

Grid Data Management Platform

Enterprise meter data management — from AMI reads to certified bills, outage-aware VEE, gas, device commands, and market settlement, at utility scale.

The Grid Data Management Platform (GDMP) is the core of the family: a complete Meter Data Management System. It ingests interval reads, register reads, and events from head-end systems over Kafka; validates, estimates, and acts on them through a configurable VEE engine that validates, estimates, and acts, with weather-aware and machine-learned estimation; synchronizes master data from the utility's systems of record; and serves certified, immutable, auditable data to billing, outage operations, gas operations, market settlement, analytics, and regulators — with a full exception workbench, coordinated device commands, and a standalone operations monitor around it.

Kafka-native

streaming ingestion pipeline

Full-cycle VEE

validate · estimate · act

Electric + gas

one pipeline, commodity-aware

Billing-grade

certified · immutable · auditable

KEY FEATURES

Streaming ingestion

Interval reads, register reads, and signals flow in over governed Kafka topics into versioned day facts — idempotent, durable, with DLQ replay governance and full support triage tooling.

VEE engine

Validation rule families for register, interval, cross-channel, and extreme-value checks; estimation by reference day, load-profile regression, temperature correlation, and interval-register conversion; action rules that estimate, flag, open exceptions, notify, or raise service orders.

Exception management lake

A workbench for the exceptions VEE raises: assignment pools and rules, escalation policies, manual override and suppression, bulk resolution, trends, a command-day graph, and a map.

Master data sync (SDR)

Continuous synchronization of customers, contracts, premises, devices, and channels from the systems of record — staged, validated, conformed with SCD history, traceable payload by payload, with audited recovery for anything that failed.

Projection & decision serving

Raw facts, signals, and read decisions become current serving rows with replay and convergence checks — VEE, Billing, Outage, Gas, dashboards, and APIs all see one consistent answer.

Billing module

Determinants for energy, demand, TOU, reactive, ratchet, CPP/RTP, and special contracts; certification and cycle close; CIS export with profiles and acknowledgments; daily extract; rebill, dispute, and hold; NEM credits; immutable ledgers; and shadow reconciliation for cutover.

Outage module

A first-class outage record with lifecycle, scope, evidence, and policy; outage-aware VEE treatment; holds and automatic restoration replay; outage-linked exception resolution; PSPS handling; and a command center with map.

Gas commodity

Pressure districts, governed conversion factors (JSON, CSV, EDI 867), HDD and diurnal-profile derivation, gas VEE kernels, safety events, unaccounted-for gas, gas billing certification, dashboards, and a library of standard reports.

Coordinated Control Operations Device commands — disconnect, reconnect, on-demand reads, pings — with CCO assignments, device criticality, request statistics, and a billing pull-request boundary.	Virtual & unmetered meters Formula-driven virtual meters, submeter and check-meter context, and unmetered supply — the network the utility actually has.
Search & master-data workspace Elasticsearch-backed global, master-data, and exception search; analyst inquiry over customers, premises, devices, and attributes with comments, tags, and personalization.	Operations Monitor A standalone, read-only monitoring application: pipeline health, queue lag, worker metrics, runtime-stage logs, Grafana dashboards, and an alert catalog with drill-down queries.
Market settlement & rate analysis Companion services for wholesale settlement — zonal load, forecasts, capacity tag sets, LMP, UFE and loss factors, supplier tranches, approvals and submissions — and rate analysis of what interval usage would cost under alternative schedules.	Admin & access control A feature catalog with role bindings and navigation; bill cycles, day types, gate policies, rate schedules, source systems, device groups, retention, and system configuration — governed through Keycloak, with schema-scoped isolation.
Point-in-time recovery Base backups, incrementals, and continuous WAL archiving to off-cluster storage: restore to any second within retention into a side instance, verify it, and cut over from ControlPlane — the live database keeps serving throughout.	Continuous Kafka archive Every message on the selected topics streams to object storage as it arrives — replayable back into Kafka, and a record of exactly what was received and when.

HOW DATA FLOWS THROUGH THE PLATFORM

- Ingest** — head-end systems publish reads and signals onto governed Kafka topics; workers land every payload idempotently, with traceability and DLQ replay.
- Assemble** — day facts are versioned and correlated with the master-data picture — customer, premise, device, channel — synchronized continuously from the systems of record.
- Validate & act** — the VEE engine validates, estimates, and acts under an eligibility gate; findings become estimates, flags, exceptions, notifications, or service orders, with outage policy applied to affected days.
- Project & serve** — decision and serving rows refresh with replay and convergence checks, so every downstream consumer reads one consistent, current answer.
- Certify & deliver** — billing determinants are certified and exported to CIS, daily extracts stream, settlement and analytics draw from the same serving data — every step observable in the Operations Monitor.

WHO WORKS IN IT EVERY DAY

Billing operations	Certified determinants, cycle close, CIS export and acknowledgment, rebill, dispute and hold — with an immutable audit trail.
VEE & exception analysts	The exception lake: assignment, escalation, override, bulk resolution, trends, and the reasons a key/day was eligible, quarantined, or waiting.
Outage & gas operations	The outage command center with PSPS and holds; gas factor status, UAG alerts, safety events, and certification queues.

Market & settlement teams	Wholesale settlement calculations, forecasts, approvals, and submissions; rate analysis against real interval usage.
SRE & support	Operations Monitor, Grafana dashboards, alert catalog, runbook-driven playbooks, point-in-time restore, and Kafka archive replay.
Deployment teams	Client configuration workbook, bootstrap package, readiness gates, smoke tests, rollback runbook, and operations handoff.

USE CASES

- **AMI rollout backbone** — collect, validate, and store data from millions of smart meters as the utility's authoritative meter data repository.
- **Billing-grade data supply** — deliver certified determinants to CIS with every estimate, edit, rebill, and hold auditable — and prove parity against the legacy system before cutover.
- **Outage-aware operations** — treat meter data correctly through outages and PSPS events, replay on restoration, and close the exceptions an outage caused in bulk.
- **Multi-commodity utilities** — run electricity and gas on one platform, with commodity-specific derivation, VEE, safety, and billing where it matters.
- **Remote device operations** — coordinate disconnects, reconnects, and on-demand reads through the same governed data spine.
- **Retail and wholesale settlement** — settle supplier load against market data from the same certified usage the bills came from.

TECHNOLOGY

Python / FastAPI services · Kafka streaming backbone · PostgreSQL + TimescaleDB · Elasticsearch · Angular workspace · Spark ML + MLflow estimation service · Grafana · Keycloak · pgBackRest PITR · Kafka Connect S3 archive · Docker / Kubernetes

BETTER TOGETHER

GDMP anchors the family: Grid Data Simulator feeds it realistic AMI, SCADA, and CIS streams for testing, the Integration Suite connects it to enterprise systems, Enhanced Analytics and Reporting visualize its data, Whisper-Wind is embedded in its workspace, Home Energy Management extends it behind the meter, and the Testing Platform verifies every release against it.