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2025.08.

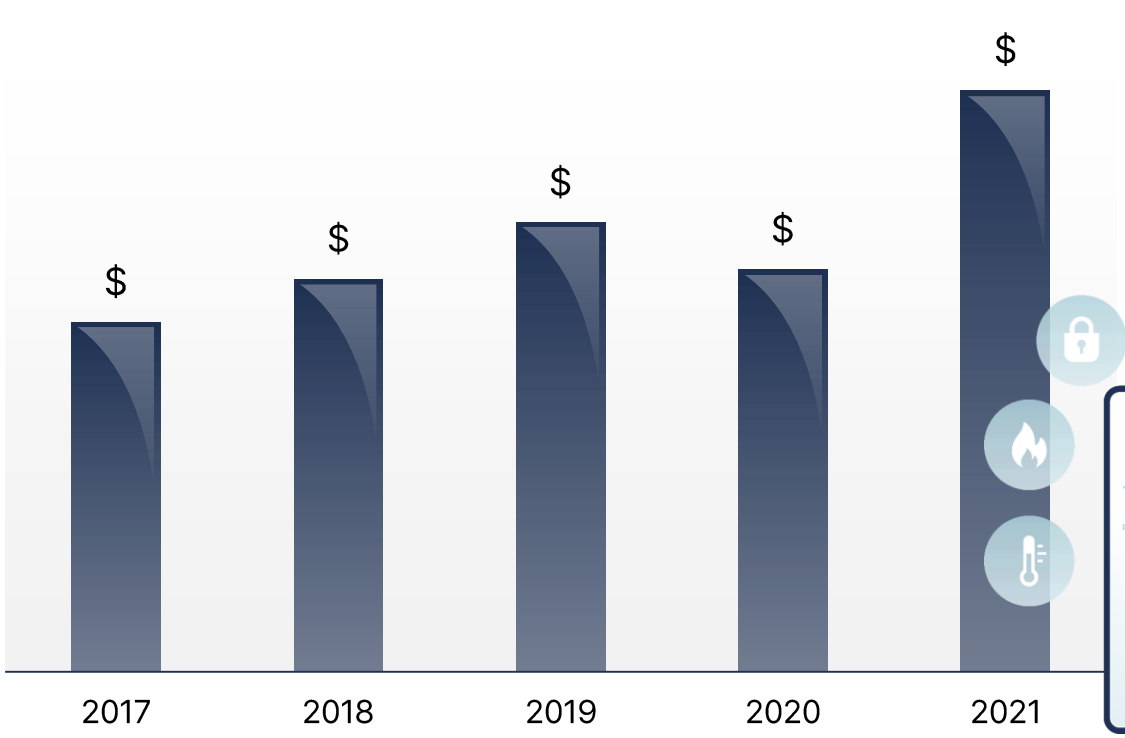
Smart Power Platform

Next Generation Intelligent Power Network System for Zero-Energy Smart City Implementation

Problem recognition

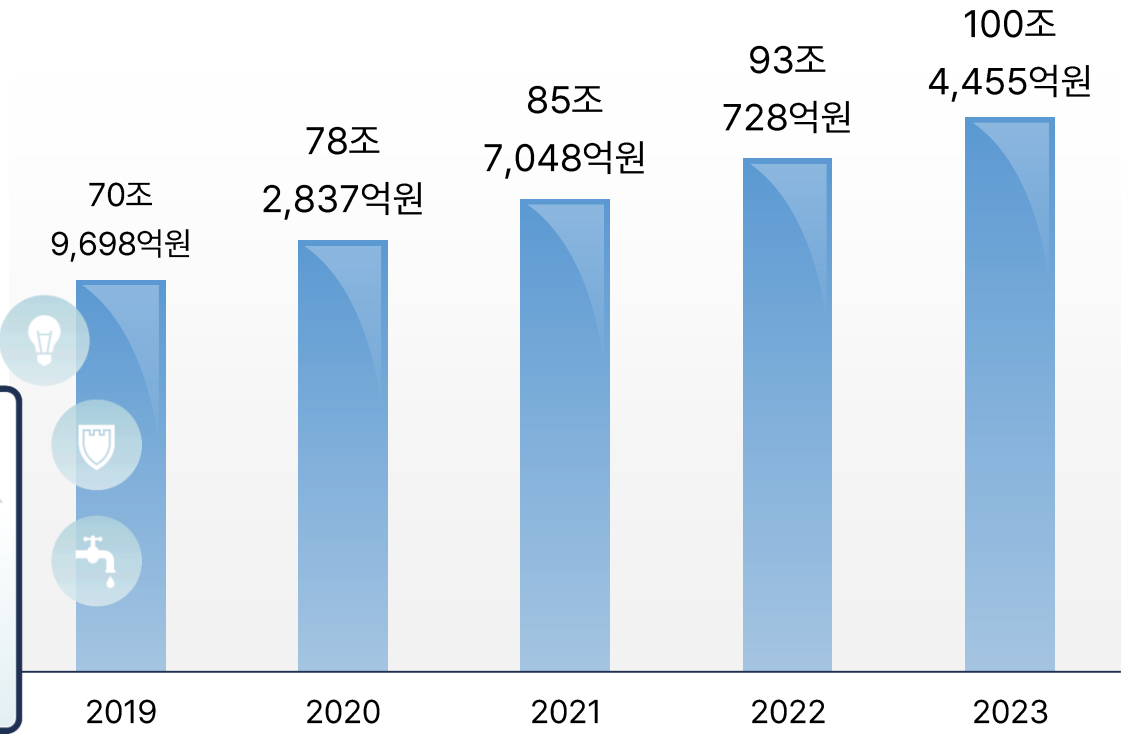
Smart home platform and smart city expansion

Global smart home market size trend



출처 : 스트래티지애널리틱스, 2021 세계 스마트 홈 전망

Domestic smart home market size trend



출처 : 한국AI스마트홈산업협회, 2020 스마트홈 산업현황

Problem recognition

smart home appliances

standby power
11%

an existing house

Korea Energy Agency presentation material

standby power
25%

smart home homes

Expert presentation material

Electricity bill
100%+∝
impression

Problem recognition

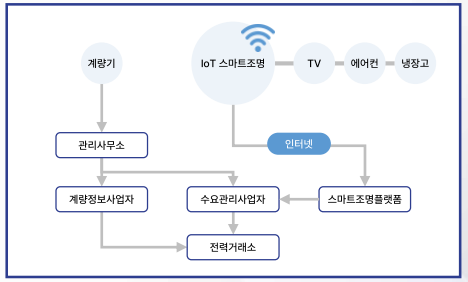
Blackout problem is serious

- Global Blackout Surge
- Recently, the power shortage has intensified due to the rapid growth of the global "AI Semiconductor and AI Data Center.“
- One or two nuclear power plants are needed just to run one AI semiconductor factory, such as using electricity, more than 30 times the amount of power used for maintenance in data centers with AI functions
- Power Market with Smart Distribution and Optimization Solution "No Business Model to Respond to Supercycle "

Absence of "demand resources" business model for source power remote control

DR demand resources and solution transformation process

Unplugging the cord (analog)



Auto DR

Citizen DR

Smart DR (digital transformation)

Solution

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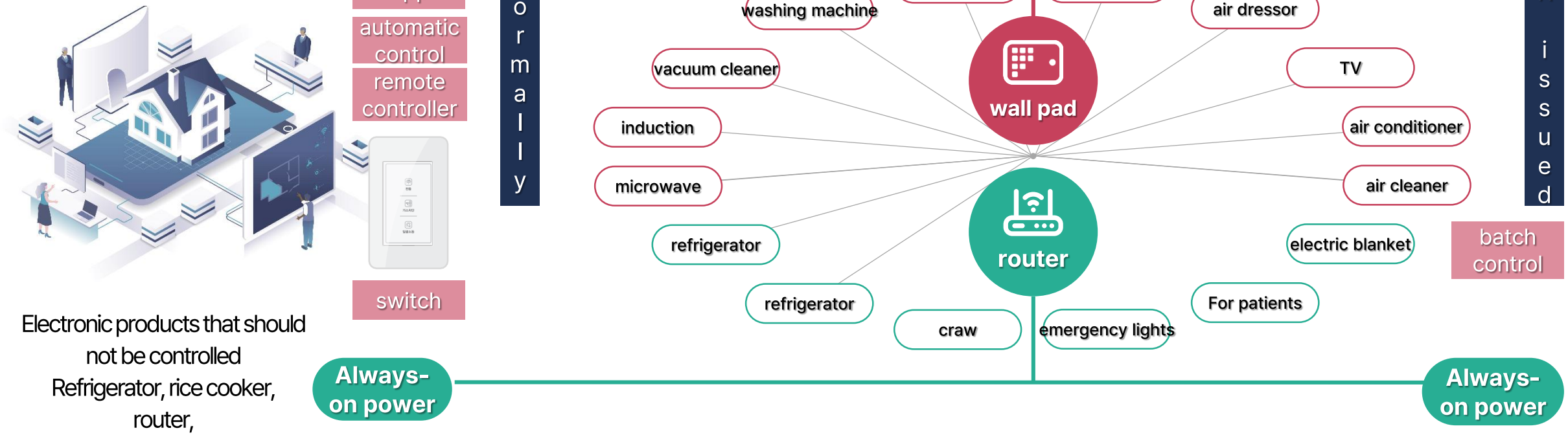
Smart power platform design based on smart distribution system (app, EMS)

DR control system for demand management, such as 100% blocking of standby power through app-based remote/automatic/manual power control when going out and sleeping and remote control of power for all consumers in case of power supply emergency.



Solution

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"Smart DR solution" for remote power control based on smart distribution system(app, PMS)

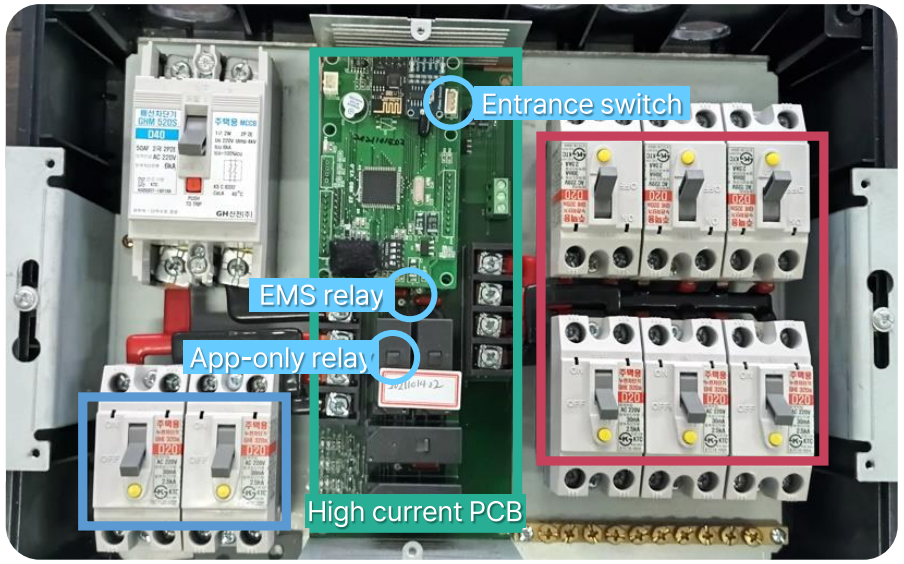
PCB module for remote control of power, separated into constant power and forced power in the distribution panel, and equipped with communication modules, IC chips, sensors, and relays

App

Remote power control system for your own home and your parents' home anywhere in the country.

remote control

home smart distribution board



Earth leakage circuit breaker for constant power

Earth leakage circuit breaker for forced power supply

Entrance wired/wireless switch

manual control

RF remote control and wired/wireless manual switch at the front door for use by elderly people who cannot use apps

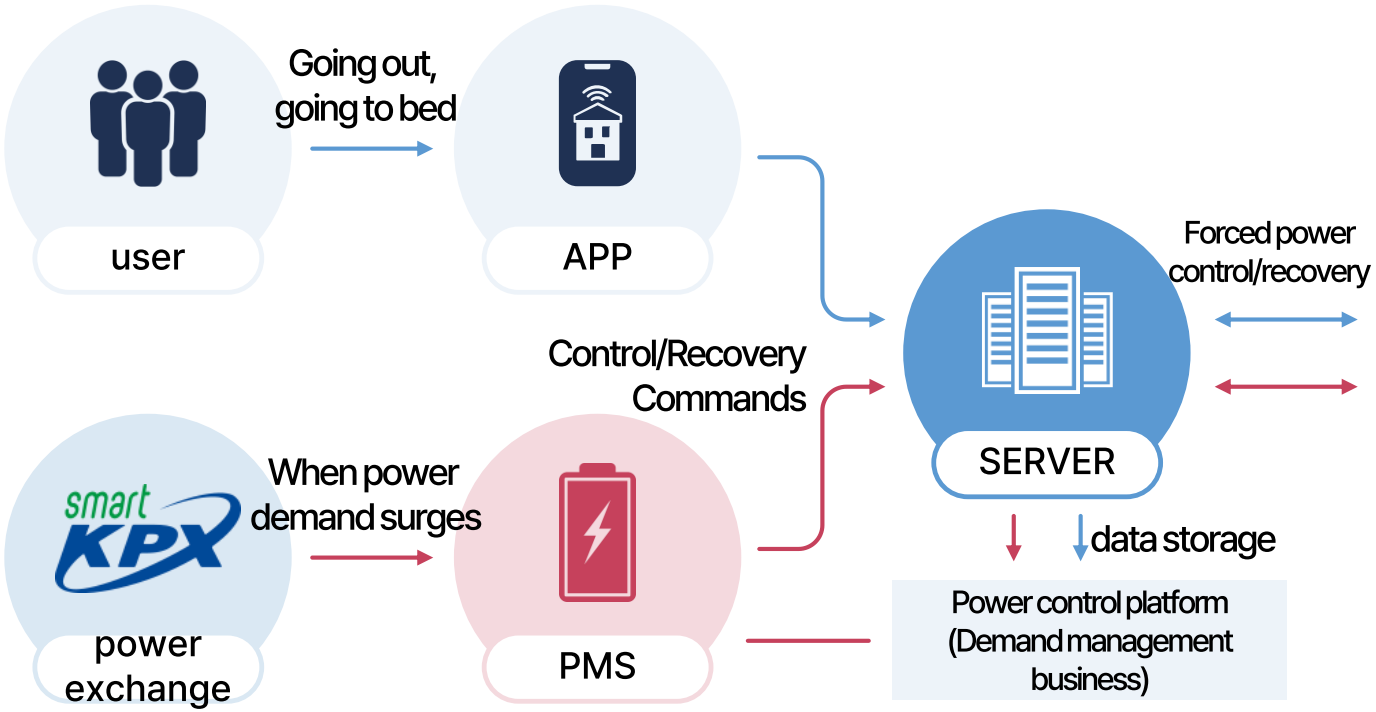
1	100% standby power block
2	One app Versatile power control possible
3	Strengthening safety management by linking temperature, smoke, flame sensors and gas locks
4	linked to government policy DR solution for power demand management

Solution

Control system for apps and smart DR solutions based on smart distribution system (App, PMS)

In case of power supply emergency, fine dust warning, abnormal temperature occurrence, or insufficient supply reserve capacity, the Korea Power Exchange issues DR.

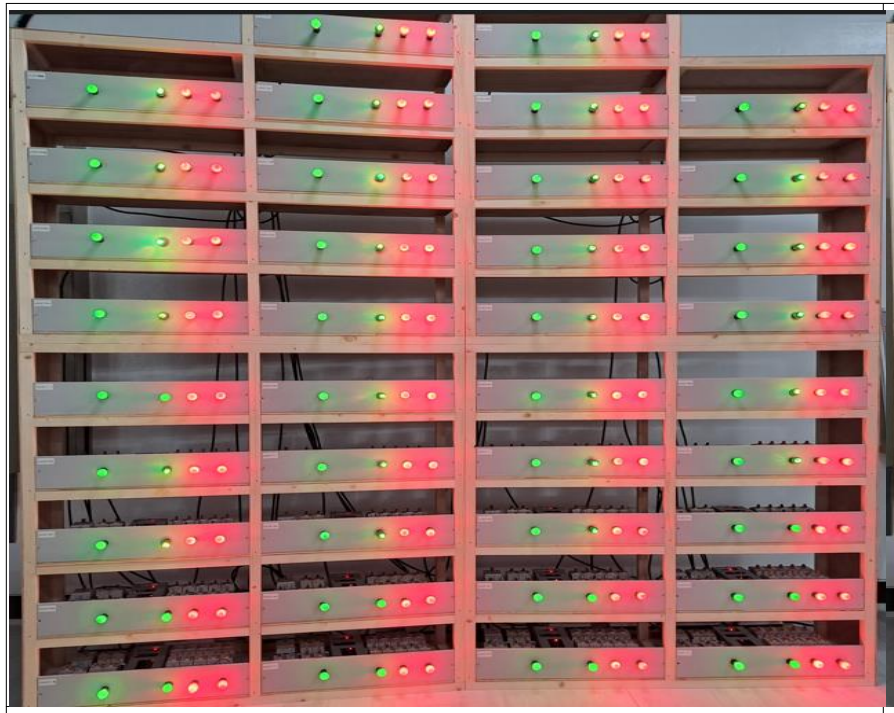
* The power control system monitors power usage, sensor detection, etc. of all customers and remotely controls the power (forced power) of all customers when DR is issued



Solution

Smart Power Platform for Electricity Saving, Safety Management, and Demand Management in Apartment Houses or Smart Cities

Demand Response Control System Demonstration (40th Generation Apartment)



an entire generation **ON**

Compulsory power for all generations when demand response is issued **OFF**

customer benefit

Calculation of carbon emissions when 100% standby power is cut off as suggested by Korea Energy Agency and experts

Due to the global energy shortage, electricity bills are expected to rise by 40-90%, and it is time to improve energy efficiency, starting with homes.

Even though we are aware of the problems of reducing and disposing of fossil power plants, the number of fossil power plants continues to increase.

Customers can solve social problems such as achieving carbon neutrality, reducing greenhouse gases, and responding to climate change, and this can create a virtuous cycle that returns profits.

	Save annual power usage	Save on annual electricity bills	Annual greenhouse gas reduction	Reduction in annual carbon emissions
An existing house	4,800kwh(11%) = 528kwh	137,280	0.24256 tCO_2	0.25064 tCO_2
smart house	4,800kwh(25%) = 1,200kwh	312,000	0.55128 tCO_2	0.56964 tCO_2

core technology

Comparison of existing distribution boards and smart distribution systems

	Existing technology	proposed technology
Technology name	 distribution board	 Smart distribution system
characteristic	· A device that simply distributes power according to various loads such as lighting, electric heat, and power loads.	· "Digital transformation" from iOT-based existing power to smart power · App function: Power remote/automatic/voice/manual control · EMS function: Remote control of forced power to multiple consumers in the power control system
pros and cons	· Equipped with only some functions such as overcurrent and earth leakage blocking	· Convergence technology for saving electricity bills, safety management, and demand management · Distributed energy, virtual power plant, and smart grid core technologies · Internet and server installation required as it is IOT-base
note	· **Recently launched a smart distribution panel that provides power consumption and progressive alarms, including measuring instruments.**	· Korea Energy Agency is currently applying for new items for "high-efficiency energy equipment," and when certification is secured, it will be possible to pursue private contracts and government subsidy projects.

Promotion of verification and pilot projects

K-Testbed Demonstration

제 2022 – 01호

K-Test Bed Technology/Product Performance Confirmation

1. **실증기술(제품)명** : 대기전력 제로화 및 자가 안전관리 주택용 "스마트 분전반 시스템"

2. **신청인**
   가. 법 인 명 : 에너파이브 외1
   나. 사업자번호 : 675-49-00351
   다. 소 재 지 : 제주특별자치도 제주시 노연로 133, 301호

3. **기술개요**
   ◦ 기존 분전반을 개선한 IoT용 PCB모듈화 탑재로 전력제어 및 안전관리까지 가능한 스마트 분전반 시스템(어플리케이션, EMS)

4. **기술성능확인 장소** : [illegible]

5. **성능확인 조건**
   센터 내 실증실험동 1세대에서 전자제품 설치하여 스마트 분전반 적용시 및 미적용시 각 28일간 전력 측정

6. **기술성능확인 내용**
   ◦ 스마트 분전반 적용시 대기전력 차단확인 및 미적용시와 대비하여 절감되는 전력량(18.8%) 측정
   ◦ 스마트 분전반 운영시 단자부 온도측정
   ◦ 휴대전화 앱을 통한 전력 원격제어 및 자동제어 동작여부 확인
   ◦ 노약자용 수동스위치 동작여부 확인

「K-테스트베드 공동운영규정」 제17조에 의거 위 실증기술(제품)에 대한 성능확인서를 발급합니다.

2022년 2월 9일

한국토지주택공사 사장

Ministry of Land, Infrastructure and Transport, Smart City National Pilot City Innovation Service Model Discovery and Verification Expansion Project

business overview

name	스마트분전반 시스템 (앱,EMS) 기반 국민DR 실증
cost	300 million won
place	Busan eco delta smart village
period	2023. 05. 04 ~ 2023. 11. 10
company	(주)에너파이브
consignment agency	(주)파란에너지

2층형(2F) - 19세대

구 분		블록형				단독형		
		A	B	C	D	E	F	G
세대수		4	2	4	2	5	1	1
면적(㎡)	공급면적	92.95	100.87	101.30	94.78	98.31	29.51	51.99
	서비스면적	30.95	26.30	32.82	25.37	27.74	13.84	14.53
	마당&테라스	51.46	55.82	43.87	44.91	61.87	61.24	6.50

3층형(3F) - 37세대

구 분		블록형				단독형		
		A1	A2	B1	B2	C1	C2	D
세대수		8	8	4	4	4	3	6
면적(㎡)	공급면적	125.77	125.45	130.00	130.31	129.91	129.91	155.21
	서비스면적	51.97	52.36	59.37	59.77	57.20	57.20	56.35
	마당&테라스	47.34	47.34	99.36	97.63	90.45	89.42	95.44

Technology verification

Busan Smart Village DR control system verification

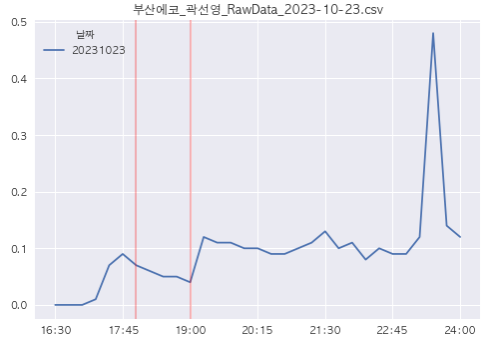
control system

스마트빌리지 1...	2018287253	101호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	7,855.41 Wh 119,198,48,14:5...
스마트빌리지 1...	2022611861	102호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	7,766.8 Wh 118,47,129,105:...
스마트빌리지 1...	2022546325	105호	ON	ON	ON	ON	정상	센싱불가	정상	기본모드	3,751.19 Wh 119,198,48,197:...
스마트빌리지 1...	2022677397	106호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	3,537.18 Wh 58,29,99,200:50...
스마트빌리지 1...	2018221717	108-1호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	6,614.98 Wh 211,197,55,230:...
스마트빌리지 1...	2028182933	111-1호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	6,276.91 Wh 119,198,35,11:6...
스마트빌리지 1...	2024382101	112-1호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	6,890.68 Wh 58,29,103,205:5...
스마트빌리지 1...	2015534485	112-2호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	7,445.57 Wh 182,225,254,11...
스마트빌리지 1...	2015403413	113-1호	ON	ON	ON	ON	정상	센싱불가	정상	기본모드	6,646.23 Wh
스마트빌리지 1...	2017173653	114-2호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	5,717.39 Wh 58,235,148,139:...
스마트빌리지 1...	2022874005	119호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	6,681.03 Wh 211,197,57,106:...
스마트빌리지 1...	2022415253	120호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	6,723.92 Wh 58,235,72,120:5...
스마트빌리지 1...	2017239189	121호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	5,943.93 Wh 221,164,73,166:...
스마트빌리지 2...	2022808469	204호	ON	OFF	OFF	OFF	정상	센싱불가	정상	EMS모드	8,660.1 Wh 182,225,254,12...

Technology verification

First results of the Korea Power Exchange National DR demonstration project (8th generation: 60-minute data visualization data analysis)

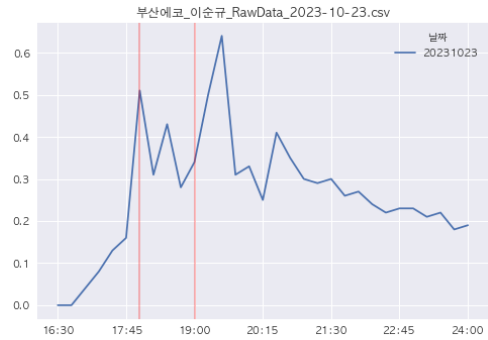
reduction rate : 42.9%



reduction rate : 9.1%

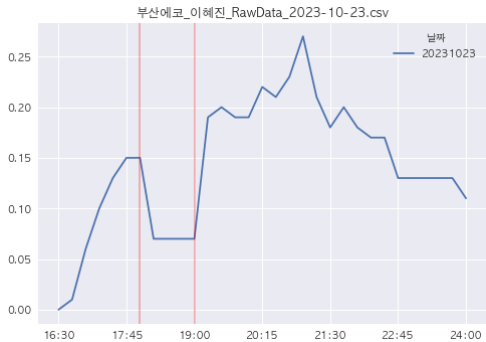
reduction rate : 16.7%

reduction rate : 33.3%

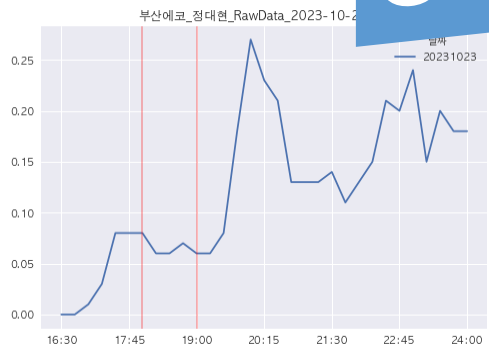


평균 전력 감축율

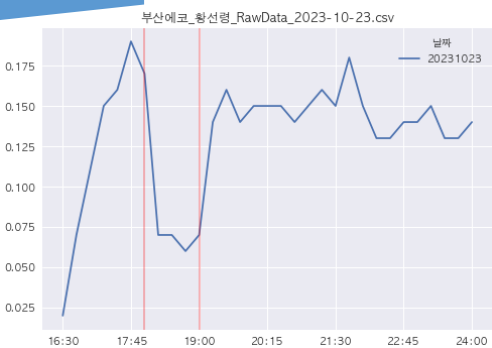
35.61%



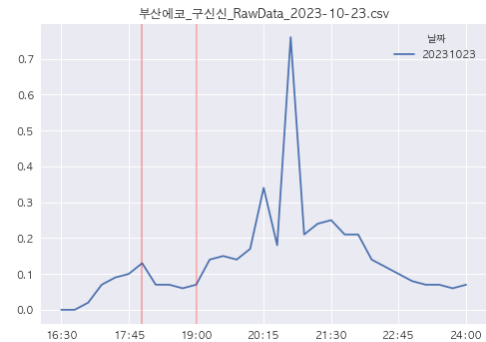
reduction rate : 53.3%



reduction rate : 25%

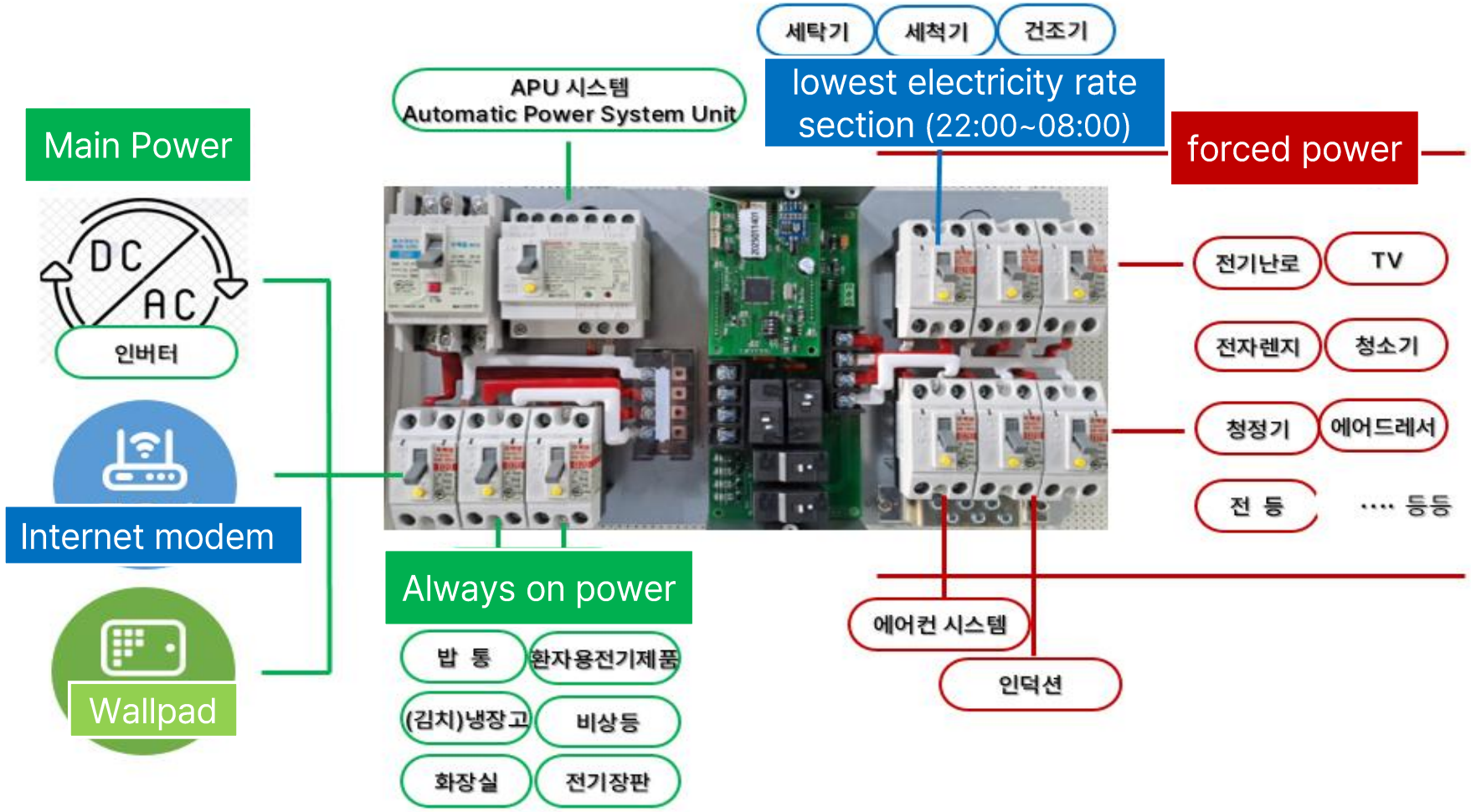


reduction rate : 58.8%



reduction rate : 46.1%

Smart Distribution Panel System (App, EMS) with APU for Large Apartment



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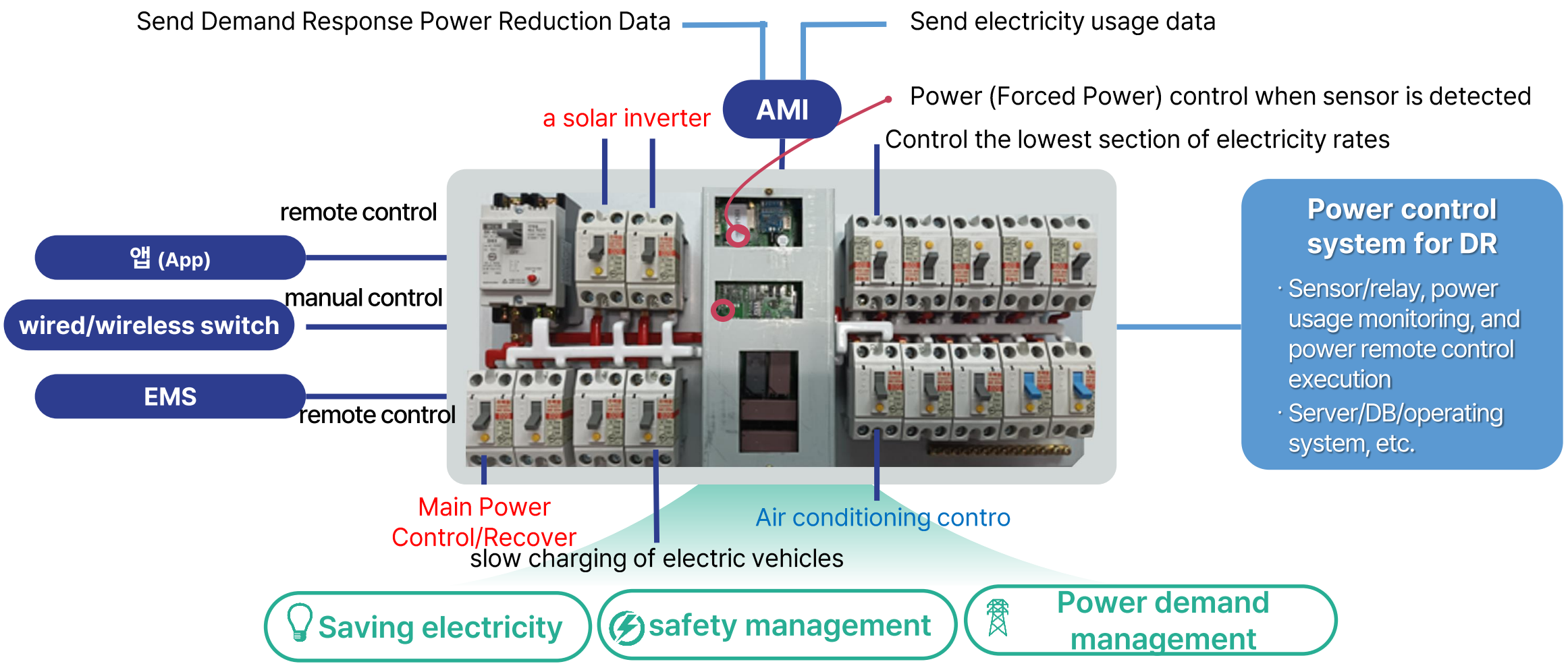
Solar Smart Distribution Panel System (App, EMS) Conceptual Chart for IOT

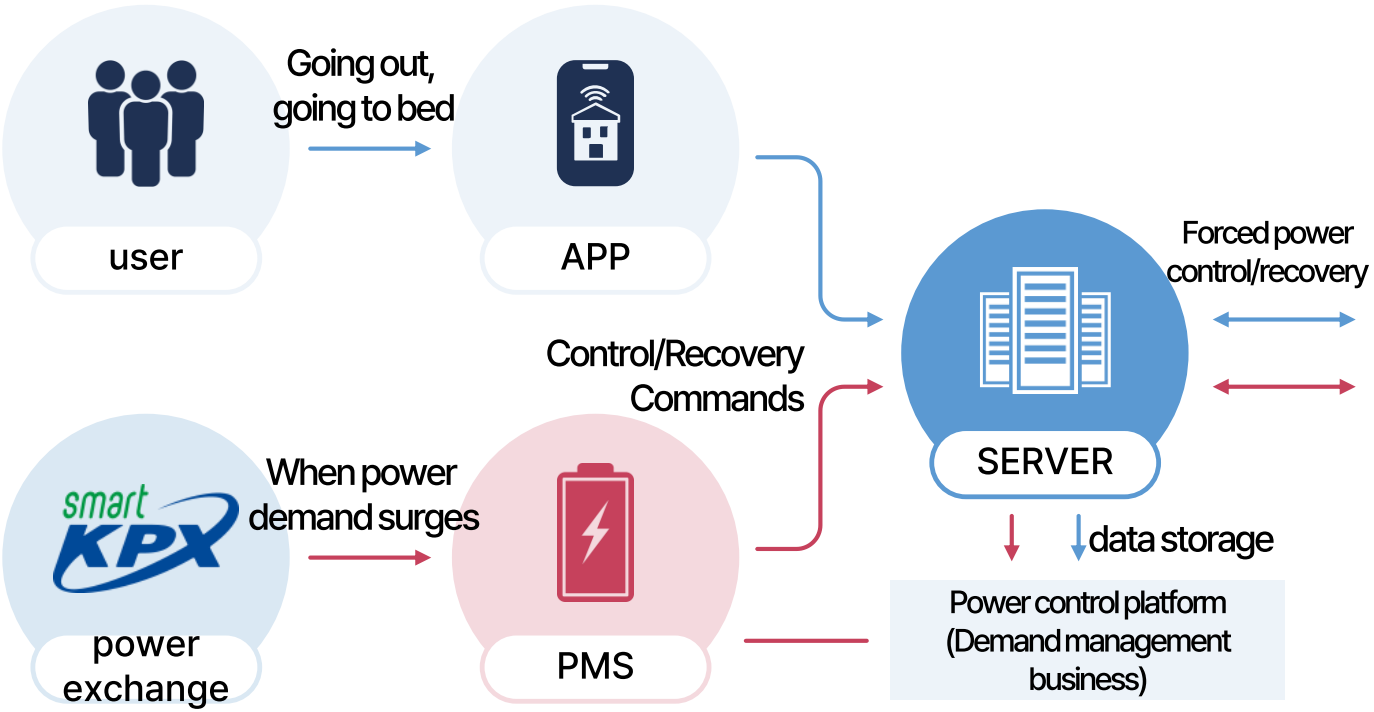


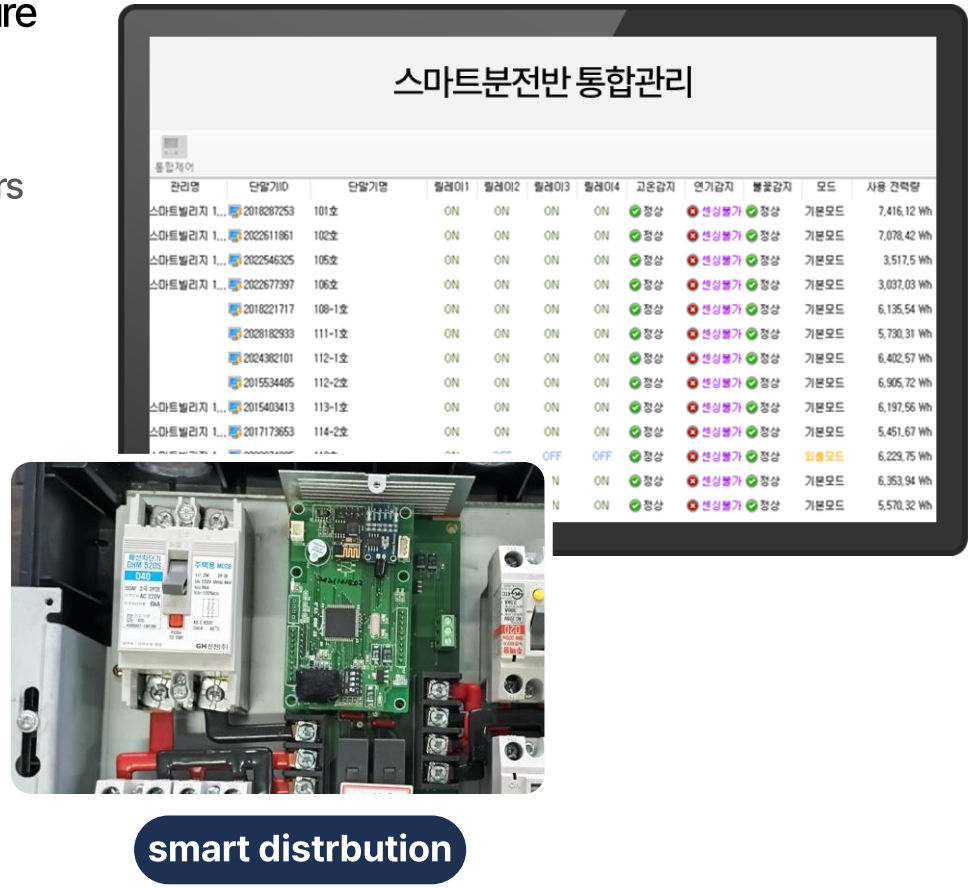
Technology verification

Control system for apps and smart DR solutions based on smart distribution system (App, PMS)

In case of power supply emergency, fine dust warning, abnormal temperature occurrence, or insufficient supply reserve capacity, the Korea Power Exchange issues DR.

* The power control system monitors power usage, sensor detection, etc. of all customers and remotely controls the power (forced power) of all customers when DR is issued





competitive advantage

Competitiveness

Core technology

	division	detail	Registration details
1	**Save on electricity bills**	· App-based remote/automatic/manual power control when going out or sleeping, blocking 100% of standby power · App (Android, IOS) based control and wireless switch contro	~ 40%
2	**safety management**	· 온Equipped with temperature, smoke, and flame sensors · Two-way control system linked to power and gas lock can be installed · Electrical fires can be prevented even when pets run and play on an induction cooker.	~ 60%
3	**Power demand management**	· Remote control of forced power supply to consumers when electricity demand surges and fine dust emissions reduction measures are issued · Operation of control system for DR · Core technology for self-sufficient demand response virtual power plant autonomous operation	~ 60%

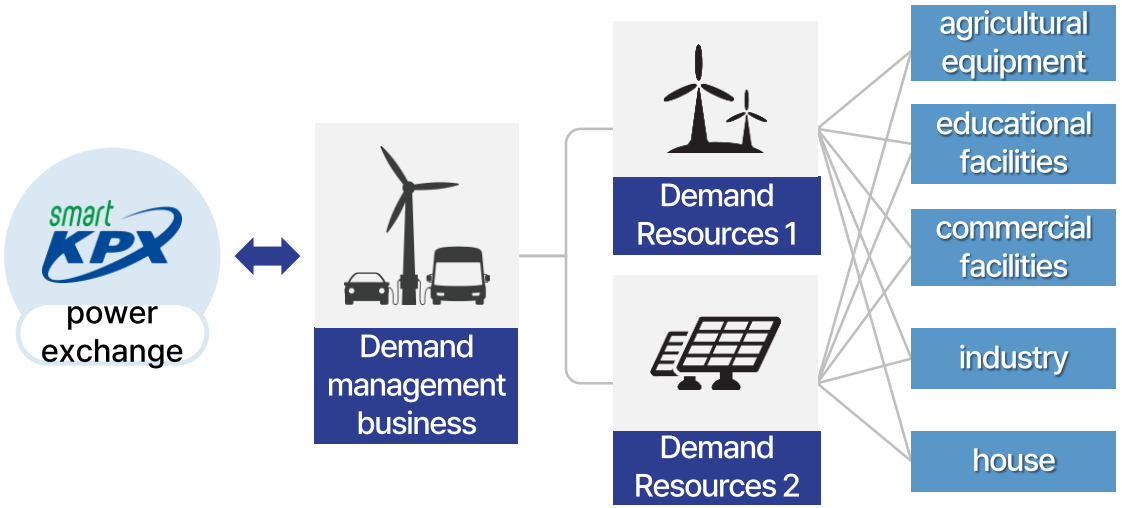
Compare products from other companies

item	distribution board	smart distribution board(other)	smart distribution board(our)
power remote control	×	×	**O**
Standby power blocking rate	×	×	**100%**
Safety management function	×	×	**O**
Power demand management	×	×	**O**
power control system	×	×	**O**

Korea DR (demand response market) market size

The DR market began in earnest in January 2015 to improve energy efficiency and resolve the blackout that occurred in Korea on September 15, 2011.

Demand response market operating system



power exchange

- Demand resource trading market operation /
- Request for mandatory reduction in power demand (sudden power supply order)

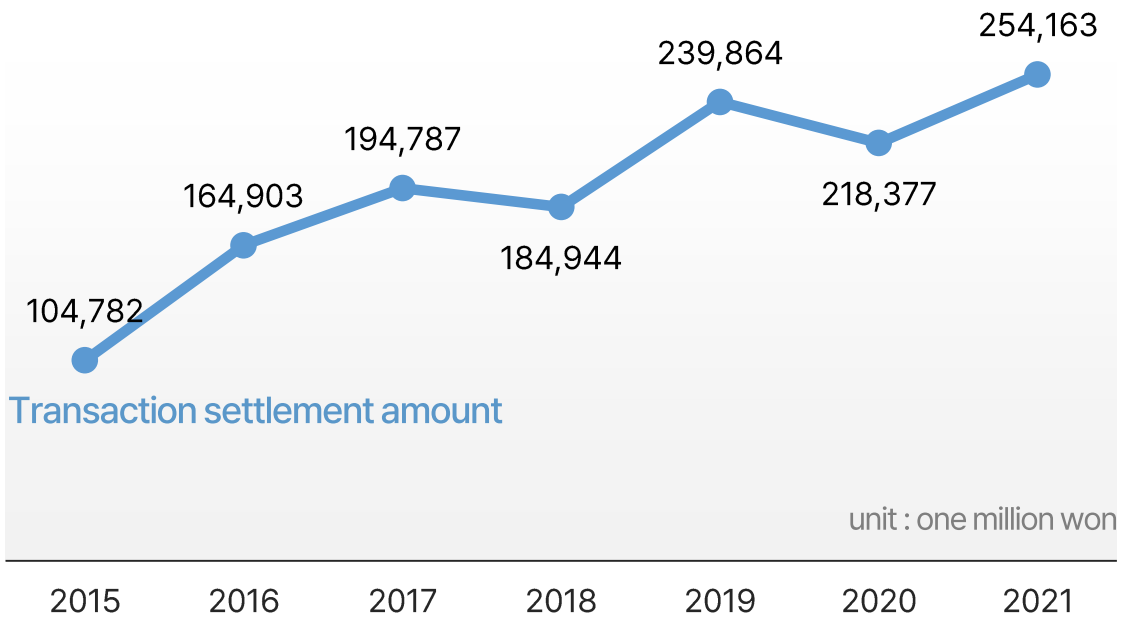
Demand management business

- Discovery and registration of
- demand resources
- mplementation of demand resource
- reduction directive and participation
- in one-day exhibition
- Participating customer monitoring

Participating Customers

- Signing a contract with a demand management business
- Reduce demand according to demand reduction instructions

Demand resource transaction settlement trend by year



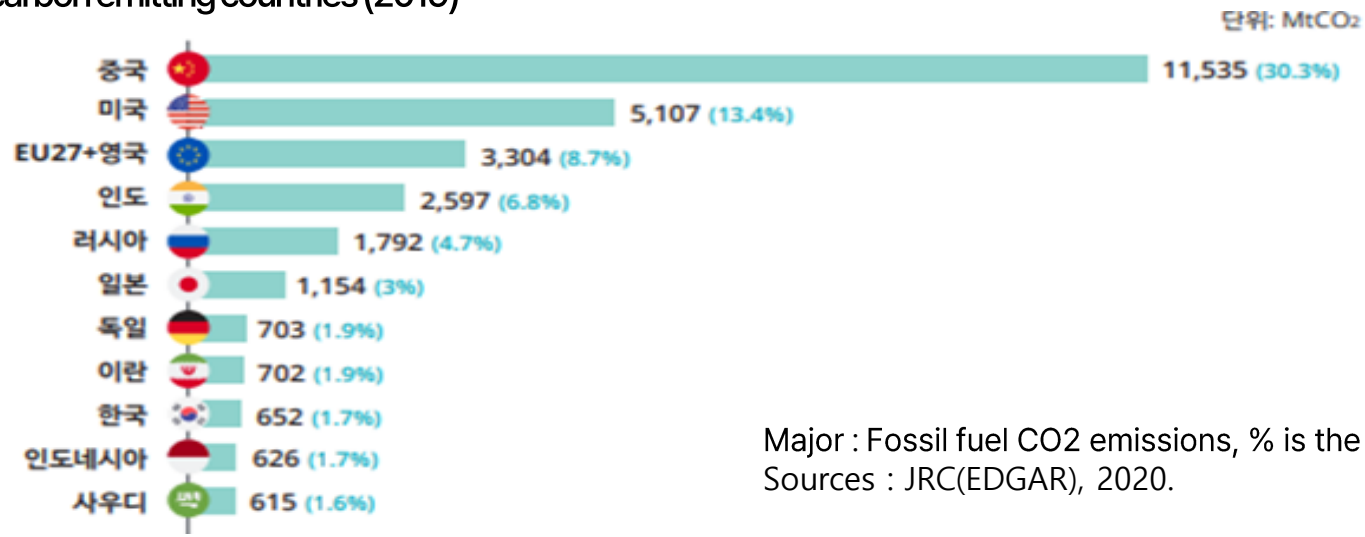
Source: Korea Power Exchange '2021 Electricity Market Statistics'

Market size

UK DR (demand response market) market size

In the UK, the demand resource capacity secured in the one-year advance auction in 2022 is 528MW, which is more than twice the transaction volume in 2021.

Top carbon emitting countries (2019)



Major : Fossil fuel CO2 emissions, % is the proportion of global emissions in the country
Sources : JRC(EDGAR), 2020.

Comparison of auction bid volume before and after revision of capacity market support plan

연도	수요반응자원(MW)	가스발전(MW)	전체(MW)
2018년	195 (5%)	2,030 (56%)	3,626
2020년	239 (11%)	986 (44%)	2,252

Analysis of overseas energy conversion technology trends (energy efficiency and electrification sector)

▢ Energy efficiency improvement and electrification are presented as the means with the highest contribution to greenhouse gas reduction among various technologies. (IEA, 2020)

- CO2 reduction contribution by technology : efficiency improvement(44%) > renewable energy(36%) > carbon capture(6%)

▢ Energy efficiency improvement technology covers a wide range of energy consumption, making it difficult to clearly classify and define, but is largely divided into improved device efficiency and improved operational efficiency.

division	Characteristics and main trends
Improved device efficiency	Development of technology to increase consumption efficiency of energy-consuming devices - (USA) Securing 200Kw super premium industrial electric motors - (Germany) Launch of a product with improved efficiency by integrating motor, inverter, and pump, and development of a two-way inverter capable of reactive power compensation
Improved operational efficiency	Control device energy consumption and optimize heat network - (Japan) Next-generation AMI distribution and data visualization development - (Netherlands) Development of data center cooling system and heat source device - (UK) Intelligent network control, flow optimization

※ reference : Technology and Innovation(2022), Energy efficiency improvement technology development trends and issues

Market size

Global technology trends related to power demand management

Core technology name	Country with the best technology	holding institution	Main research content	Highest technology spec
Demand resource management technology	USA	EnerNOC	Development of proprietary DR algorithm	Demand management load capacity approximately 33GW
Energy big data processing technology	USA	AutoGrid	Power grid big data analysis/prediction	Cloud-based power platform operation
Energy management system technology	USA	IBM	Building energy analysis and control solution	Establishment of adaptive rule based model
	korea	Encored Technology	Provide energy saving solutions for building/home use	Development of power usage collection/analysis system

※ Reference: Korea Smart Grid Association/Korea Electric Power Newspaper, Smart Grid Yearbook

Our power demand management technology

Core technology name	Country with the best technology	holding institution	Main research content	Highest technology spec
DR management technology Energy management system	korea	enerfive	IoT-based DR control system for power demand management	power remote control (Smart distribution board)

Market expansion strategy

VPP core technology: Demand-responsive power self-sufficiency virtual power plant autonomous operation solution technology development

The need to develop a new self-sufficient energy conversion business model using distributed resources that excludes the KEPCO power system to respond to climate crises such as war and fossil power generation is emerging.

There is a need to pass the "Special Act on Distributed Energy Activation" and establish a local distributed energy smart power ecosystem.

Eco-friendly electric vehicle charging fee, home building factory application service

- Special discount rate: ESS charging rate of 80% or more
- General rate: ESS charging rate 40%~80%
- Demand surcharge: ESS charging rate 10%~40%
- 제|Development/verification collaboration with Jeju Island's electric vehicle regulation-free special zone is necessary.

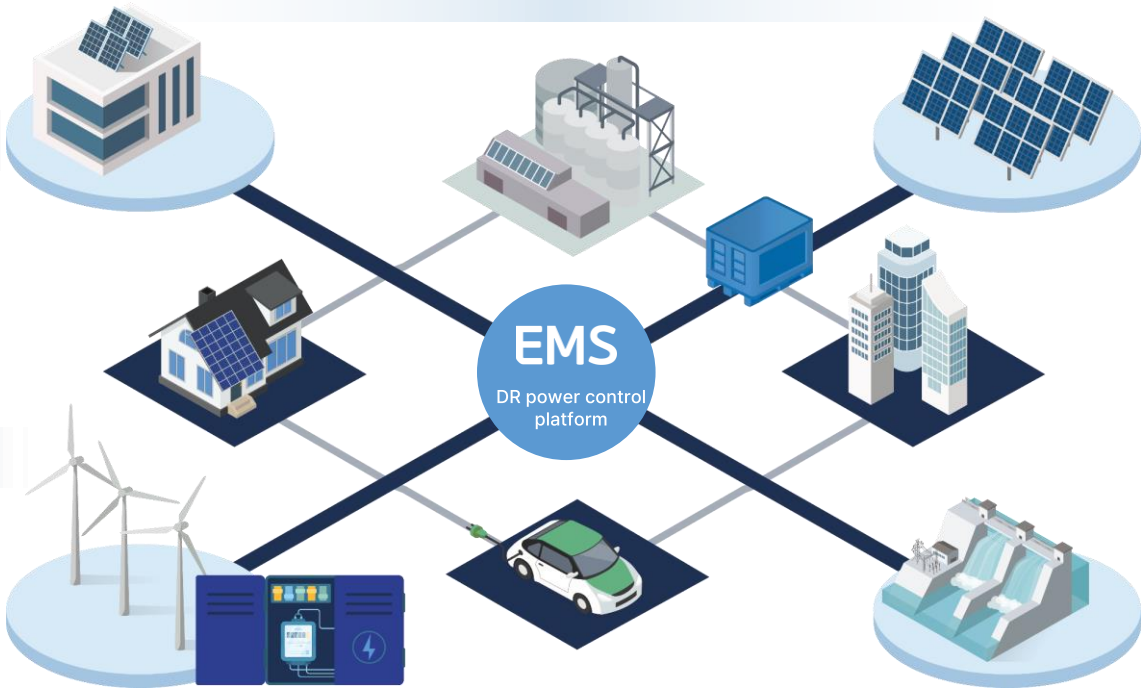
Artificial intelligence, big data, and security-based DR autonomous operation system

- ESS charging rate 20%~10%: step-by-step control
- ESS charging rate below 10%: All simultaneous control
- Need for development/verification collaboration with Gwangju City's green energy development regulation-free special zone

DR power control autonomous operation system development and infrastructure construction

- Server, DB, operating system, etc.

Focus on eco-friendly green energy
Self-sufficient smart power autonomous operation concept diagram



(주)에너파이브
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