

Grid Data Enhanced Analytics

Live operations and planning analytics for electricity, gas, and water — GIS, SCADA, and AMI joined into one picture.

Grid Data Enhanced Analytics (GDEA) ingests a utility's connectivity model from ArcGIS, its real-time SCADA telemetry and events, and its AMI meter reads and events — supplied by the Grid Data Management Platform where both are deployed together — joins them, and serves the result as a live map and a full suite of network analytics — across electricity, gas, and water, where which commodities a deployment runs is a setting, not a build. On top of that join sit real solvers — power flow for the electric feeders, hydraulic solves for gas and water — a what-if scenario sandbox, a complete large-load interconnection workflow for the data-center era, and a library of set-based analysis checks. GDEA is deliberately monitoring-only: there is no command path to the field, which makes it safe to put in front of every desk in the utility.

Millions

of assets on the live map

High-throughput

telemetry ingested & archived

Multi-commodity

electricity · gas · water

Checks & solvers

scoped per commodity

KEY FEATURES

Live network map

Vector-tile rendering keeps millions of assets fluid at every zoom level, with live telemetry and events overlaid on the connectivity model, every meter modeled at a real addressed building — and operators' own tags and comments on any asset.

Power flow & hydraulic solvers

A power-flow solve per electric feeder, and hydraulic solves for the gas and water networks — real physics against the as-imported model.

Scenario sandbox

Propose a change to any of the networks — reconductor a feeder, replace a main, re-set the city gate — and see exactly what moves. Base and scenario are solved in the same call, so the difference is the change and nothing else.

Fault location

Locates faults by independent methods — from measured fault current, and from which meters went dark — and says whether they agree.

AMI meters & communications

Every meter is a modeled service point with its interval reads and events — tamper, last gasp, power restored — and the AMI communications network is its own graph, so a cluster of silent meters on one collector reads as a comms fault, not an outage.

Reliability engineering

SAIDI, SAIFI, CAIDI, MAIFI, and CEMI computed to IEEE 1366 — per feeder, per substation, and system-wide.

Capacity, voltage & demand

Feeder-by-feeder headroom with the binding constraint named, conservation voltage reduction analysis, and load broken down by customer class.

Asset health & failure risk

Transformer thermal aging from loading and ambient temperature, plus a per-asset probability of failure from a trained model.

Investment planning Ranks candidate projects against the constraints the analytics actually found — what should be built, and in what order.	Gas & water analytics Unaccounted-for gas, regulator droop, odorant and pressure integrity, line pack, and a graded leak register with due dates; and minimum night flow per district metered area — the small-hours reading that says a district is leaking.
Cross-commodity interdependency What a failure in one network does to plant in another — the de-energized feeder that was carrying a pump station — inferred from geometry and labeled as such.	Analysis engine Set-based checks across model, flow, condition, revenue, gas, comms, interdependency, observability and weather engines, scoped per commodity, every finding ranked, linked to the map, and honest about truncation and coverage.
Large-load interconnection The data-center queue as a register: duplicate-candidate netting with honest gross and net totals, point-load feasibility per ramp step, a ladder of connection options ranked by cost per megawatt admitted — plus fault duty, UPS voltage step, and N-1 alternate-supply checks at the point of connection.	Service order integration The utility's service orders mirrored over Kafka beside what GDEA found: the work open on each asset, the findings nobody has been sent to, and a request for work raised from the gap — requested by GDEA, always dispatched by the utility.

ONE QUESTION PER SCREEN

Every GDEA surface is built to answer a single operational question, completely:

Map	Where is it, and what is happening to it right now.
Scenario	What would this change do — solved, diffed, and refused with reasons when it cannot hold.
Analysis	What is wrong with the record — worst first, per commodity.
Faults	Where the fault was — from the fault current, and from who went dark.
Reliability	SAIDI, SAIFI, CAIDI, MAIFI, and CEMI to IEEE 1366 — regulator-ready.
Capacity & CVR	How much more each feeder can take, and what voltage headroom could be traded for demand.
Asset health & risk	Which transformers are aging fastest, and each asset's probability of failure.
Planning	What should be built, and in what order.
Large loads	Does this data center fit, what would make it fit — and what is that worth.
Gas balance & leaks	Where the gas is going, and which leak is past its due date.
Night flow	Is this water district leaking.
Service orders	Is anybody doing anything about this — and what has nobody been sent to.

FROM FIELD TO INSIGHT

- 1 Import the model** — the connectivity model arrives from ArcGIS — assets, topology, phasing, and geometry for every commodity — versioned, and checked by continuous model-quality analysis.
- 2 Terminate the protocols** — the gateway speaks DNP3 and IEC-104 to the SCADA estate, translating telemetry and events one way: inward.

- 3 **Join, store, and solve** — SCADA telemetry, and AMI reads and events already validated by the Grid Data Management Platform, land against the model through a high-throughput Kafka-to-database path — then the solvers run: power flow per feeder, hydraulics for gas and water.
- 4 **Serve every audience** — the same joined, solved picture powers the control room, the planner, the gas and water operators, and the executive dashboard.

DESIGNED FOR TRUST

- **Monitoring-only by architecture** — no control path to the field — enforced in the code, not a configuration.
- **Honest about evidence** — never presents “not measured” as “nothing found”; names stale evidence and truncation.
- **Scale as a first principle** — zoom gating, scoped feeds, Kafka-to-COPY writes, and a DuckDB-read Parquet archive.
- **Self-aware analytics** — finding-quality tracking and referential-agreement checks catch the platform being wrong.
- **Integrated by contract** — OpenAPI derived from the running code, and an MCP server built from it for AI assistants.

USE CASES

- **Storm and outage response** — fault locations from independent methods shorten patrols and restoration.
- **Regulatory reliability reporting** — IEEE 1366 indices computed from source data, defensible in front of a regulator.
- **DER and load-growth planning** — headroom, CVR, and the sandbox show where the next EV fleet can connect.
- **Data-center interconnection** — honest queue totals, feasibility per ramp step, options ranked by MW per dollar.
- **Evidence-based asset investment** — failure risk, aging, and ranked projects make budgets defensible.
- **Gas and water loss programs** — unaccounted-for gas, regulator droop, the leak register, night flow.

ONE PLATFORM, MANY DESKS

Control-room operators	The live map, scoped live feeds, alarm overlays, and the equipment detail panel.
Planning engineers	Capacity, CVR, power flow, the scenario sandbox, and ranked investment planning.
Interconnection engineers	The queue register, connection ladder, and fault-duty, voltage-step, and N-1 screens.
Gas & water operators	Unaccounted-for gas, regulator performance, the leak register — and night flow per district.
Integrators & administrators	OpenAPI and MCP, roles, the Platform Manager gate, illustrated user guides, the simulator bridge.

TECHNOLOGY

Angular SPA · FastAPI backend · PostgreSQL + PostGIS + TimescaleDB · DuckDB + Parquet archive · Redis · Kafka · Keycloak · DNP3 / IEC-104 gateway · AMI via GDMP · vector tiles (deck.gl) · power-flow & hydraulic solvers · MCP server

BETTER TOGETHER

GDEA is the family's network eye: GDMP supplies validated AMI meter reads and events, Grid Data Simulator feeds it SCADA in test through the bridge that ships with it, Reporting embeds its insights, and Whisper-Wind gives it a voice.