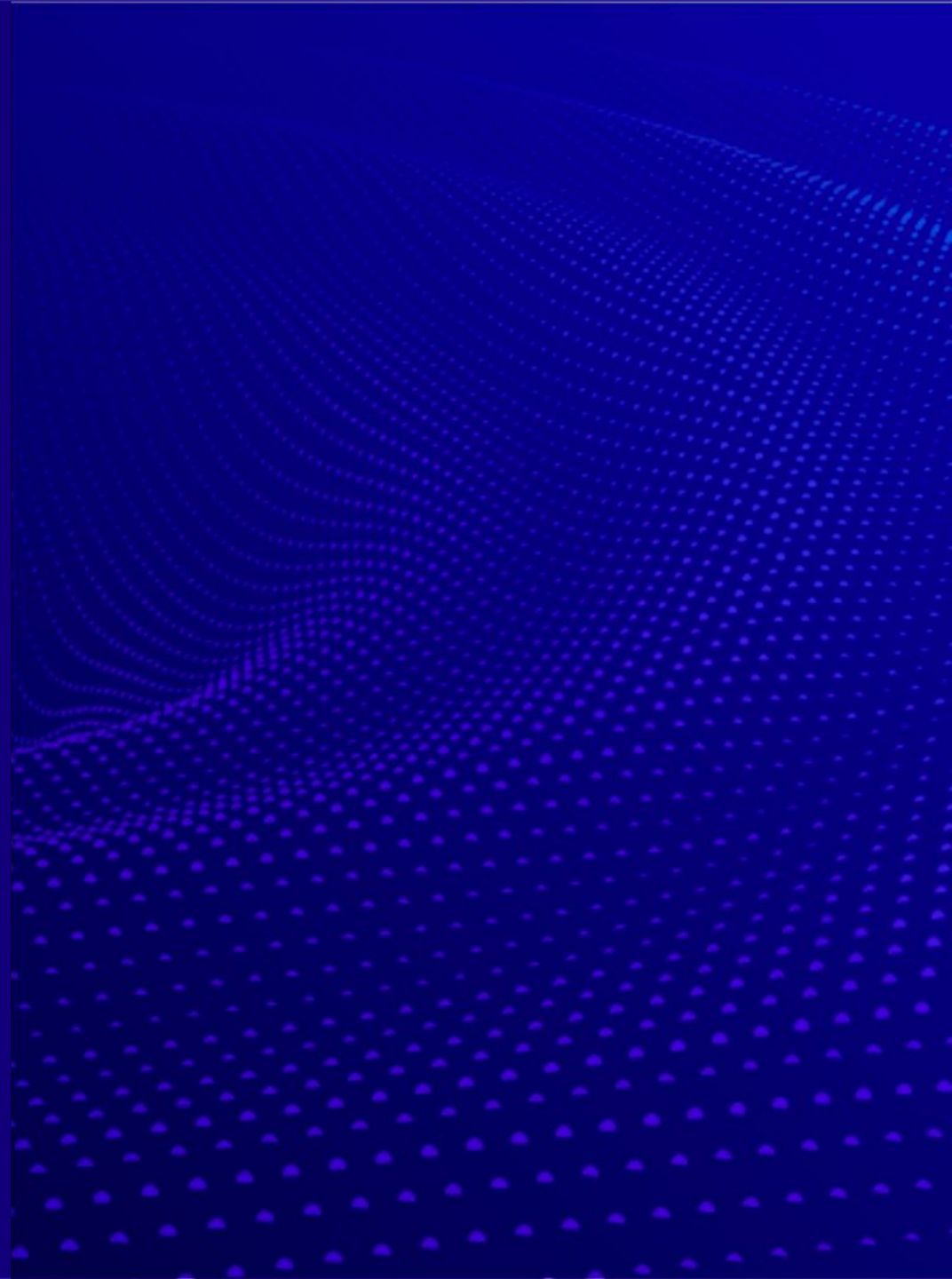# Adaion

Bright data for a bright future

20/09/2022

Why Adaion

A transformation era in the energy sector industry

Adaion

Grid operators are currently facing a distribution scenario with growing penetration of non-manageable generation assets in both MV and LV. This new paradigm challenges grid quality and hinders communications with higher noise and excessive traffic, giving a key role to LV grid (the great unknown).

The smart grid of the future is here and operators depend, more than ever, on the optimization of their processes and resources as well as getting quality data to make better business decisions.
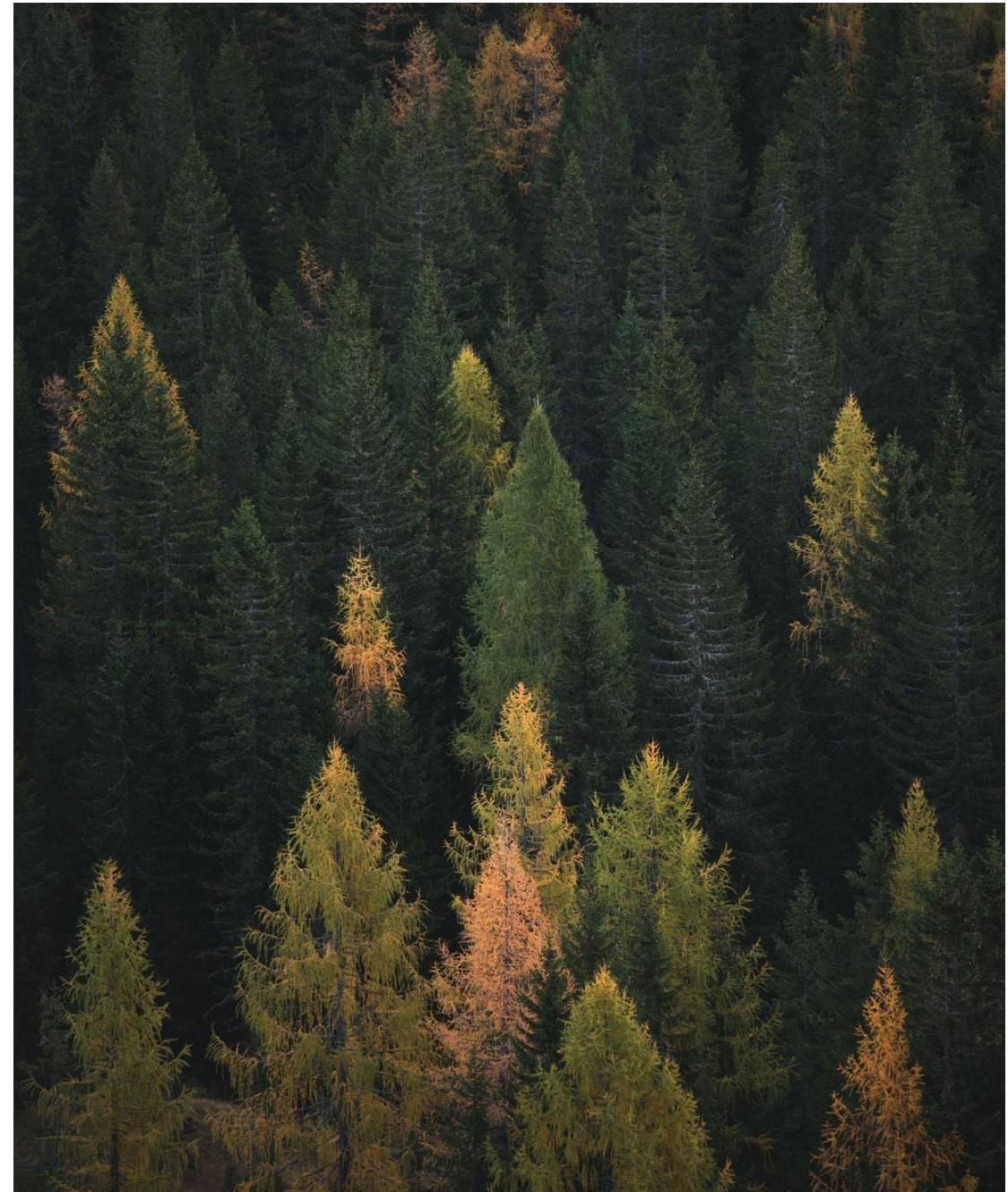
Digilitalization, monitoring and management in modern grids:

Adaion

- ◇ Decentralization
- ◇ Non-manageable assets, high renewable penetration
- ◇ Grid quality
- ◇ Non-visibility of Low Voltage Grid
- ◇ New stakeholders - Energy Communities
- ◇ New requirements - Node capacity (new clients)
- ◇ Potential retribution changes towards Digitalization and Active Network Management
- ◇ Technology enabling new possibilities
  - ◇ Big data
  - ◇ Digital Twin
  - ◇ Flexibility
- ◇ Path towards a more autonomous grid
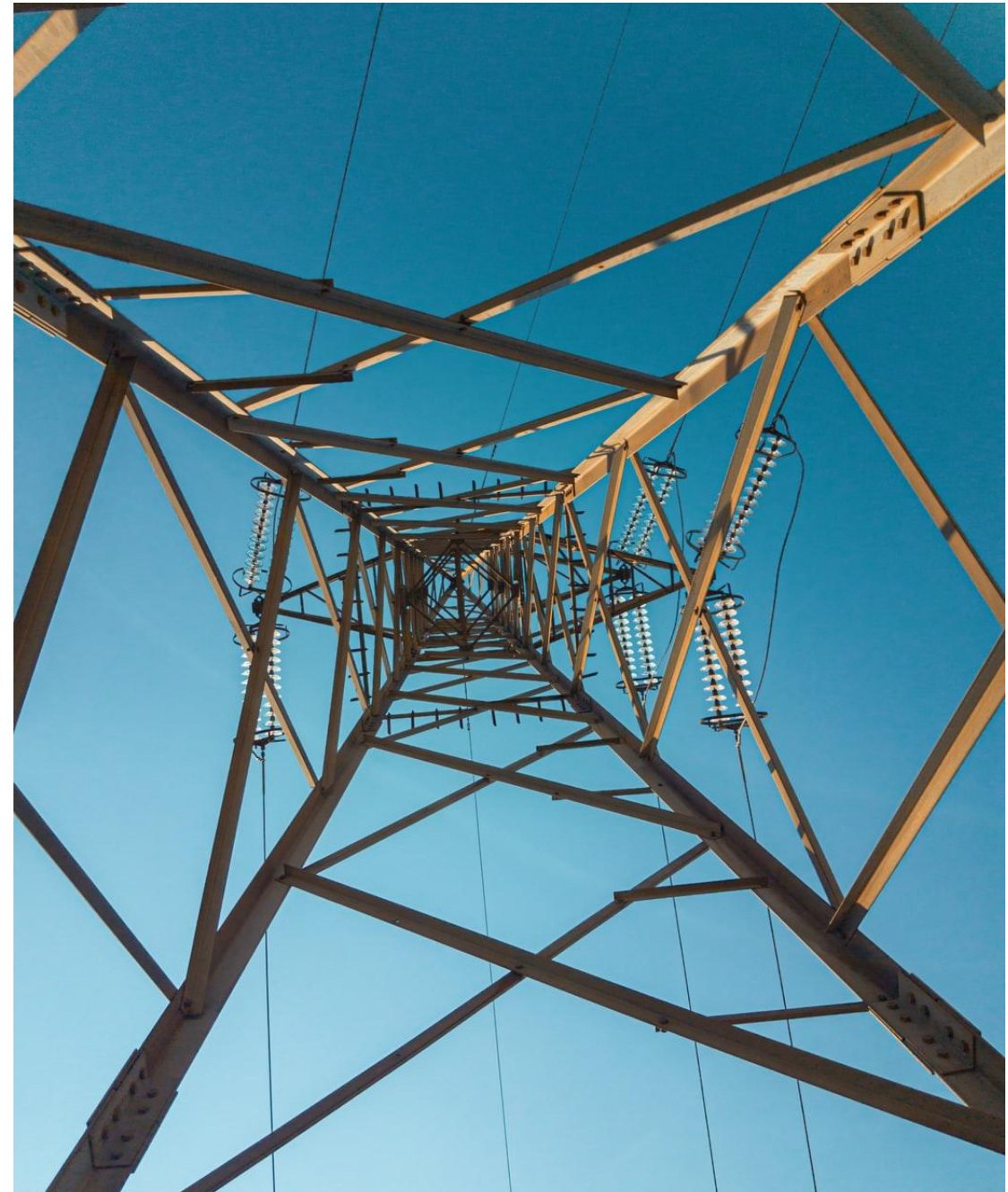
Experiences in the digilitalization process of Local Energy Distributors:

Adaion

- ◇ Multiple sources of information - Digital Tower of Babel
- ◇ Huge amount of information not providing value
  - ◇ **SCADA** - operation of MV grid
  - ◇ **ADMS** - expensive and high customization
  - ◇ **Smart meters** - invoicing. Slow rate communications by PLC
  - ◇ New metering devices - **Advanced LV Monitoring**
  - ◇ Variety of monitoring apps to deal with

Data based platforms as a solution to provide the maximum value from available data

Our three pillars:

Adaion

1

2

3
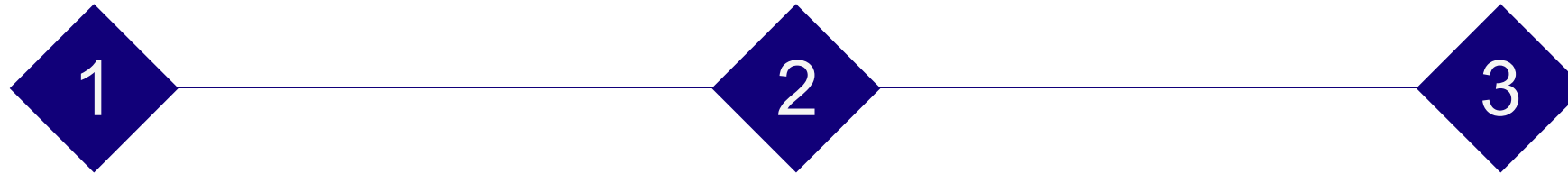
Bright data

Depurated, standardized and enriched data to support Grid Operators on their way to digitization.

Bright decisions

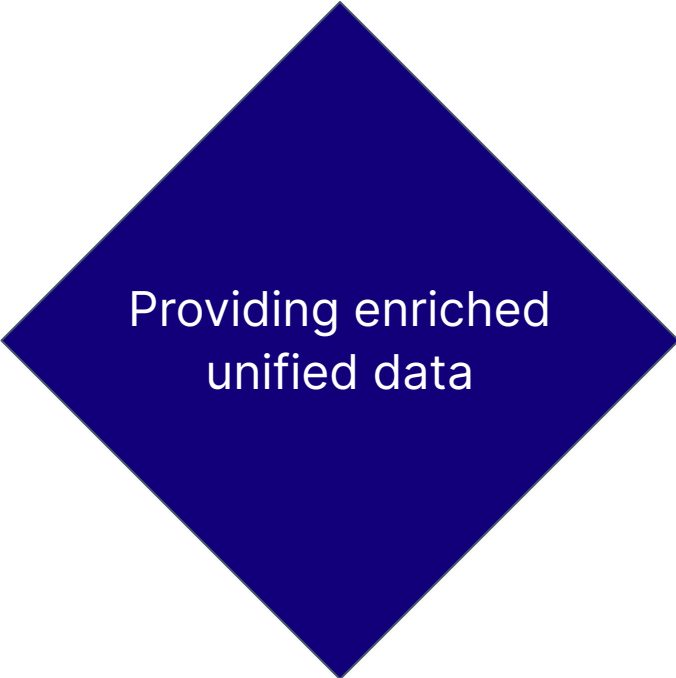A solution that sheds light on data, enabling more effective decision making and reducing processing time.

Bright future

State-of-the-art technologies to pave the way of the electricity ecosystem in its transition to clean energy.

Adaion is a cloud based platform that applies AI to the grid to get maximum value from available data, helping Grid Operators to make smarter decisions.

The platform with analytical capabilities that supports network planning, operation and maintenance.

Providing enriched unified data

Real-time and historical data

Transparent and accessible

Resources that enable better business decisions

Adaion

Digitalization

We digitize the measurement, debug and enrich the data to provide a unified model.

Visualization

Check the real-time status of your MV and LV networks and take decisions based on insights from your data.

Digital Twin

We digitize the infrastructure by creating a model that emulates network behavior.

Interoperability

We integrate information received from different types of sources with connectors.

Forecasting

Predict the grid behavior leveraging our AI techniques.

Automation

Our applications guarantee significant savings in management time, rather than wasting time on manual calculation tools.

Our Process

Energy Cloud

The platform provides tools and services to integrate grid data streams for better business analysis and decision making. It allows grid operators to get ready for a more sustainable future.
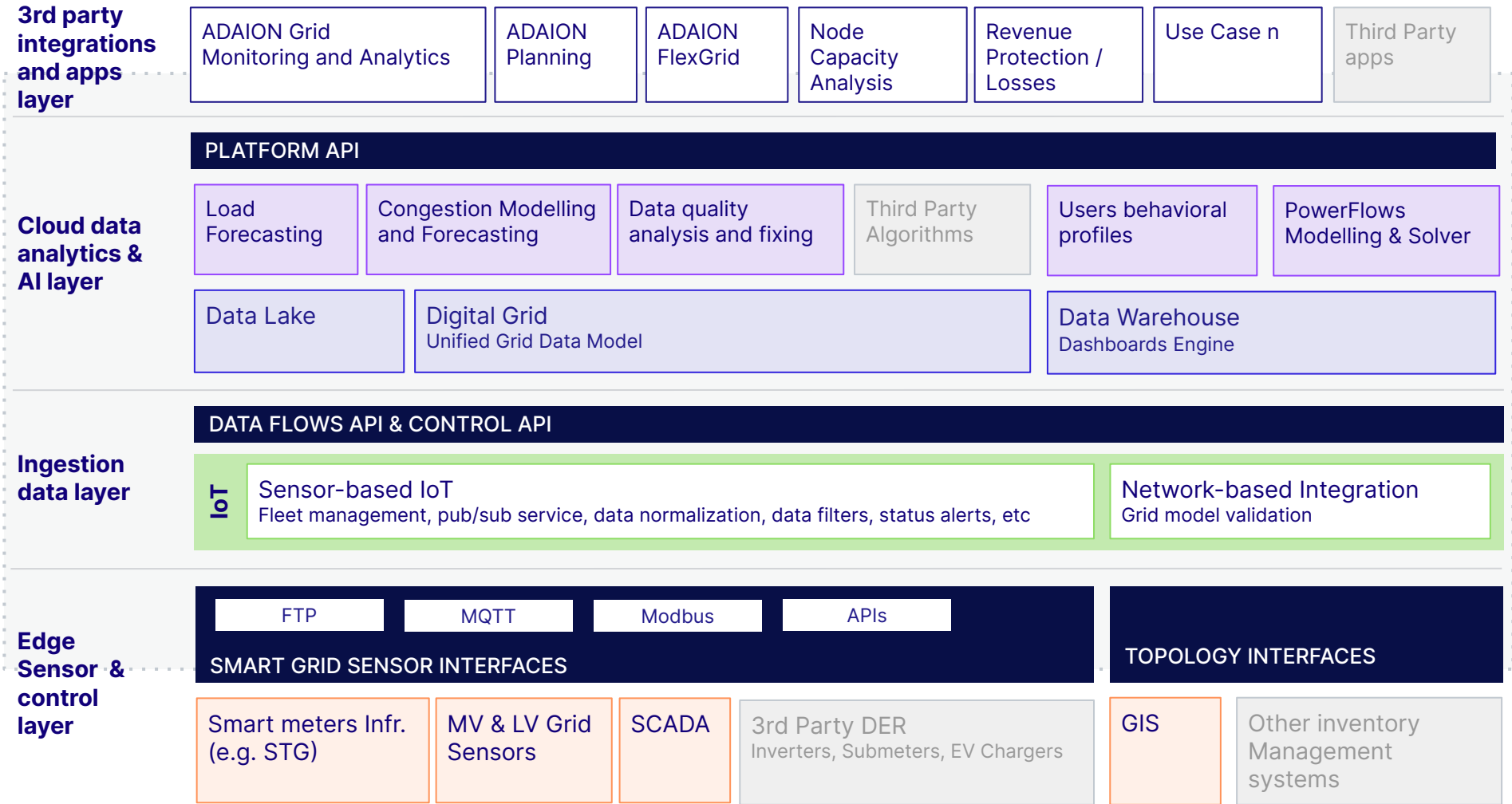
Adaion

Grid Operating System

The data integration, digital twin and all the AI techniques and tools, such as power flow, constitute the **digital grid**, base for a higher visualization of both LV and MV grid and any use case.

Digital Twin

Digital network representation enables decision making. Adaion helps building and validating MV/LV models and run simulations easily, while debugging GIS information.

(Big) Data Integration

Adaion integrates all data sources in a unified and open model to keep growing.

Energy Cloud

The platform provides tools and services to integrate grid data streams for better business analysis and decision making. It allows grid operators to get ready for a more sustainable future.

Adaion

Digital Grid

Smart Meters
ML/VL Sensors

DERMS Apis
Other Sources

(Big) Data
Integration

Use cases
Digital Grid

Digital Twin

Modeling Tools
GIS
Other Sources
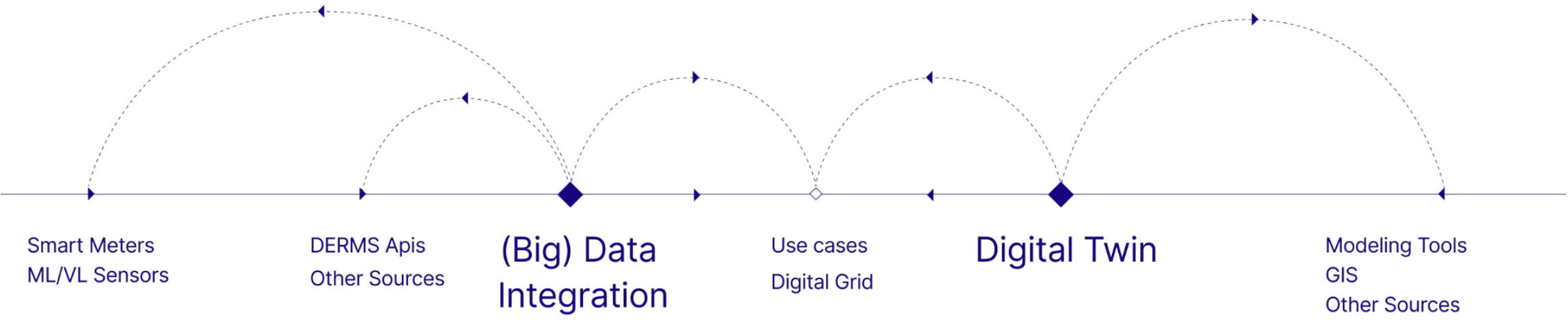
Our
Technology

Energy Cloud Architecture

Adaion

3rd party integrations and apps layer

| ADAION Grid Monitoring and Analytics | ADAION Planning | ADAION FlexGrid | Node Capacity Analysis | Revenue Protection / Losses | Use Case n | Third Party apps |

Cloud data analytics & AI layer

PLATFORM API

| Load Forecasting | Congestion Modelling and Forecasting | Data quality analysis and fixing | Third Party Algorithms | Users behavioral profiles | PowerFlows Modelling & Solver |

| Data Lake | Digital Grid Unified Grid Data Model | Data Warehouse Dashboards Engine |

Ingestion data layer

DATA FLOWS API & CONTROL API

IoT

| Sensor-based IoT Fleet management, pub/sub service, data normalization, data filters, status alerts, etc | Network-based Integration Grid model validation |

Edge Sensor & control layer

| FTP | MQTT | Modbus | APIs |

SMART GRID SENSOR INTERFACES

TOPOLOGY INTERFACES

| Smart meters Infr. (e.g. STG) | MV & LV Grid Sensors | SCADA | 3rd Party DER Inverters, Submeters, EV Chargers | GIS | Other inventory Management systems |

(Big) Data Integration

Solving the Tower of Babel:

- ◇ Ingestion of a wide variety of data from a wide diverse of protocols
- ◇ Universal access to the normalized information: streaming queues, datalake, datawarehouse

"Garbage in, garbage out"

Place value on data: **better decisions are taken with better data.**
- ◇ Mining, structuring and enriching
- ◇ Manage assets:
  - ◇ Assets monitoring
  - ◇ Status alerts
  - ◇ Data gaps warnings
  - ◇ Data gaps retry
  - ◇ Data filtering
  - ◇ Gaps filling
  - ◇ Outliers removal
  - ◇ Fleet management
  - ◇ Onboarding of new devices
  - ◇ Report of non-coherent information

The quality, availability and accessibility of this layer determines the performance of any type of application built upon it.

LV and MV grid modelling and simulation Digital Twin.
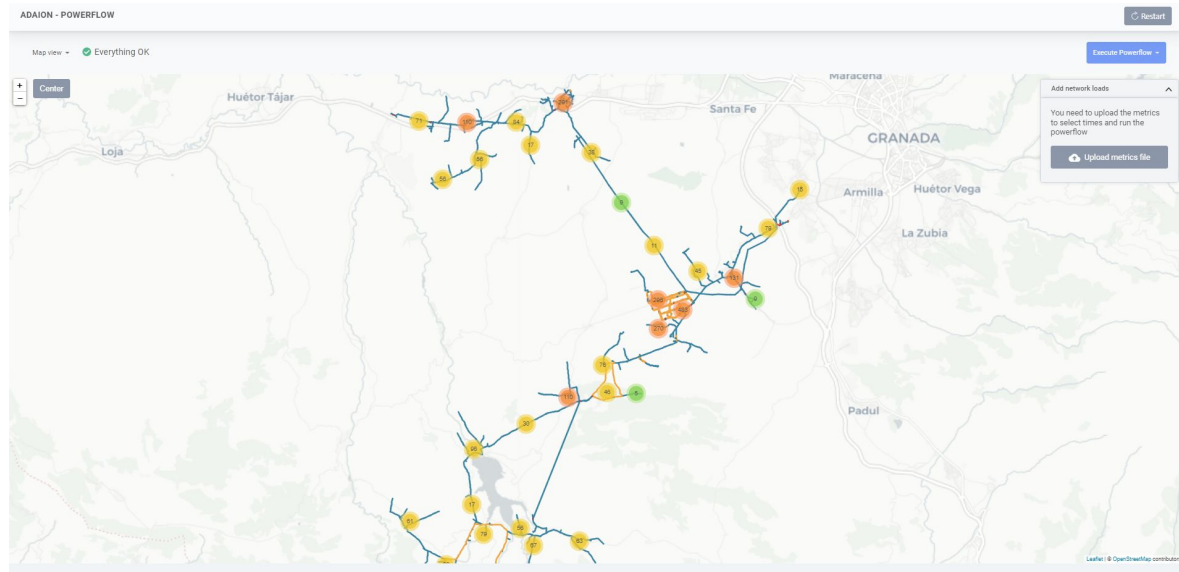
Representation of real-world assets which is able to replicate the behaviour of the distribution grid:

- ◇ Topology created and validated from GIS available information
- ◇ Measurements connection

Digital twin Grid Model creation & validation

ADAION Includes specific tools for the **creation** and **management** of the digital twin: GIS integration, model generation, model validation, load validation, consistency analysis, etc. This will provide a more comprehensive view of the grid by combining information from sources such as GIS and other modelling tools to validate how accurate is this image compared to its physical twin.

Adaion
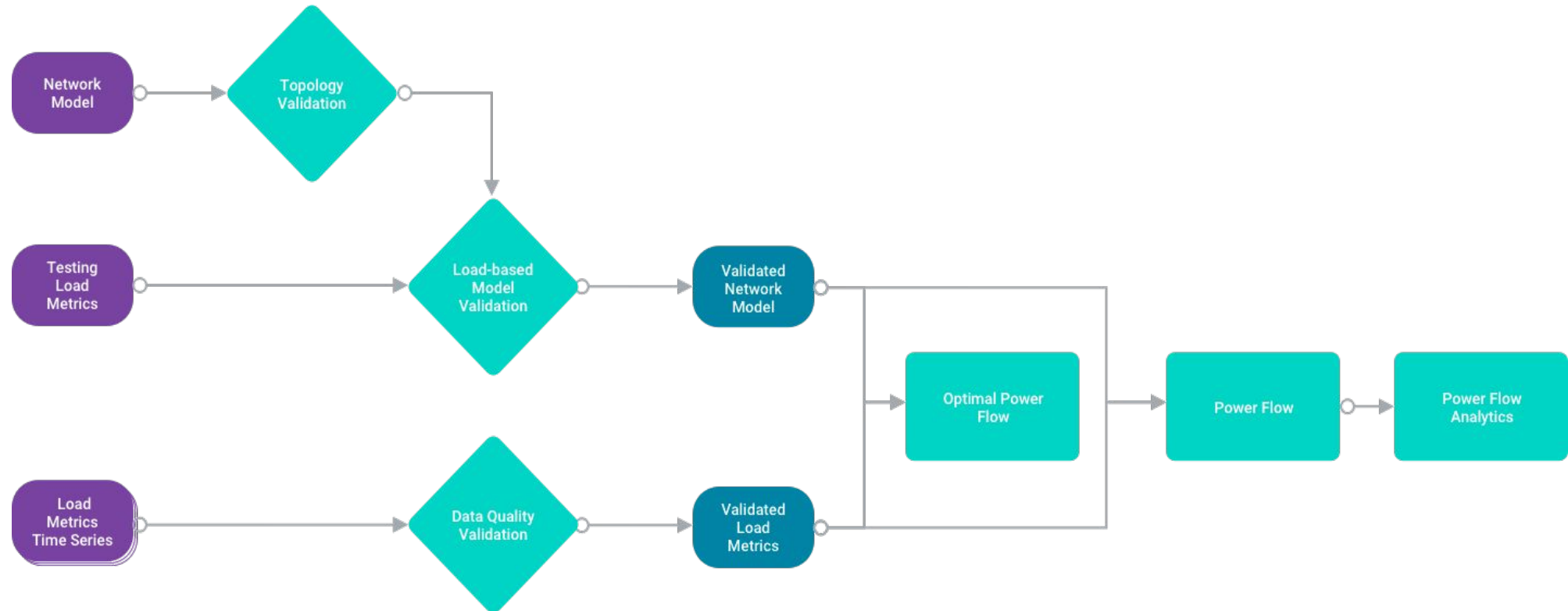
Interoperability and modularity

- ◇ Access to data (dataware house, datalake and streaming queues)
- ◇ Access to ADAION tools (power flow, forecast methods...)
- ◇ PaaS/SaaS/FaaS models enabled by microservice architecture involve lower maintenance, operation and updating costs.
- ◇ Interoperability. The use of APIs enables the development and integration of third parties' solutions or own developments.

Applications
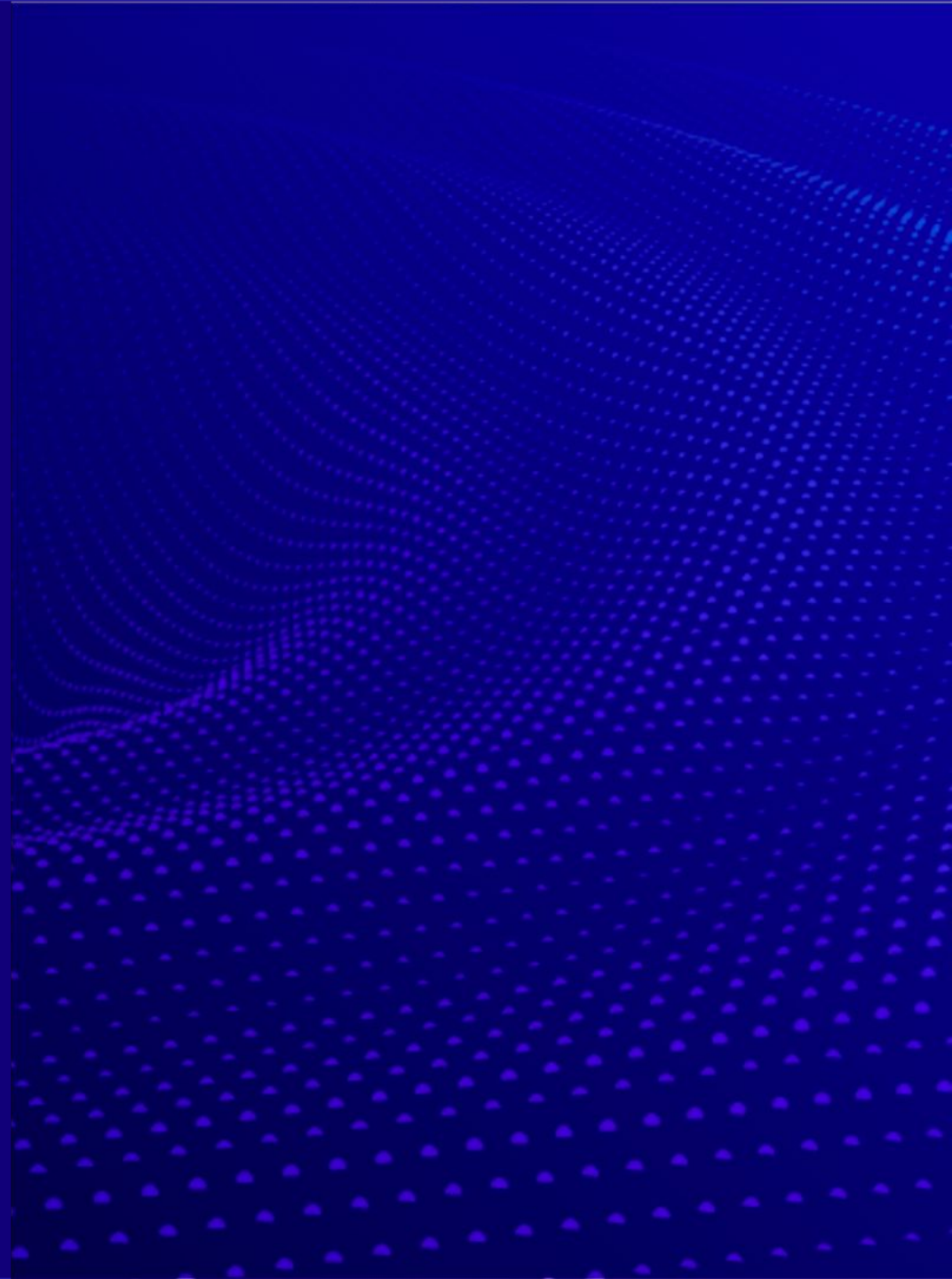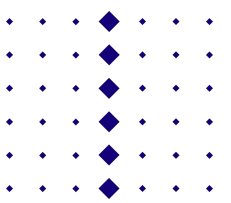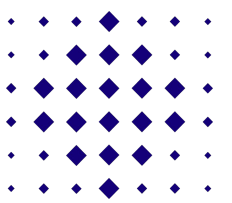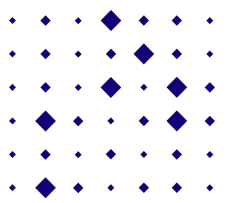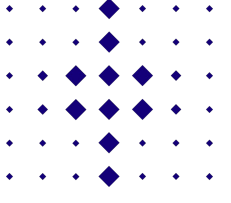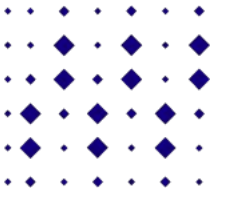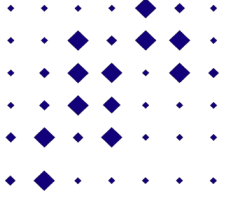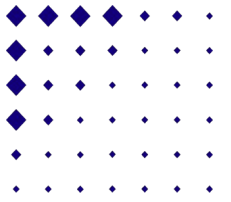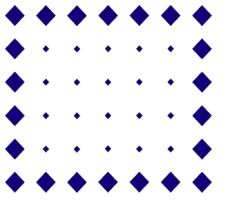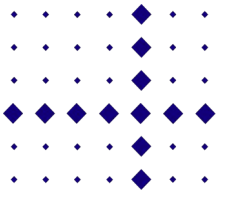
Infrastructure and measurement digitalization

Multiple use cases can be solved by different applications which leverage the algorithms and tools in the Cloud data analytics & AI layer combined with data provided by the ingestion layer.

Many of these apps require the use of the digital twin. Application performance depends on data quality (granularity, timeliness, completeness, etc).
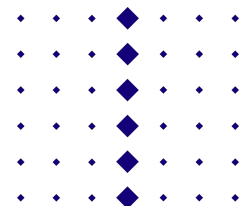
Grid Basics	Solar feed-in	Losses detection
(Big) Data Integration	Flex Grid	Modeling and Forecasting
Powerflow	New Requirements Connection	Data Management

Dashboard
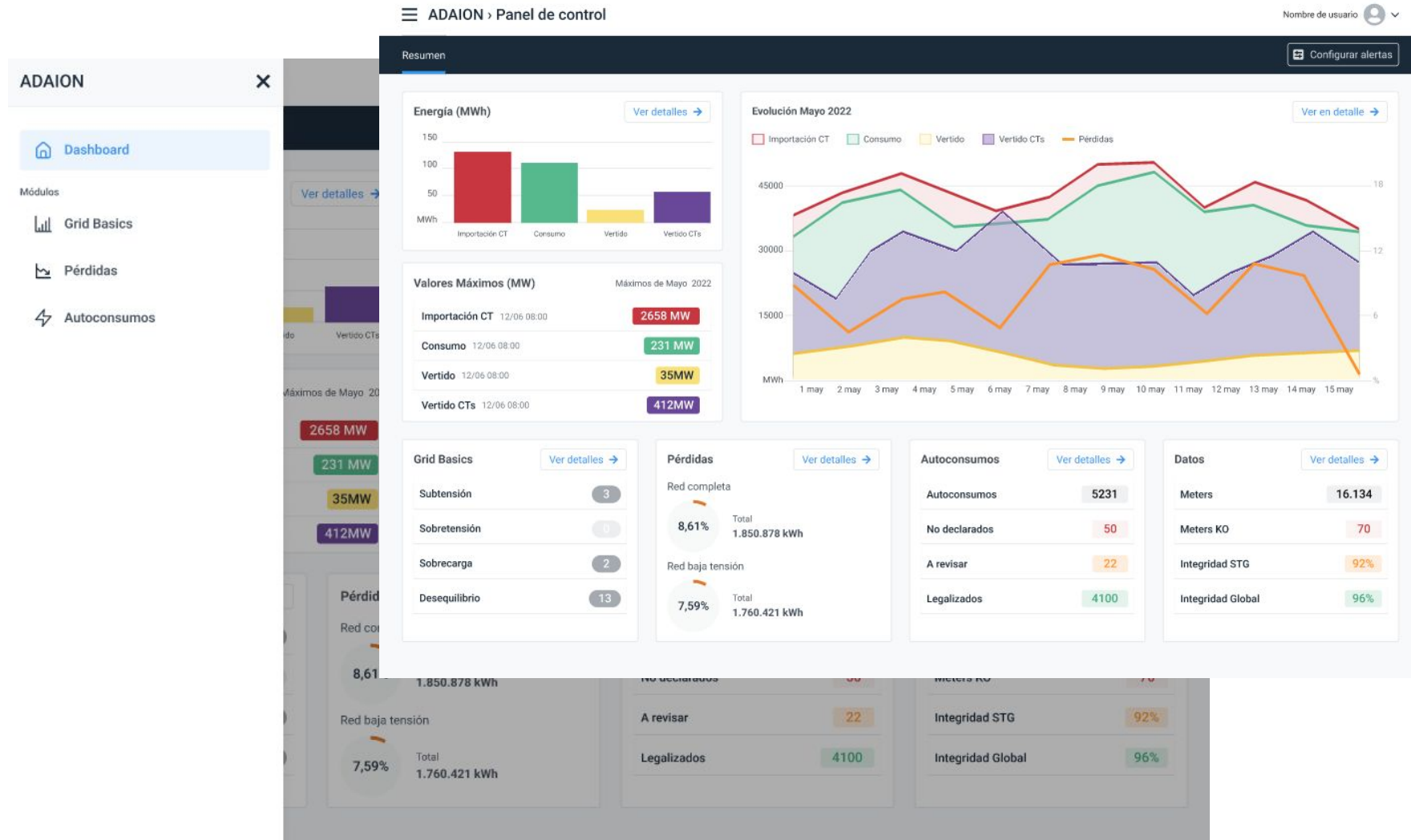
Grid Basics

Check the real-time information state of your MV and LV grids at phase level, and take decisions based on the advanced analytics about your grid congestions.

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ADAION Grid Basics · Nombre de usuario

Estado de la red · Análisis · Parámetros de calidad

CT_ZELUAN · Últimas 24 horas · Todas las líneas de Baja Tensión

Baja Tensión

Líneas (11)	Eventos (13)	Alertas (2)
Línea 1	1	1
Línea 12	1	1
Línea 8	4	
Línea 4	3	
Línea 2		
Línea 3		
Línea 7	4	
Línea 6		
Línea 10		
Línea 11		

Media Tensión

Métricas · Eventos (3) · Alertas (0)

Tensión

Intensidad

Potencia reactiva

Fase 1 · Fase 2 · Fase 3

Eventos (13) · Alertas (2)

Tipo	Fases	Valor	Riesgo	Línea	Desde	Hasta
Desequilibrio de int.	RST	100 %	Alto	Línea 1	27 Jul 13:00	27 Jul 13:00
Desequilibrio de int.	RST	5 %	Medio	Línea 3	27 Jul 13:00	27 Jul 13:00
Sobrecarga	R	30,79 A	Alto	Línea 12	27 Jul 13:00	27 Jul 13:00
Sobrecarga	T	75,86 A	Medio	Línea 11	27 Jul 13:00	27 Jul 13:00
Sobretensión	S	240,91 V	Alto	Línea 3	27 Jul 13:00	27 Jul 13:00
Sobretensión	R	239,37 V	Alto	Línea 4	27 Jul 13:00	27 Jul 13:00
Sobretensión	T	240,84 V	Alto	Línea 7	27 Jul 13:00	27 Jul 13:00
Desequilibrio de int.	RST	100 %	Alto	Línea 9	27 Jul 13:00	27 Jul 13:00
Desequilibrio de int.	RST	5 %	Medio	Línea 9	27 Jul 13:00	27 Jul 13:00
Sobrecarga	R	30,79 A	Alto	Línea 1	27 Jul 13:00	27 Jul 13:00
Sobrecarga	T	75,86 A	Medio	Línea 4	27 Jul 13:00	27 Jul 13:00
Sobretensión	S	240,91 V	Alto	Línea 4	27 Jul 13:00	27 Jul 13:00
Sobretensión	R	239,37 V	Alto	Línea 3	27 Jul 13:00	27 Jul 13:00

Grid Basics. LV and MV monitoring and visualization

Adaion

ADAION Grid Basics

Cerrar sesión

| Estado de la red | Análisis | | ≡ Parámetros de calidad |

Estado de la red

Últimas 24 horas ▾   Buscar localida 🔍   Lista   Mapa

CTs (73)	Localidad	Conexión	Eventos
CT_ESCUELASLACHAR	Lachar	✓	98
CT_ZELUAN	Lachar	✓	89
CT_RESIDENCIA	Lachar	✓	52
CT_FIESTAS	Lachar	✓	50
CT_JAEN	Lachar	✓	36
CT_RODRIGUEZACOSTA	Lachar	✓	23
CT_CEMENTERIO	Lachar	✓	22
CT_EL CERRILLO	Lachar	✓	9
CT_PARQUE	Lachar	✓	7
CT_VISOGSA_CT	Escuzar	✓	
CT_CORTIJO BENZAIRE	Lachar	✓	
CT_PARAISO	Moraleda de Zafayona	✓	
CT_NEUMATICOS DUQUE	Lachar	✓	
CT_PEÑUELAS 3	Lachar	✓	

Eventos ocurridos   Ver eventos

Subtensión	Sobretensión	Sobrecarga	Desequilibrio
96	191	0	99

Fallos en la comunicación

No se detectan fallos de comunicación en el sistema.

Solar feed-in

Detect automatically solar feed-in facilities in your grid while fast checking their legal state and the cases pending review.
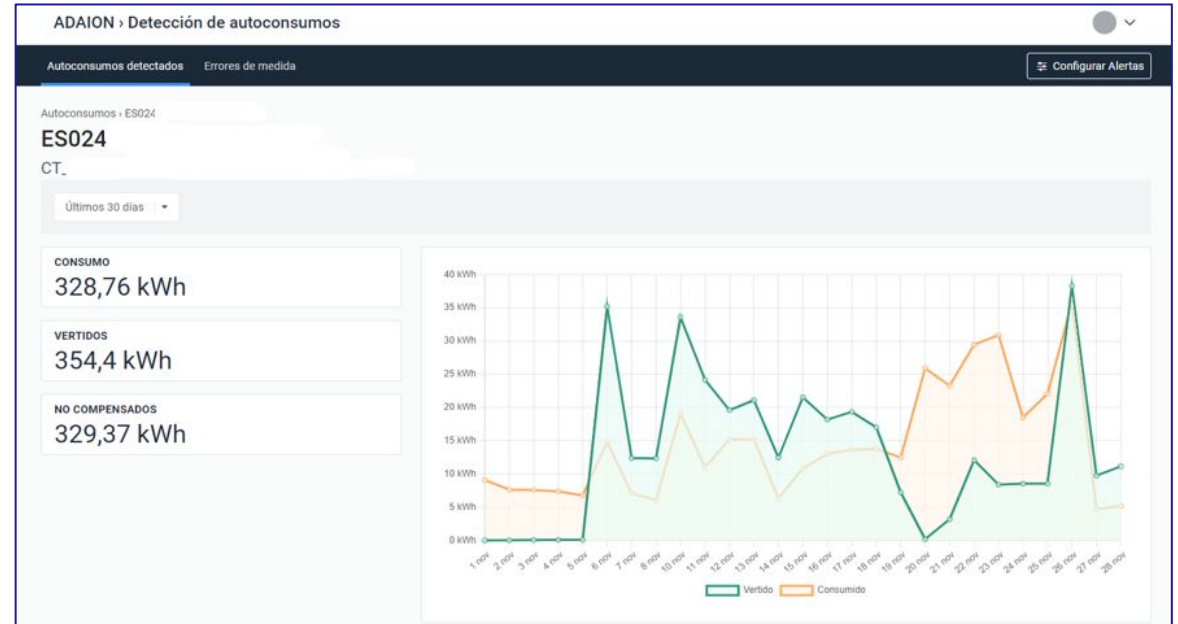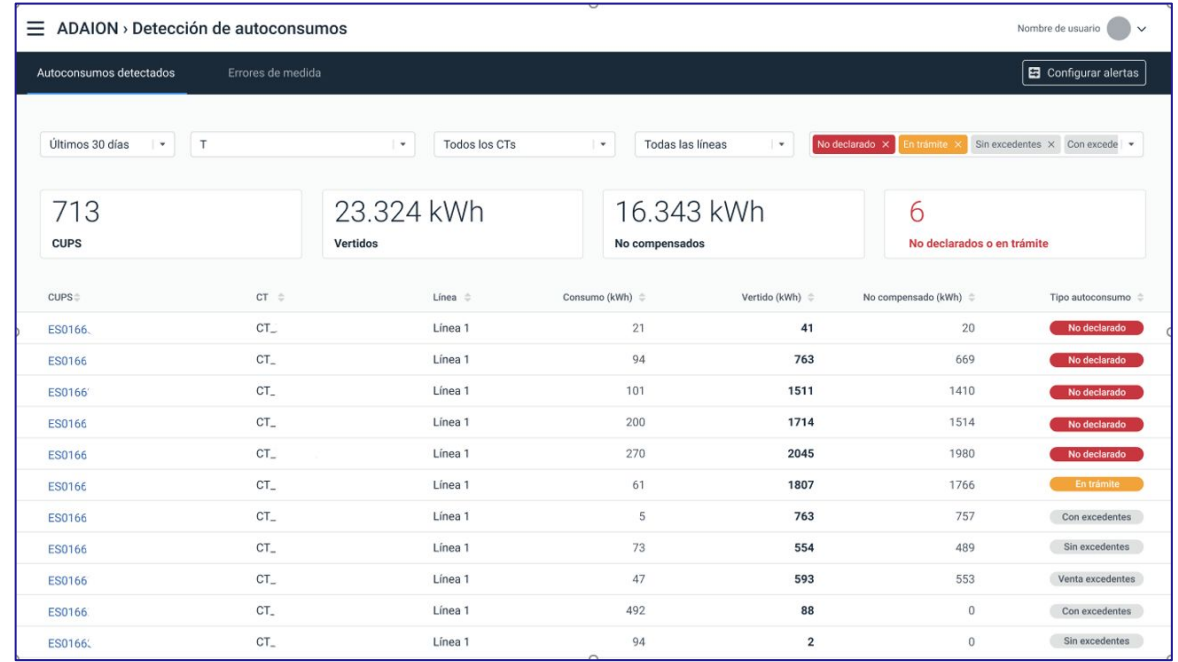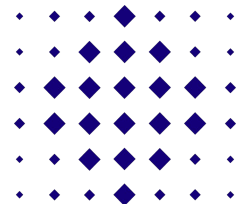
Losses detection

Automatic calculation of LV losses based on multiple sources of information at grid, substation and line levels. Visualization ranging from monthly evolution to hourly curves.

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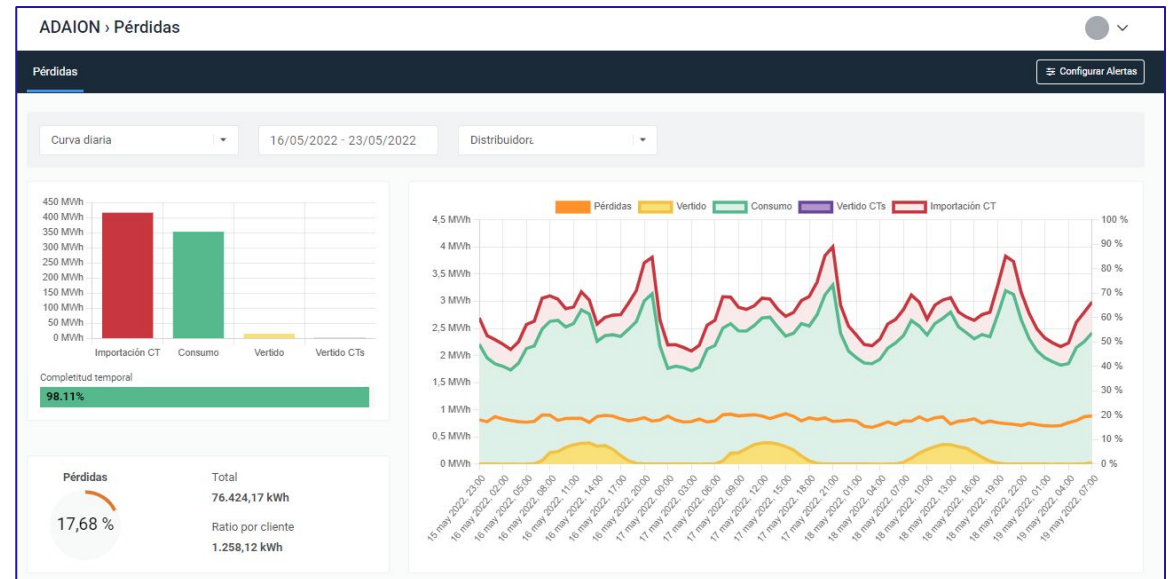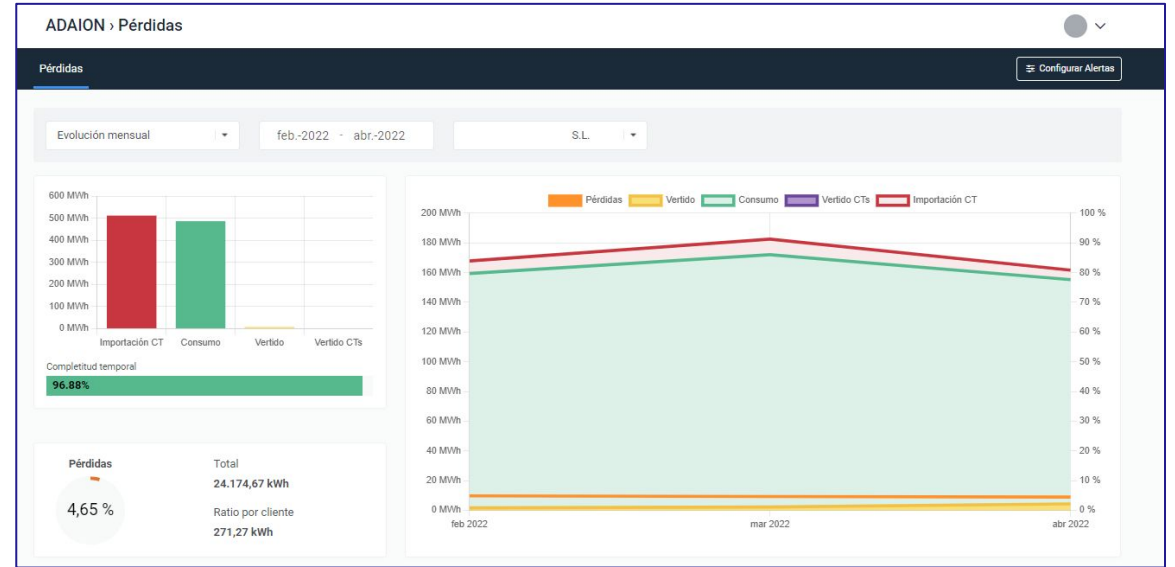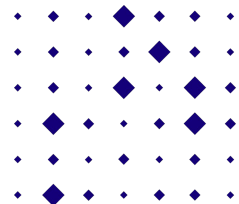
Losses detection

Ver por trafos	▾	Umbral de fiabilidad ⓘ	80%	▾	<	Abril 2022	▾	>

Trafo Q	Completitud temporal (%) ⇅		Pérdidas (%) ⓘ ⇅	Importación CT (kWh)	Consumo (kWh)	Vertido CTs (kWh)	Vertido (kWh)	Total pérdidas (kWh)	Pérdidas/Cliente
CT_	▬▬▬	77,22	11,35	11.303,00	7.942,00	0,00	0,00	1.282,54	61,07
CT_	▬▬▬	98,67	9,04	26.250,00	25.433,00	0,00	1.713,00	2.528,11	12,04
CT_	▬▬▬	99,59	4,55	50.130,00	48.433,00	0,00	619,00	2.310,28	13,59
CT_ C	▬▬▬	98,36	3,67	15.616,00	15.982,00	0,00	1.545,00	629,66	6,00
CT_	▬▬▬	98,76	1,34	34.508,00	33.938,00	0,00	205,00	464,83	2,06
CT_	▬▬▬	97,35	0,80	23.797,00	23.484,00	0,00	235,00	192,16	0,85
CT_	▬▬▬	92,85	-	0,00	9.488,00	0,00	344,00	-	-
Total	▬▬▬	**97.25**	**4,46**	**161.604**	**155.212**	**0**	**4.317**	**7.407,59**	**95,6**

Flex Grid

Adaion

Our algorithms can predict congestion and distribution quality issues in the short term related to voltage, intensity, and power, calculating the flexibility required to avoid them and providing solutions by orchestrating the resources available in the area.
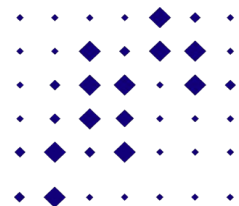
Modeling and forecasting

Among other features, our modules include congestion modelling and forecasting or high-resolution load forecasting based on AI techniques, such as deep learning, fuzzy approach, or inverse power flow.

Load Forecasting & Feeder Mapping

ADAION offers **forecasting services** based on **deep learning** techniques. By means of the ADAION's microservice architecture, the systems offers APIs for load forecasting with **minute precision even if sources report hourly sampled data with a delay of 24 hours**.

As a line of **research**, ADAION is working on identifying the phase of smart meters by means of voltage measurement clustering, taking into account the correlation between voltages profiles and without a priori knowledge about topology.
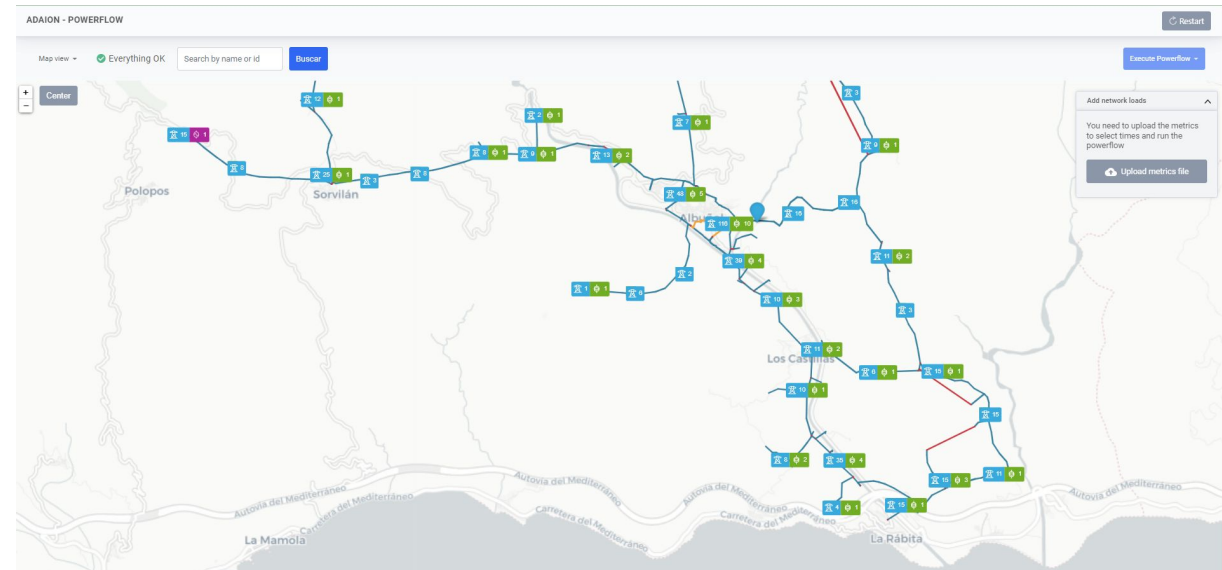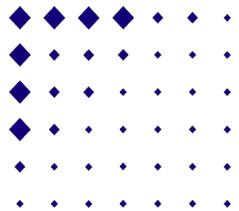
Adaion

Output: P y Q at each supply point (hourly)

Input: S02 from the day before and G56 two hours in advance

Model: LSTM specific for each supply point



Legend:
- Ground Truth
- Prediction
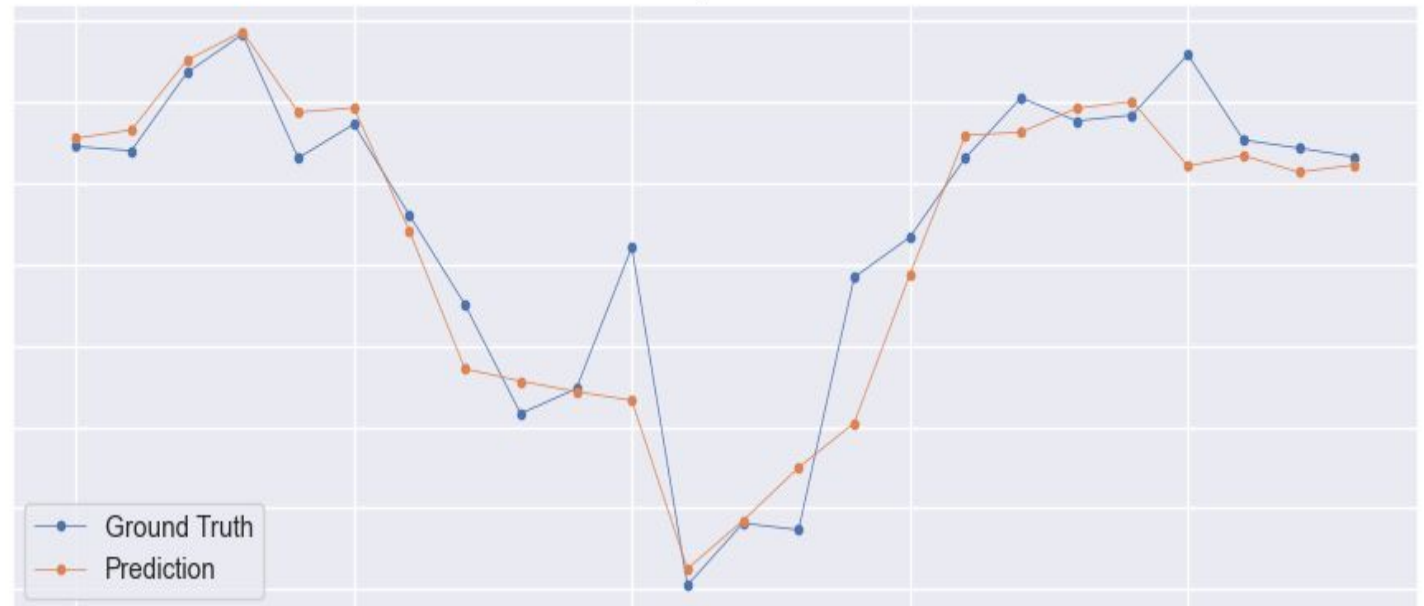
Powerflow

Run balanced and unbalanced (three-phase) power flows over your MV and LV digital twin and selects the most appropriate data set leveraging the (big) data capabilities of the platform.

Adaion

(Big)Data Management

Monitor the general state of your overall information from any device, check how much expected information are you missing and which ones are not reporting.
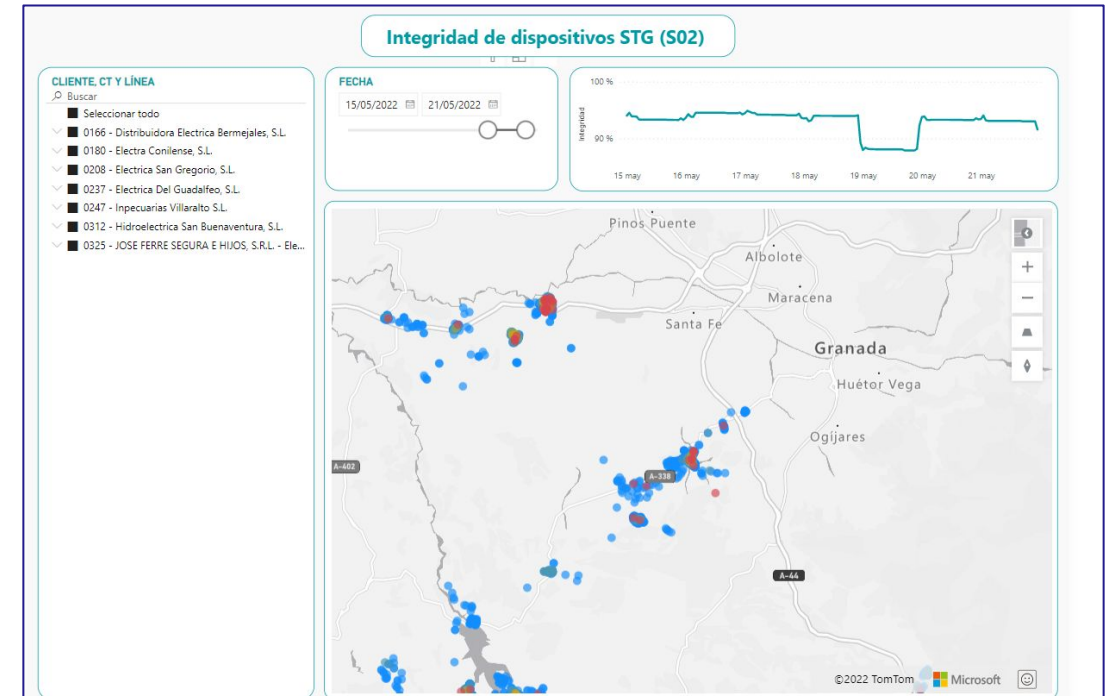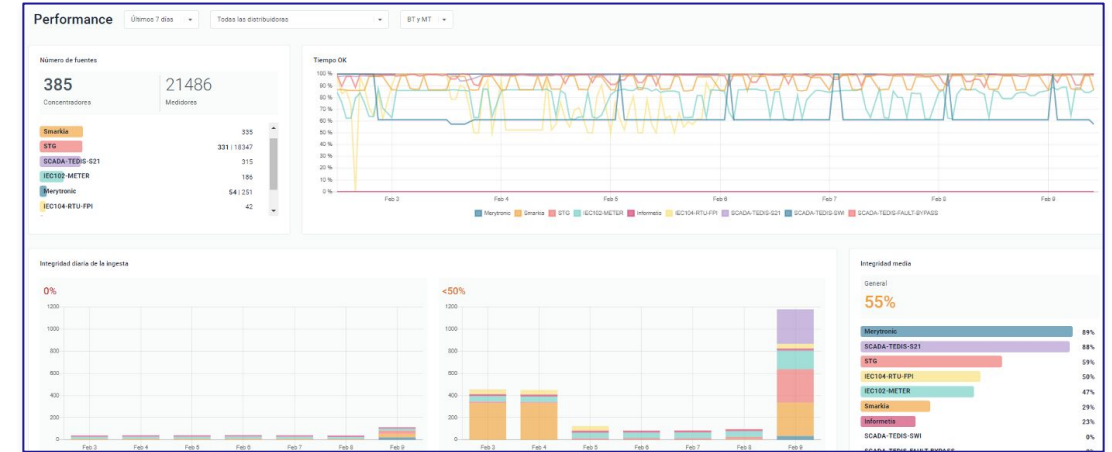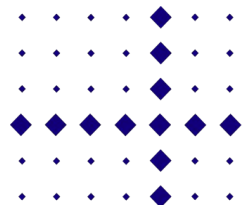
References

Adaion is present in innovative projects throughout Europe

Adaion

Interoperable tools for an efficient management and effective planning of the electricity grid

Pro-sumer AwaRe, Transactive Markets for Valorization of Distributed flexibilITY enabled by Smart Energy Contracts

ENabling FLexibility provision by all Actors and sectors through markets and digital TEchnologies

Big Data & AI Driving Energy Services to Building Sector

Summary

Adaion

Adaion

Adaion is a cloud platform which provides a set of tools to support the operation in a digitized grid:

- ◇ Grid modeling, visualization and monitoring
- ◇ Advanced analytics
- ◇ Specific use cases: flexibility, loss detection, data management, new connection requirements, etc.

Adaion data-driven architecture includes technologies such as advanced algorithms, AI techniques, digital twin and IoT Platform.

The high flexibility, scalability and interoperability of this technology facilitates the integration of existing solutions.

Adaion

Thank you

Contact details:

https://www.adaion.energy/

manuel.reyes@turningtables.global