IERE Electric Power Technology Platform

2025 IERE-TPC Taipei Net-Zero Workshop

AMI Development in Taiwan

Smart Meter Deployment & Application

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Abstract


一 AMI Deployment
二 Taiwan AMI Architecture
三 Next Generation AMI System
四 Big Data Applications

Smart Meter Rollout Plan

Following Taiwan Government Smart Grid Planning

	2013 - 2018	2019 - 2020	2021年 – 2024	2025 - 2030
Industry	System Construction	Upgrade 2G to 4G	System Enhancement	Industrial meters has all deployed in the year of 2013.
Commercial Residential – Strategy	Area Usage 900KWH	Area Usage 700KWH	Area Usage 500KWH	Area Usage 400KWH
Commercial Residential – Target	200K Meters	1M meters	3M meters	6M meters
Commercial Residential – Result	230K Meters	1.09M meters	The year of 2035 will be all deployed.	
Monitoring Usage	60%	63%	69%	81%

80/20 Rule

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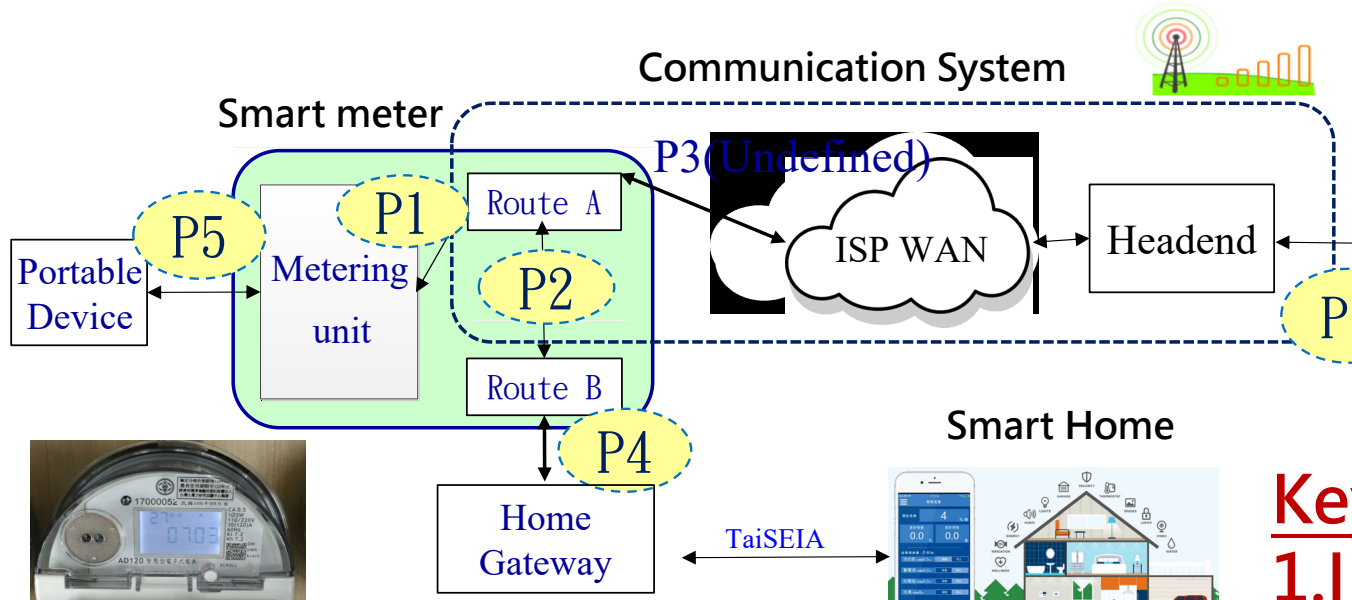
AMI Architecture in Taiwan



Route A Module　Route B Module

P1: IEC 62056 (DLMS/COSEM)
P2: IEC 62056 HDLC
P3: Open Standard(4G、NBIOT、RF...)
P4: TaiSEIA(CNS 16014)
P5: CNS 15593
P6: IEC 61968(CIM)

Key Features：

1.IEC Standard
2.Plugable module
3.Avoid Vendor Lock-in
4.Support Smart Home

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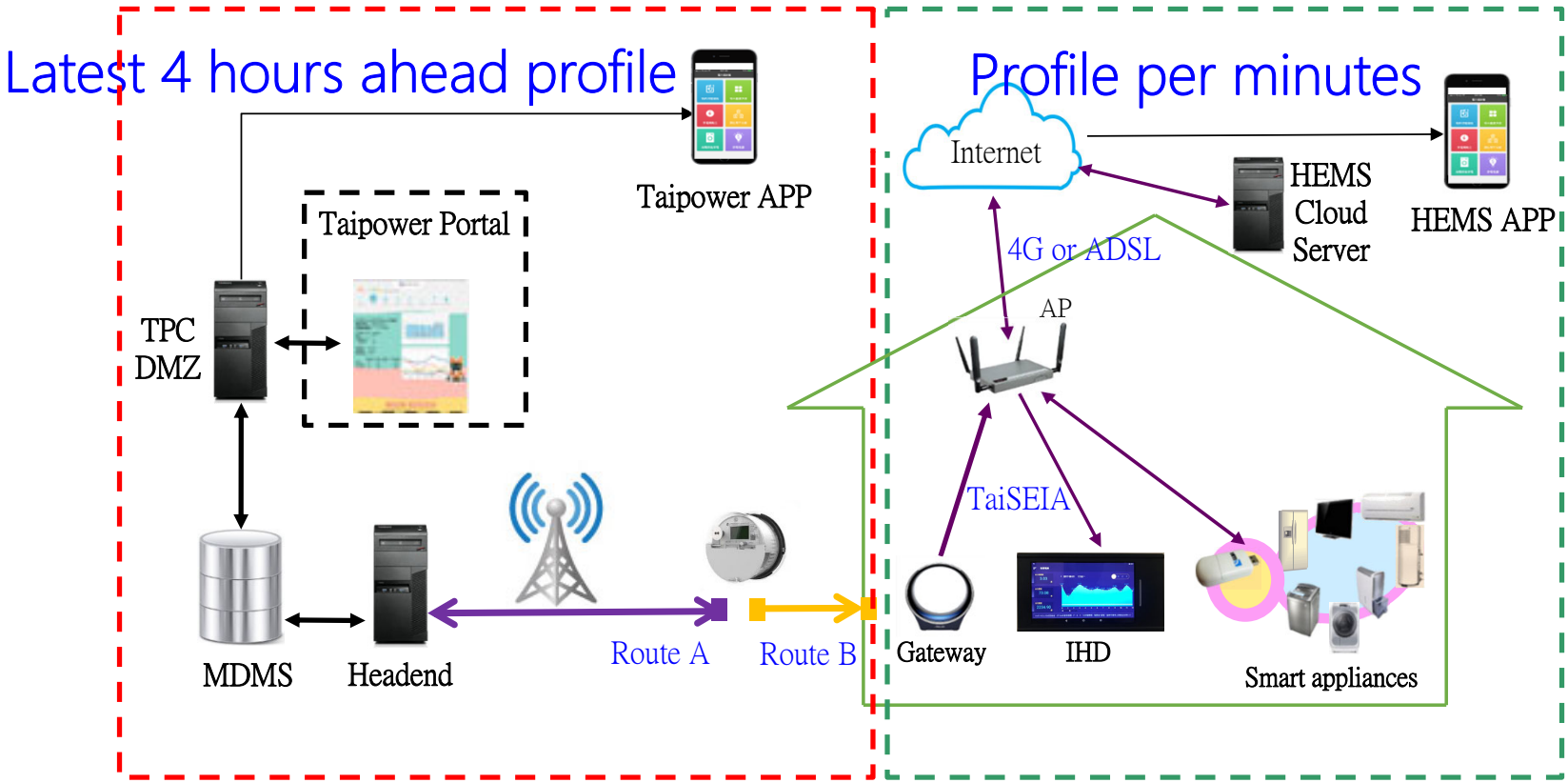
Connects HEMS with Smart Meter



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Local AMI Vendors in Taiwan

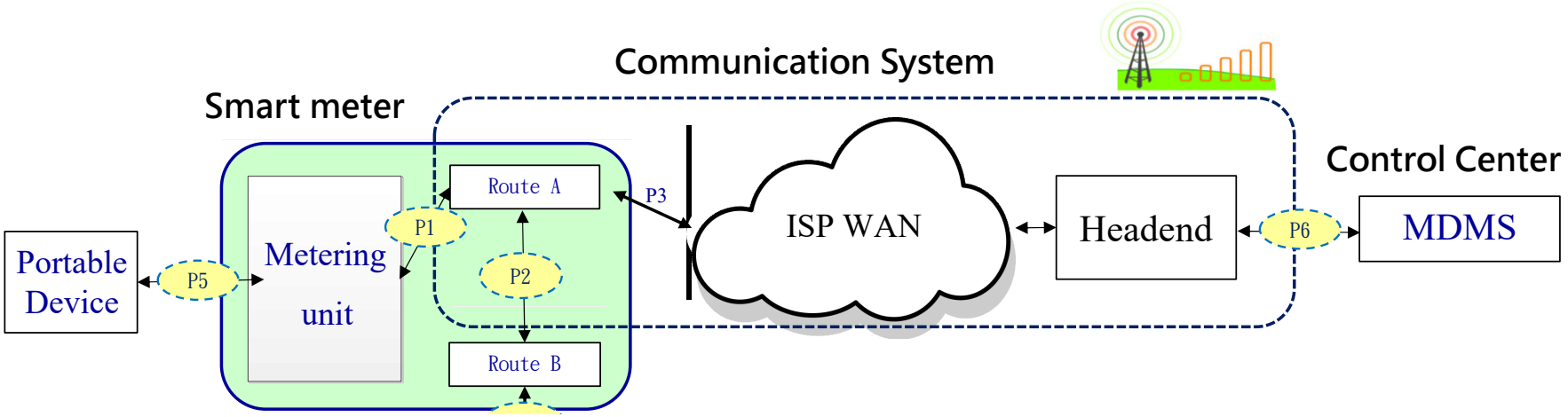
The Most complex integration！

Smart Meter

Communication

Information System

Taiwan AMI Performance



Meter reliability Rate

99.31%

Communication Success Rate

97.3%

Billing Cycle Success Rate

99.19%
(Under 97.3%)

P.S：How to improve PKI index ?
How to increase AMI benefits ?

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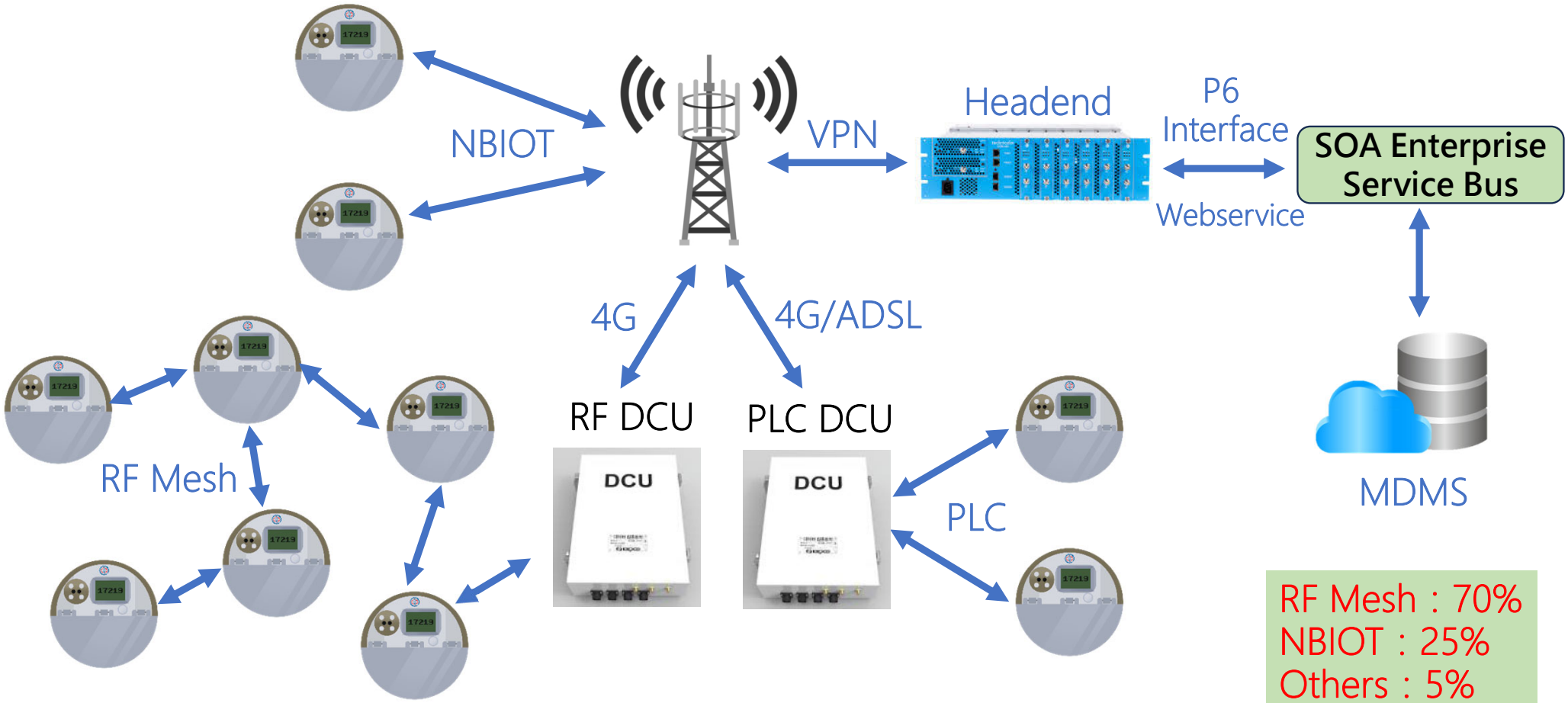
Taiwan AMI Communication Architecture



RF Mesh：70%
NBIOT：25%
Others：5%

P.S：1% without communication(people reject repeaters)

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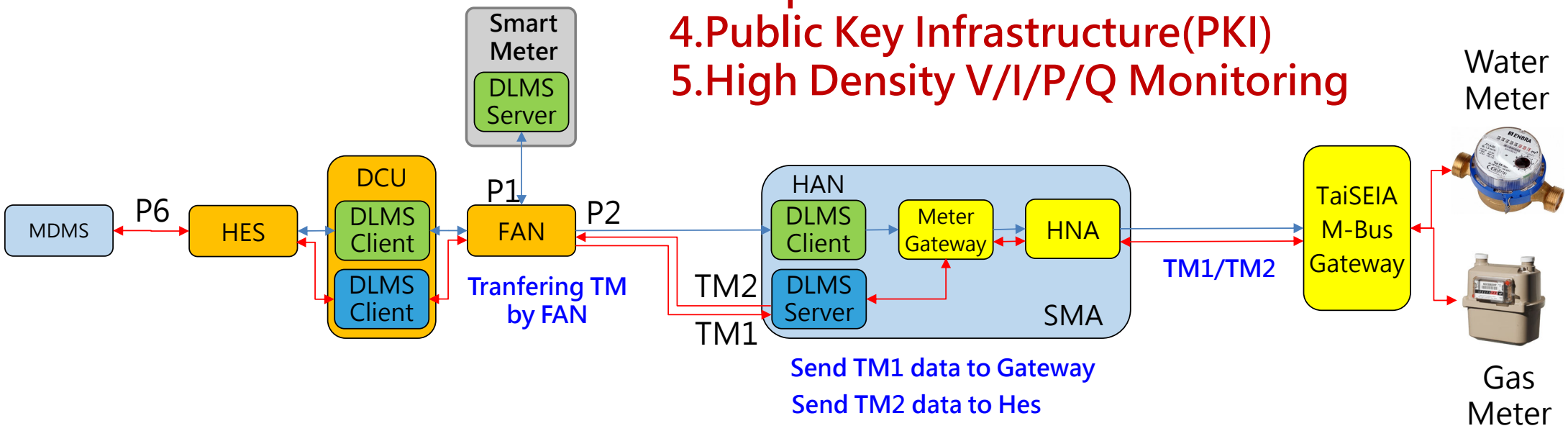
Next Generation Smart Meter Functions

Highlights：

1. Route A/B Bidirectional data exchange
2. Bluetooth
3. Temperature Sensor
4. Public Key Infrastructure(PKI)
5. High Density V/I/P/Q Monitoring



Next Generation AMI Communication

Medium Voltage(11.4kV/22.8KV) BPLC Pilot

There are 5 PLC Stations connected: M → L1 → L2 → L3, R

Station 1	Station 2	Distance
M	L1	180m
L1	L2	150m
L2	L3	200m
M	R	380m

Difficult Communication in Basement

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Next Generation AMI Communication

One Year pilot

The communication is perfectly stable !

(No fault occurs)

嘉年華戲院(L3)

3Mbps ⇄ 4Mbps

嘉義慈濟診所(L2)

8.5Mbps ⇄ 9.5Mbps

財神帝國大樓(L1)

21Mbps ⇄ 24.5Mbps

嘉義市立美術館(M)

4G → Internet

21Mbps ⇄ 17Mbps

合作金庫(R)

Monitoring Power Dispatching Room

PLC Master Site (No Camera)

Monitoring Voltage & Current data per minutes

TagName	Value	Result
PM04		
PM04.Vln_avg	116.026	Good
PM04.Vll_avg	0	Good
PM04.I_avg	0	Good
PM04.Freq	60.034	Good
PM04.kW_tot	0	Good
PM04.kvar_tot	0	Good
PM04.kVA_tot	0	Good
PM04.PF_avg	0	Good
PM04.kWh	0.01	Good
PM04.kvarh	0	Good
PM04.kVAh	0.01	Good

TagName	Value	Result
PM04		
PM04.Vln_avg	115.912	Good
PM04.Vll_avg	0	Good
PM04.I_avg	0	Good
PM04.Freq	60.05	Good
PM04.kW_tot	0	Good
PM04.kvar_tot	0	Good
PM04.kVA_tot	0	Good
PM04.PF_avg	0	Good
PM04.kWh	0.01	Good
PM04.kvarh	0	Good
PM04.kVAh	0.01	Good

TagName	Value	Result
PM04		
PM04.Vln_avg	229.133	Good
PM04.Vll_avg	0	Good
PM04.I_avg	0	Good
PM04.Freq	60.05	Good
PM04.kW_tot	0	Good
PM04.kvar_tot	0	Good
PM04.kVA_tot	0	Good
PM04.PF_avg	0	Good
PM04.kWh	0.005	Good
PM04.kvarh	0	Good
PM04.kVAh	0.005	Good

PLC Master Site (No Sensors)

TagName	Value	Result
PM04		
PM04.Vln_avg	229.133	Good
PM04.Vll_avg	0	Good
PM04.I_avg	0	Good
PM04.Freq	60.05	Good
PM04.kW_tot	0	Good
PM04.kvar_tot	0	Good
PM04.kVA_tot	0	Good
PM04.PF_avg	0	Good
PM04.kWh	0.005	Good
PM04.kvarh	0	Good
PM04.kVAh	0.005	Good

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Next Generation AMI Communication

System Demo

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The Roadmap of AMI Big Data Analysis

	At present		Development in the future		
User Serv	●Develop Energy-Saving Service ●Promote Smart HEMS	Demand Manage	▲School ADR Program ▲Aggregator promoting	■Develop residential ADR	◆HEMS Service
	●Develop New TOU Rates	TOU Rates	▲Industry real time pricing ▲New TOU pricing ▲Smart Stree light pricing	■EV Charging pricing	◆Low voltage peak variable electricity price
	●Provide Over Usage Notification ●Visualize Power Usage	Customer Service	▲Enhance Taipower Apps ▲Smart Home Monitoring	■NIALM Analysis	
	●Auto Metering	AMI Metering	▲Instant moving settlement with APP ▲Remote cut off power		
Grid Support	●Study EV Charging Mode ●Promote Smart Streetlight ●Build utility-scale MicroGrid	Smart App	▲Study G2V&V2G Charging techs ▲Promote Smart Streetlight	■Test utility-scale MicroGrid	
	●Reduce Power Loss ●Visualize voltage variation	CBM	▲improve 3-phase unbalance	■optimize Distribution Transformer Capacity	◆Develop Distribution Transformer CBM Maintenance
	●AMI Outage event to OMS	Control	▲Construct ADMS	■Use AMI Data to run advanced functions	
	●Predict PV power output	PV	▲Upgrage PV prediction Algorithm	■use AMI for predicting	◆Enhance GEMS System

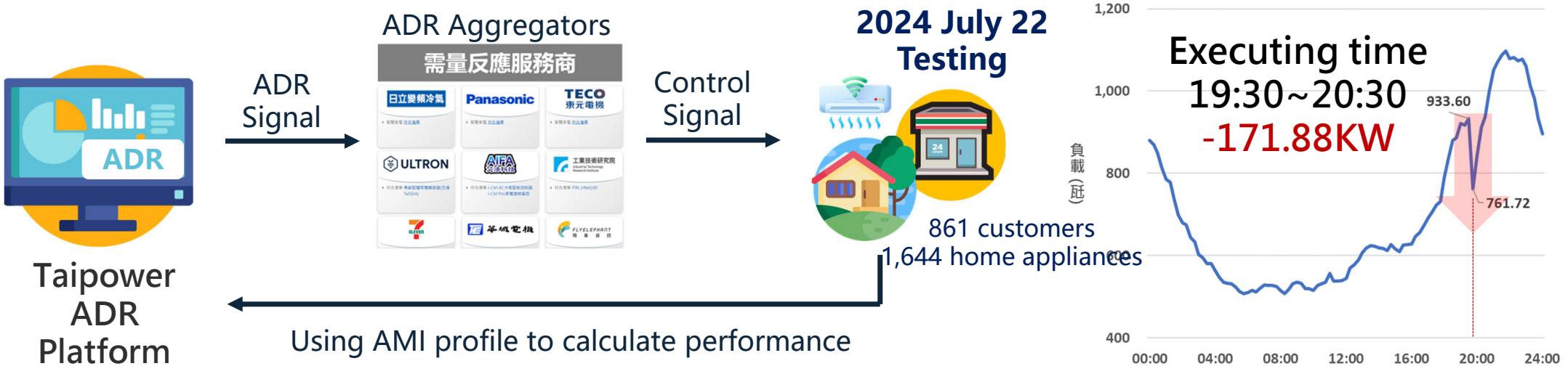
AMI Infra

- Industry Finished 2013
- Residential started in 2017
- 2024 ●3.2 million
- Accelerate Deployment
- 2025 ▲
- 2026 ■ ●Goal : 5 million
- 2027 ◆
- 2030 ★ ●Goal : 7 million
- Complete Roll-out 2024 ●Goal : 1.5 million

Pilot project of ADR for residential and commercial customers

Target Combined with low-voltage AMI deployment, demand response is pushed to small residential and commercial users。

Result A total of 2,319 households and 4,341 devices participated in the ADR trial. During the pilot testing period, ADR was executed 38 times, saving a total of 15,000 kWh of electricity.



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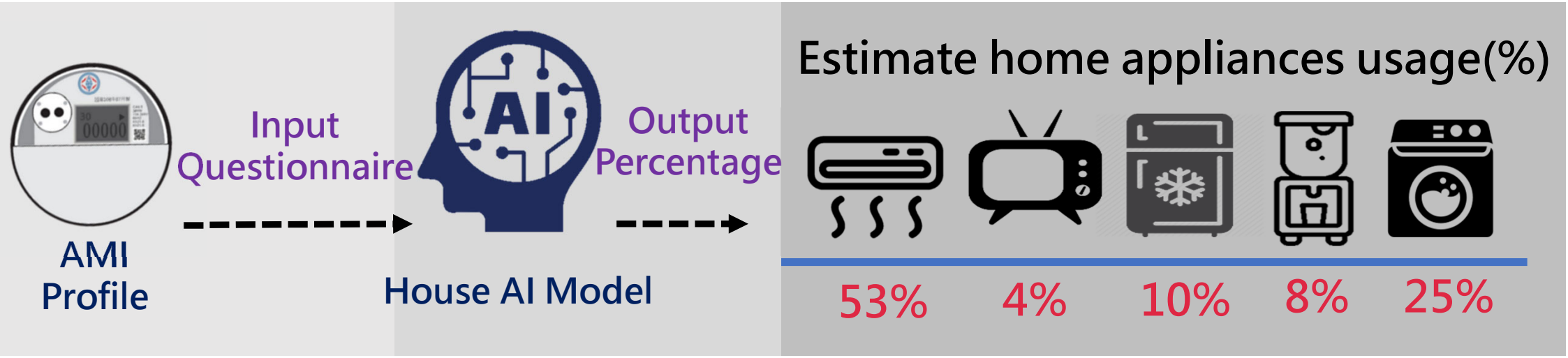
House Power Usage Analysis

The AI analysis model has been under development since 3 years ago



Ext Apps

Comparing with your neighbourhoods

- Subscribers : 39,795 (2025 Apr)
- Satisfication : 90.3% (2025 March Survey)
- Using this service can promote energy-saving awareness : 5.4%

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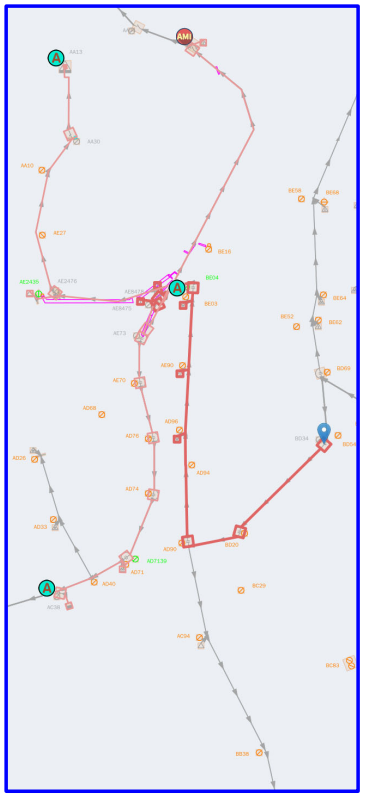
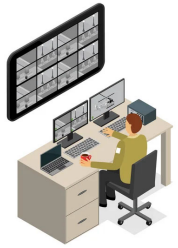
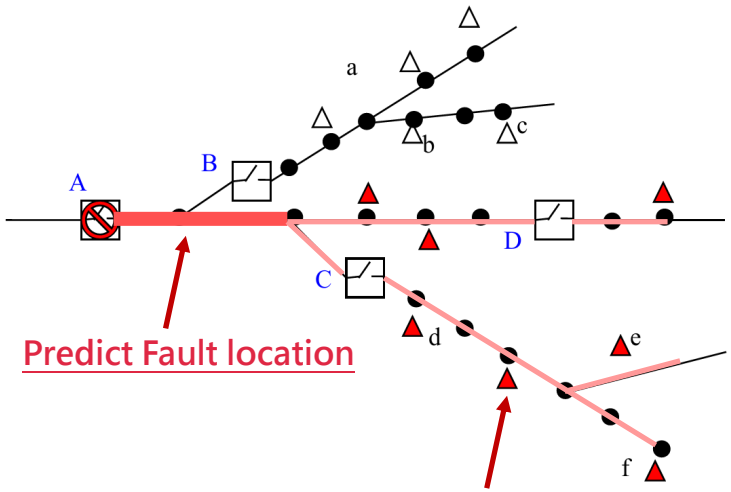
Feeder branch fault prediction



(OMS)
Outage Management System





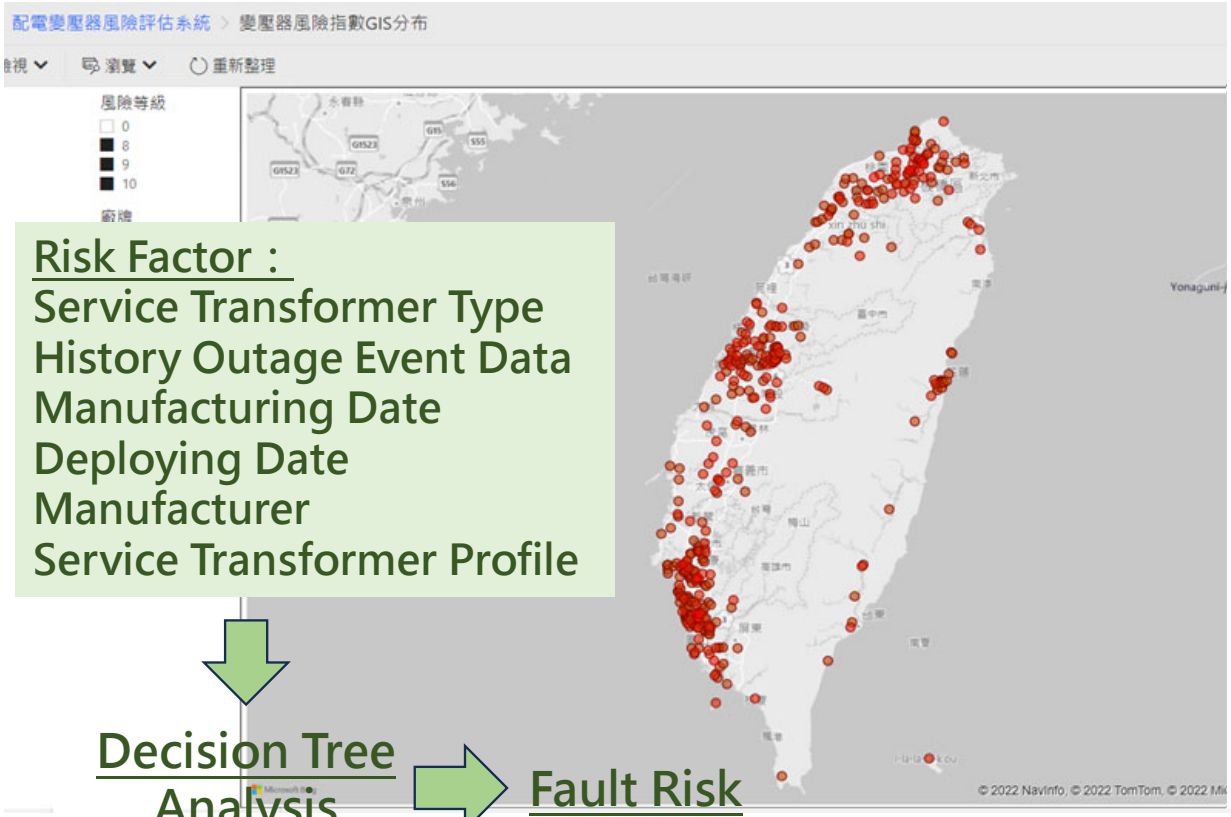
1.OMS will receive outage events from smart meter and combine with call-center tickets from customers.
2.OMS will draw colors to identify fault branch segment and support operator to make a good dispatching decision.

By using AMI outage events, OMS can help feeder operators quickly identify fault segment and reduce repairing time.

圖片資料摘自網路

Developing CBM of Service Transformer Mainteance

The Healthy(Fault Risk) Map



Risk Factor：
Service Transformer Type
History Outage Event Data
Manufacturing Date
Deploying Date
Manufacturer
Service Transformer Profile

Decision Tree Analysis → Fault Risk

Overloading prediction & Alarm

Predict distribution Transformer profile with AMI data

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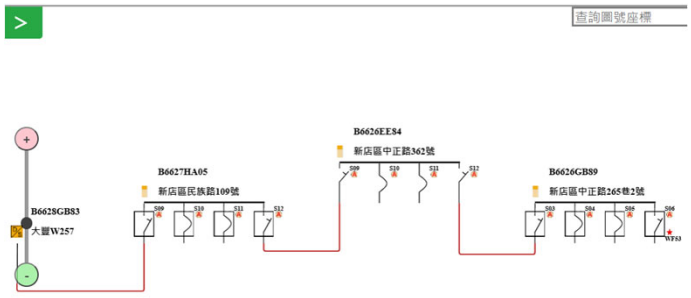
Feeder Visualization Platform Development

四

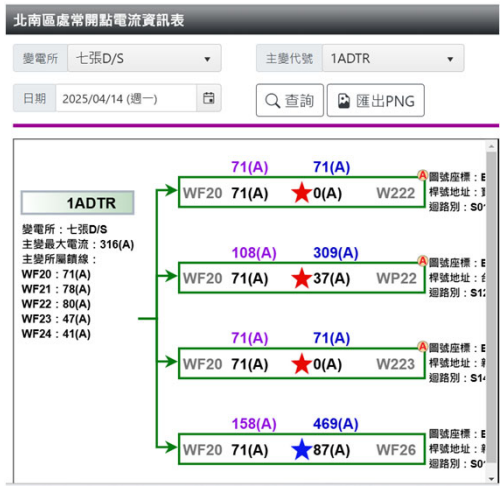
Supporting to develop Grid AMI applications： FVIP System

Rich User-Friendly topology

Power Flow Visualization



Feeder Auto-display topology



N-1 reporting(Switching order suggestion)

Key Features：

1. FVIP system Successfully integrated with OMS、ADMS & AMI System
2. Distribution power big data analysis platform
3. Providing Web-based Single-sign on portal for feeder operator, maintenance crews and planner.

- Analyze Power loss
- Detect Electricity Theft

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