

OPENGRID PLATFORM COMPONENTS – OPEN STANDARDS & SCHEMA

One open platform, powerful interoperable components

OpenGrid's foundation is robust, trusted, open data, with task-ready applications layered on top. Each component was shaped by conversations with the grid planning community and user research on modeling pain points, and each deep-dive sets out what we heard, the outcome we're working toward, and a draft product concept for the community to react to.

Each deep-dive draws on more than 65 conversations with over 55 participants globally across the grid planning ecosystem, conducted in early 2026. We group participants into six personas along two lines: whether they produce analyses or use them, and whether they sit inside or outside the organization whose decisions are at stake. Each group brings different needs, and together they shape how every OpenGrid component is designed. To protect confidentiality, interviewees are identified only by organization type. The draft product concepts are starting points for OpenGrid's Technical Committee and working groups to refine, and we expect scope, priorities, and naming to change as that work happens.

This summary describes the current vision for each component of the OpenGrid Platform. They are not definitive specifications and are still subject to ongoing refinement. Each component will be shaped by the Technical Committee and a working group that is open to anyone who wants to take part. We expect scope, priorities and naming to change as that work happens. Comments, corrections and alternative proposals are welcome. We are publishing at this stage deliberately, so that direction can be shaped in the open rather than presented once it is already fixed.

Open Standards & Schema

Pain points, from user research

Two datasets can describe the same asset and still be impossible to combine, and the main existing standard, CIM, has worked well for transmission networks in numerous geographies but not for market and system models or for distribution data. Nearly every interviewee raised this pain point, each for a different reason: reducing multi-tool fragmentation, making shared data easier to find and use, supporting cross-system operator work, and enabling transparency and audit.

What we heard

- A European TSO said CGMES works for grid models, where the physics is universal, but market and system models have no equivalent standard.
- A large European DSO said CIM is driven by TSO needs and does not suit DSO data volumes. DSO asset volumes run about 100x TSO level, and Europe has 4,000 DSOs against about 60 TSOs.
- An Asia Pacific DSO extended CIM in-house for distribution-level fields and pays for a third-party CIM translation product. Another large European DSO reported the same workaround independently.
- A US RTO keeps operations and planning data in separate databases, and within planning splits power flow, dynamics, economics, and short circuit data into their own silos. A vendor consolidation project has run years past its original schedule and still doesn't reconcile the topology mismatch between planning (bus-branch) and operations (node-breaker) models.
- The Asia Pacific DSO maintains separate PowerFactory, PSS/E, and PSCAD models and keeps them synchronized by hand.
- A large European DSO shows what integration takes today: to replace separate, hand-maintained models in its SCADA and grid planning systems with one model per voltage level, it had to build its own data model on top of CIM.

- Where a shared format does exist, it works: a US ISO's reliability and production cost tools reuse the same power flow files, so interoperability is not a pain point for that part of its work. Market models and distribution data have no equivalent.
- A US IOU asked for a data decoder ring: a standard translation framework that converts each region's models into one common format.
- A grid simulation company pointed to circuit simulation as a model for success, where a shared netlist format spawned an entire commercial ecosystem, while power flow has had no equivalent for 50 years. Without a common schema, cheap AI tooling risks having "500 balkanized tools instead of 5."
- A European data think tank said research partners waste significant time cleaning data, with no standards, inconsistent metrics, and different schemas across frameworks.

What users asked for

- A grid simulation company proposed a standardized schema from capacity expansion through power flow, with automated extraction for different modeling needs.
- An open resource planning initiative said standardized assumptions may matter as much as open-source models.

Vision

Planners, tools, and AI agents within the OpenGrid platform share a common language for describing power systems, so any two studies can be connected and compared by default.

A power system described once, in enough detail, can serve every planning question, from long-term capacity expansion to production cost, network reliability, distribution, and dynamics, with each drawing a consistent view of the same underlying system. The same asset carries the same identity in every dataset that describes it. Teams in different organizations, sectors, and countries define and exchange modeling work in the same terms, and a study done in one place can be understood and reused in another.

This matters more as AI makes software cheaper to write. Without shared conventions, cheap tooling fragments into hundreds of tools that can't work together; with them, people and agents build on each other's work and results stay consistent and checkable. Standards earn adoption by working in useful tools and datasets, and they evolve through an open process anyone can join.

Draft product concept (for discussion)

Open Standards & Schema is the shared contract that lets everything else interoperate. It is a set of published specifications for how grid modeling data is structured and described, plus the tools to check that data and software conform to them. The core covers system data and planning assumptions: the description of the power system itself and the assumptions studies make about its future. Model parameters and solver settings stay with each application, and schemas for model outputs and handoffs between tools are a possibility for further consideration. The standards have four parts:

- 1. Domain data schemas** define structure, fields, and units for each domain, adopting or extending credible existing standards and authoring new ones only where none exist. They make relationships explicit and typed, such as which plant, bus, and zone a unit belongs to, or which technology class it represents, so capacity expansion results can be placed onto nodes. They also set conventions for time series, including time zones, resolution, and the distinction between forecasts and actuals. They describe data on its own terms, free of assumptions borrowed from any one tool (such as a zero that really means "no limit"), and support multiple levels of detail, from zonal to nodal, with consistent translation between them.
- 2. A metadata layer** wraps every dataset with what no domain schema captures: license, provenance, coverage, quality, versioning, and, for each field, the concept it represents, its unit, and the reliability of its values (for example, measured versus estimated).
- 3. Shared vocabularies and component identifiers** give schemas and metadata a common set of concepts, including a controlled unit vocabulary. Per-unit values carry their base alongside them, so a number keeps its meaning when it moves between datasets. Datasets that adopt them use the same terms and identifiers directly. Those that don't, such as legacy or third-party data, can still be mapped to them, so the same quantity or asset is recognized as equivalent wherever it appears.
- 4. Reference documentation and a conformance test suite** let a data provider or tool builder check that their output conforms. Conformance events where tool builders test against a shared corpus could accelerate adoption.

Around all of it sits an open governance process, so the community can propose and shape changes. Most other components depend on this one: the Data Hub's search, linking, and quality signals rest on the metadata layer, the Translator resolves formats against the vocabularies, and orchestration uses them as the handoff contract between steps. One likely shape is a family of domain schemas, for example for bulk transmission and for distribution, sharing one core of units, identifiers, and provenance, plus common data infrastructure for validating, storing, and accessing data that works the same way across all of them. A database of record, from which study-specific datasets are generated on demand, is one example of what that infrastructure could look like. A central tradeoff is how prescriptive to be: a tightly specified schema is easier to validate but harder to adopt, while an extensible one is easier to adopt but harder to keep compatible as it evolves. How far and how quickly to converge is a decision to be made later with Technical Committee and community input.

Boundaries. Applying the schemas to actual datasets is Data Hub work. Moving data between formats is the Translator. Transporting and sequencing it is APIs & Integrations and Workflow Orchestration. Model blocks, the standard interfaces for families of models such as capacity expansion or production cost, build on these schemas and are covered under Workflow Orchestration and Model Plugins.

Who We Heard From

Our platform components were shaped by more than 65 conversations with over 55 participants across the grid planning ecosystem. We group them into six personas along two lines: whether they produce analyses or use them, and whether they sit inside or outside the organization whose decisions are at stake.

Producer Side — People Who Run the Models

Transmission-System Users. Engineers and planners at ISOs, RTOs, TSOs and vertically integrated utilities who model the bulk system, often chaining three to five specialized tools through a single study.

Primary Distribution-System Users. Operators and modelers of distribution networks, from Europe's largest DSOs to small municipal utilities with one- to five-person teams.

Point-Source Modelers. Developers, hyperscaler procurement teams and community energy buyers who model a single point of grid interaction, with analyses that must be defensible enough to underwrite capital commitments.

Consumer Side — People Who Use the Results

Internal Decisionmakers. People who use model outputs to allocate their own organization's capital and must trust analysis they did not run.

External Evaluators. Regulators, intervenors, advocacy organizations, think tanks and data-infrastructure bodies who use outputs to scrutinize decisions made by better-resourced entities.

Straddling Both

External Primary Modelers. Analysts at public utility commissions, reliability councils, think tanks and capacity-building organizations who run their own models to examine decisions made by others.