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TEPCO AMI System Enhancements and IoT Solutions

Junya Takada
Head of Technologies, Landis+Gyr Japan K.K.
Char of Wi-SUN Alliance Japan Marketing Sub-committee

129 Anos de Excelência

Alcance Global e Presença Local
Sede suíca com localizações
Em mais de 30 países
no mundo

Empresa Global de AMI do ano 2023
pela Frost & Sullivan
- pelo 7º ano consecutivo

Maior **rede mundial de IoT** com 1.3 bilhões de leituras por dia
com uma precisão de 99.99%

Infraestrutura Inteligente
Parceria com o Google

Maior base instalada com mais de **335 milhões** de equipamentos no mundo

Mais de 137 milhões de dispositivos inteligentes conectados implementados

Mais de **20 milhões de pontos** com serviços gerenciáveis

de serviços para mais de **3,500 clientes** como um parceiro confiável

Mais de 9,5 milhões de toneladas em emissões de CO2 evitadas pela base global de Medição Inteligente da Landis+Gyr

Landis+Gyr

FÓRUM LATINO-AMERICANO DE SMART GRID
SMART GRID

AGENDA

1. Our Qualifications
2. Japan and Japanese Utilities
3. Industry and Regulatory Directions
4. Our Approach and Solutions
5. Key Take Aways and Q&A

THEME:

Landis+Gyr has transformed its offering from a leading AMI Platform into a comprehensive IoT Platform, enabling utilities to become DERMS-ready. This evolution can be achieved incrementally through upgrades, eliminating the need for a complete system overhaul and/or meter replacements.

Key Facts: Landis+Gyr Japan Accomplishments

VOLUME

- Supported over 29 Million Smart Meter Deployment in 7 years.
- Over 1.4 Billion Records collected every day.
- Meter Reads Success Rate: 99.95% (in 48-hour window)

VELOCITY

- All Meter Reads sent to HES every 30 min.
- HES to MDMS Linkage also every 30 mins.
- Meter Reads records sent to hundreds of retail utilities every 30 min.
- Voltage reads push every 5 min. to HES from bellwether meters.

VARIETY

- Ability to read and deliver control commands to other utilities owned battery operated Gas & Water Meters via Wi-SUN Enhanced HAN.
- Ability to read and deliver control commands to PV, EV chargers, heat-pumps, batteries, etc.

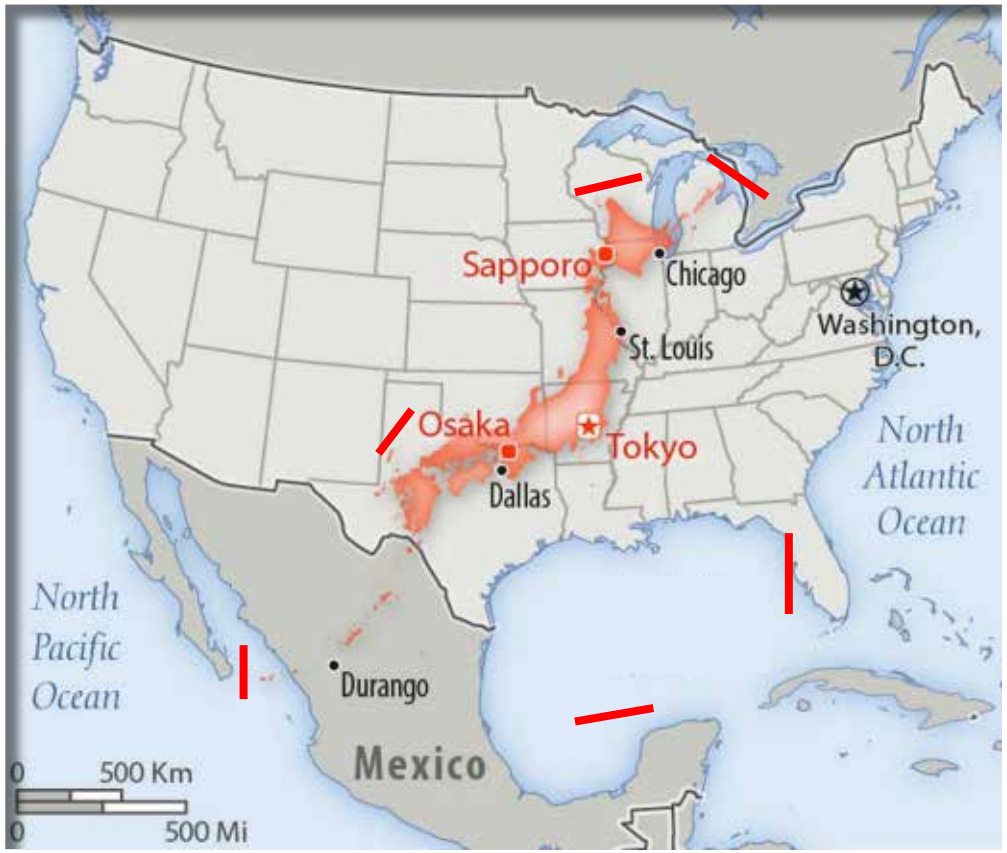
Japanese Utilities

Introduction to Japan

- Japan has 11th largest population of 125 million people, and the world 3rd largest economy.
- Japanese Imperial House started in 2683 years ago, and current emperor is the 126th, the longest standing royal family in the world.
- Japan comprises of over 14,000 islands extending along the Pacific coast of Asia.
- Japan has the sixth-longest coastline in the world at 29,751 km (18,486 mi).
- Japan has the eighth-largest exclusive economic zone (EEZ) in the world, covering, 470,000 km2 (1,730,000 sq mi).

- Japan stretches over 3000 km (1900 mi) northeast–southwest facing Russia, South Korea, China, Taiwan, and USA (Guam)
- Japan is substantially prone to earthquakes, tsunami, and volcanic eruptions because of its location along the Pacific Ring of Fire.
- It has the 17th highest natural disaster risk as measured in the World Risk Index.
- Japan has 111 active volcanoes. Destructive earthquakes, often resulting in devastating tsunami, occurring several times each century.

Introduction to Japan

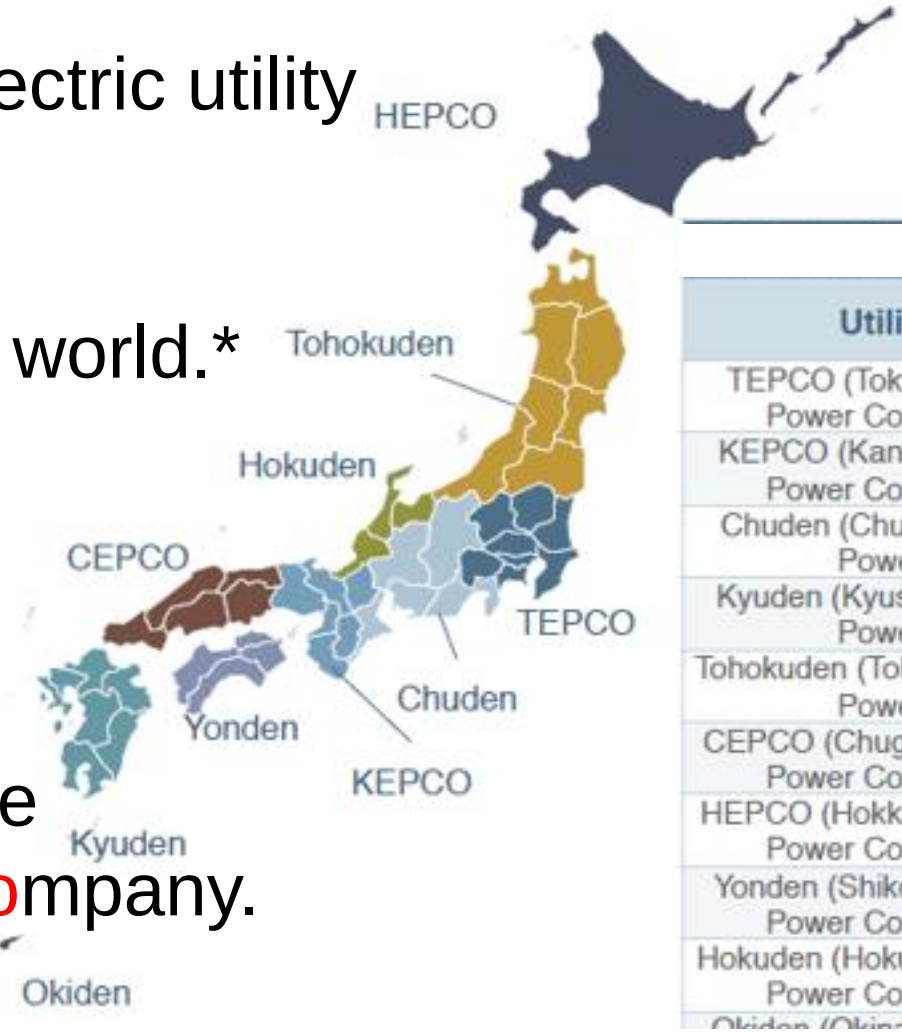


Japan’s 10 Regional Electricity T&D Companies

TEPCO is the 6th largest electric utility in the world by revenue.

KEPCO is 9th largest in the world.*

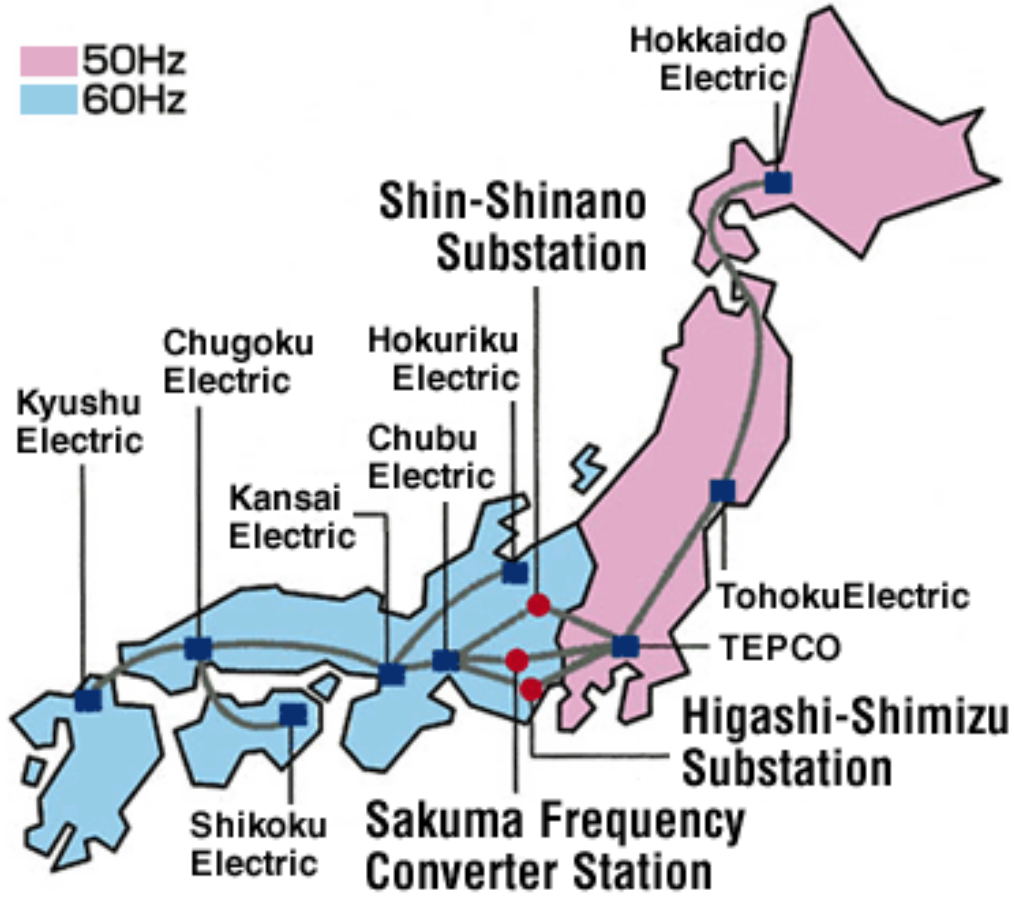
TEPCO is an abbreviation and the English brand name for Tokyo Electric Power Company.



Utility	Total customers
TEPCO (Tokyo Electric Power Company)	29,030,976
KEPCO (Kansai Electric Power Company)	13,607,233
Chuden (Chubu Electric Power)	10,580,446
Kyuden (Kyushu Electric Power)	8,633,540
Tohokuden (Tohoku Electric Power)	7,715,034
CEPCO (Chugoku Electric Power Company)	5,243,498
HEPCO (Hokkaido Electric Power Company)	4,023,233
Yonden (Shikoku Electric Power Company)	2,848,697
Hokuden (Hokuriku Electric Power Company)	2,105,557

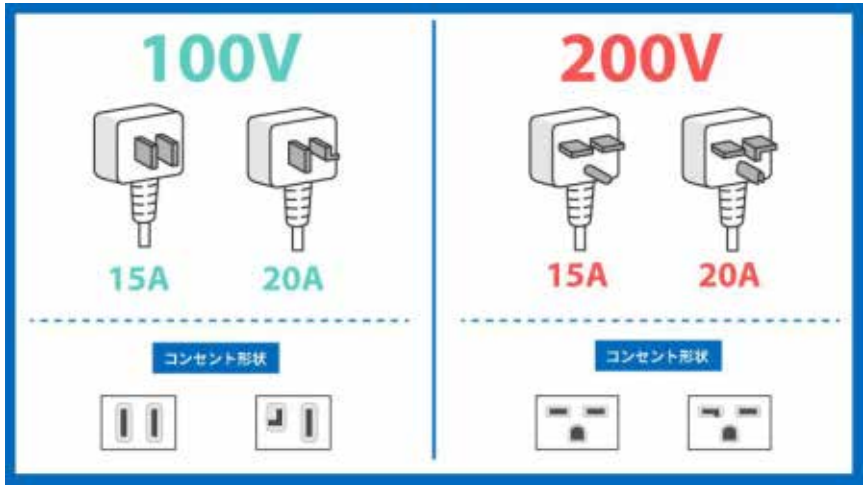
*Source: Investopia.com: 10 Biggest Utility Companies Worldwide

Two Frequencies, Two Voltage, and Two Meters



KEPCO Type Smart Meter

TEPCO Type Smart Meter



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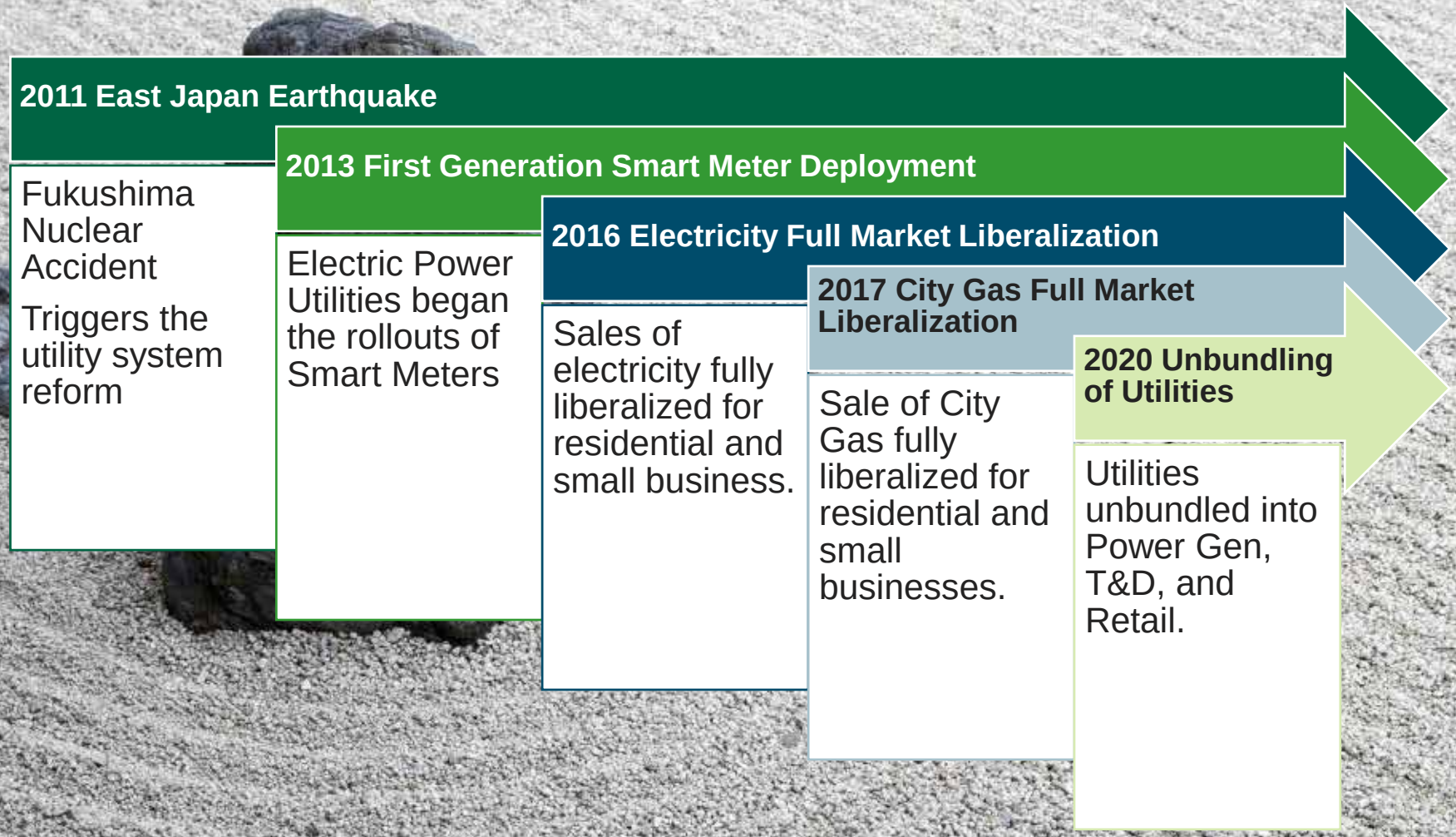
Industry and Regulatory Directions

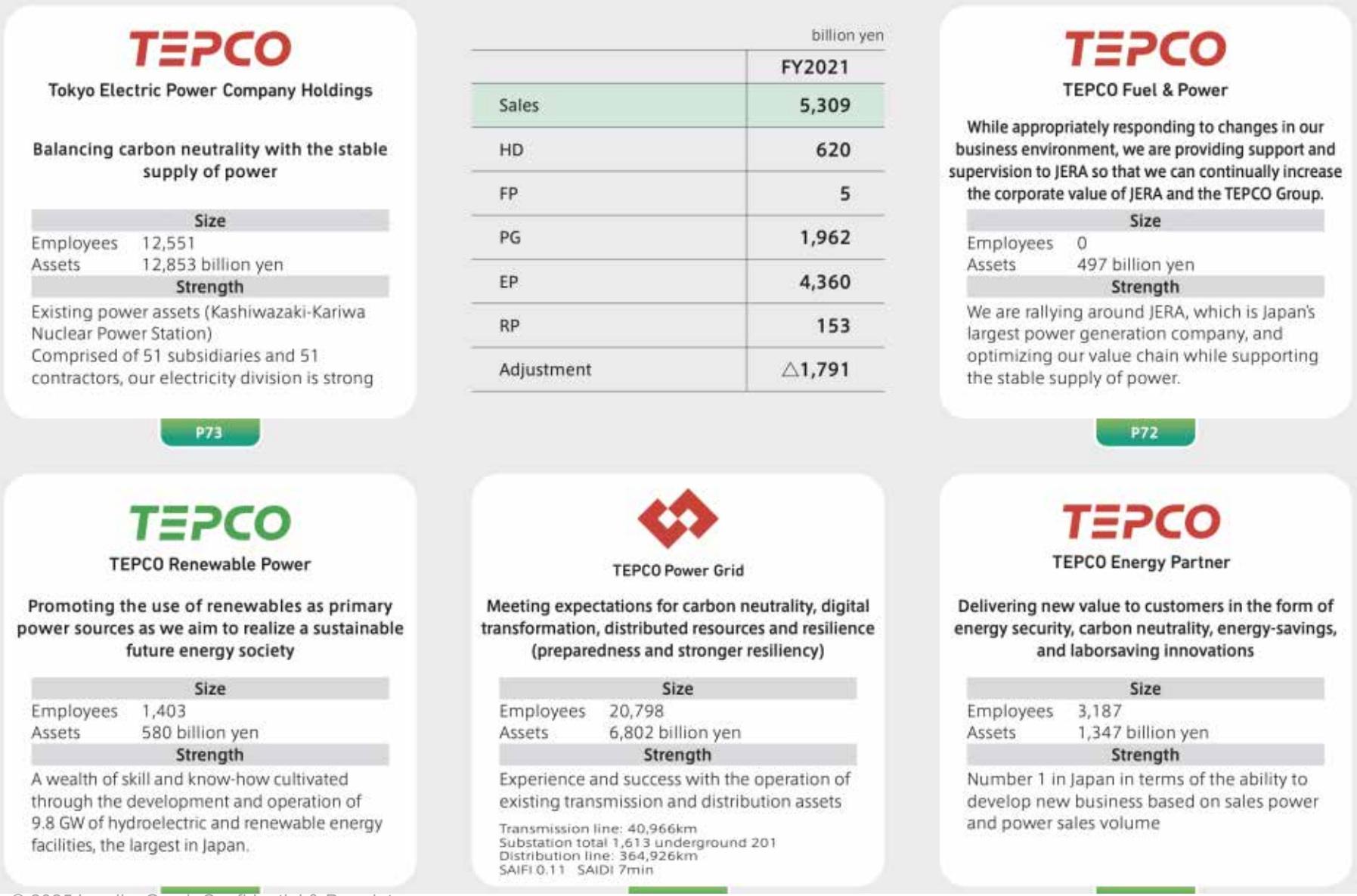
Events for Utilities in Japan

Ministry of Economy, Trade and Industry (METI) is driving the utility industry reform.



Unbundled TEPCO Group

Reference: TEPCO Annual Report



TEPCO

Tokyo Electric Power Company Holdings

Balancing carbon neutrality with the stable supply of power

Size	
Employees	12,551
Assets	12,853 billion yen

Strength

Existing power assets (Kashiwazaki-Kariwa Nuclear Power Station)
Comprised of 51 subsidiaries and 51 contractors, our electricity division is strong

P73

billion yen

	FY2021
Sales	5,309
HD	620
FP	5
PG	1,962
EP	4,360
RP	153
Adjustment	△1,791

TEPCO

TEPCO Fuel & Power

While appropriately responding to changes in our business environment, we are providing support and supervision to JERA so that we can continually increase the corporate value of JERA and the TEPCO Group.

Size	
Employees	0
Assets	497 billion yen

Strength

We are rallying around JERA, which is Japan's largest power generation company, and optimizing our value chain while supporting the stable supply of power.

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TEPCO

TEPCO Renewable Power

Promoting the use of renewables as primary power sources as we aim to realize a sustainable future energy society

Size	
Employees	1,403
Assets	580 billion yen

Strength

A wealth of skill and know-how cultivated through the development and operation of 9.8 GW of hydroelectric and renewable energy facilities, the largest in Japan.

TEPCO Power Grid

Meeting expectations for carbon neutrality, digital transformation, distributed resources and resilience (preparedness and stronger resiliency)

Size	
Employees	20,798
Assets	6,802 billion yen

Strength

Experience and success with the operation of existing transmission and distribution assets

Transmission line: 40,966km
Substation total 1,613 underground 201
Distribution line: 364,926km
SAIFI 0.11 SAIDI 7min

TEPCO

TEPCO Energy Partner

Delivering new value to customers in the form of energy security, carbon neutrality, energy-savings, and laborsaving innovations

Size	
Employees	3,187
Assets	1,347 billion yen

Strength

Number 1 in Japan in terms of the ability to develop new business based on sales power and power sales volume

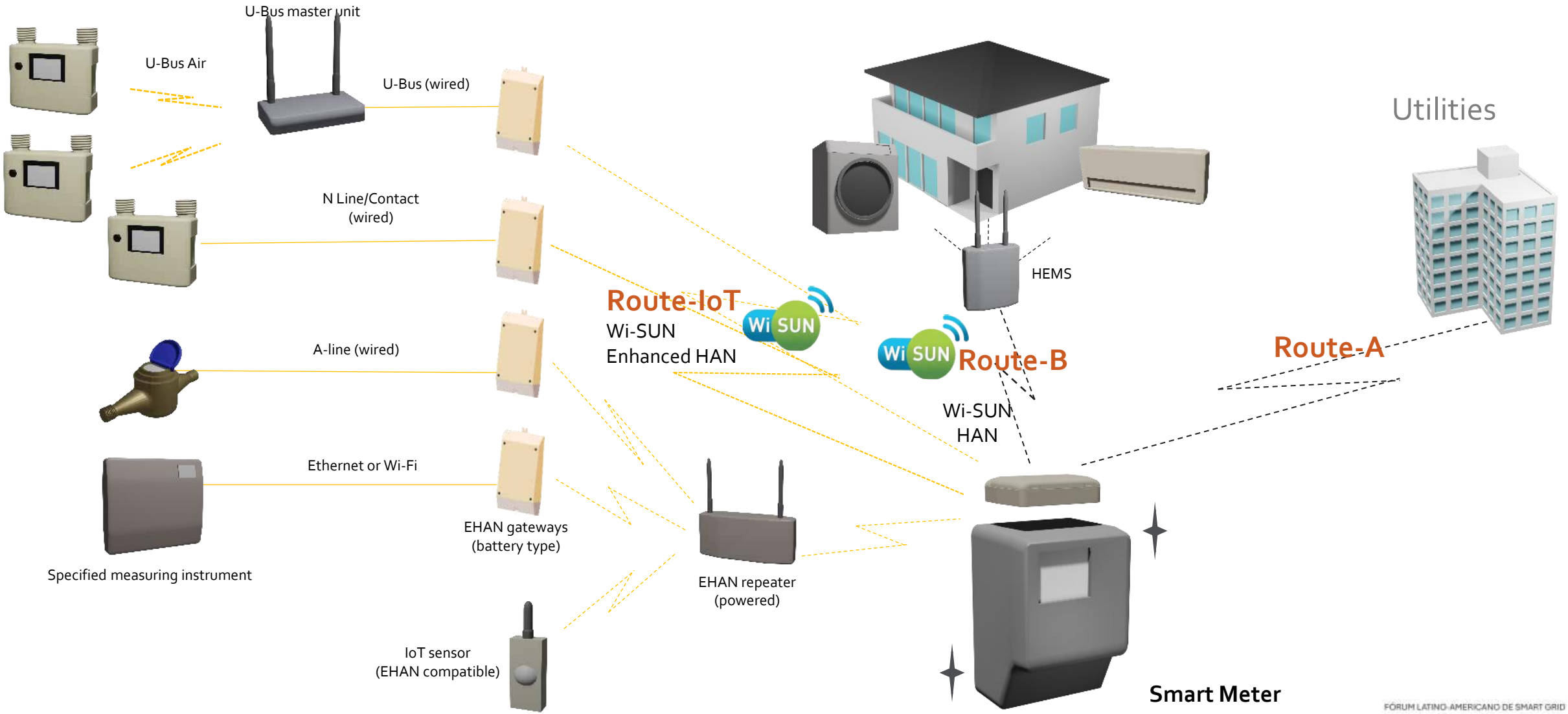
AMI Paradigm Shift

New | No Change

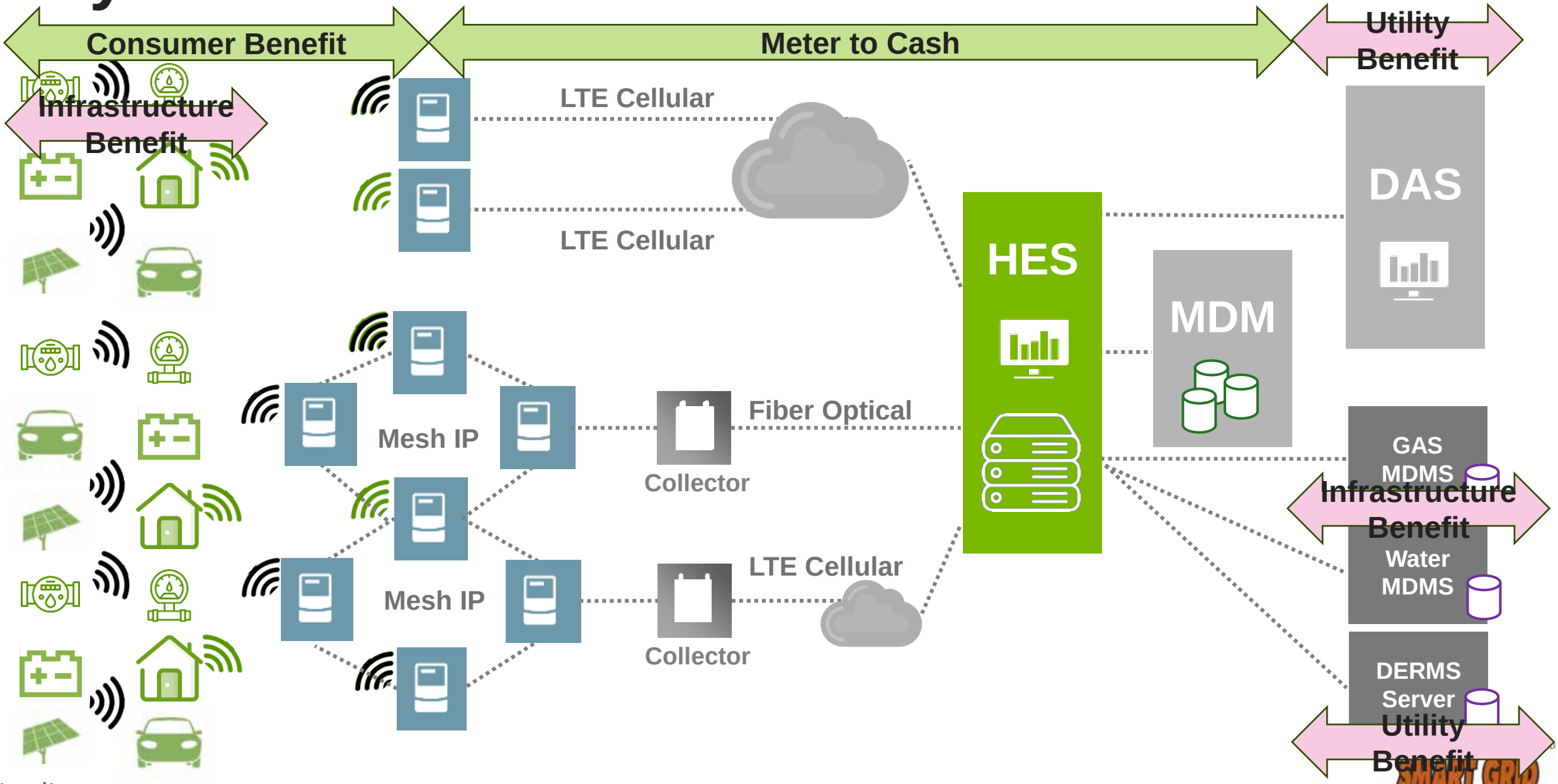
	Meter Unit			Communication Unit, System				
	Interval	Reads	Retention	Route-A	Route-B	Retention	Data to	++ Feature
Gen1	30 minutes	Active Energy	45 days	30 min	Wi-SUN, PLC	2 years	Reseller	-Remote Service Disconnection -Remote Load Control (under Single Phase 60A)
	Instant	-Active Energy -Current	-	On-demand		-		
Next Gen	15 min every 30 min	Active Energy	Enough for transaction	30 min	Pri: Wi-SUN Sub: Wi-Fi 2.4GHz 30 min, 1 min, instant	3 years (to be studied)	Reseller, Generation, Aggregator, T&D, Energy Management, etc	-Remote Service Disconnection -Remote Load Control (Single Phase 120A) -Outage Detection (*) -Route-IoT, Joint Metering, Non-Billable meter support
	5 min	-Active Energy -Reactive Energy -Voltage	Configurable	-10% within a few days -3% within 10 min				
	1 min	Active Energy	60 minutes					
	Instant	-Active Energy -Current	-	On-demand				

Reference: Next Generation Smart Meter System Review Committee Report May 2022

AMI 3 “Routes”

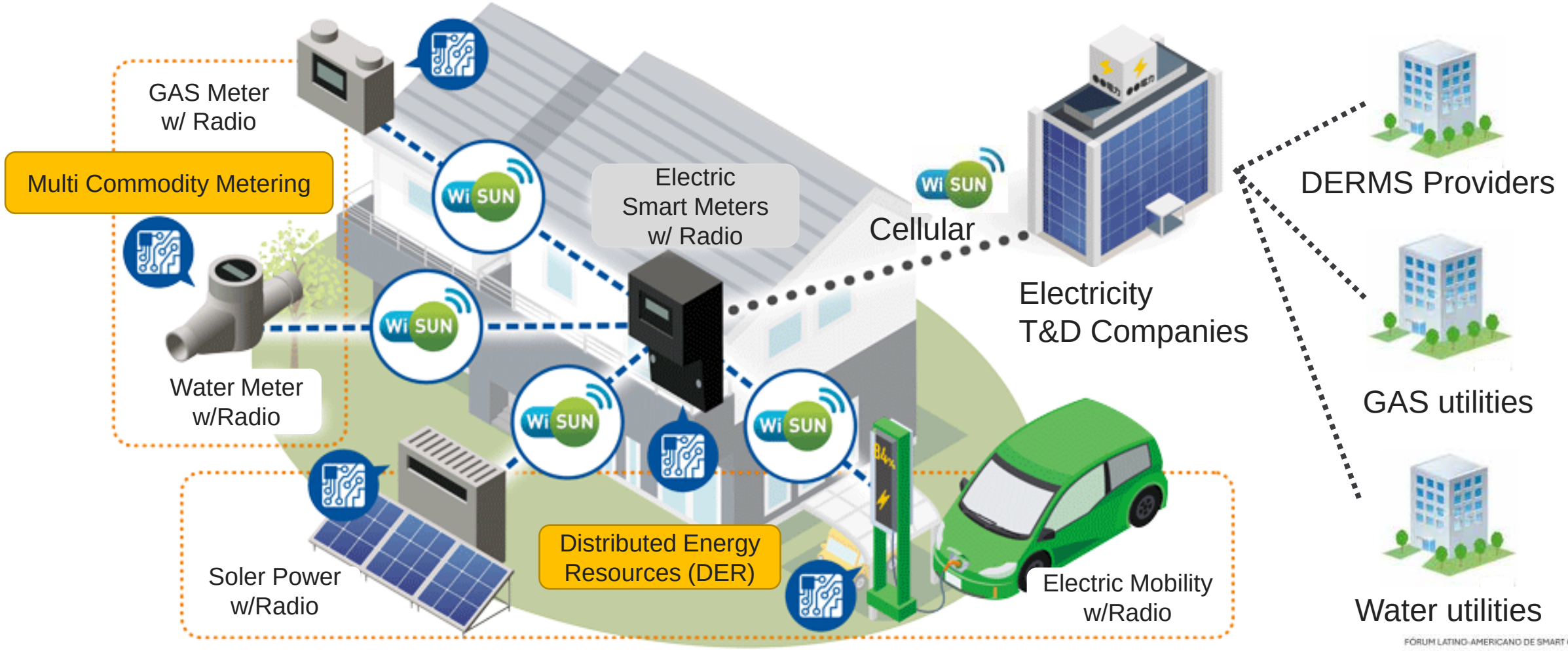


System Architecture



Japan Future Vision of DERMS and IoT

Making Electric T&D Companies and Electric Smart Meters work as Communication Hub For Multi-Commodity Metering and for DERMS.



Reference: National Institute of Information and Communications Technology (NICT) Press Release

Our Approach and Solutions

The Project

Landis+Gyr has transformed its offering from a leading AMI Platform into a comprehensive Utility IoT Platform, enabling utilities to become more resilient and DERMS-ready. Over 10 million in-meter communication modules can be remotely upgraded to meet the new IoT use cases without service interrruptions.

CHALLENGES

- ✓ Integrating new functionalities into an already mega-scale AMI without disrupting services or violating SLAs.
- ✓ 1 min interval data collection every 5 mins to identify fault in the network and quick recovery from power outage.
- ✓ Addressing aging and inflexible IT infrastructure while mitigating increased security threats.
- ✓ Meeting the requirements to be Multi-Commodity Readiness without any field trips and/or meter replacements.
- ✓ Adapting the AMI to support more use cases, such as enhancing grid resiliency.
- ✓ Managing the time and cost pressures associated with upcoming deploying 2nd Gen Smart Meters.

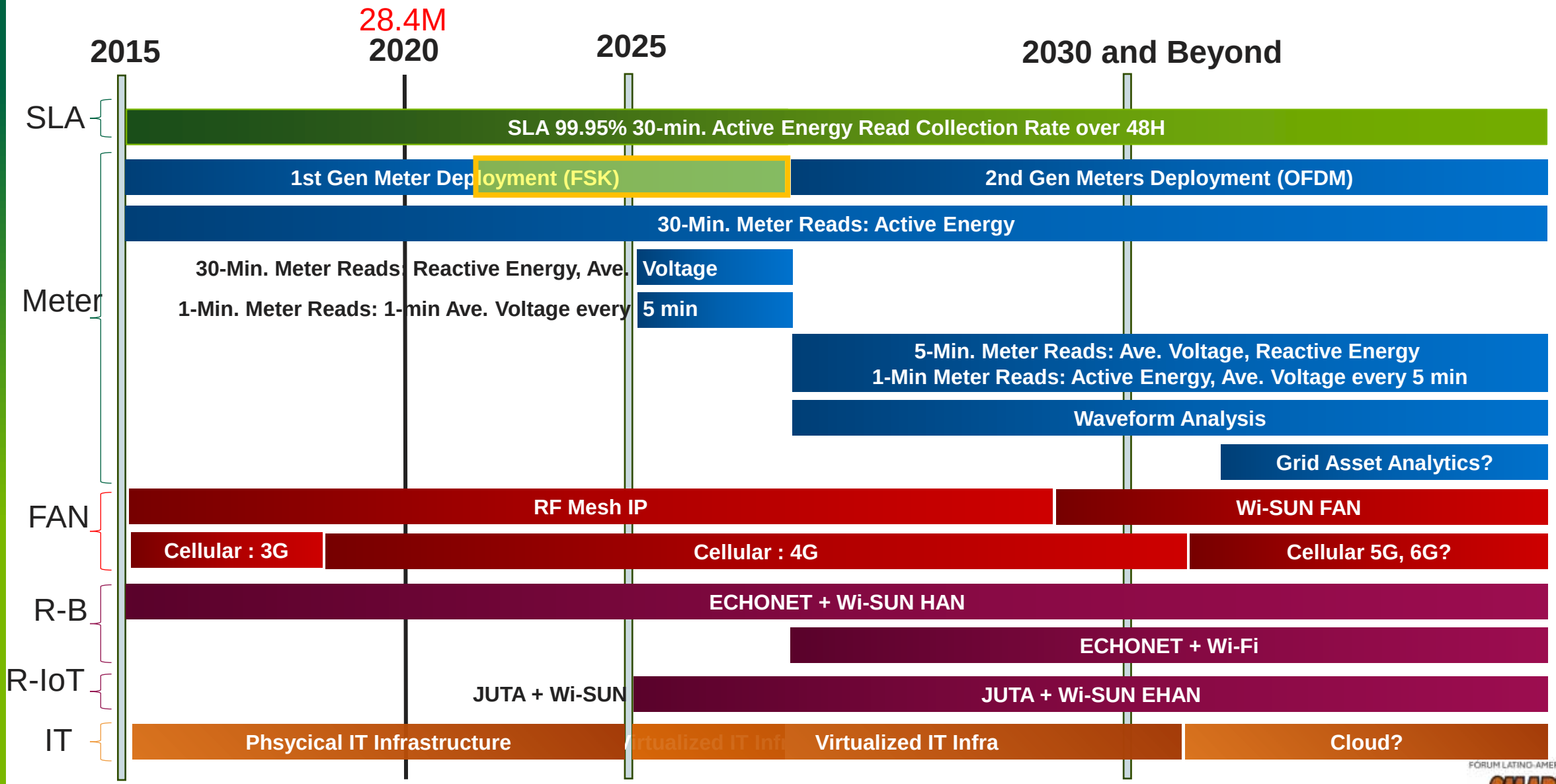
Landis+Gyr – SOLUTIONS

- ✓ End-to-End Management for the project.
- ✓ 24/7, 365 days/year on-site support and maintenance.
- ✓ Use Standard based communication protocol such as Wi-SUN and Cellular.
- ✓ Enabling a single radio chip to support three different protocols through remote firmware updates.
- ✓ 2,000 Meter Test farm in Japan.
- ✓ Scalability Performance Test System simulating 15 million meters.
- ✓ HES Uplifting with data migrationng from the existing system with proprietary method.
- ✓ Creating a virtualized IT environment with a new monitoring system.

OUTCOMES

- ✓ Successful system migration without SLA drop or system outages.
- ✓ Ready for future IT security risks with flexible IT infrastructure and a new monitoring system. And advanced security measures for new IoT devices.
- ✓ Transitioned to virtualized IT with a modernized monitoring system.
- ✓ Refreshed the operation console system.
- ✓ IoT-ready firmware developed to retrofit and upgrade the existing radio remotely.
- ✓ Ability to handle multi-commodity metering.
- ✓ 2,000 Meter Test farm built in Japan.
- ✓ Multiple simulators developed for system stress test and interface testing with other systems.

AMI to Utility IoT Platform Evolution Model



Incremental Feature Addition

Wi-SUN EHAN Implementation	Heat Sensing	Anomaly Detection for Distribution Network	Monitoring System Refresh
Gas & Water Meters over Electric AMI	Single Radio Chip supports -Mesh IP FAN -Wi-Sun EHAN -Wi-SUN HAN	Advancement Distribution Automation (ADAS) System Linkage	New Operation Console System
IoT Device and DERMS Readiness	IoT Device Security Protection	IT Infrastructure Refresh and Virtualization	Advanced Disaster Recovery

Key Take Aways

Landis+Gyr has transformed its offering from a leading AMI Platform into a comprehensive IoT Platform, enabling utilities to become DERMS-ready.

Investment Protection by Continuous Improvement

- ✓ IoT Enablement was achieved with our multi-purposing single radio through remote firmware update onto existing meters without physical replacement. (OTA Retrofitting)
- ✓ The evolution to Utility IoT was achieved incrementally through HES upgrades, eliminating the need for a complete system overhaul.

No Service Interruptions

- ✓ Enhancements were made while keeping 99.95% data collection rate and zero interruptions to services.
- ✓ IT infrastructure was refreshed to modern technologies without any service interruptions.

Future Proof and End-to-End Management

- ✓ Adaptation of standard based technologies such as Wi-SUN and Cellular makes it easy to achieve interoperability.
- ✓ We have capability to manage projects from end-to-end while being standard based and open

Obrigado

The origami crane is one of Japan’s most iconic paper-folding creations, symbolizing peace, hope, and resilience.

We have designed this origami crane as the symbol of our project, featuring the flags of the USA, India, and Japan, where this project was conducted.

This is to celebrates our cross-cultural efforts in craftsmanship, our shared pursuit of quality, and our dedication to delivering exceptional outcomes for our customers.