# EIPGIRD Profile

COMMUNITY ENERGY MANAGEMENT • VIRTUAL POWER PLANT PLATFORM

November, 2023

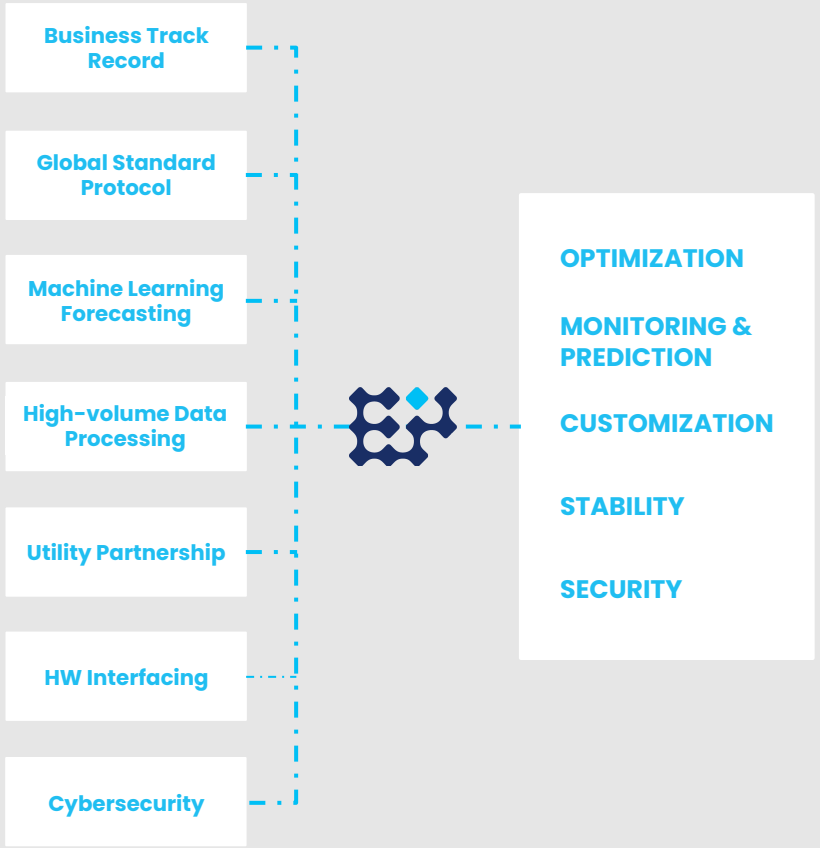
EIPGRID

# EIPGRID at a glance

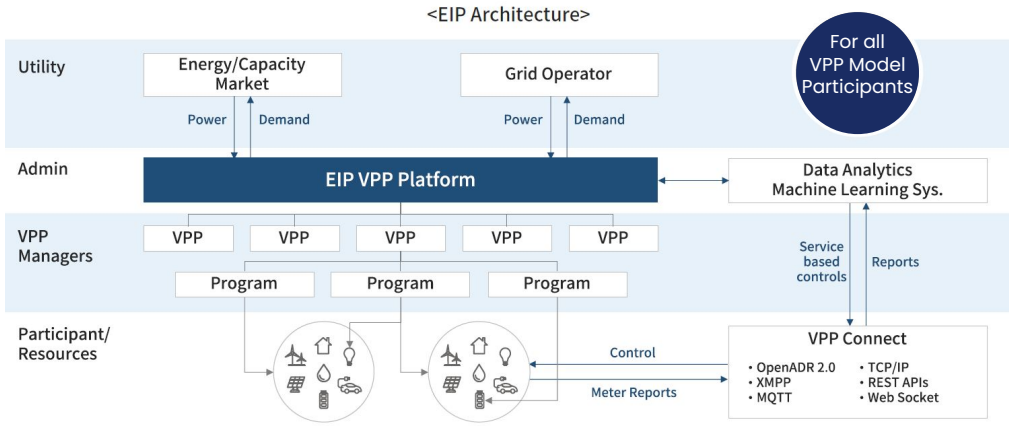
HISTORY • ARCHITECTURE • TECHNOLOGY

## EIP BUSINESS STRENGTH AND CAPABILITIES

- In the Energy Business since 2014
- Virtual Power Plant Platform Software Developer and energy services provider
- Developed Korea's first Automated Demand Response Management System
- Extended areas of application
  - Distributed Energy Resources Management, Battery ESS Management, Micro-Grid, Virtual Power Plant, Vehicle to Grid, all combined into a single platform
- Overseas footprint
  - Japan, Southeast Asia, Europe, North America
- Carbon Credits accounting & trading (in development)
- Global data service (in development)



# EIP VIRTUAL POWER PLANT PLATFORM




openADR ALLIANCE

REST API

Modbus

MQTT

XMPP

ICCP/TASE.2 LIBRARY

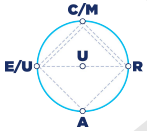
## EIP PLATFORM ARCHITECTURE

- **Cloud-based energy solution for participants** *(Utilities, Load Aggregators, End-users)*
- **Operation / Monitoring of distributed resources**
  - Renewables, Storage, Electric Vehicles, etc.
  - Supports numerous protocols for resources <-> platform communication
- **Advantages**
  - **Participants:** Can participate in several programs simultaneously
  - **Resources:** All types supported, scalable without limit
  - **Protocols:** All resource communications supported

# EIPGRID VIRTUAL POWER PLANT : ENERGY-AS-A-SERVICE FOR COMMUNITIES

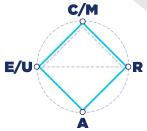
## UTILITIES

- Stabilize the grid 24/7 by leveraging data collection and AI to offset the variability of renewables
- Offer incentive programs to users who help balancing the grid through load curtailing or capacity supply to the grid



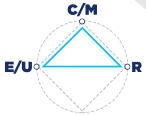

## AGGREGATORS

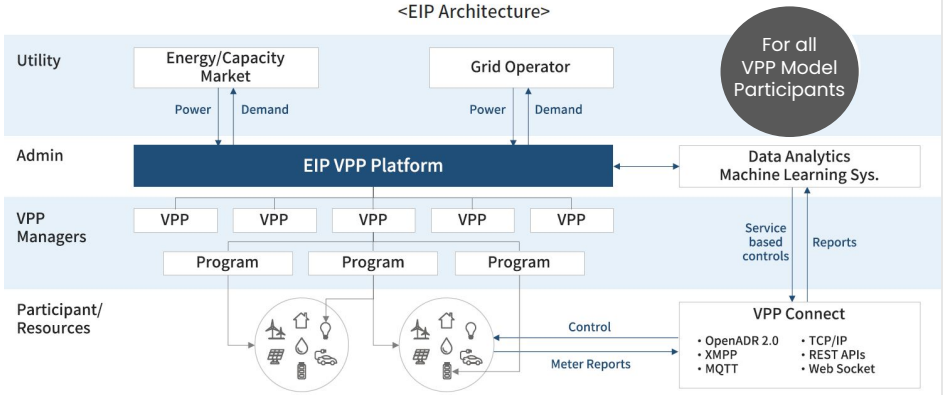
- Help communities monetize their energy resources and participate in their local energy market
- Act as a gateway between the grid and the communities and support end-users earning incentives according to their resources capacity




## COMMUNITY MANAGERS

- Monitor, operate and manage renewable energy resources in one or multiple communities
- Promote generation and use of affordable and low carbon electricity towards households, commercials and industrials



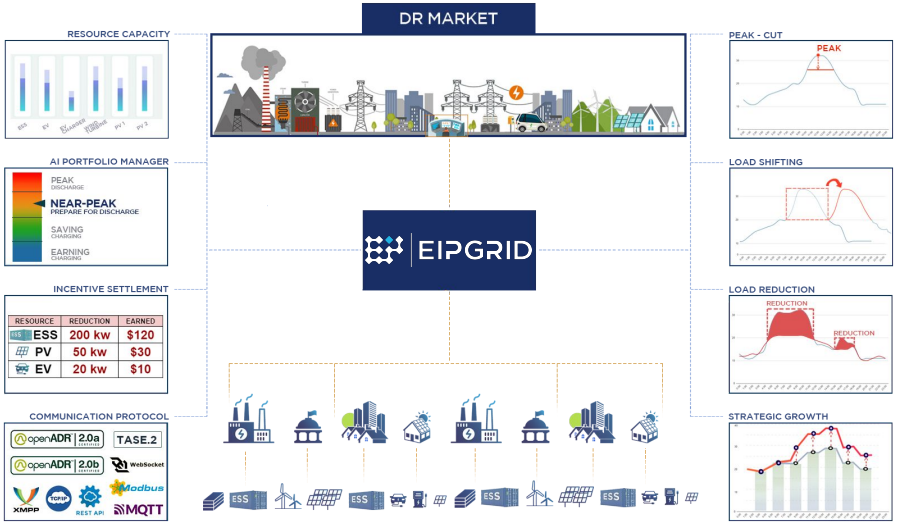
# EIPGRID STRENGTHS AND DIFFERENTIATORS

| | | |
|---|---|---|
| 01 | Multi-purpose resources monitoring, aggregation and control | • Aggregation, control and orchestration of both demand and supply side endpoints<br>• Support of multiple operations schemes: Demand-Response, price arbitrage, peak-cut, Frequency Regulation, trading, etc. |
| 02 | Hardware Agnostic Platform | • Interfacing, monitoring and control of any resources regardless of the brand and build (solar PV, Battery ESS, EVs, etc.)<br>• Large and growing coverage of communication and data protocols |
| 03 | Market Agnostic Platform | • Highly customizable modules and algorithm enabling rapid adaptation to new market rules<br>• Growing geographical coverage achieved thanks to customizability (Japan, South Korea, USA, Malaysia, Thailand) |
| 04 | Customer Agnostic Platform | • Multi-layer Energy as a Service ecosystem<br>• Unified ecosystem for any type of client: utilities, grid operators, aggregators, asset owners |
| 05 | Time Series data aggregation & end to end data security and governance | • World's fastest time series database for optimized VPP operations<br>• Top end node security |

# Business Applications

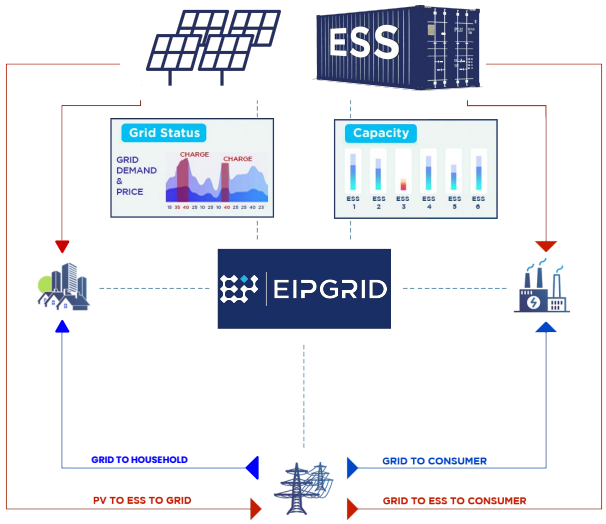
DEMAND RESPONSE • ESS • EV • SOLAR • MICROGRIDS

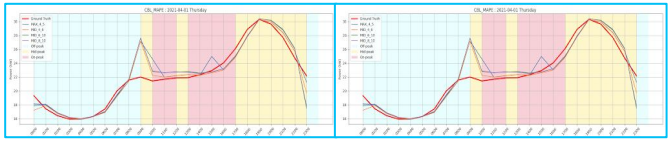
# EIP PLATFORM BUSINESS APPLICATIONS




## DEMAND FLEXIBILITY MANAGEMENT

- **Grid Balance**
  - Utilities and grid operators maintain grid stability by sending demand reduction signals
  - Load Aggregators or resource owners earn incentives by lowering their electricity use in response (Demand flexibility programs participation)
- **Distributed Energy Resources Management**
  - Monitoring grid supply, demand and load shift capacity in real-time, thanks to advanced data collection capabilities
- **AI Portfolio**
  - Automated forecast and scheduling based on local energy consumption pattern and grid status
  - Automated signal dispatch and response
- **Automated Demand Response Management System**
  - Management System fully customized and tailored to local market rules
  - User friendly design : utilities and Load Aggregators directly manage participants joining their programs

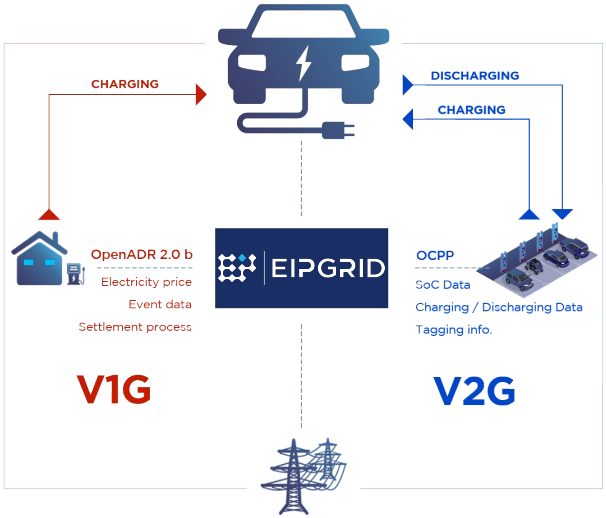


## ENERGY RESOURCES OPERATION AND MANAGEMENT

- **AI-based resource monetization**
  - Forecast electricity generation and automatically bid to the local electricity market
  - Automatically store excess / cheap electricity and perform price arbitrage or peak cuts when demand/price is high
  - Support the grid with ancillary services or frequency response services
- **Anomaly Detection**
  - Detect changes in the system's temperature, voltage, current, etc. as well as any unusual access to the system, send alert messages to operators and take early action to prevent damages / issues
- **TSDP - Time Series Database Technology**
  - Real-time unstructured big data is collected, curated and structured for efficient and precise analysis and performance tracking
- **System Interfacing**
  - Multiple brands, data and communication protocols supported
  - Generation resource coupling with battery or consumption site

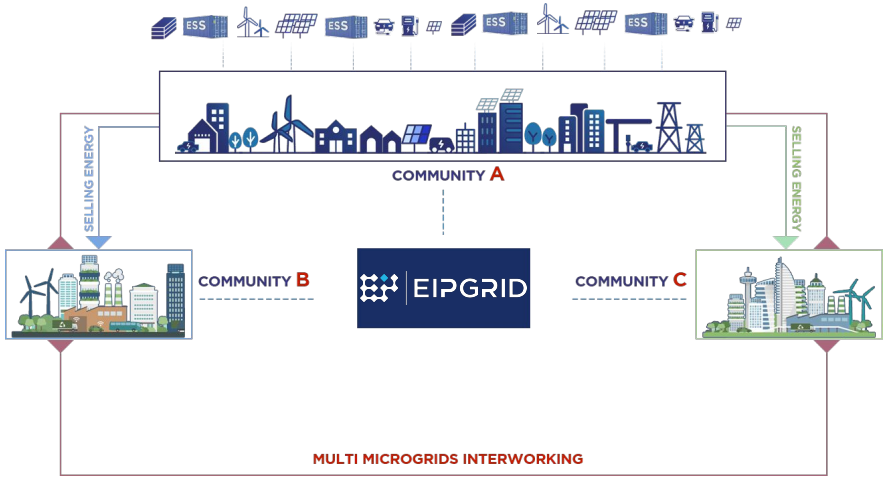
# EIP PLATFORM BUSINESS APPLICATIONS




## EV MANAGEMENT

- **V1G smart charging**
  - Earn incentives by charging EVs during excess electricity supply
  - Remotely dispatch charging signal to any EV fleet, monitor response and control charging speed according to local grid capacity
- **V2G - Connect to the EV charging station**
  - Participate in Demand-Response program and earn incentives by supporting the grid (EV discharge into the grid) during peak demand or supply trough
  - Gamification model (ranking, lottery, etc.) to secure long-term commitment by participants
- **Operate / participate regardless of scale**
  - Model applicable to households (when pooled into a local group of program participants) or EV fleets

# EIP PLATFORM BUSINESS APPLICATIONS




## MICRO GRIDS

- **Energy independence**
  - By integrating the distributed energy resources into one unified platform, EIP can turn any community into a flexible, decentralized network that can utilize the energy assets according to their needs, and become more reliable, stable, and sustainable, not relying fully on the grid
- **Multi Micro-Grids Interworking**
  - Based on the energy needs and load capacity of its resources, a community can interact on its own with the grid or other micro-grids and generate financial opportunities for all energy market players regardless of their role in the power system

SCHEDULING

MONITORING

FORECASTING

# References

CLIENTS • AWARDS • CAPABILITIES • USE CASES

# EIPGRID : CLIENTS AND PARTNERS

| CLIENTS | | | | PARTNERS |
|---|---|---|---|---|
| **Private** | GS Caltex | kt | posco 포스코DX | intertrust<br>rainforest automation<br>NECTEC a member of NSTDA<br>BlackRidge TECHNOLOGY<br>telenor \| connexion<br>SGtech School of Renewable Energy and Smart Grid Technology Naresuan University<br>kx amazon web services<br>경희대학교 KYUNG HEE UNIVERSITY |
| | Rockwell Automation | SK E&S | & Others (confidential) | |
| **SI & Engineering** | TIS TIS INTEC Group | GUNKUL not only the energy, we care | DOOSAN | |
| **Utilities & energy operators** | Busan city gas \| SK E&S | eMotorWerks An Enel Group Company | FULL ADVANTAGE | |
| | GRID SYSTEM OPERATOR | 한국전력공사 KOREA ELECTRIC POWER CORPORATION | KEPCO KDN | |
| | KPX 전력거래소 KOREA POWER EXCHANGE | PEA PROVINCIAL ELECTRICITY AUTHORITY | การไฟฟ้านครหลวง Metropolitan Electricity Authority | |
| | TENAGA NASIONAL | TNB RESEARCH | & Others (confidential) | |

# RECENT AWARDS

Top 10 Utilities Technology Solution Provider across the APAC region

*2019*

*Awarded by* ***Utility Tech Outlook magazine***

Top 20 AI Solutions Companies

*2022*

*Awarded by* ***CIOReviews***

Best Cloud Services in South Korea

*2023*

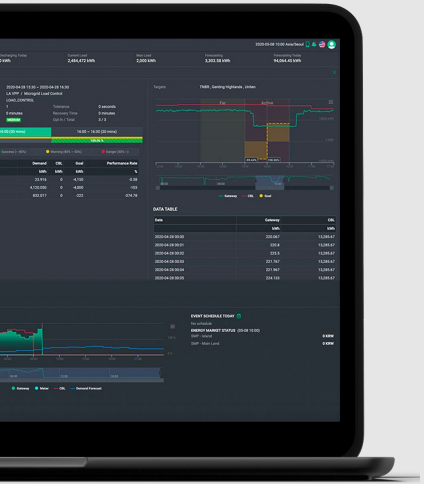
*Awarded by* ***Global Financial Market Review***

ECCK Sustainability Awards Top Finalist ("Green Steps" category)

*2023*

*Awarded by* ***European Chamber of Commerce in Korea***

# EIPGRID VIRTUAL POWER PLANT PLATFORM - CAPABILITIES AND USE CASES



# Virtual Power Plant Platform

Hardware and Market Agnostic
Highly Secure
AI-enabled

## Load Aggregation and control for Demand-Response

**Highly customizable solution**

**Multiple jurisdictions with various market rules covered**

**References:**

- Japan: 4 utilities ; 1,200 participants
- S. Korea: 1,000+ participants
- Thailand: 200+ participants
- USA - California: scheduled 2024

## Energy assets monitoring, control and orchestration

**No hardware limitation**

**No limit in terms of scale**

**References:**

- USA: Battery storage + EV orchestration
- S. Korea: Battery storage monitoring and operation
- S. Korea: PV Solar aggregation, monitoring and management
- Malaysia: Battery storage monitoring and operation

## Vehicle to Grid Management

**V1G smart charging (mono-directional)**

**V2G programs (bi-directional)**

**References:**

- UK | S.Korea : EV fleet monitoring with real time smart charging management

# SUPPLY AND DEMAND SIDE CAPACITY UNDER OPERATION

**23** sites

ESS

740 MWh

**3** battery providers

**6** PMS providers

**700+** sites

incl. VPP participation

PV

600 MWp

**4** power generators

**700** sites

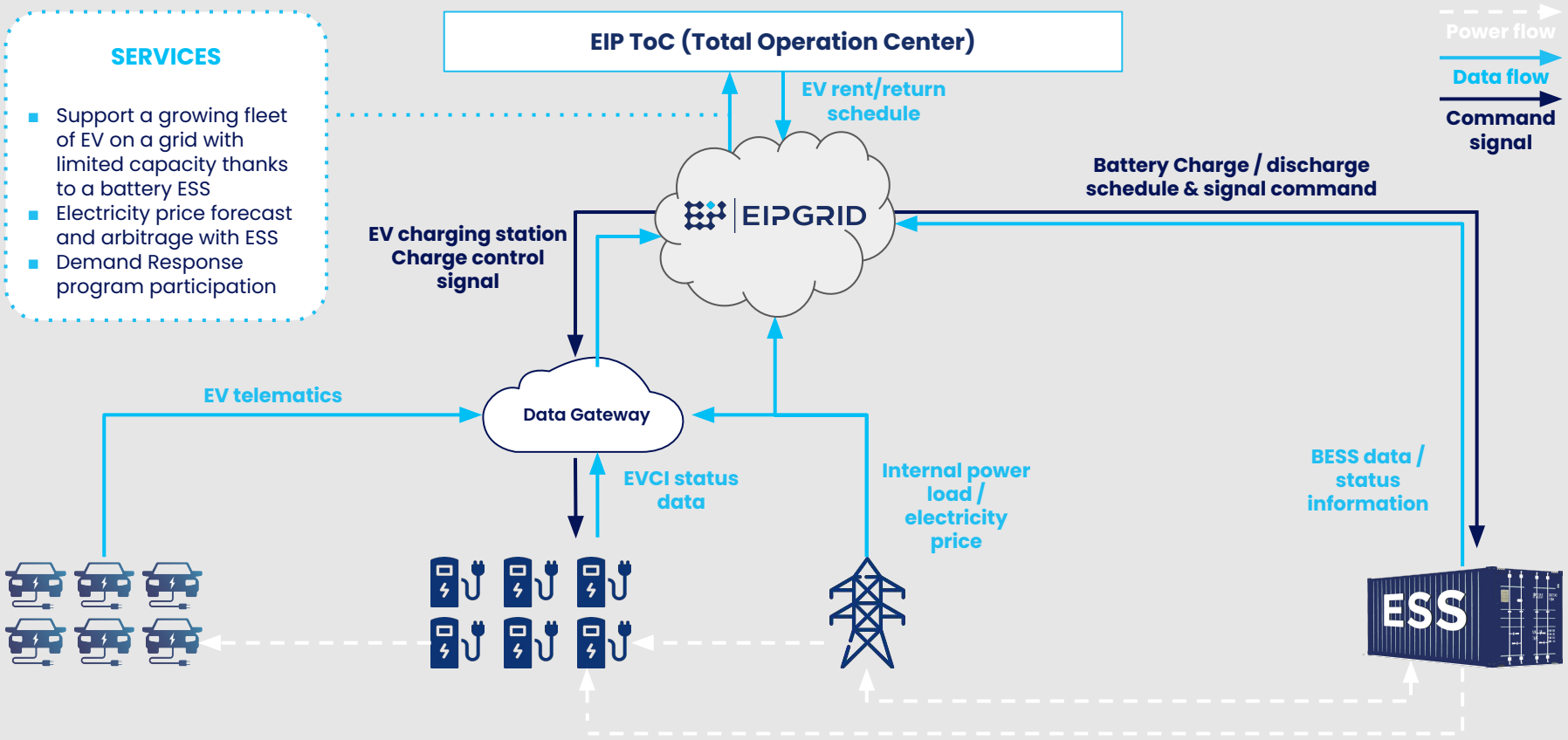
DR

2.1 GW

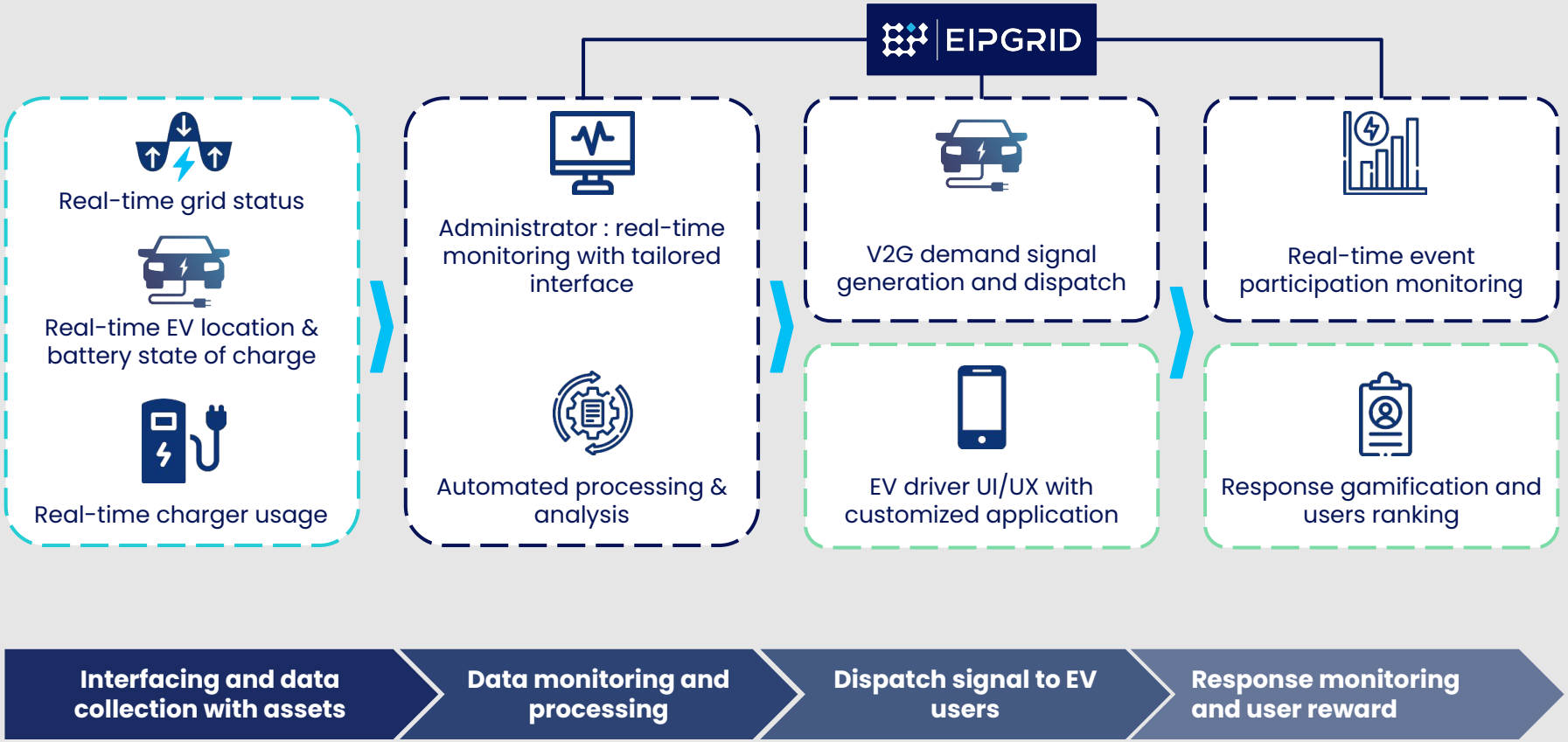
**2,000+** participants

**7** Aggregators / utilities

# USA : MULTI-RESOURCES ORCHESTRATION ON A UNIFIED PLATFORM



# UK-KOREA : VEHICLE TO GRID POC WITH USER GAMIFICATION MODEL



# UK-KOREA : VEHICLE TO GRID POC - TWIN DEMONSTRATION

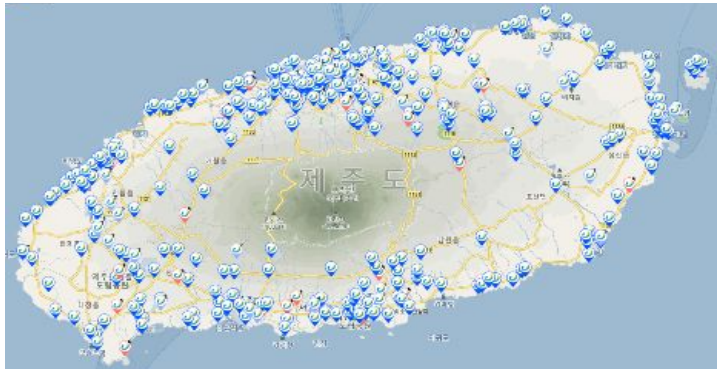
## JEJU ISLAND
## VEHICLE-TO-GRID (R&D)

**91** electric vehicles

- V1G operation w/ real time grid balancing
- Virtual V2G demo

**527** chargers

- Push notification System
- Gamification model + participant reward




## CORNWALL
## VEHICLE-TO-GRID (R&D)

**112** electric vehicles

- V1G / V2G operation
- Real time grid balancing

**112** chargers

- Push notification System
- Gamification model + participant reward

# UK-KOREA : GAMIFICATION MODEL FOR EV RESOURCE MANAGEMENT

## INPUT

Real-time grid status

Real-time EV location

Real-time State of Charge

Real-time charger usage

## MONITORING / PROCESSING

Administrator : real-time monitoring with tailored interface

Automated processing & analysis

## EVENT MANAGEMENT

Event dispatch & mobile notification

Real-time event participation monitoring

Settlement, user reward and user ranking

# UK-KOREA : EV DISPATCH SCHEDULING


## REAL-TIME USER RESPONSE MONITORING

### EV fleet view with per user details :

- Charged / discharged kWh
- # of response / total time spent participating

### EV chargers fleet view details :

- Charged / discharged kWh
- Start -> Finish State of Charge
- Time spent

# JAPAN - CUSTOM DR MANAGEMENT SYSTEM

## CUSTOM DR MANAGEMENT SYSTEM

**4 utilities** served

**White label** platform business model

**1,200** participants

## HIGHLY CUSTOMIZED FUNCTIONALITIES

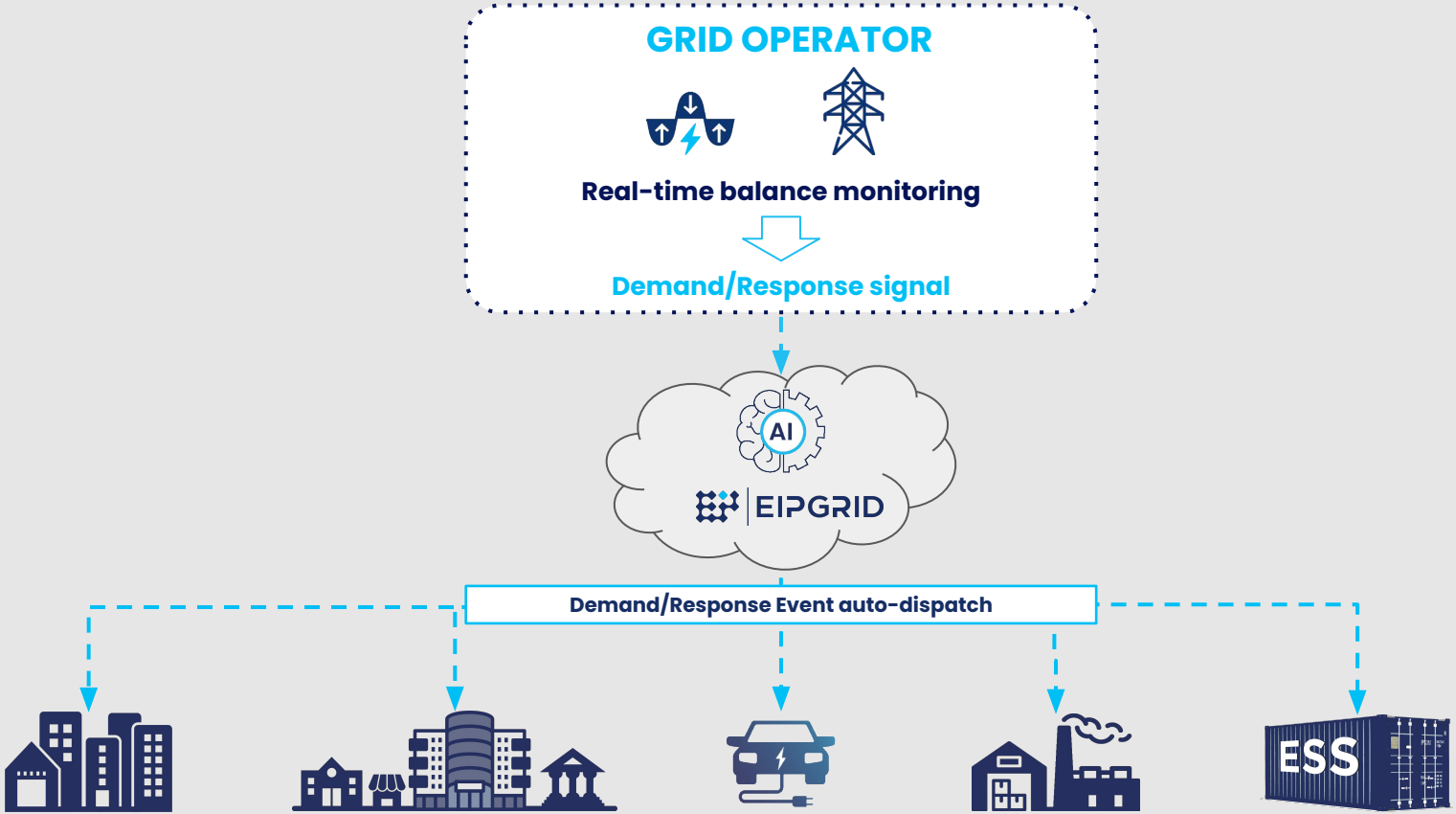
- Tailored to Japanese market rules and mechanism - including Japan specific CBL
- Emergency response system (power outage, earthquake) with 24/7 monitoring
- IoT integration for remote device control

Supply-side resource grouping and aggregation

Demand-Response, Peak-cut and load-shifting

Vehicle-to-grid ; vehicle-to-home

# JAPAN : DEMAND/RESPONSE EVENT DISPATCH APPLICATION

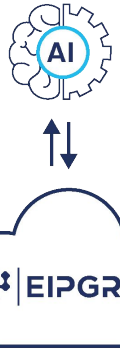


# JAPAN : EMERGENCY EV DISPATCH DURING POWER OUTAGE

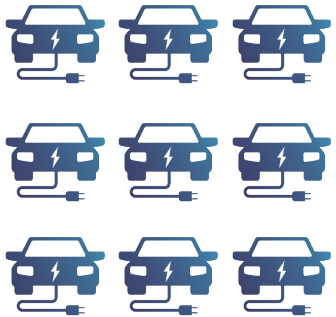
**Emergency signal from after power outage** → **AI-based allocation decision** → **Emergency dispatch signal** → **EV as energy backup supply for critical facilities**

## GRID OPERATOR

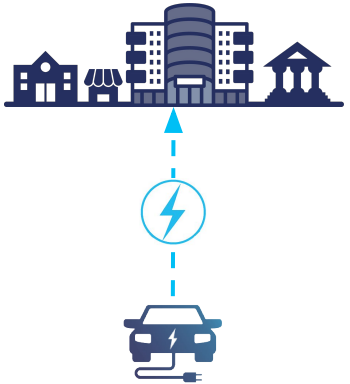
## VPP




## EV FLEET



## DISPATCH



# KOREA : BATTERY ESS MANAGEMENT

## OPERATION & MANAGEMENT OF A COUNTRY-WIDE BESS FLEET

**690 MWh**
capacity

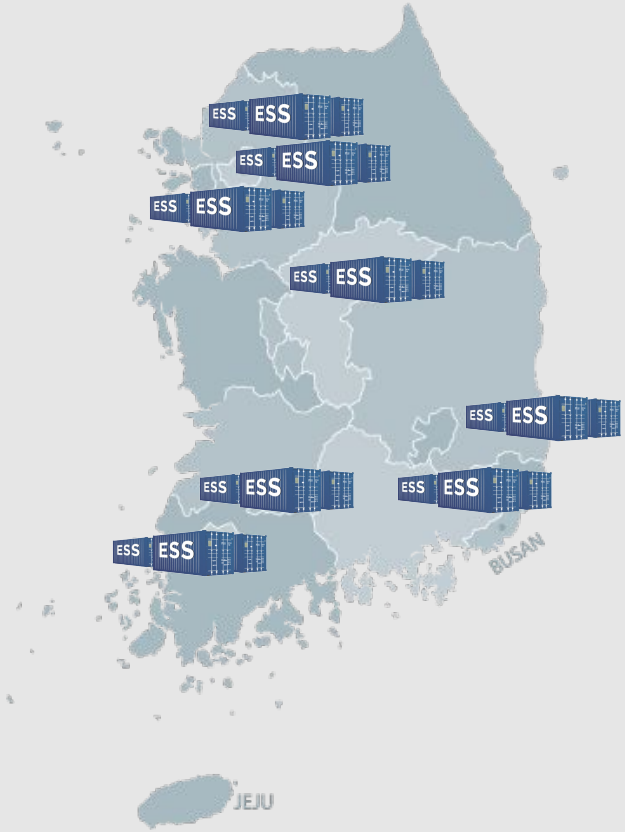
**18** industrial sites

- Power arbitrage
- Peak cut, Demand-Response
- Frequency regulation
- PV solar coupling

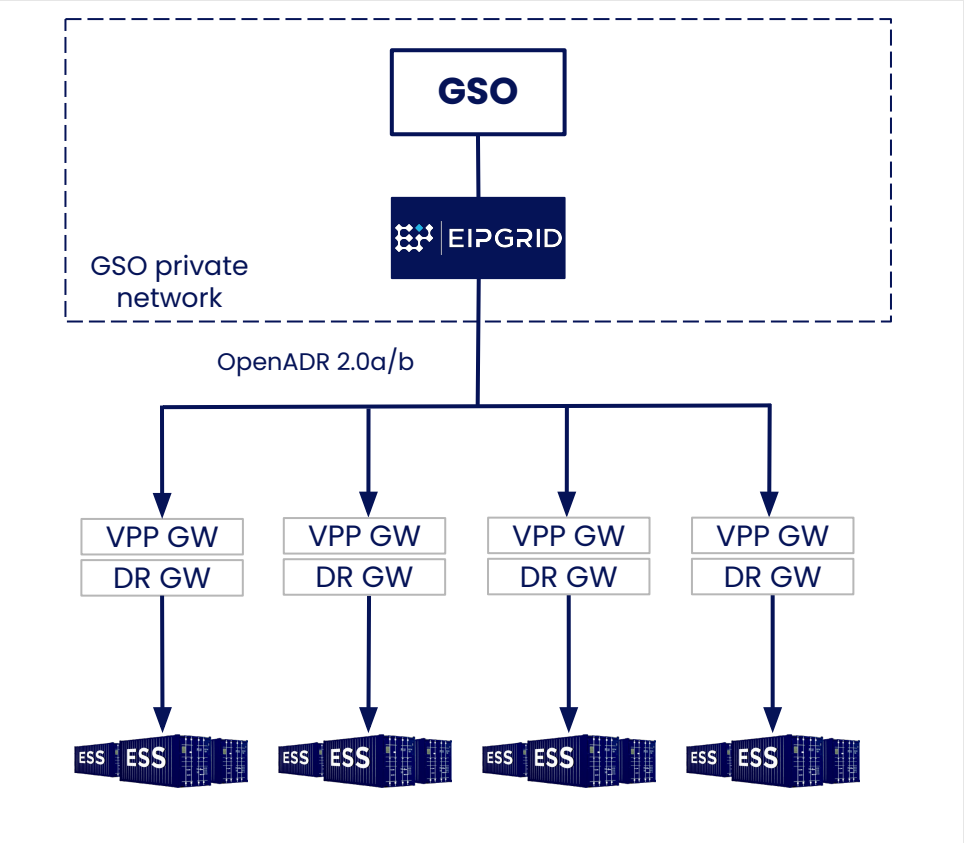
**700,000+** cells monitored
**700,000** data points/min

- Temperature, voltage, state of charge, state of health
- AI-powered anomaly detection
- Real-time notification

**75+GB**
**of data**
collected per day



# MALAYSIA : BATTERY ESS MANAGEMENT




## MALAYSIA - BATTERY ESS OPERATION & MONITORING

**24/7** operation with

**Real-time** monitoring with Data backup

**AI-powered** daily forecast & load scheduling

**Automated** Peak-cut, energy arbitrage, demand-response

Emergency reaction time **<2 sec**

**Smooth operations**
In difficult environments

# KOREA : SOLAR PV AND DEMAND-RESPONSE

## KOREA - PV OPERATION & MONITORING

**Real-time Data** by EIP **VS** **10 mins** interval by others

Component/function level anomaly detection

Mobile notification

On/off remote function

**125 MWp**
206 sites
Capacity under monitoring

**600 MWp**
700+ sites
Capacity participating in VPP brokerage market

## KOREA - DEMAND RESPONSE

**2.1 GW**
Cumulative DR Capacity