related capability: multiple Flex units per location - A single controller/location can register more than one independent "Flex" unit — used for participation in demand-response or grid-balancing programs — by assigning distinct devices to distinct strategies, each with its own certified meter. This allows one physical site to offer two or three separate flexibility units to an aggregator instead of only one for the whole site. This is at the moment open and not fully supported.

Troubleshooting

Issue	Possible cause
A subordinate branch appears to be more constrained than its own configured limit would suggest.	The parent level's limit has been reached, so the controller is branch further, as designed.
A device's actual power is lower than a forecast or planning module expected.	The device's Strategy-level or device-level limit was reached below the forecast.

Frequently asked questions

Where should the AI energy manager optimization mode be placed on a multi-level site?

Always on the topmost-level Strategy. It needs data from every subordinate Strategy to allocate power correctly across the whole site, which it only receives when placed at the top of the hierarchy.

Can one branch use more than its "share" of the parent limit?

Yes. Allocation between branches is dynamic: if one branch is using less than its share, other branches under the same parent can use the freed capacity, as long as the parent's overall limit is not exceeded.

Can a single location offer more than one flexibility (Flex) unit to an aggregator?

Yes — by assigning separate devices to separate strategies, each with its own certified meter, one location can register two or three independent Flex units instead of one for the whole site.