Amperecloud Migration Service

User Documentation

Getting Started

1. Sign in and select a company

After signing in via Keycloak (Single Sign-On), the **company selection** is displayed. Pick the company you are onboarding sites for. You are redirected to the project overview automatically.

You can switch companies at any time via the **"Switch company"** button in the top right.

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2. Project overview

The project overview shows all existing migration projects of the selected company as cards. Each card shows the project name, number of sites, and a progress ring.

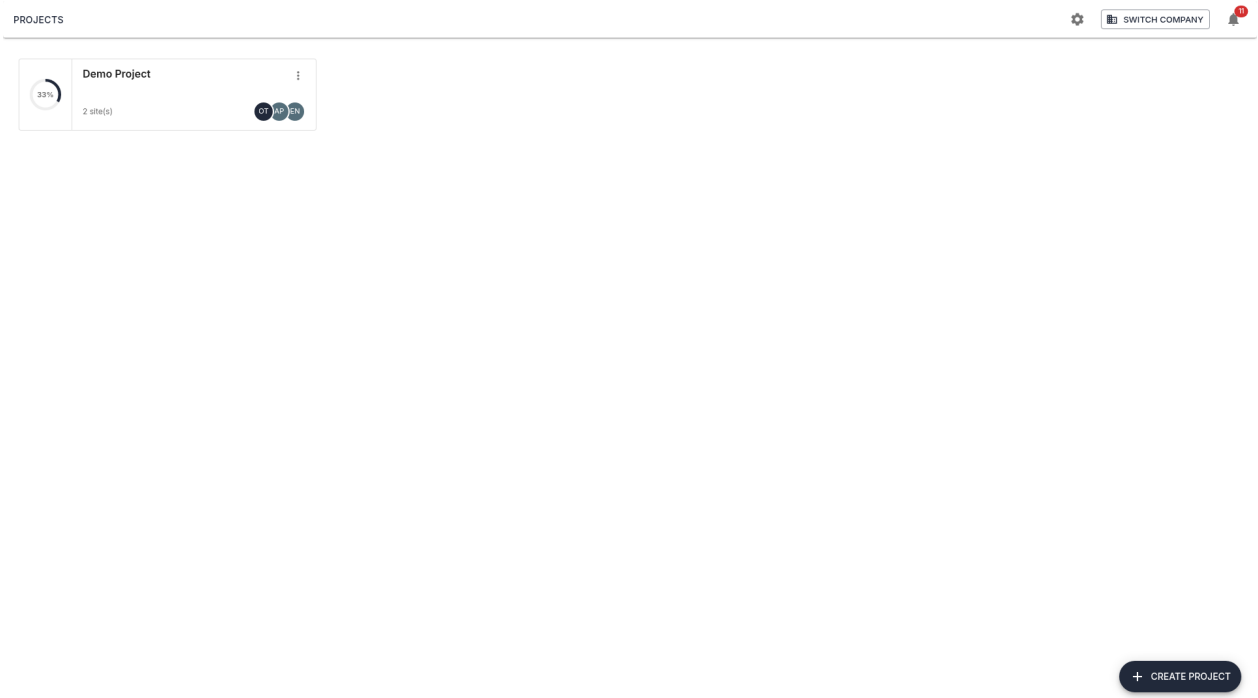

Figure 1: Project overview

Use the **three-dot menu** on each card to rename or delete projects. There you can also assign an **Owner** and any number of **Participants** — these are used for task assignment and notifications across all sites in the project.

Notifications

The **bell icon** in the top bar shows the unread count. Clicking it opens the latest notifications, filterable by scope (Company, Project, Site). The link **"All notifications"** opens the **Notification Center** with full filtering and bulk actions.

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3. Create a new project

> **Note**: Creating projects is limited to Amperecloud employees. External users see a hint message instead.

Click **"Create project"** in the bottom right. A dialog opens:

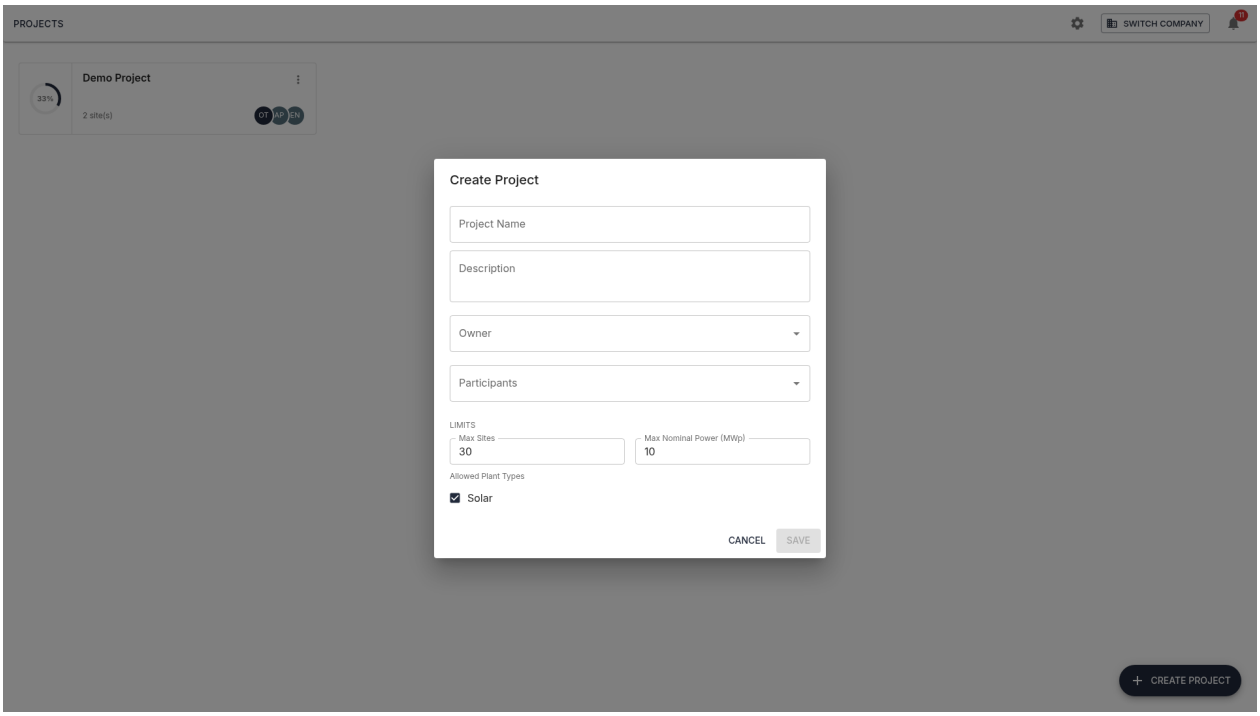

Figure 2: Create project

- **Project name** (required)
- **Description**: optional
- **Owner**: responsible admin
- **Participants**: optional co-maintainers

Project limits

When a project is created, limits are defined that constrain its scope:

- **Max. number of sites**
- **Max. nominal power** (MWp)
- **Allowed plant types** (e.g. Solar)

These limits are shown as progress bars in the site overview and validated whenever sites are added.

Click **"Save"** and the new project appears in the overview.

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4. Site overview

Click a project card to open the **site overview**. The table shows all sites with number, name, nominal power, city, progress (5 migration stages as colored dots), plant type, and owner.

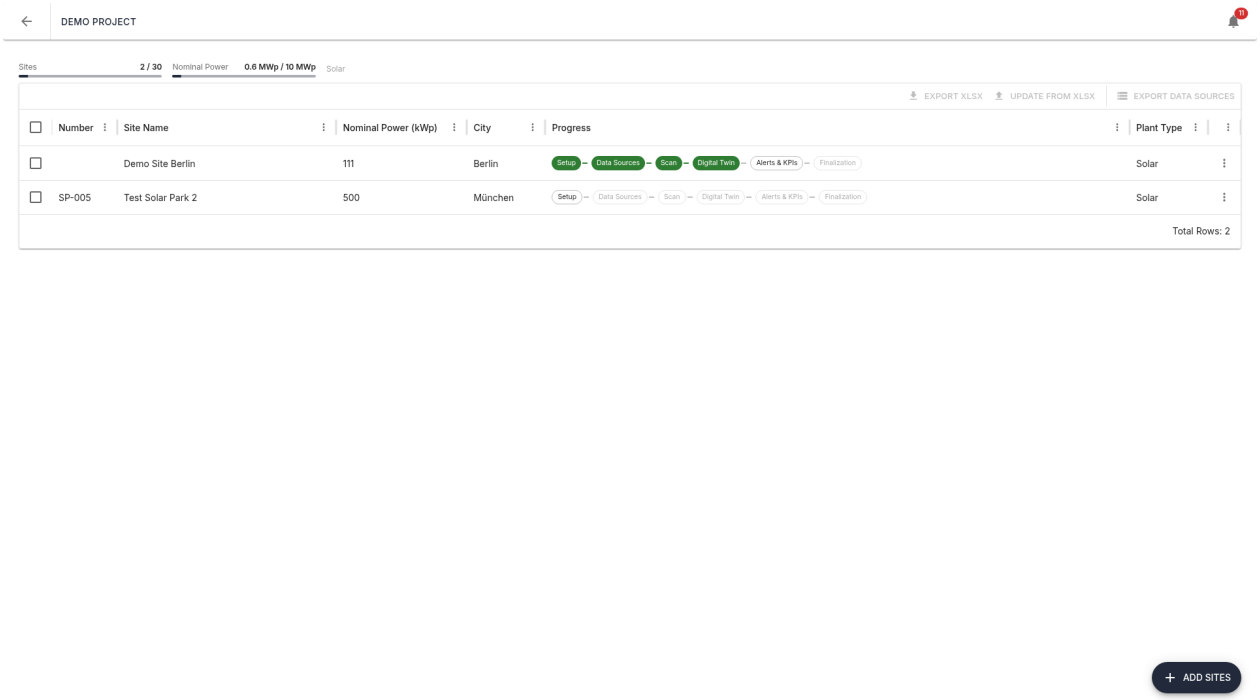

Figure 3: Site overview

The colored dots show the status of each stage: **green** = done, **orange** = in progress, **grey** = not yet started. Clicking a dot navigates directly into that stage.

Two progress bars above the table visualize the current utilization of the project limits (sites X/Y and nominal power X/Y MWp). As utilization approaches the limit, the bars change color.

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5. Adding sites

Click **"Add sites"** to open a dialog with three modes: **Single**, **Inline table**, and **Excel import**.

5a. Single site

Create a single site with full details:

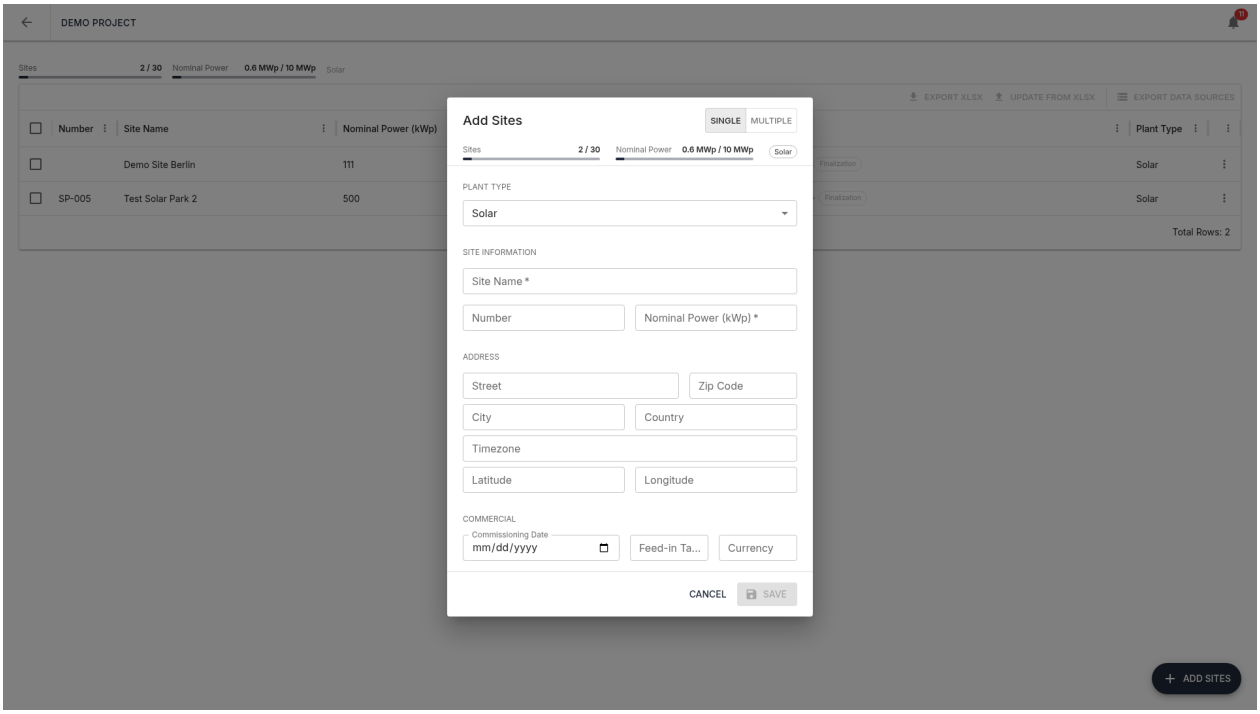

Figure 4: Single site

- **Plant type** (required)
- **Number**: optional, for sorting
- **Site name** (required)
- **Nominal power (kWp)** (required)
- **Address**: street, postcode, city, country
- **Timezone**: IANA format, e.g. `Europe/Berlin`
- **GPS**: latitude and longitude
- **Commercial**: commissioning date, feed-in tariff, currency

5b. Multiple sites via inline table

Use **"Inline table"** mode to create many sites at once — perfect for pasting from Excel.

Paste from Excel

1. In Excel, prepare columns: **Number, Name, Nominal Power** (tab-separated)
2. Select and copy (Ctrl+C)
3. Click into the first cell of the **Name** column
4. Press **Ctrl+V** — data is spread across rows and columns automatically

5c. Excel import

"Excel import" mode lets you import sites with full details (including data sources) from a structured Excel file. The template ships with dropdowns, tooltips, and plant-type-specific columns.

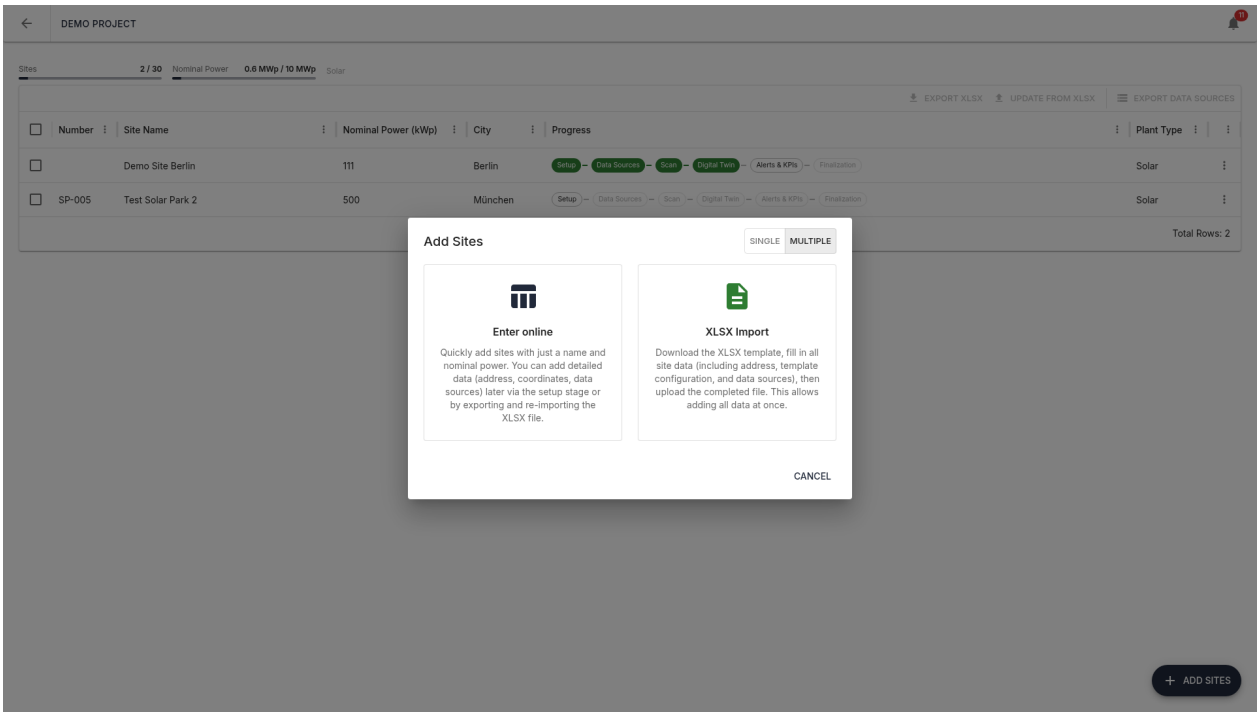

Figure 5: Multiple sites

Data sources are created automatically on import.

Limit validation

Before saving, the system checks that project limits are not exceeded. If they are, an error message with the exact reason is shown.

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6. Export and update sites

The action bar in the site overview provides Excel-based bulk operations:

- **Export sites**: Download selected sites as Excel, edit, and re-upload — only actual changes are applied, locked stages are protected
- **Export credentials**: Download FTP/SFTP/Email credentials of selected sites as Excel (one sheet per connection type)

Next steps

Once sites are created, onboarding begins. Each site passes through **6 migration stages**:

1. **Setup** — Complete general site data (→ 02-Setup)
2. **Data Sources** — Configure FTP/SFTP/Email endpoints (→ 03-Data-Sources)
3. **Scan** — Analyze raw data traces and create mapping rules (→ 04-Scan)
4. **Digital Twin** — Refine the device structure and sync to platform (→ 05-Digital-Twin)

5. **Alerts & KPIs** — Configure reading sources, KPIs, alerts, and satellite data (→ 06-Alerts-KPIs)
6. **Finalization** — Final review of the entire onboarding and handover to the customer for production

Click a site in the overview to start with the first stage.

Stage 1: Setup

The Setup stage is the first step in onboarding a site. All fundamental site data needed for the subsequent migration stages is captured here.

Overview

Clicking a site in the site overview opens the stage view. It is split into three areas:

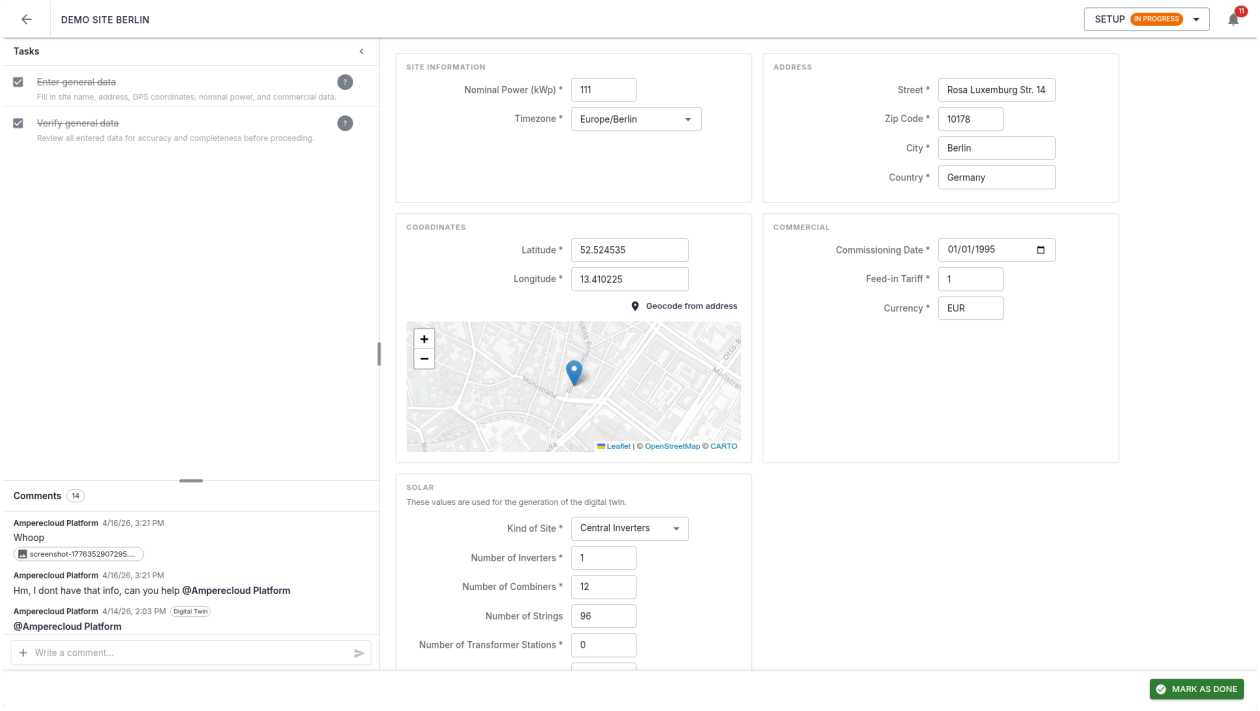

Figure 6: Setup overview

- **Left**: tasks and comments
- **Right**: site information (form)
- **Bottom bar**: stage status and action buttons

Panels are resizable by dragging the divider. The left sidebar can also be collapsed to give the form more space — the collapsed state is remembered per browser.

Fill in site data

The form is split into sections:

Site information

- **Nominal power (kWp)** *
- **Timezone** * (IANA, e.g. `Europe/Berlin`)

Address

- **Street** *
- **Postcode** *
- **City** *
- **Country** *

Coordinates

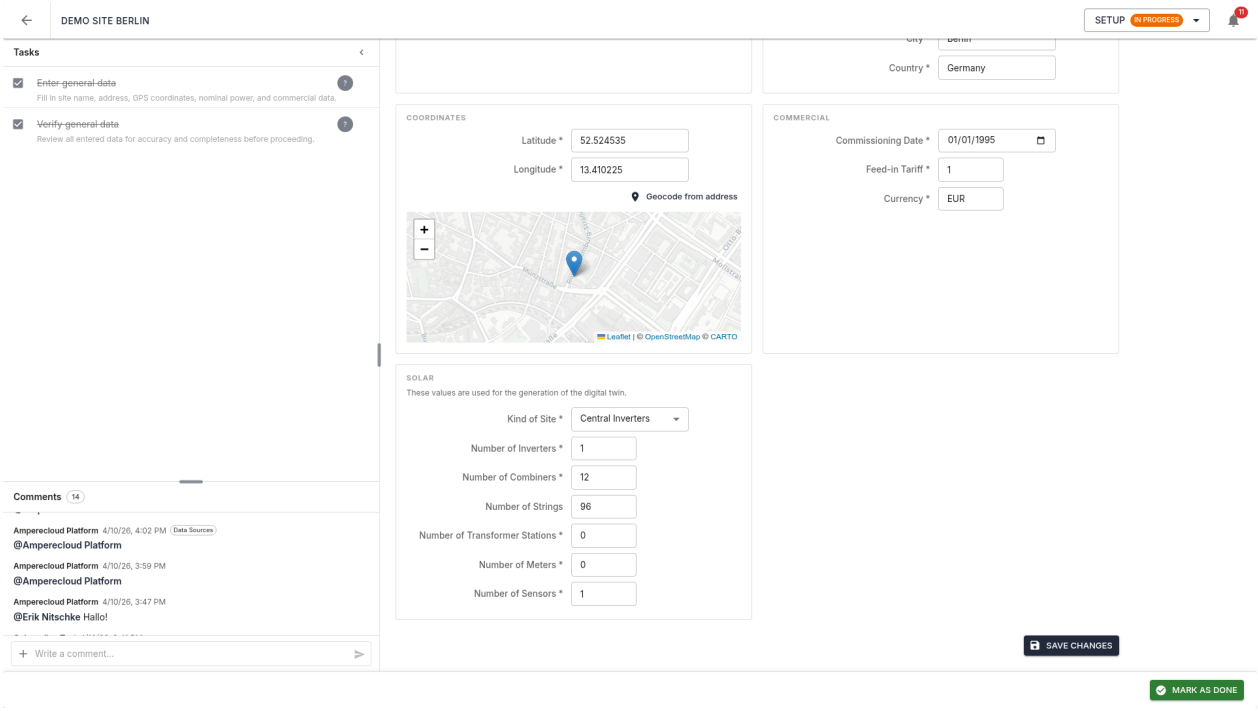

Figure 7: Coordinates and map

- **Latitude** * / **Longitude** *
- **Geocode from address**: automatically derives GPS from the address (OpenStreetMap/Nominatim)
- **Map preview**: interactive map with a draggable pin for manual adjustment

Commercial

- **Commissioning date** *
- **Feed-in tariff** *
- **Currency** *

Plant-type specific fields (Solar)

For solar sites, extra fields are shown that are needed to generate the digital twin:

- **Inverter type** * (string or central)
- **Number of inverters** *
- **Number of string combiners** *
- **Number of strings**: optional

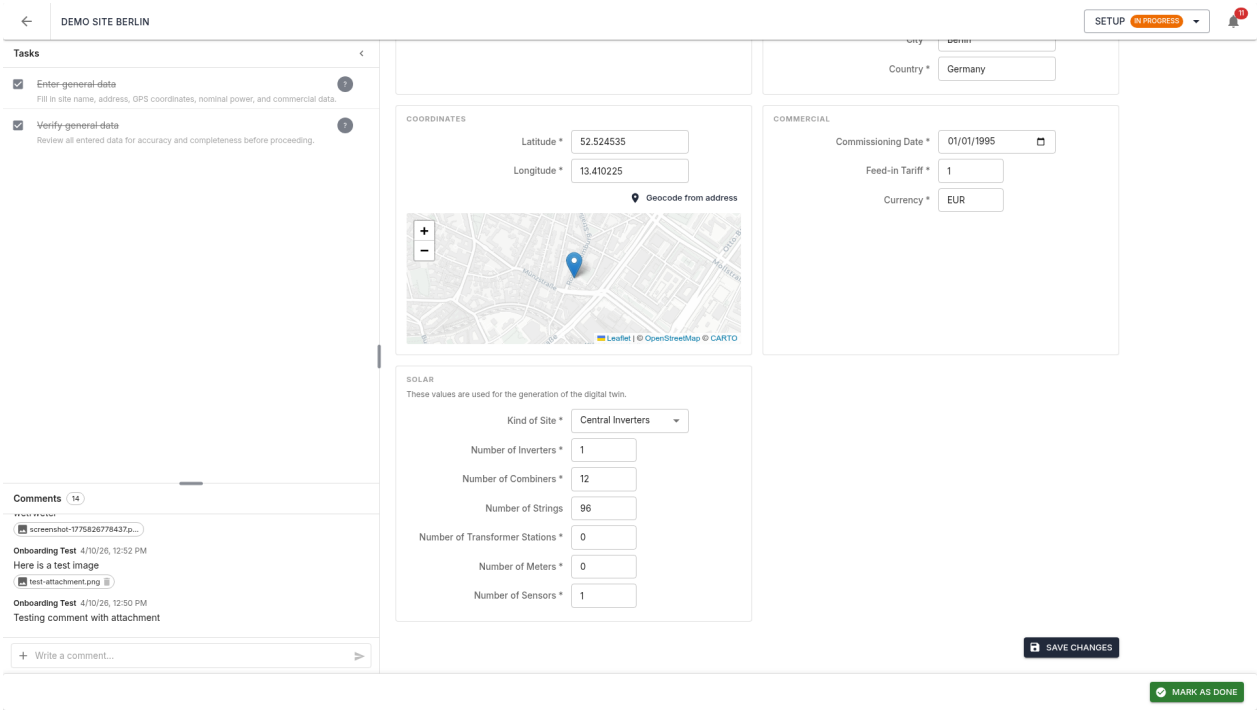

Figure 8: Commercial and plant type

- **Number of transformer stations** * (0 if not present)
- **Number of meters** *
- **Number of sensors** *

Click **"Save changes"** when done.

> **Note**: All fields marked with * are required. Data is synchronized with the Amperecloud platform when the stage is completed.

Tasks

The Setup stage has two tasks:

1. **Enter general data** (Owner): fill in all form fields
2. **Verify general data**: check accuracy

The second task is locked (shown with a padlock) and unlocks only after the first is done.

Click the checkbox to mark a task complete.

Comments

The comments panel below the task list allows you to leave notes. Comments are stage-specific and recorded in the audit log.

Mentions (@)

Via the **“+” menu** or by typing `@` in the comment field, project participants can be mentioned. Mentioned users receive a notification; mentions are highlighted blue in the saved comment.

Attachments, screenshots and screen recordings

The **“+” menu** also provides:

- **Attach file**: any file up to 10 MB; images and videos render in a preview modal
- **Screenshot**: captures the visible window and opens an editor with arrows, shapes, text, and freehand drawing for annotations
- **Screen recording**: record up to 2 minutes of screen (optional microphone)

Selected attachments appear as chips in the comment field and are only saved together with the comment.

Complete the stage

Once all tasks are done, click **“Mark as done”** in the bottom bar.

Completion dialog

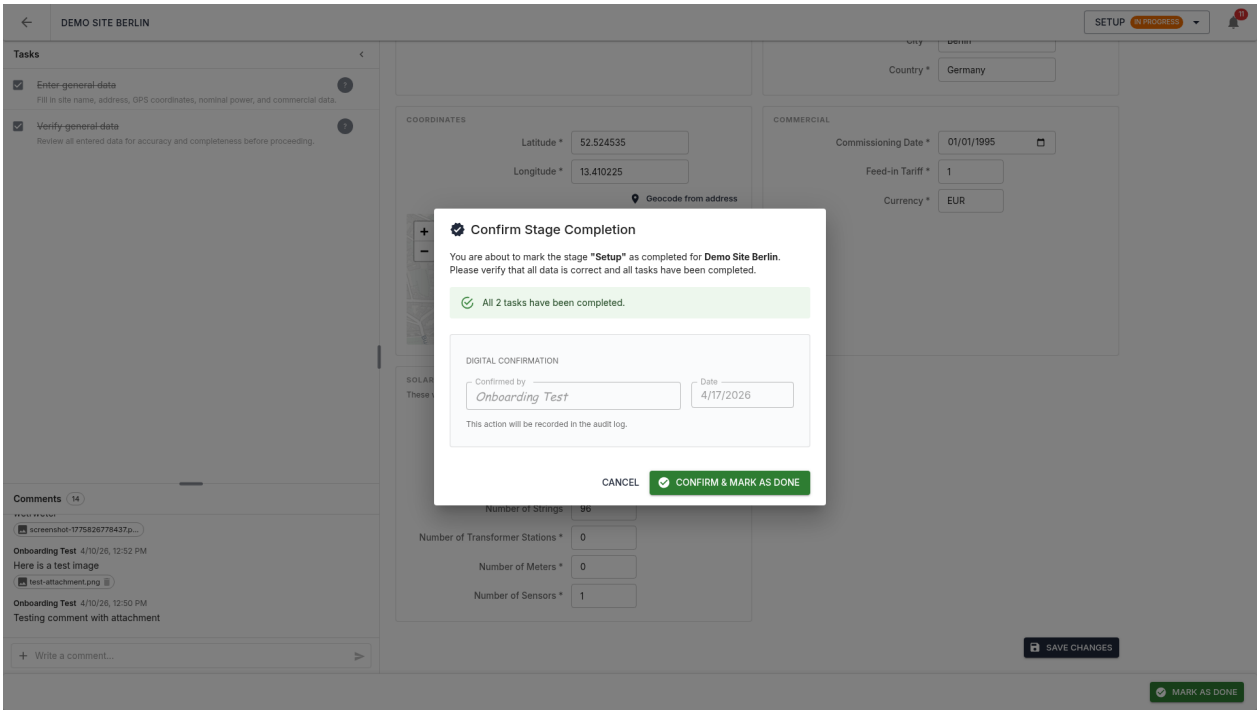

Figure 9: Completion dialog

The dialog shows:

- Summary of task status
- **Digital confirmation** with the signed-in user’s name and date

- A note that the action is logged in the audit log

On completion, site data is synced to the Amperecloud platform. If the sync fails, the error is shown and the stage stays open.

Completed stage

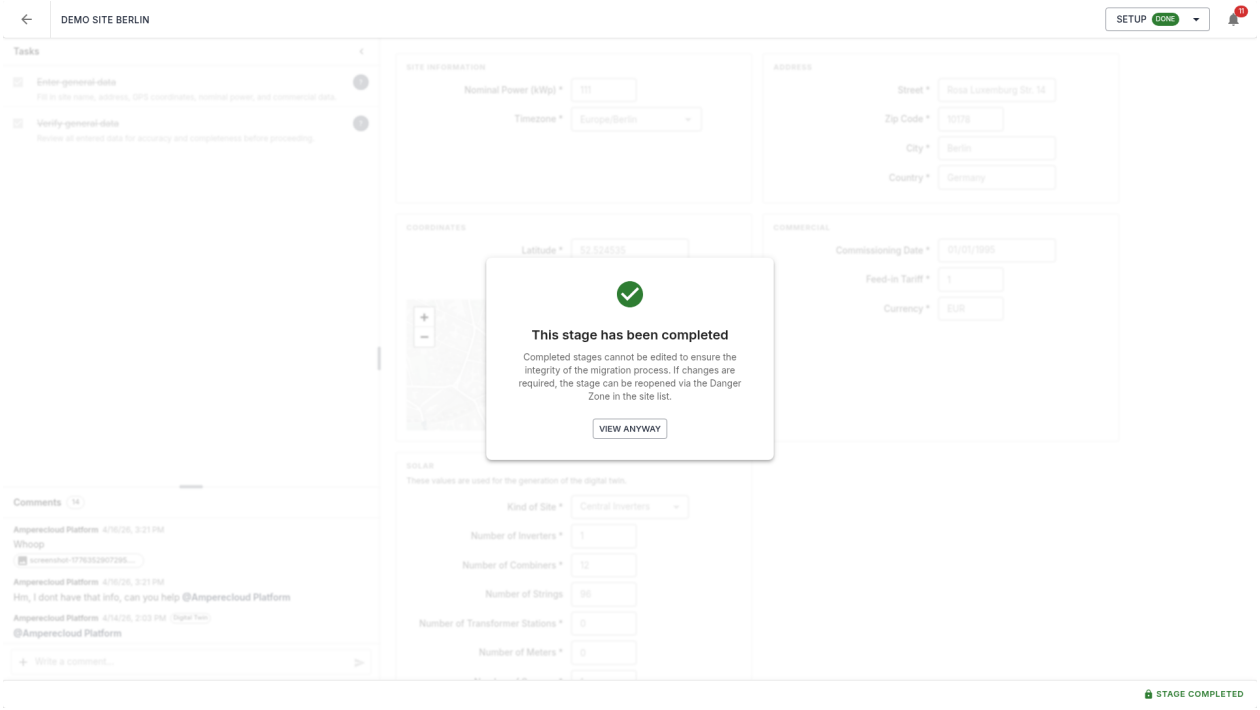

Figure 10: Stage completed

After completion the stage is locked. An overlay indicates this. **"View anyway"** opens the stage read-only.

> **Note**: If changes are needed after completion, the stage can be reopened via the **Danger Zone**. This is limited to Amperecloud employees and requires an override authorization (reason + approver). All overrides are recorded in the audit log.

Next stage

After completion, **Data Sources** unlocks. → 03-Data-Sources

Stage 2: Data Sources

In the Data Sources stage you configure the connections used by dataloggers and controllers to send monitoring data to the Amperecloud platform.

Overview

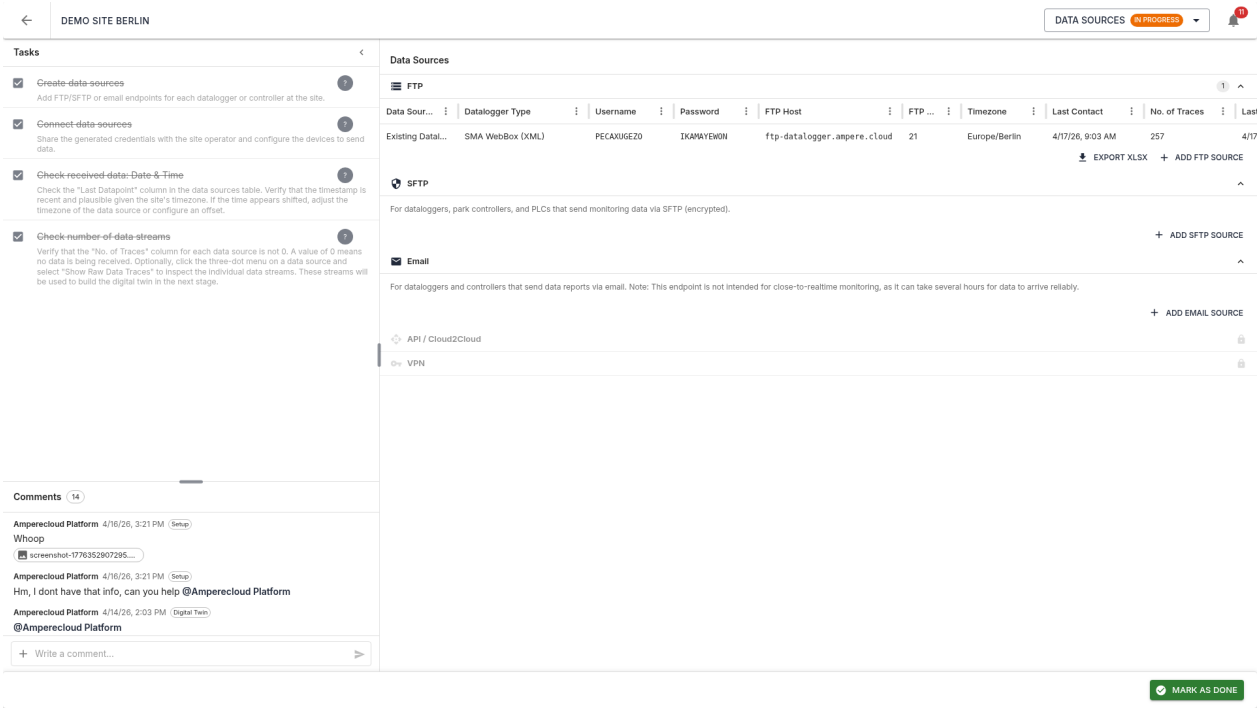

Figure 11: Data Sources overview

The view is split in two:

- **Left**: tasks (4 items) and comments
- **Right**: data sources grouped by connection type (FTP, SFTP, Email, API, VPN)

Connection types

FTP

For dataloggers, park controllers, and PLCs sending monitoring data via FTP. On creation an FTP account is generated automatically. The credentials are shown in the table:

- **Source name**: free-text name
- **Datalogger type**: e.g. SolarLog, Huawei SmartLogger, SMA WebBox
- **Username / password**: auto-generated
- **FTP host**: `ftp-datalogger.ampere.cloud`
- **FTP port**: `21`
- **Timezone**: configured timezone of the datalogger
- **Last contact**: last time data was received

SFTP

Like FTP, but encrypted: - **SFTP host**: `sftp-datalogger.ampere.cloud` - **SFTP port**: `22`

Email

For dataloggers that send reports by email. A unique email address is generated automatically.

> **Note**: email endpoints are not suited for real-time monitoring — data can take hours to arrive.

API / Cloud2Cloud and VPN

Reserved for future use, currently unavailable.

Create a data source

Single

Click **"Add FTP source"** (or SFTP / Email). A dialog opens in **Single** mode:

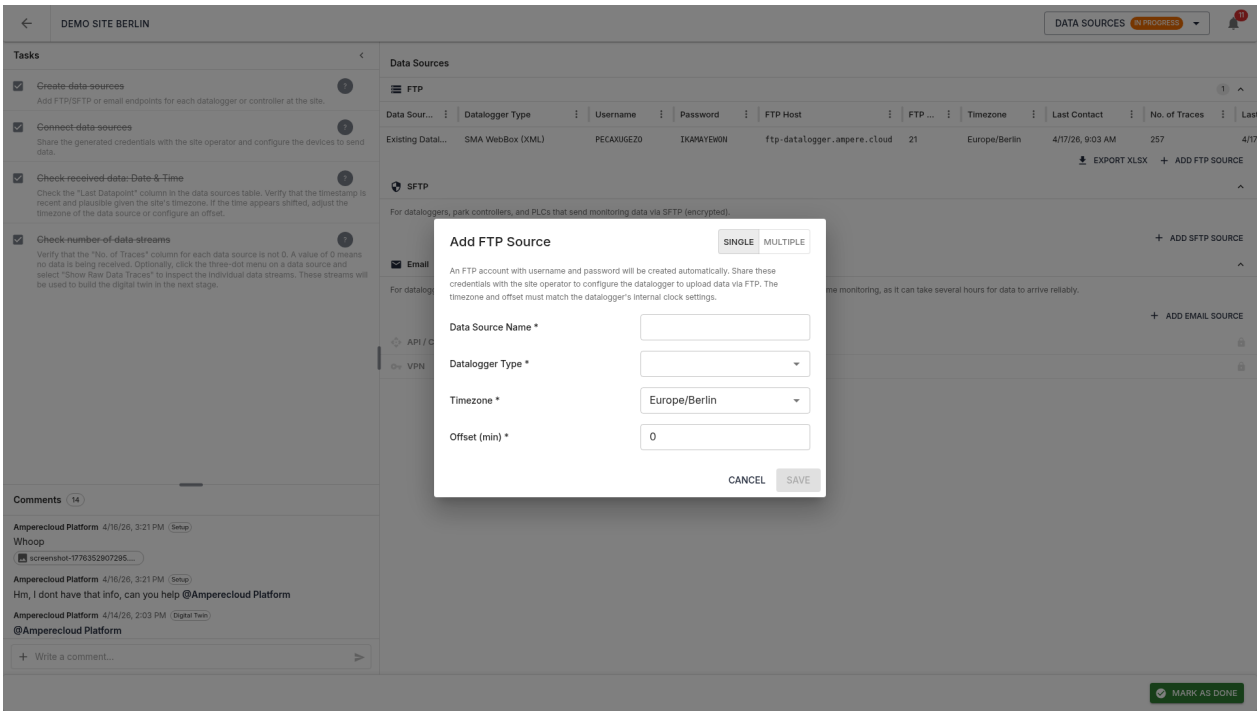

Figure 12: Create FTP

Fields:

- **Source name** * (e.g. "INV South 01")
- **Datalogger type** *: pick from dropdown
- **Timezone** *: must match the datalogger's internal clock
- **Offset (min)** *: time offset (default 0)

Click **“Save”** to create the source; credentials appear in the table.

Multiple (batch)

Switch to **“Multiple”** in the dialog:

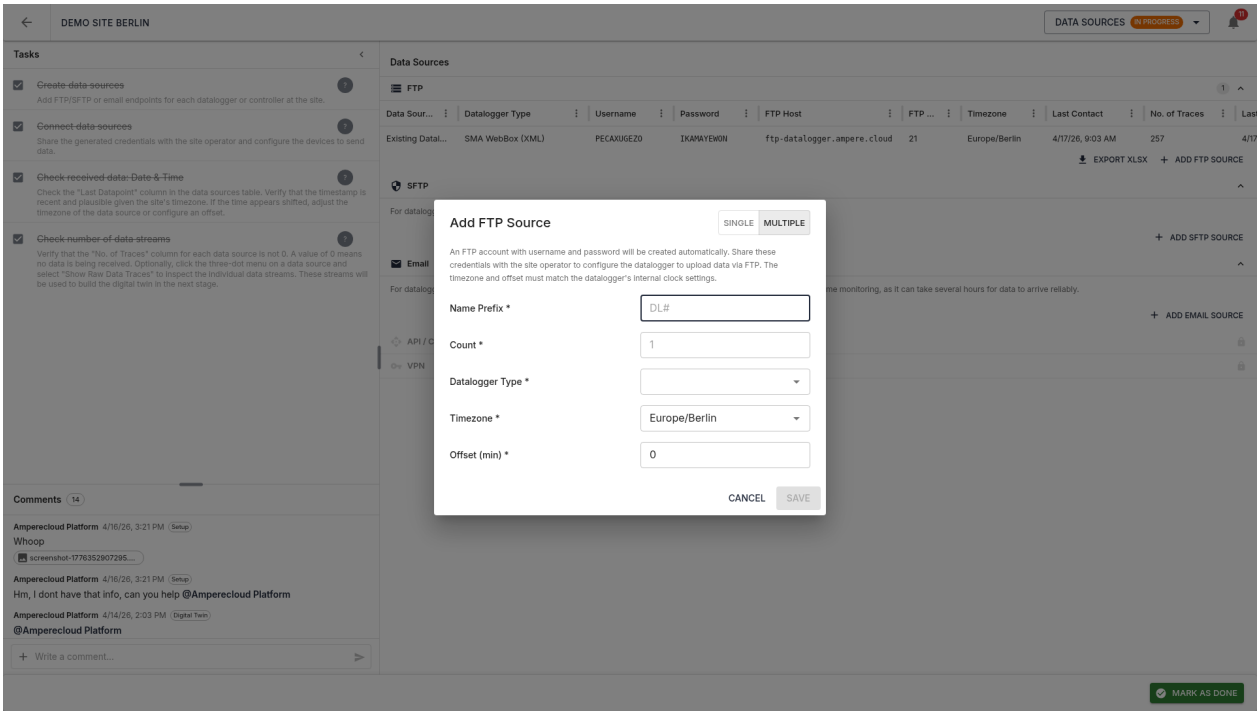

Figure 13: FTP batch

- **Name prefix** * (e.g. “DL#”)
- **Count** * (1–99)

Sources are named `DL#-00`, `DL#-01`, `DL#-02`, …. Datalogger type, timezone, and offset apply to all.

For more than 5 sources a **progress bar** is shown. If any fail, an **error report** with the affected entries is shown at the end.

Distribute credentials

The generated credentials need to be shared with the site operator or hardware installer so they can configure the dataloggers accordingly.

XLSX export

Use **“Export XLSX”** to download all credentials of a connection type as an Excel file. The file includes host, port, username, password, and timezone. A bulk export of all credentials across selected sites is also available in the site overview.

Verify data reception

Once data arrives, the following columns update:

- **Last contact**: check that the timestamp is recent and plausible
- **Trace count**: number of reading streams — 0 means no data

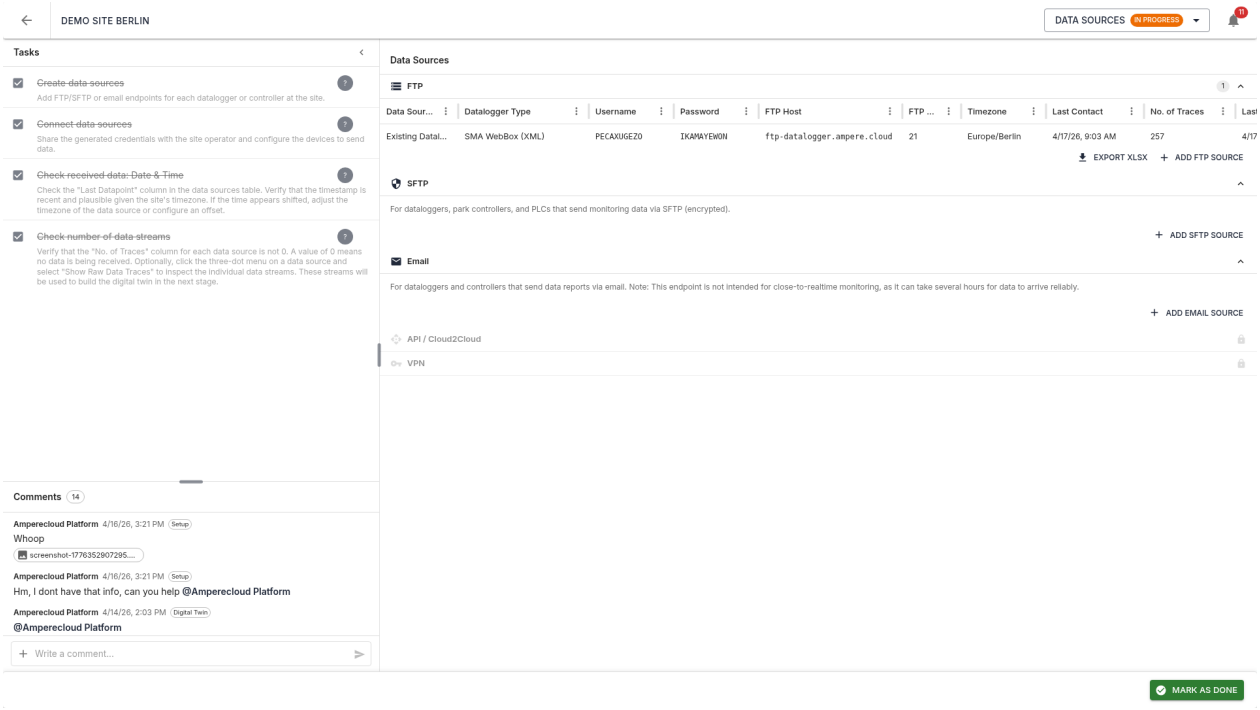

Figure 14: Data sources with traces

The received data traces will be used automatically in the next stage (Scan) to build the digital twin.

Show raw traces

Via the **three-dot menu** ( ) at the end of each row, select **"Show raw traces"**. The left sidebar (tasks / comments) is collapsed automatically to maximize space for the panel:

The table shows, per trace:

- **Key**: technical trace name (e.g. `MeanPublic/SCDDE1AZ:180170410:Pac`)
- **Value**: current reading
- **Timestamp**: last measurement

Checkboxes on the left select traces to plot in the **chart** above the table, so values can be checked for plausibility, correct scaling, and gaps.

Tasks

The Data Sources stage has four tasks:

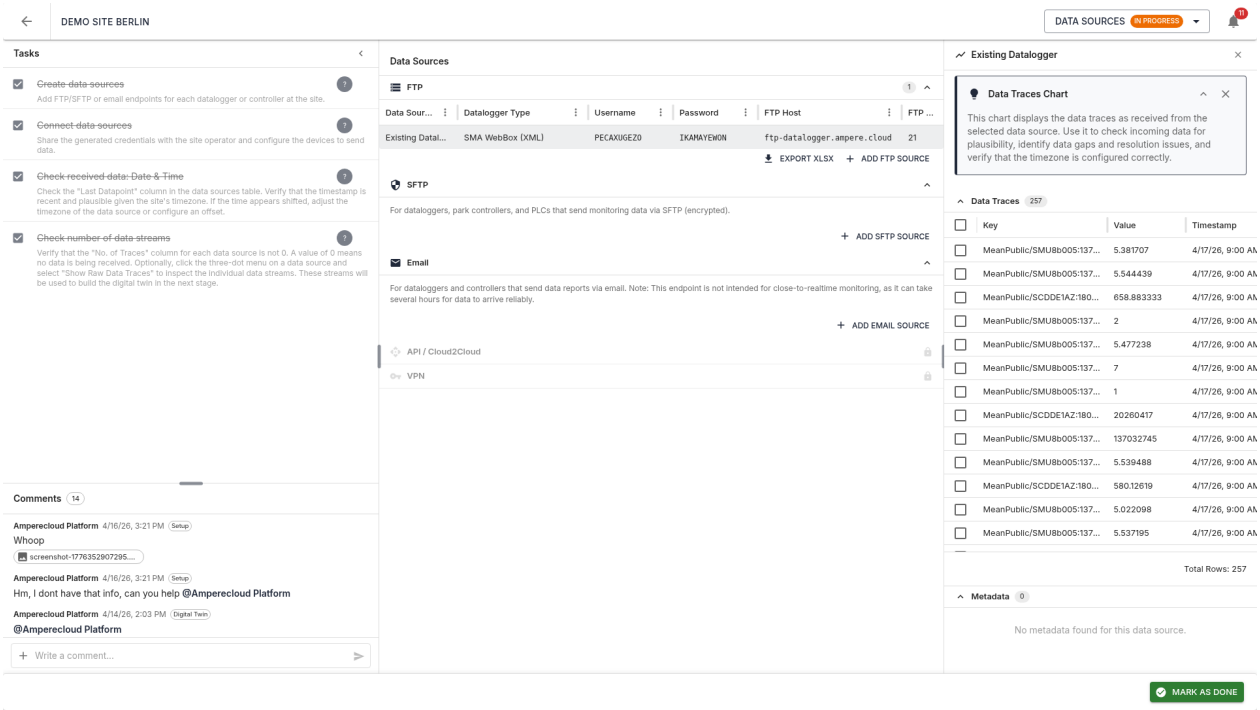

Figure 15: Raw traces

1. **Create data sources**
2. **Connect data sources**: share credentials and configure the devices
3. **Check received data: date & time**: verify timestamps, adjust timezone or offset if needed
4. **Check trace count**: make sure traces are being received (column „Trace count" not 0)

Tasks 3 and 4 are available only after task 2 is done.

Complete the stage

Same as the Setup stage: finish all tasks, then mark as done via the bottom bar. A pre-completion validator checks that at least one data source is receiving traces. Completion requires a digital confirmation and is recorded in the audit log.

Next stage

Scan unlocks next. → 04-Scan

Stage 3: Scan

In the Scan stage, the **digital twin of the site** is generated from the received raw data traces. This is done by creating **mapping rules** — via the AI assistant, manually in the rule editor, or by importing a template. A simulation shows the result as a device hierarchy. When the stage is completed, the twin is handed over to the next stage for refinement.

Overview

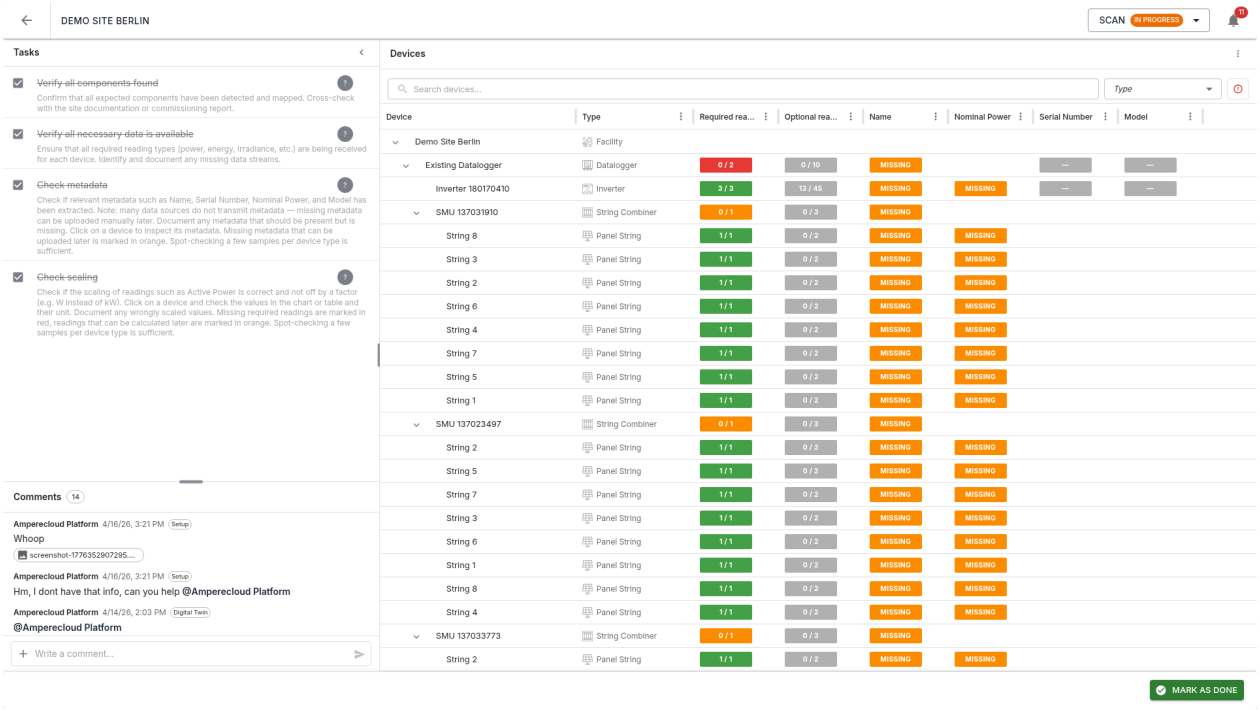

Figure 16: Scan overview

Two-panel layout:

- **Left**: tasks (4) and comments
- **Right**: device tree with all detected components of the site

The tree shows the hierarchy: **Facility → Datalogger → Inverter → String Combiner → Strings**. Each row shows device name, type, metadata (Model, Name, Nominal power, Serial number), and the count of mapped required readings as status pills.

Color coding

- **Green**: reading / metadata present and mapped
- **Red (Required)**: must be mapped in this stage — otherwise the stage cannot be completed
- **Orange (Calculable / Uploadable)**: needed later, can be calculated or uploaded in a later stage
- **Grey (Optional)**: no action required

Search and filter

The **search field** and **type filter** help locate devices quickly — especially useful for large sites.

Side panels

Via the **three-dot menu** ( ) in the tree's toolbar, three panels can be toggled. Only **one panel is visible at a time**; opening one closes the others. The left sidebar is collapsed automatically to maximize space:

- **Show AI assistant** — opens the Spark AI chat panel
- **Show mapping rules** — opens the rule editor
- **Show direct mappings** — opens the panel for Facility and Datalogger direct mappings
- **Reset** — discards the current scan state (Amperecloud employees only)

AI assistant (Spark AI)

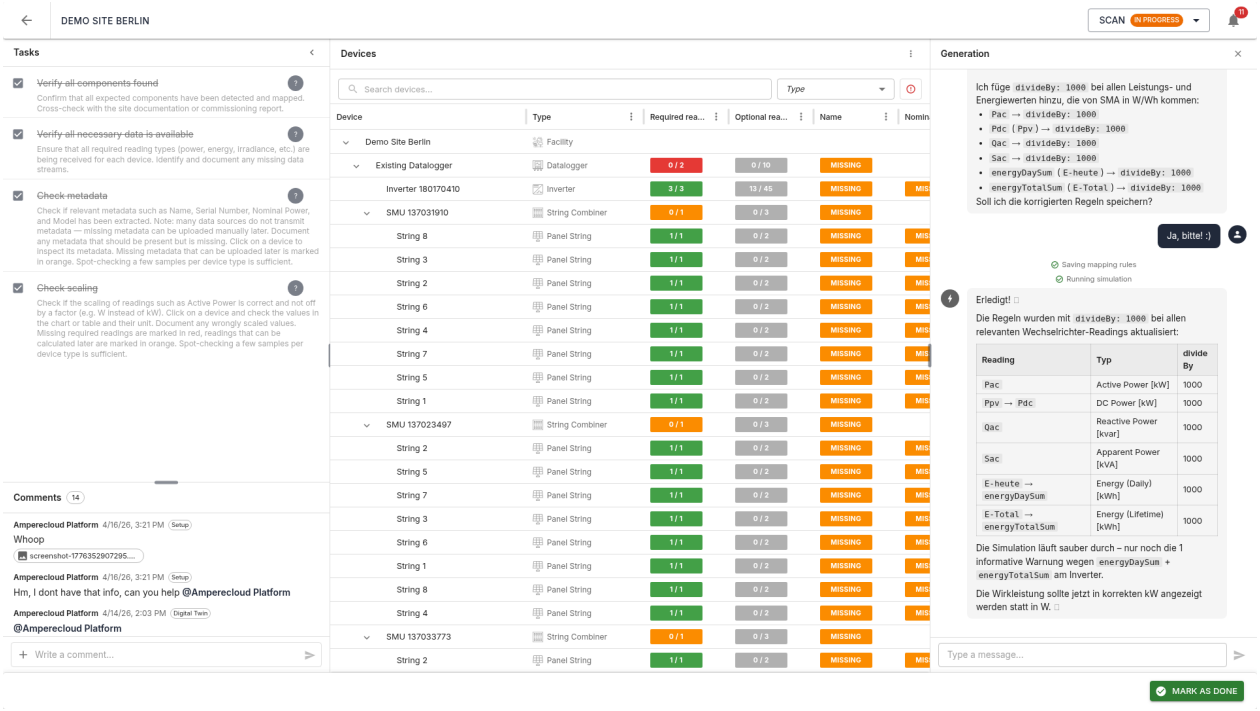

Figure 17: AI assistant

The AI assistant **Spark** drives the scan process:

1. Fetches data sources and the site configuration
2. Searches for matching templates
3. Analyzes raw traces and metadata
4. Creates or adapts mapping rules and saves them per datalogger
5. Runs a simulation and verifies the result against the site configuration

The chat shows a **summary** with device statistics, hierarchy view, and warnings (e.g. unexpected inverter count, missing required readings).

Stop button

A running AI agent can be aborted any time via the **Stop** button. Cancellation works even from a different browser tab, since status is synced via a server-side event bus.

Mapping rule editor

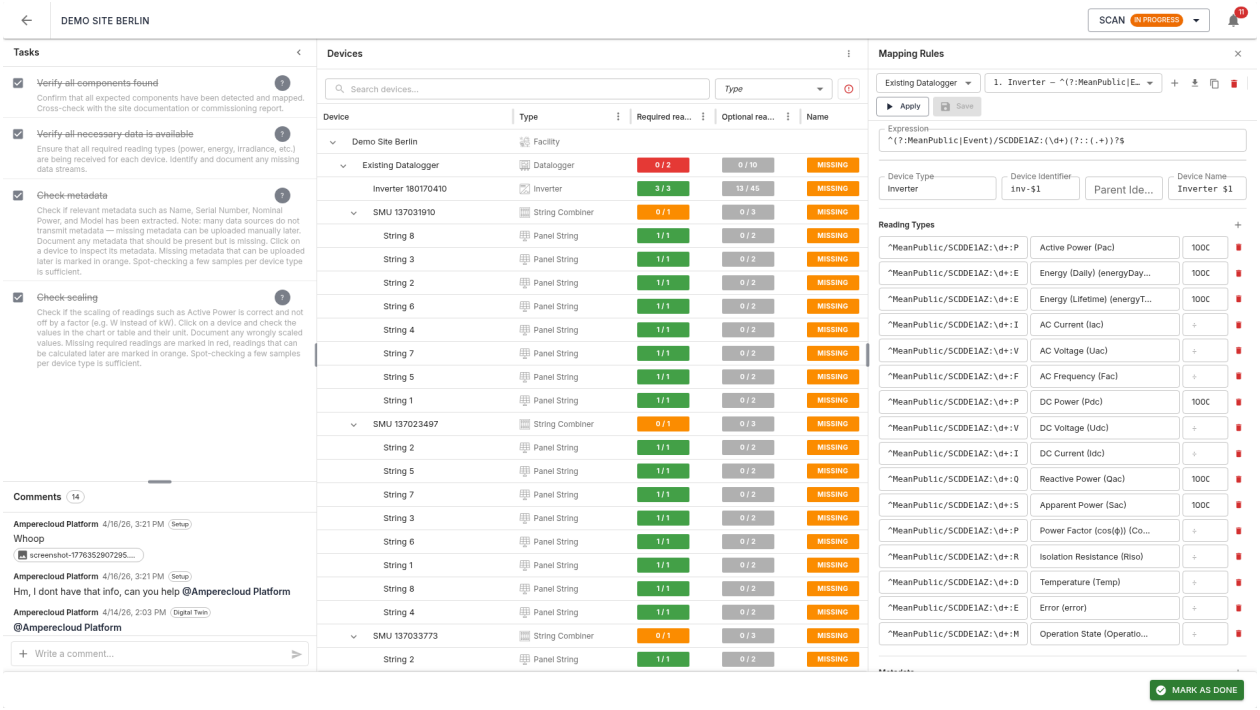

Figure 18: Mapping rule editor

The rule editor lets you create and edit mapping rules manually. Each rule defines how raw traces are mapped onto devices and reading types.

Rule selection

Top of the editor:

- **Datalogger selector**: which source the rules apply to
- **Rule selector**: dropdown of all rules, sorted by order
- **Add rule**: create a new empty rule
- **Import from template**: import rules from a platform template
- **Apply**: run a simulation and update the device tree
- **Save**: save the current rule

Device expression (regex)

The **expression** defines which raw traces this rule targets, as a regular expression. Matching traces with their current values are listed below. **Capture groups** (parentheses in the regex) are color-highlighted and can be referenced in the Device ID, Parent ID, and Device name fields as `$1`, `$2`, etc.

Device configuration

- **Device type**: (e.g. Inverter, String Combiner, Panel String)
- **Device ID**: unique identifier (can contain capture-group placeholders)
- **Parent ID**: ID of the parent device in the hierarchy (empty for root)
- **Device name**: display name

Reading types

Each row maps a **regex** to a **reading type**:

- **Expression**: regex against the full raw trace name
- **Reading type**: target reading type on the platform (e.g. Pac, Idc, Udc)
- **÷ (divisor)**: optional scaling factor (e.g. 1000 for W → kW)

  Note: the expression must be unique — it may only match one trace per device. Ambiguous expressions (e.g. `PF` matching both `PF` and `PFExt`) are reported as errors.

Metadata and status codes

Additional sections in the editor let you map **metadata** (Name, Serial, Nominal power, Model) and **Status codes** onto the devices.

Direct mappings

Some required readings do not belong to rule-generated devices but directly to the **Facility** (the whole site) or a **Datalogger**. Examples:

- **Facility**: `energyDelta`, `energyTotalSum`, `energyDaySum` (at least one required)
- **Datalogger**: `PacLimitRel`, `gridOperatorActivePowerLimit` (at least one datalogger must provide each)

The **Direct mappings** panel assigns such raw traces directly to an existing device without creating new ones.

Tasks

The Scan stage has four tasks:

1. **Verify all components found**: all expected components must be detected. Cross-check with site documentation or commissioning report.
2. **Verify all necessary data is available**: all required reading types must be received per device.

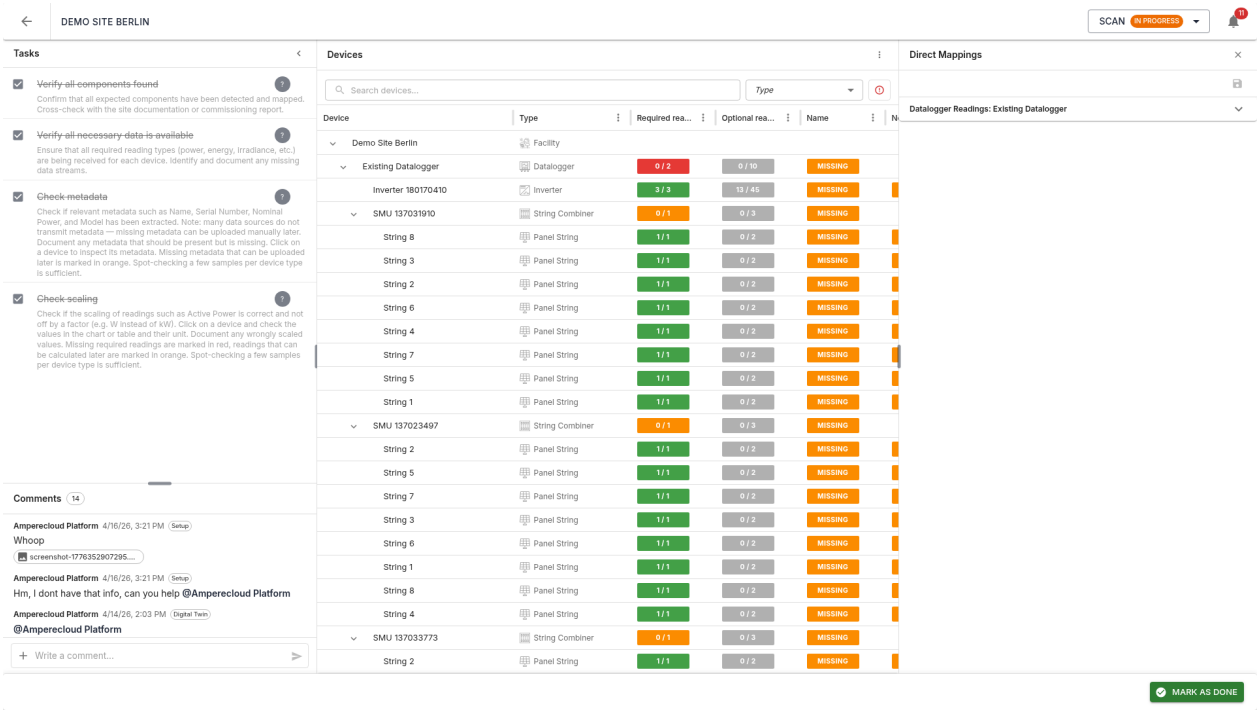

Figure 19: Direct mappings

3. **Check metadata**: Name, Serial, Nominal power, and Model should be extracted as far as available in the raw data. Spot-checks per device type are sufficient.
4. **Check scaling**: values must be plausible and not off by a factor (e.g. W instead of kW).

Tasks 2–4 are only available after task 1 is done.

Complete the stage

Once all tasks are done, complete the stage via **"Mark as done"**.

Pre-completion validator

Before completion, the system checks:

- **No critical errors** in the simulation (e.g. invalid metadata expressions, missing required readings)
- **No remaining required readings** without mapping

If a check fails, an **error dialog** describes the open issues. The stage can only be completed once everything is resolved.

> **Note**: Completing the Scan stage generates the initial **digital twin** from the simulation. It is refined in the next stage and only then synced to the platform. If the Scan stage is reopened later, the digital twin is fully rebuilt from the current simulation result on re-completion.

Next stage

Digital Twin unlocks next. → 05-Digital-Twin

Stage 4: Digital Twin

In the **Digital Twin** stage, the device structure automatically generated by the Scan stage is **refined and completed**. Names, metadata, and groups are maintained, missing devices added, or extra devices removed. When the stage is completed, the final digital twin is synced to the Amperecloud platform.

Overview

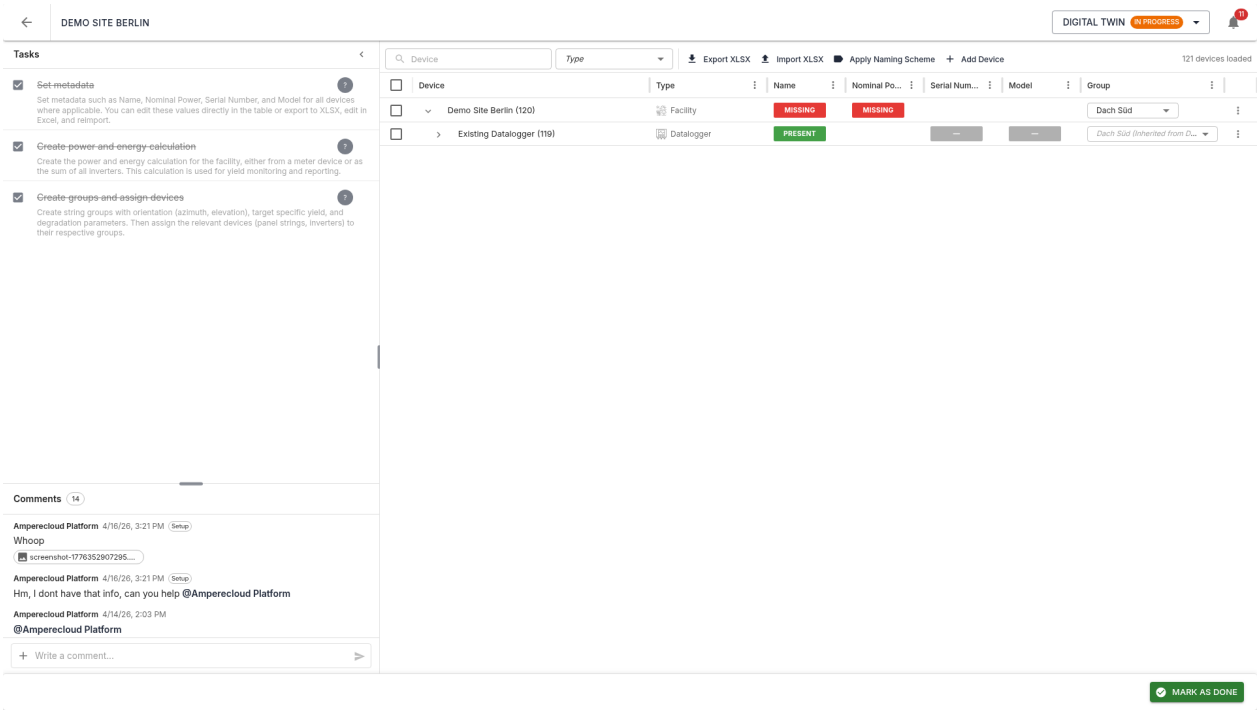

Figure 20: Digital Twin overview

The view shows the full device tree in a **DataGrid** layout:

- **Tree structure**: dataloggers as root nodes, rule-generated devices below
- **Columns**: name, type, readings (red/green), metadata (NAME, Nominal Power, Serial Number, Model) as status pills
- **Toolbar**: search, type filter, XLSX export/import, and bulk actions

Status pills

Each metadata column shows:

- **Green (Present)**: value from mapping rules or manual entry
- **Red (Missing)**: for uploadable fields — must be set before completion
- **Grey (Optional)**: no action required

The readings column shows the count of **required + calculable** readings per device type.

Managing devices

Create a new device

The **“New device”** button in the toolbar lets you create transformer stations and sections directly in the DT stage. Two modes:

- **Single**: one device with all details
- **Bulk**: many devices via a naming scheme

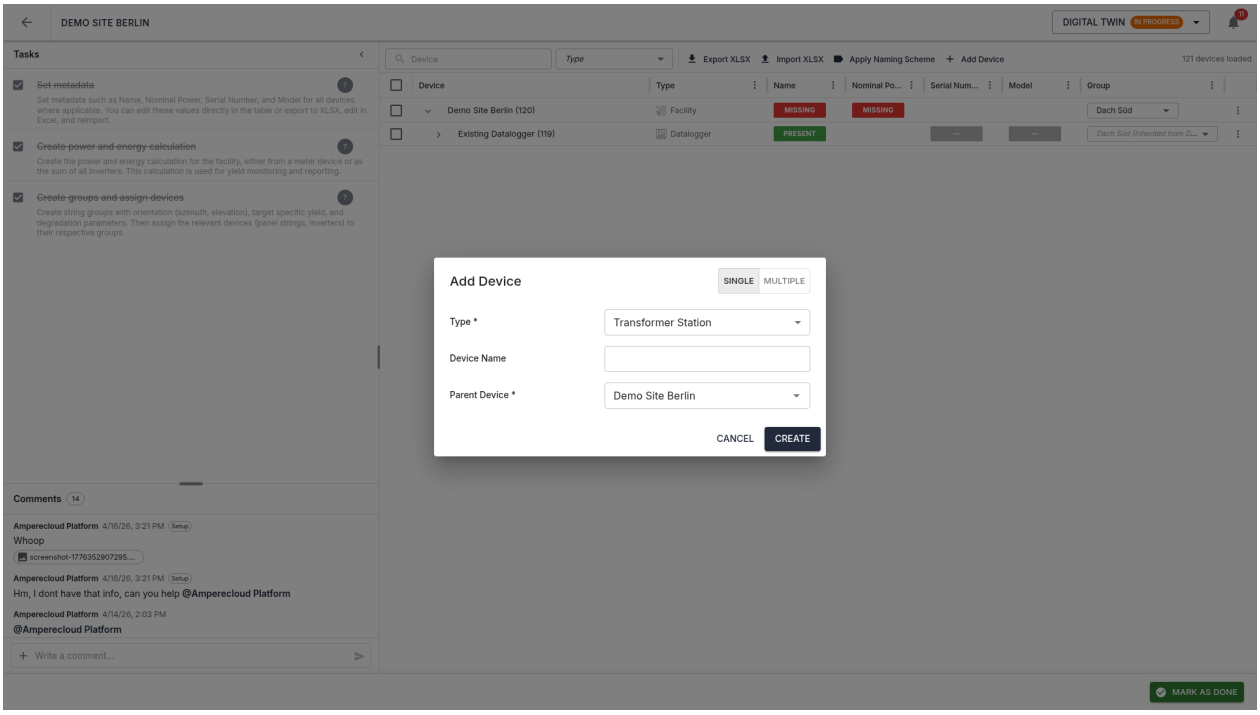

Figure 21: Create device

Move a device

Drag & drop or use **“Move”** in the three-dot menu. The system validates:

- That the target is an allowed parent type
- That the target is not a child of the moved device (no cycles)

Invalid drop targets are highlighted red while dragging.

Rename / delete

Via the **three-dot menu ( )** on each row:

- **Rename**: single device
- **Delete**: device is **soft-deleted** (marked `deletedAt`) and removed from the platform on stage completion

Bulk actions

Select multiple devices via checkboxes, then in the toolbar:

- **Assign group**: assign all selected devices to a group
- **Move**: bulk move with the same hierarchy validation as above
- **Rename**: using `{n}` as a running-number placeholder
- **Delete**: requires typing `DELETE` to confirm

Apply naming scheme

The **"Apply naming scheme"** button opens a dialog to define a **hierarchical naming pattern** per device type:

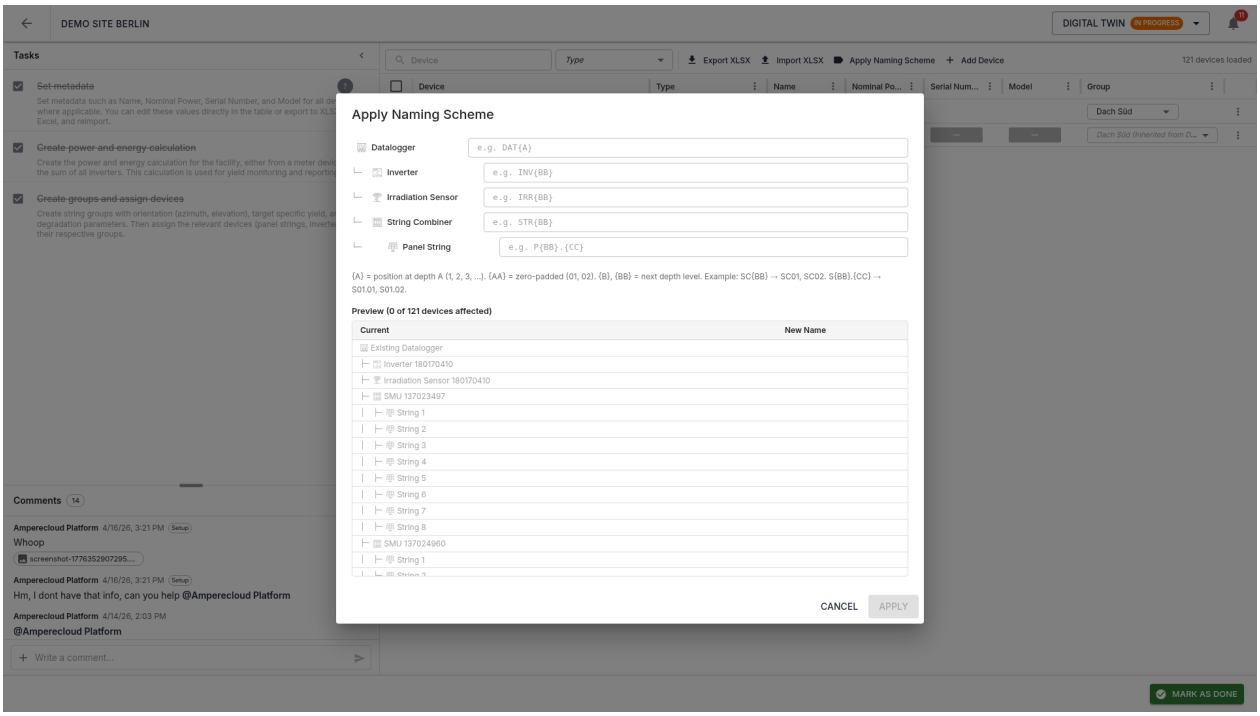

Figure 22: Naming scheme

Use the placeholders `{A}`, `{AA}`, `{B}`, `{BB}` for positional numbering (with optional zero-padding). A **live preview** in the tree shows current vs. new names side by side.

Example: `INV-{AA}` produces `INV-01`, `INV-02`, …

Edit metadata

All metadata fields (NAME, Nominal Power, Serial Number, Model) are editable by **double-clicking** the cell. Changes save immediately. For uploadable fields the pill switches from red to green once a value is set.

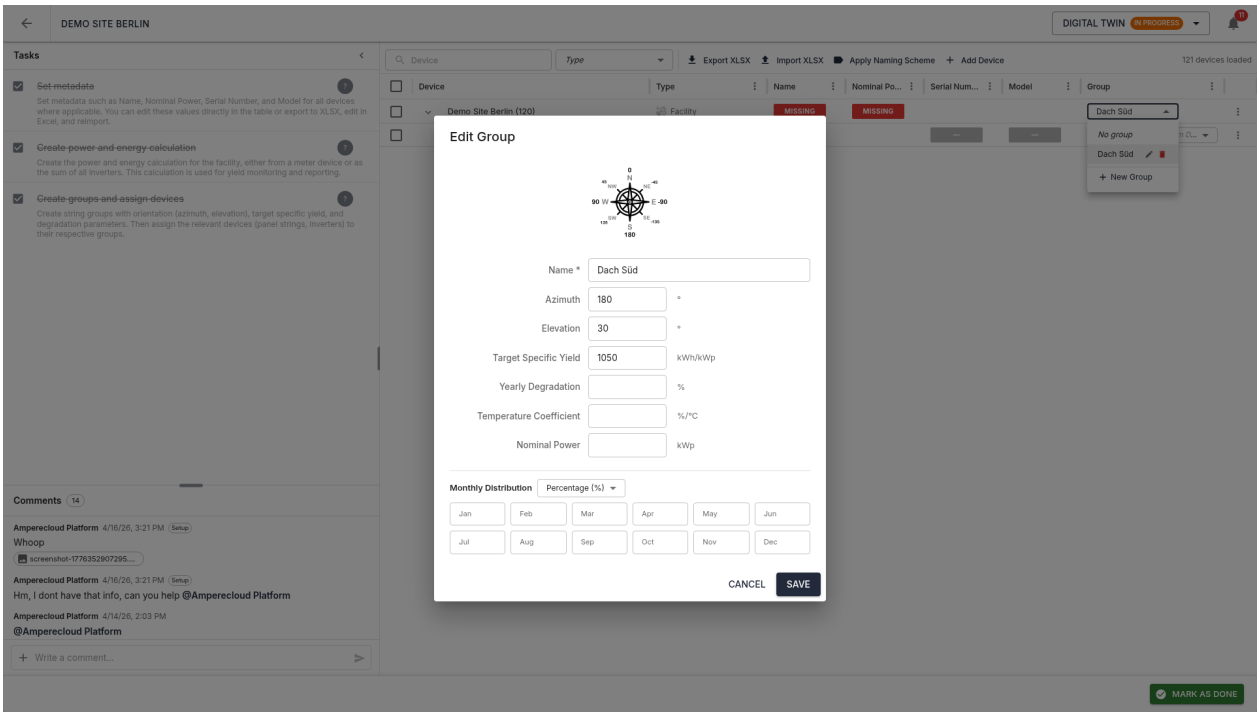

Figure 23: Groups

Groups

Groups bundle devices of the same type with **shared technical parameters** (e.g. orientation, tilt):

- **Name**
- **Azimuth** and **elevation**
- **Specific yield**
- **Degradation**
- **Temperature coefficient**
- **Monthly energy distribution** with unit selector (% / kWh / MWh) and sum validation

Groups are managed via a dedicated panel. When a device is assigned to a group, all **child devices inherit** this assignment — the row shows "GroupName (inherited from ParentName)".

Readings and metadata as pills

Each row shows **reading** and **metadata pills** directly in the table:

- **Red**: required and not yet set — blocks completion
- **Green**: present / set
- **Grey**: optional — no action required

XLSX export / import

The full device structure including metadata and groups can be exported to Excel, edited offline, and re-imported. The export file has styled headers, dropdown validations, and frozen panes for convenient editing in Excel.

On import, only **actual changes** are applied.

Tasks

The Digital Twin stage has three tasks:

1. **Set metadata**: fill in any missing uploadable metadata (Name, Nominal Power, Serial Number, Model)
2. **Create calculations**: create the calculation formulas for all orange (calculable) readings
3. **Create groups**: assign devices to groups and maintain the monthly energy distribution

---

Complete the stage

Pre-completion validator

Before completion, the system checks:

- **Group assignment**: all device types with `hasGroups` must be assigned to a group (directly or inherited)
- **Uploadable metadata**: all red fields must be set

Platform synchronization

Clicking **"Mark as done"** pushes all changes to the Amperecloud platform:

- **Create new devices** (transformer stations, sections, etc.)
- **Delete removed devices**
- **Apply moves** (parent changes)
- **Update metadata**
- **Set group assignments**

A **progress bar** with live SSE updates shows the current sync state. On error, the stage reopens and the error is shown in the dialog.

> **Note**: the sync is **idempotent** — re-completing the stage does not create duplicates but updates existing devices.

Next stage

Alerts & KPIs unlocks as the final stage. → 06-Alerts-KPIs

Stage 5: Alerts & KPIs

The final migration stage configures **reading sources**, **KPIs**, **alerts**, and **satellite data** for the site. The view is split into **four consecutive sections** worked through top-down.

Overview

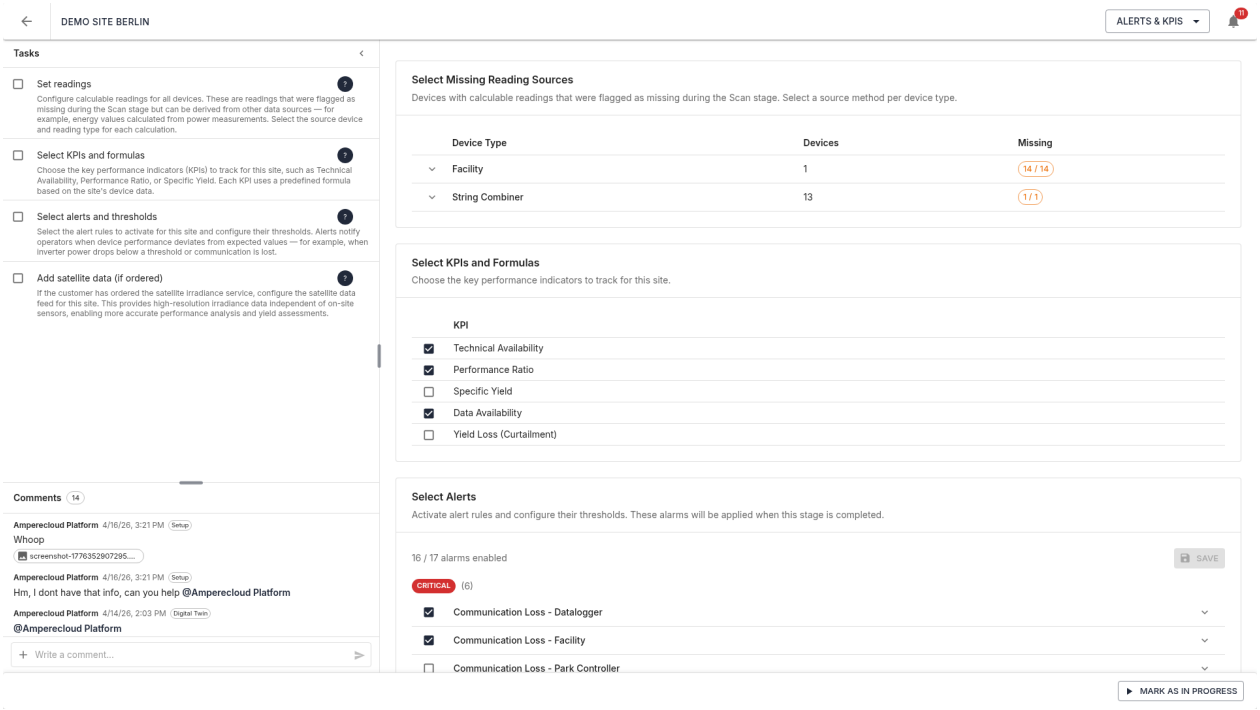

Figure 24: Alerts & KPIs overview

The right-hand side shows four sections:

1. Select missing reading sources
2. Select KPIs and formulas
3. Select and configure alerts
4. Enable satellite data

All changes are saved automatically.

---

1. Missing reading sources

This section lists every device type that still has **calculable readings** missing. A pill `X / Y` per type shows how many out of how many calculable readings need a source.

Detail view

The **+ button** next to a device type expands a sub-table listing each missing reading in human-readable form:

- **Reading**: friendly name (e.g. “Specific Yield”, “Performance Ratio”)

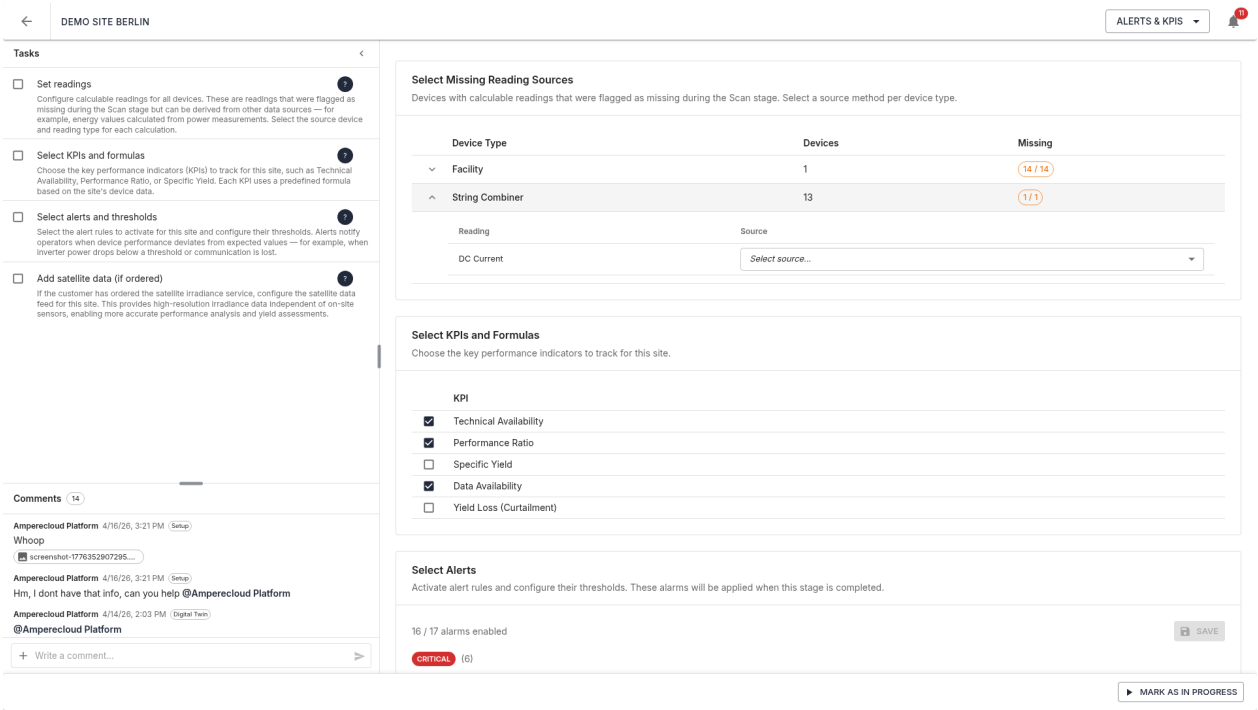

Figure 25: Missing reading sources

- **Source**: dropdown with the available source options

Source options Per reading row:

- **Formula**: value is computed from other readings via a formula
- **Aggregation**: value is aggregated (sum / average) from child devices
- **Manual**: value is entered manually on the platform

---

2. KPIs and formulas

Pick the **Key Performance Indicators** for the site that will appear in Amperecloud reports and dashboards. Typical solar KPIs:

- **Technical Availability**
- **Performance Ratio**
- **Specific Yield**
- **Utilization Ratio**
- **Self-consumption**

Selection is saved per site.

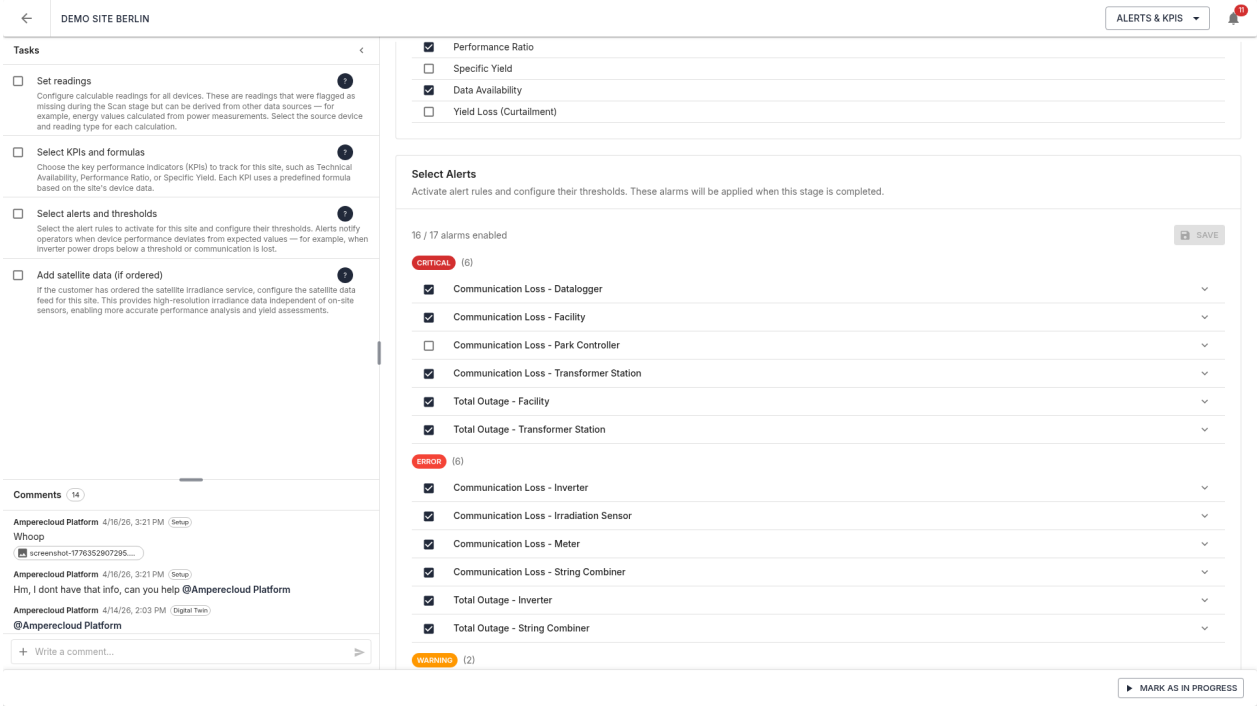

Figure 26: KPIs and formulas

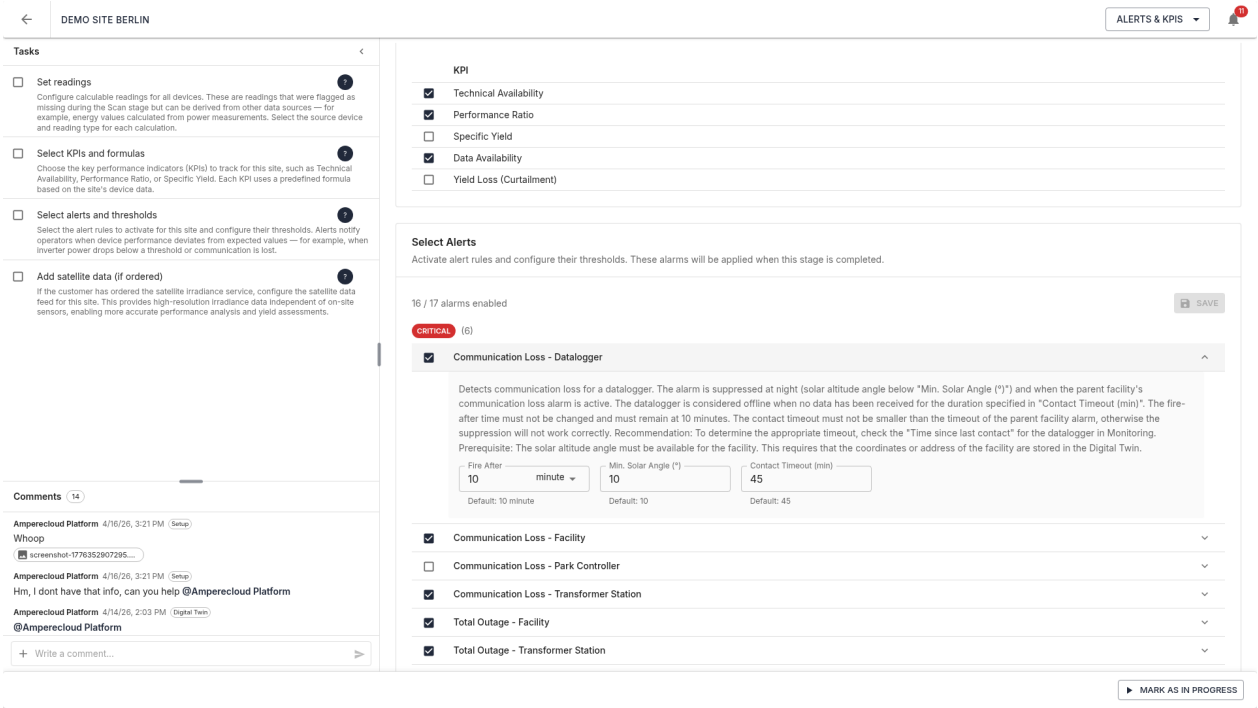

Figure 27: Alerts

3. Alerts

All **official alert definitions** of the Amperecloud platform are loaded and **grouped by severity**. Within a group, alerts are sorted alphabetically.

Alerts flagged with `defaultEnabled: true` in the **template** are pre-selected; the selection is per-site configurable.

Enable / disable

A checkbox per alert toggles it for the site.

Configure

The **expand arrow** opens the configuration area:

- **Description** of the alert
- **Fires after**: text field for the count, dropdown for the unit (seconds, minutes, hours, days). The template default is shown as helper text.
- **Placeholders**: thresholds that parametrize the alert logic (e.g. contact timeout, solar angle)

All inputs share the same visual design — defaults appear as helper text below each field.

Stored configuration

Configuration is saved per site in the `alertsConfig` field and, for each alert, stores:

- `enabled`
- `fireAfterCount` / `fireAfterUnit`
- `placeholderValues`

---

4. Satellite data

A checkbox enables **satellite irradiance data** for the site. Since this service incurs additional costs, a **warning** is shown when enabled — please confirm with the customer before enabling.

Tasks

The Alerts & KPIs stage has four tasks:

1. **Set reading sources**: assign a source to every missing calculable reading
2. **Select KPIs**: pick relevant KPIs for reporting
3. **Select alerts**: confirm active alerts and adjust thresholds
4. **Satellite data**: decide on/off and confirm with the customer if needed

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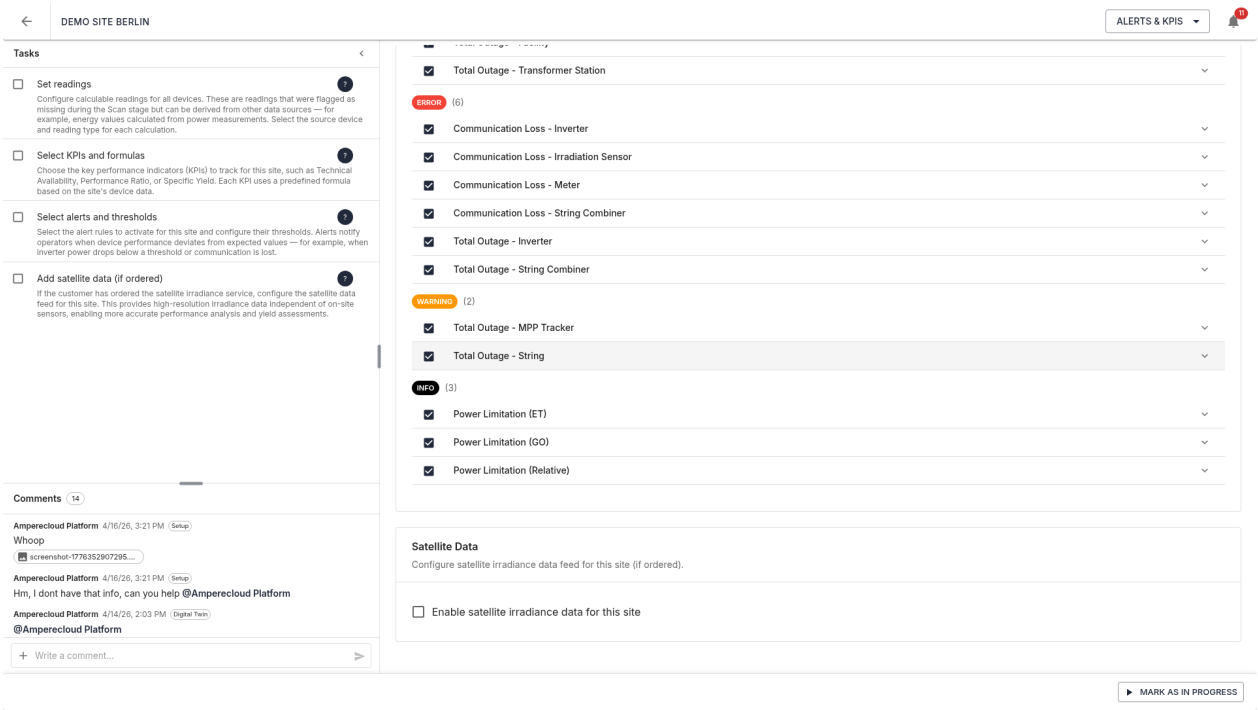

Figure 28: Satellite data

Complete the stage

Once all tasks are done, click **"Mark as done"**. Settings are transferred to the Amperecloud platform, and the site is fully onboarded.

The migration process is **complete**. The site is now fully integrated into Amperecloud and ready for monitoring, alerting, and reporting.