
ENCORED

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We provide valuable services based on our open platform and rule based artificial intelligence.

Our customer-focus and intelligent energy solutions will help your innovoation in the next geneation energy industry.

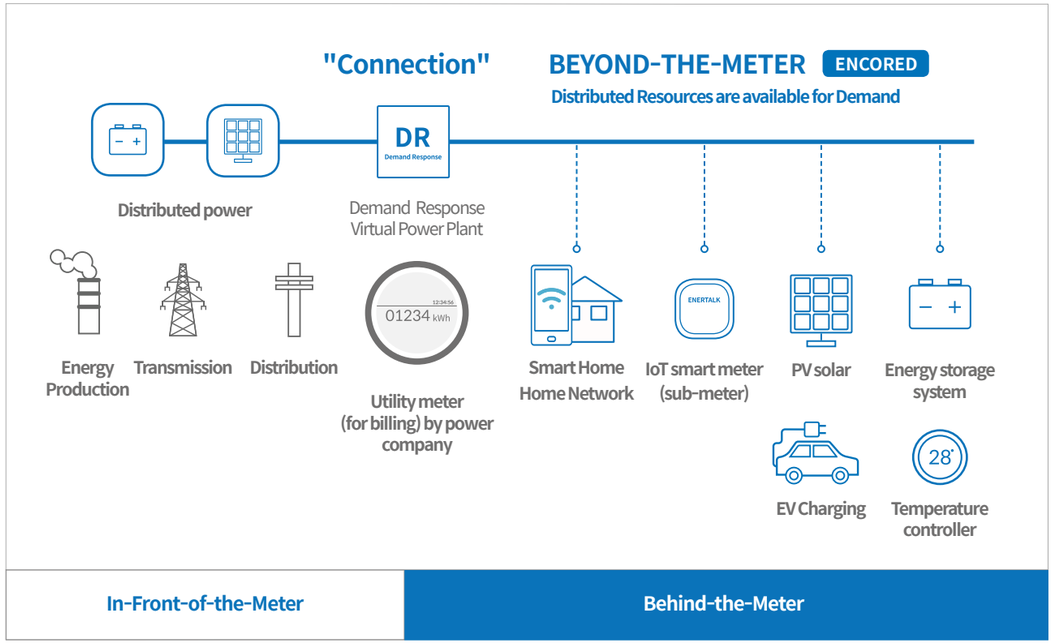
## Power Industry Trends

- Proliferation of distributed power generations including energy storage solutions
- Increase of cost-sensitive consumers with willingness for active participation
- Adoption of IT conversion technologies to energy domain where consumers produce, transmit, and consumer energy intelligently and efficiently
- Increase of renewable energy sources with high volatility such as Solar and Wind power
- Aligning efforts in reducing CO2 to mitigate earth environment and climate change
- Increase of electricity value proposition to economy from growing connectivitiy with other core infrastuctures (e.g. Communcation and Transportation)



## BEYOND THE METER

**Smart meter is not just a metering device but a platform. (“Beyond the Meter”)**



## Mission

**We make the world better and our lives more beneficial with Energy Big-Data.**

### Engage

Connection

Connects energy data and people.

### Respond

Response

Allows people to react and trade energy through mobile easily.

### Optimize

Efficiency

Achieves optimal efficiency with intelligent energy analytics.

## The value we create

**PLATFORM** ------▶▶

- Connection with customer
- Integrated energy services

**DATA ANALYTICS** ------▶▶

- Insight, Motivation
- Expertise
- Operational optimization

**Application (Business)**

- Demand Response
- Distributed Power Optimizaion
- Smart Home plug-in

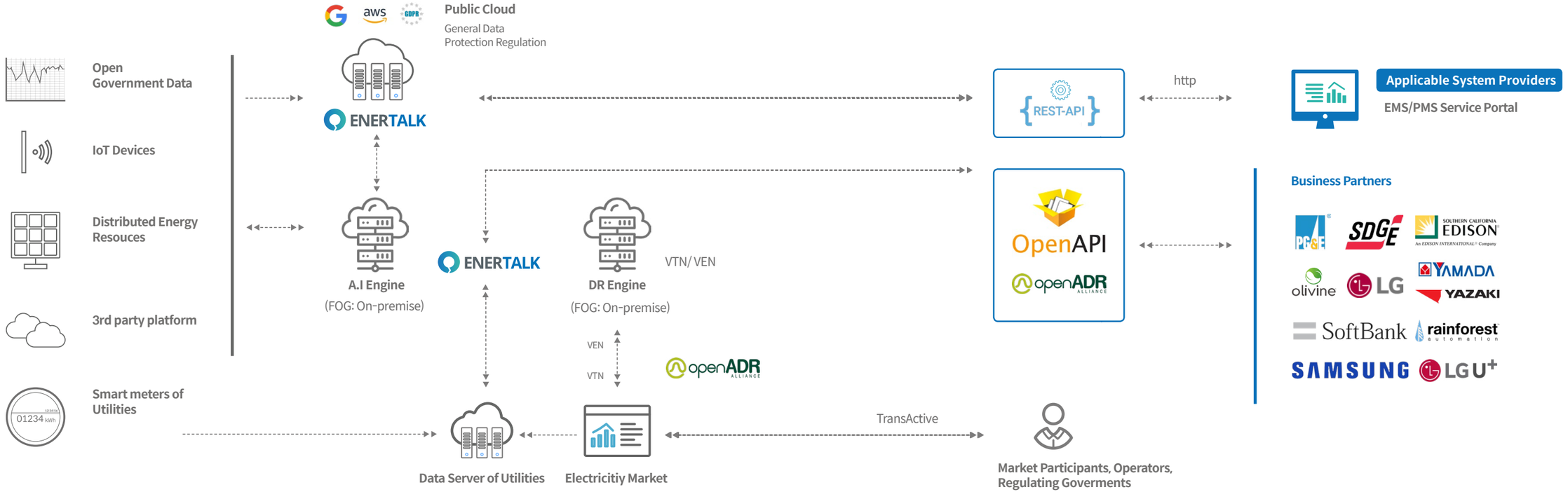
**“BEYOND-THE-METER”**

# Energy
# Artificial Intelligence (AI)
# Open Data Platform

# ENERGY AI

## AI Energy Open Data Platform

With our scalability and stability of platform, we are optimized to nonstop real-time data service.



# ENERGY AI for Distributed Energy

## Optimize the operating distributed energy with artificial intelligence technology

Our EMS engine forecasts the solar generations, grid consumption, and optimizing charging & discharing ESS baterry

| | | |
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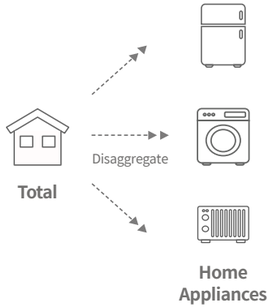
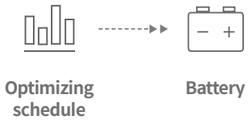
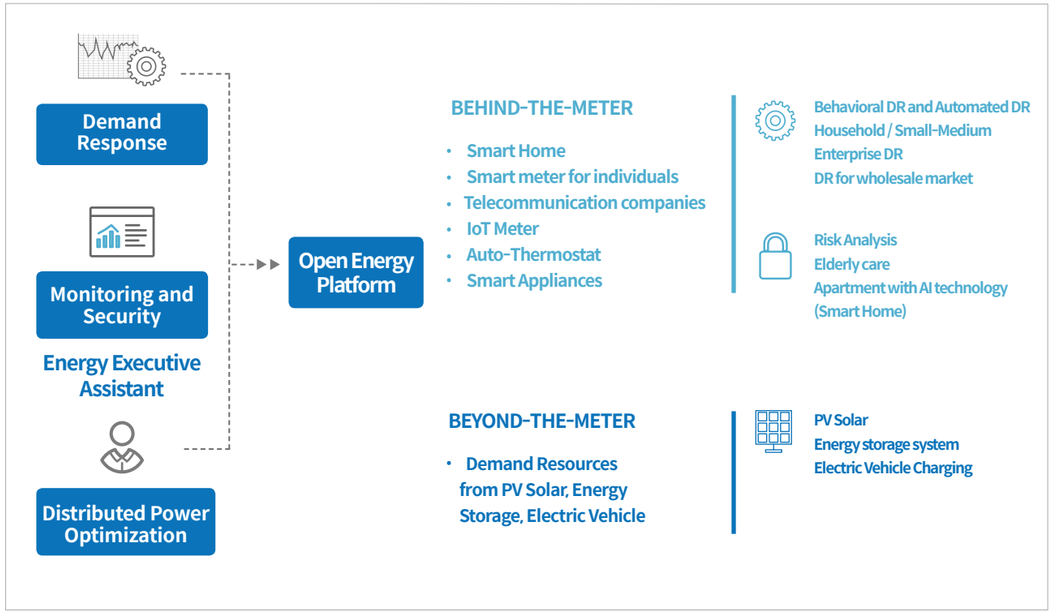
|  |  |  |
| Disaggregates consumption of each appliances for accurate demand forecasting | Optimizes the charging and discharging schedule of ESS battery based on the Time-of-Use charge | Maximizes the decrease of the demand by managing the ESS battery charging and discharging |



# Our Business Area

## Business Areas

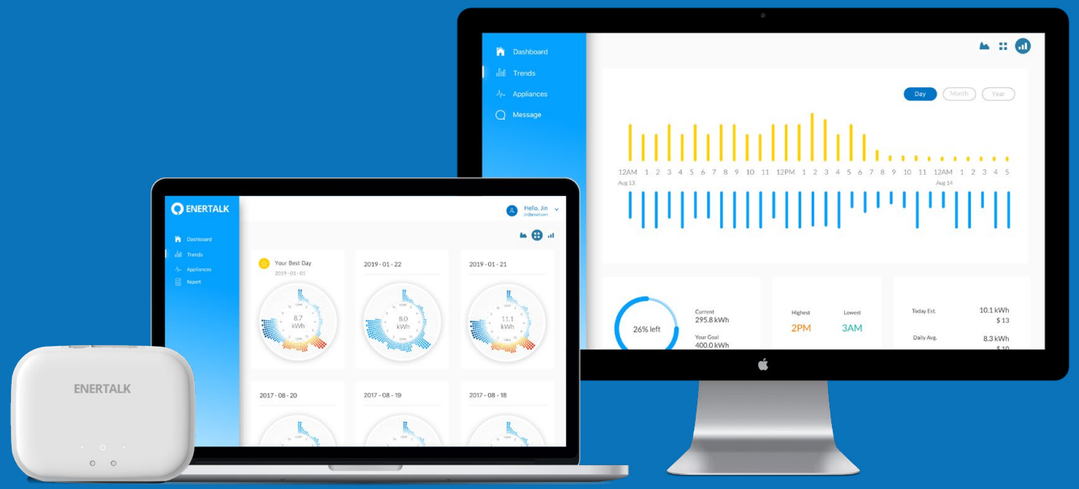



* Please contact us for further information.

Business Area

# Smart Energy Management

Real-time manage of energy in your home or store at anytime and anywhere.
Smart energy management under your control


- ✓ **Real-time monitoring with 1 second data interval**
- ✓ **Historical cumulative usage**
- ✓ **Integrated monitoring per each facility**
- ✓ **Integrated management of multiple devices**
- ✓ **Integrated monitoring with PV solar**
- ✓ **Usage goal setting**
- ✓ **Regular energy report**
- ✓ **Estimated usage of home appliances**

*Please contact us for further information.

# Internet of Things

## Our Service

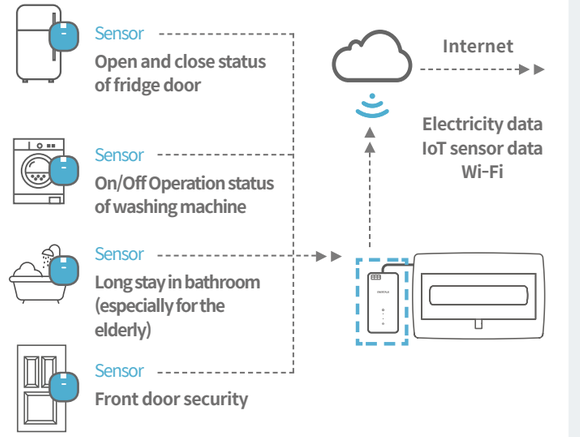
We offer a variety of services for a growing number of households living alone.
You an detect on/off operation of washing machine and open/close door status of refrigerator.
You can maintain temperature and humidity of your house at your individualized comfortable level.

| Status checking of your family members | Caring of your family members | Detection of Emergency |
|---|---|---|
|  |  |  |
| You may check home or away status of your family members through door sensors or ennertalk energy usage status | We may recommend healthy life styles based on monitoring of pattterns such as sleep time and air circulation. | We may detect emergency status from abnormal energy usage. |

- **Power management :** Provides fundamental management services such as usage and billing check, progressive billing stage check, etc.
- **Occupancy :** Energy usage information through sensor data gives information for occupancy.
- **Living patterns :** Check schedules through sensor data of waking up, eating, and absent timings.
- **Confirmation of use of household appliances :** Confirmation of use of certain appliances
- **Abnormal situation notification :** Real-time notification to the guardian in case of detection of the abnormal usage pattern (e.g. if there is no movement for 12 hours)

## System Architecture

We offer more detailed O2O service by combining the information of energy usage and environmental factor from smart sensor.




**Customer value**

**Family Care Services**

**For Parents**

- Checking occupancy and activities at home
- Monitoring of major accident sites such as bathrooms

**For Kids**

- Kid safety and activities at home

**For security**

- Monitor illegal breaks into home

**For Facility Management**

- Operation status and electricity consumption

* Currently, smart sensor is only available in Japan (2019.01)

## Use Cases

We have provided our service to a vareity of customers.

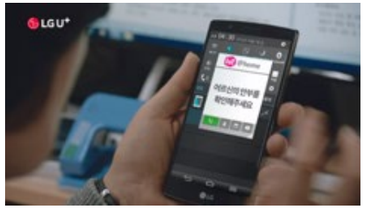
| Protector | Person to be protected | Use Cases |
|---|---|---|
| **Lifestyle manager** | **An elderly living alone** | Be able to track any of abnormal situation by receiving notifications even if they do not actually visit an elderly living alone. |
| **Parents** | **Child who lives in other state for study** | Be able to check child are doing well in dorm from the distance. |
| **Parents** | **Child who lives in other country for work** | Be able to check child are doing well from the distance. |
| **Working couple** | **Child** | Be able to check whether kid come back safely from school. |
| **Spouse** | **Spouse** | Be able to check if your spouse comes home safely from work. |
| **Child** | **Parents** | Be able to check if parents are doing well from the distance. |

- According to the 2010 Population and Housing Census in Korea, the nation's one-person household numbers steadily increase, reaching 25% of the total population
- Approximately 30% of elderly people live alone
- As of 2012, 41.8% of the youth population (aged 19~24) are living in a studio (2013, Korea Institute for Youth Policy)
- 4 houholds out of 10 (38.3%, Statistics Korea in 2015) have both parents are working and it keeps increasing
- The number of remotely and separately living couples due to studying or work has increased from 1.15 million in 2010 to 10% (2010, Population and Housing Census), and the number of working couples who live separately due to the relocation of public institutions from Seoul to other cities has increased for two years (National Statistical Office in 2016)



## Services for the elderly based on ENCORED device and platform

| | |
|---|---|
| **Prime Customer** | LG U+ telecommunication, Inc. |
| **Partner Organizations** | Ministry of Health and Welfare, Single Elderly Support Center |
| **Project Title** | System of taking care of the elderly living alone using IoT energy meter |
| **Goal** | Establish social safety infrastructure for 1,000 elderly people living alone |
| **Outcome** | Established system to prevent solitary death of elderly living alone nationwide |



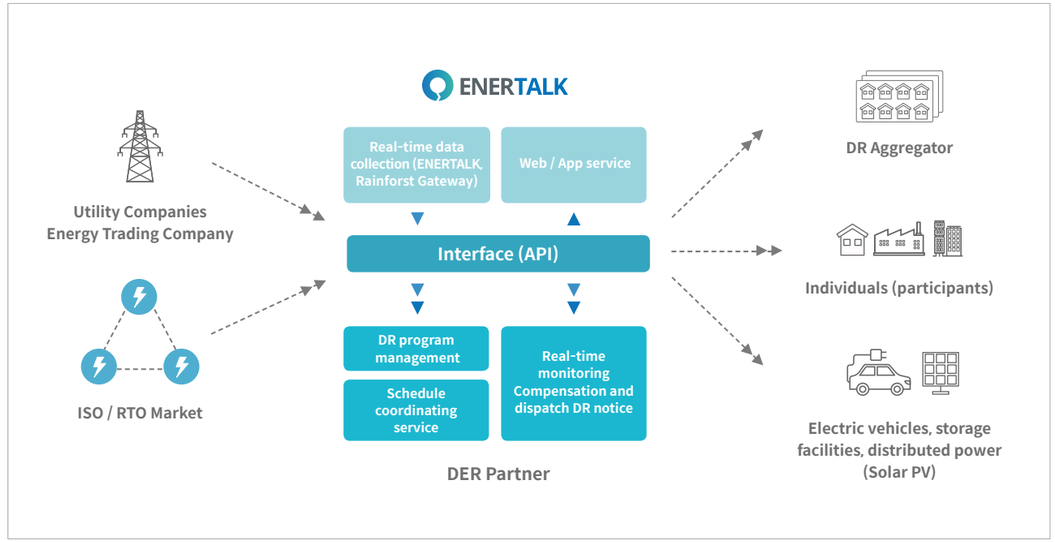

### Push Notification to Lifestye manager

- Automatically checks elderly person living alone for 24 hours at an hour interval.
- Be able to monitor abnormality from usage pattern graph.
- Send push notifications

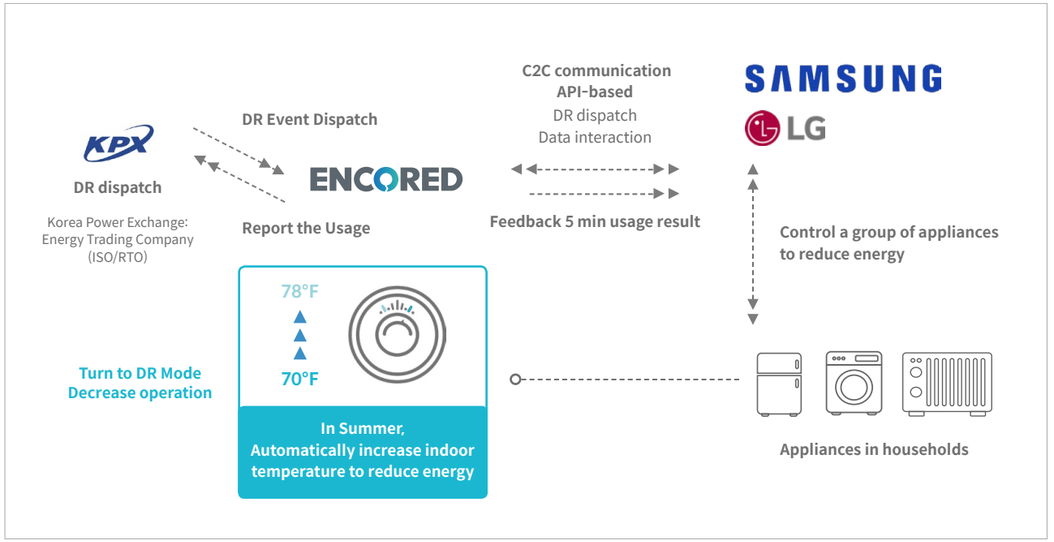
# Automated Demand Response

## ENCORED DR System

Our DR platform is easy to use by Utility companies, DR operators, and customers with DERs.
It can play an outstanding role in fast response DR within 30 minutes.




## How it works



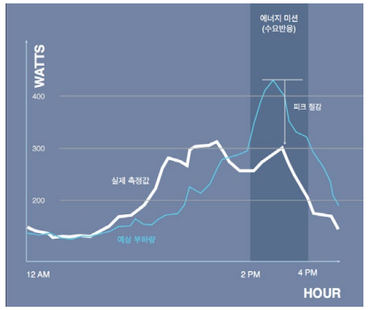
## Case. **Residential DR in Korea**

We have been working on a small-scale demand response project with partners consisting of nine domestic companies, universities, research institues and utilities to meet the thesis of ‘Development and Demonstration of individual DR BM for Demand Response of Small Electric Consumers.’

We have already proven its effectiveness with the participation to platform ENERTALK “Energy Mission”, which delivers mobile push notifications and all DR event messages according to the reduction scheme.

**17%**

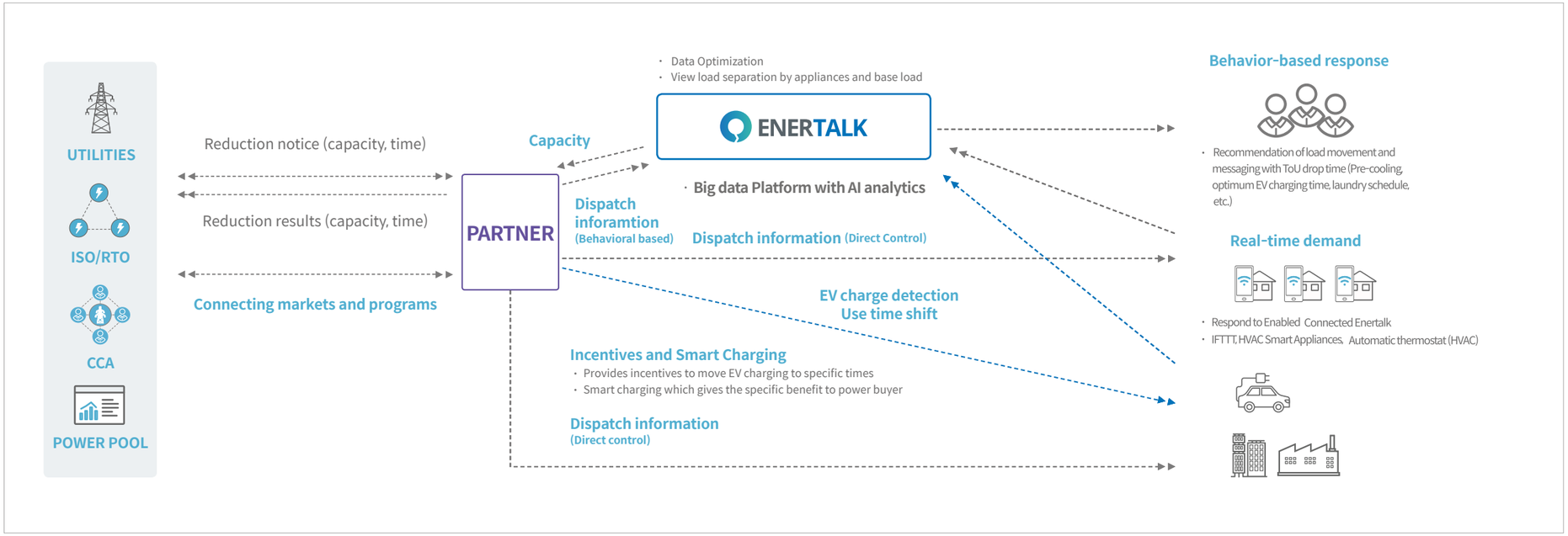
**Average load shaving of 17% on average (30,000 households)**




## How we dispatch DR : Energy Mission


Mission notice ▶▶▶ Mission in progress ▶▶▶ Mission complete ▶▶▶ Settlement after ranking

## Case. **Demand Response Business with Local Partners**



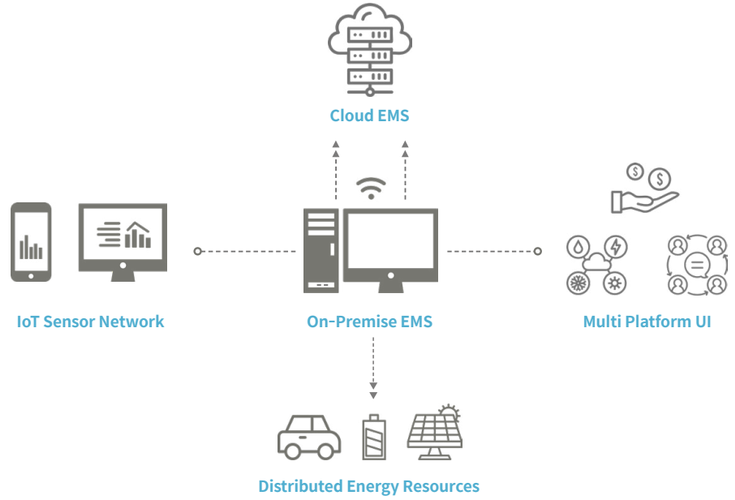

ENERTALK

AI Demand Response Platform

# Smart Microgrid

## What is Microgrid?

A group of interconnected loads and DERs with clearly defined electrical boundaries that act as a single controllable entity with respect to the grid to enable it to operate in either grid-connected or island mode.




**Smart MG Platform 4th industrial revolution** **“The most resilient distributed power system”**

## DIFFERENTIATED TECHNOLOGIES

### Cloud-based multi-level EMS

- Easy to add/sub MG EMS
- Tightened security

### Advanced algorithms

- Reinforced machine learning
- DERs optimized scheduling
- DERs coordination control

**★ 10% profit increase demonstrated in Korean EWP project**

### Hybrid ESS

**Mode 1 - Normal operation**
- Current source mode (grid-feeding)
- Optimal control : maximization of revenue

**Mode 2 - Contingency operation**
- Voltage source mode (grid-forming)
- Optimal control : minimization of cost

**Transient - UPS operation**
- Automatic mode change for contingency
- Uninterruptable operation mode change with STS

# Microgrid Project : Hawaii, United States

**Project size of $3M USD**

## Microgrid Project : Hawaii, United States

### Cloud EMS

- Big data collection / preprocessing / analysis
- Load and solar forecasting with reinforcement deep learning
- Optimal generation plan based on reinforcement deep learning

### Microgrid EMS

- Optimal generation planning (cost or CO2 emission)
- Monitoring DERs and Analyzing field data
- Peak monitoring and estimation
- Cost analysis

### Islanded Mode Operation

- Coordination control
- Frequency control
- Black start
- Automatic synchronizing
- A.I.-based Algorithms

### Power Management System

**Solar**

- 500kW
- N-Type
- Bifacial module (+ 5~30%)

**ESS**

- 250kWh PCS
- 750kWh Battery
- 98.7% Effiency

**UPS**

- For whole Microgrid system

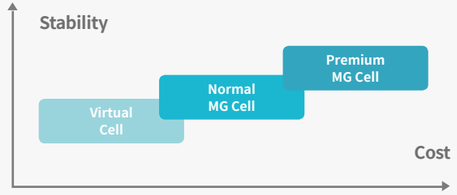
**Smart meter & Gateway**

- Wireless connection
- Low power cosumption
- Real-time data transmission

# Microgrid for Campus

## Seoul National University (No.1 Energy Consumption in Seoul)

It consists of a cell system area that efficiently operates energy and a cloud area
that provides various services based on IoT.

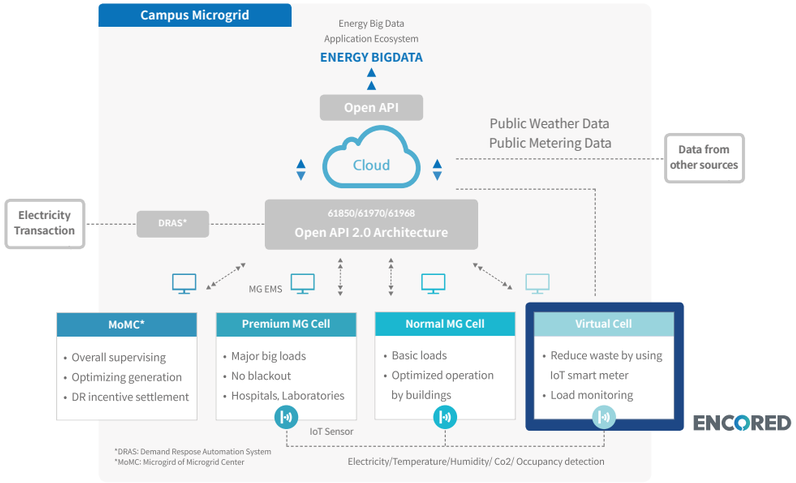



**New approaches for microgrid in campus**

- Classify into 3 categories based on stability/ cost and Buildings-specific models

**Campus-Customized Microgird Solutions**

- **Premium : Hospitals, Laboratories**
- **Normal : Dormitories**
- **Virtual : General buildings**




* Project goal: Reduce energy consumption by 10% in virtual cell



# Application of Energy AI to Microgrid

## Profit Increase by applying AI algorithm to ESS battery

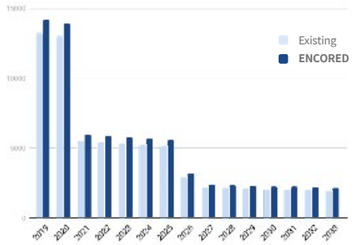
Reducing result of 8.3% by just improving charging and discharging algorithm only.
It equals to about $5.2M USD profit increase.

**Steel Manufacturing Factory**

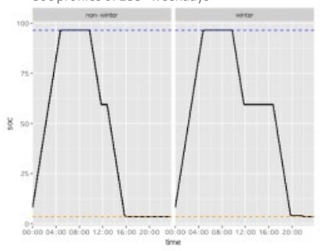
**Site Info.**

- Contract power : 350,000 kW
- Battery : 108,000 kWh
- PCS : 20,000 kW
- PV : 0 kW

**Annual Revenue Change**

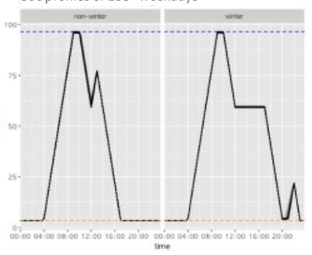



Soc profiles of ESS : weekdays




Existing Charge/Discharge Profile

Soc profiles of ESS : weekdays

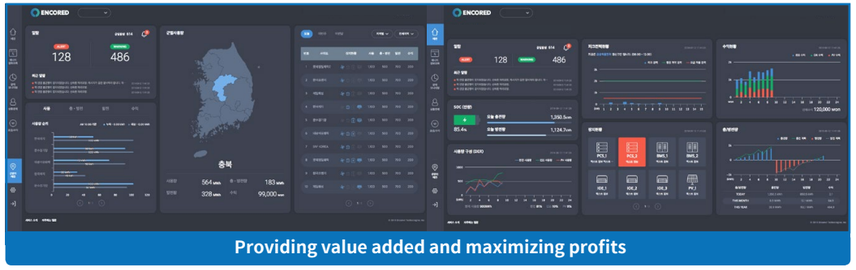



**ENCORED Charge/Discharge Profile**

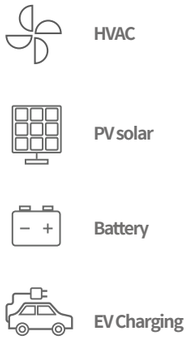
# AI-based cloud EMS

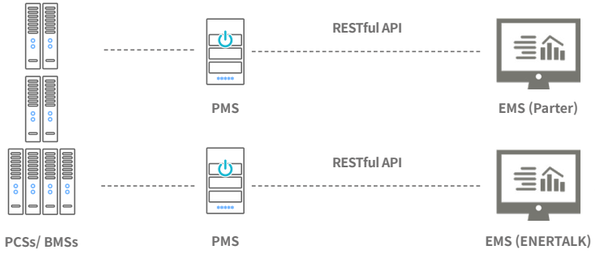
## Distributed Energy Optimizing System Integrated with AI Engine

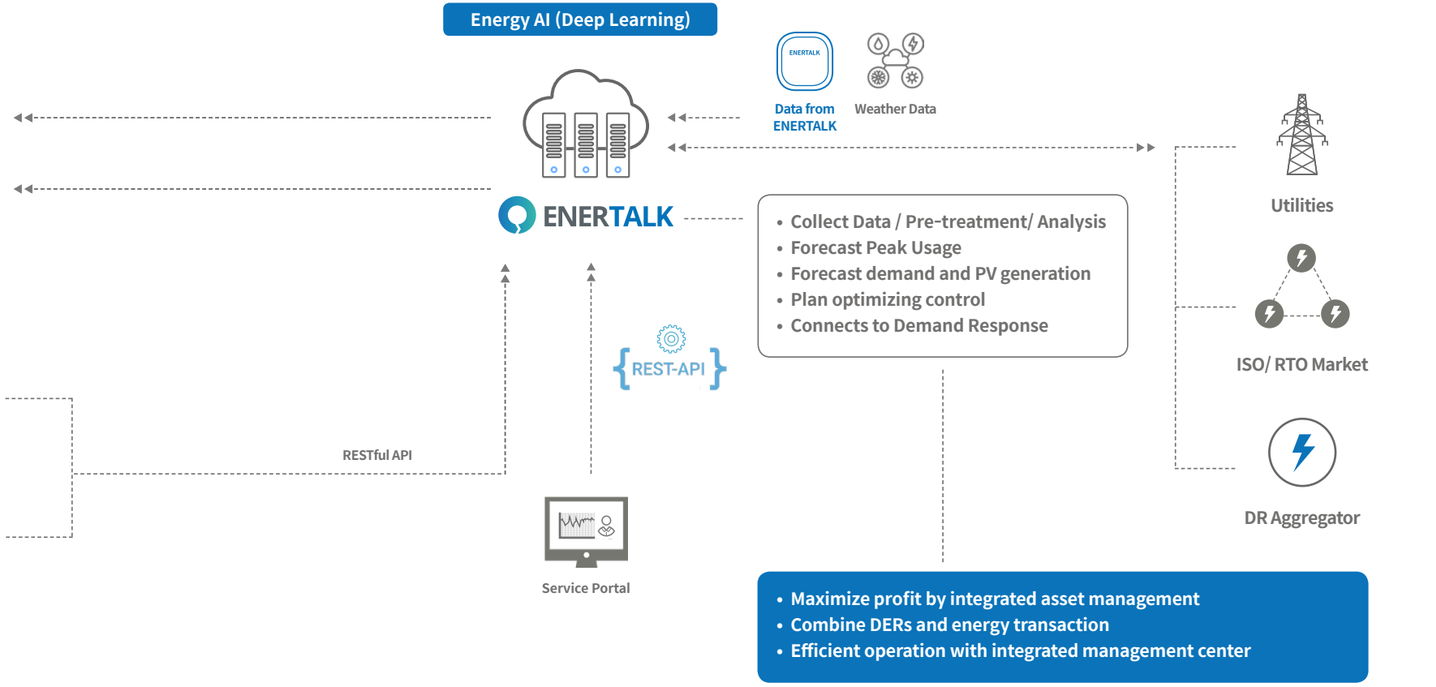
We integrate optimization operation by connecting multiple EMS and PMS to maximize profit through artificial intelligence engine.



Providing value added and maximizing profits



# Metering Devices

## ENERTALK 1


- For Homes
- Single-phase two-wire
- PV Solar support
- Wireless (Wi-Fi) communication
- ENERTALK for billing 2019.05 Release

## ENERTALK 2


- BLE Communications
- Working as a hub of ENERTALK TOUCH

## ENERTALK TOUCH


- Temperature
- Humidity
- Lighting
- Acceleration
- Works with ENERTALK 2

## SMART APPLIANCES

- Interface with our DR platform with open API
- Disaggregation energy into individual appliances (only available for 1-second interval data service) such as TV, refrigerator, air conditioner, rice cooker, washing machine, microwave oven, high load, constant load

**ENERTALK PLATFORM OPEN API**


## ENERTALK PRO

- For Shopping mall buildings
- Three-phase, four-wire support
- PV Solar measurement
- Wireless (Wi-Fi) communication

## SOLAR PLUG

- PV Solar measurement
- Single phase -2 wires only
- Wireless (Wi-Fi) communication

## ENERTALK BUILDING

- Multi-channel measurement (24ch)
- Single-phase / three-phase
- Wired (Ethernet) communication
- Measurement of usage by facilities


## ENERTALK EDGE GATEWAY

- 5-minute data monitoring device for DR business
- For checking the total amount of electricity in buildings and factories
- Wired (Ethernet) communication

* Please contact us for any further information.

www.enertalk.com

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