



Accelerating Digital Power Systems.

From Regulation and Technology to Real-World Experience

May 25

 Milan



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01 Journey of Gridspertise

02 Business models and regulatory enablers – international experience

03 Gridspertise - Advance Metering Infrastructure

Lunch

04 Gridspertise - Grid digitalization and automation

Agenda

09:00 – 09:30

- Overview of Gridspertise's journey
- Digital grid solutions and innovation

Q&A session





Luiz Gazulha

Global Head of Public Affairs
& Partnerships



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Who we are

Our Story

Gridspertise, Aidon and Energyworx consolidate their **20+ years of know-how** in smart grids and smart metering in **Gridspertise Group**, jointly controlled by Enel and CVC Capital Partners.

As pioneers in **smart energy**, Gridspertise Group is the technological partner driving **grid modernization** with integrated devices, services, and cloud edge solutions that enable, monitor, manage, and transform grids for energy players.

We redefine grid intelligence through **modular solutions** and an **as-a-service approach**, ensuring flexibility, reliability, and optimal end-to-end performance.

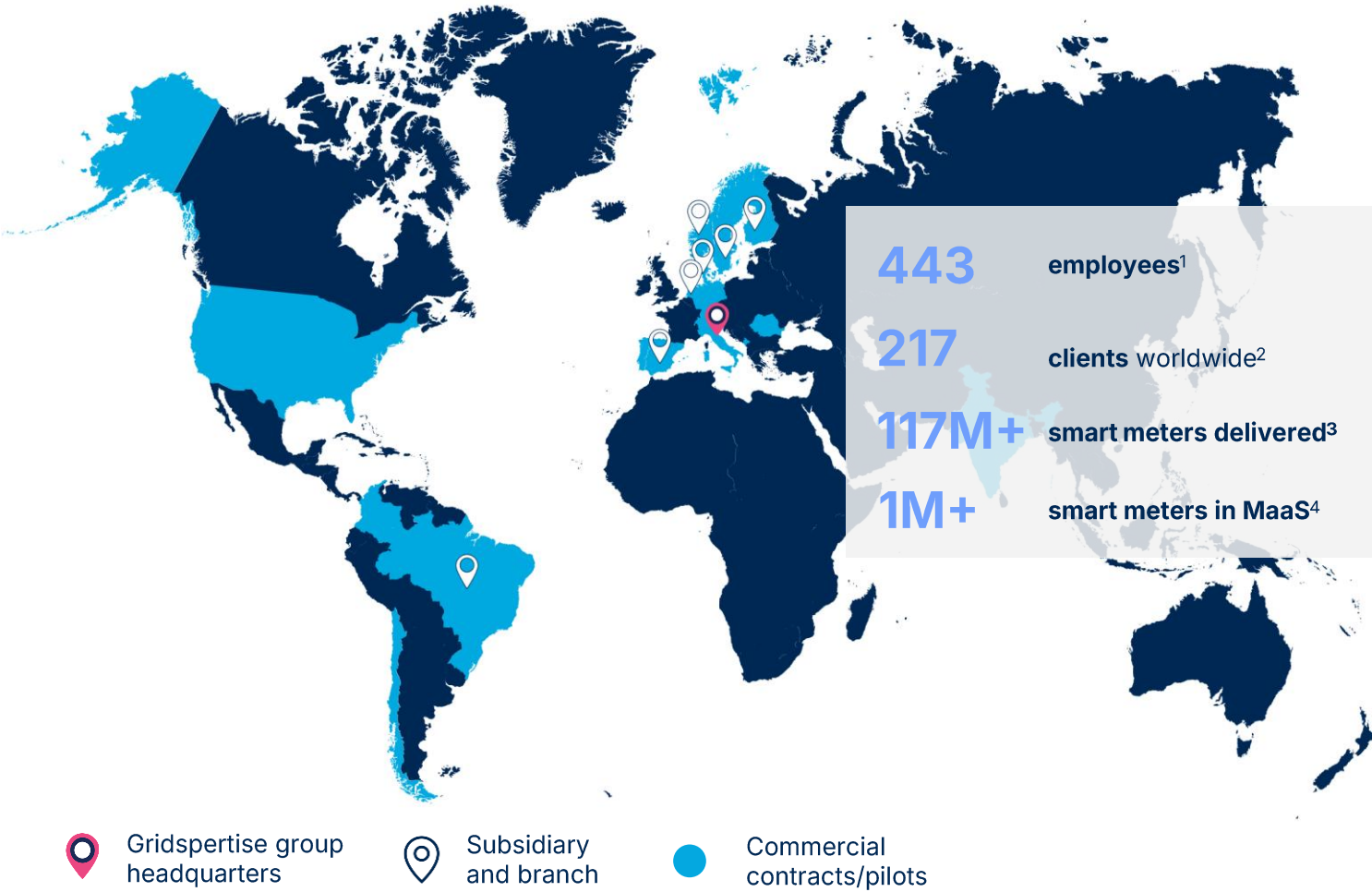
Our Mission

At Gridspertise Group, we **shape the future of energy** creating value for our customers with actionable intelligence.

It is about delivering a new era of **sustainable** and **reliable** smart grids, with real-world solutions that solve challenges in a more effective, adaptable, and results-driven way, moving from possibility to tangible outcomes.

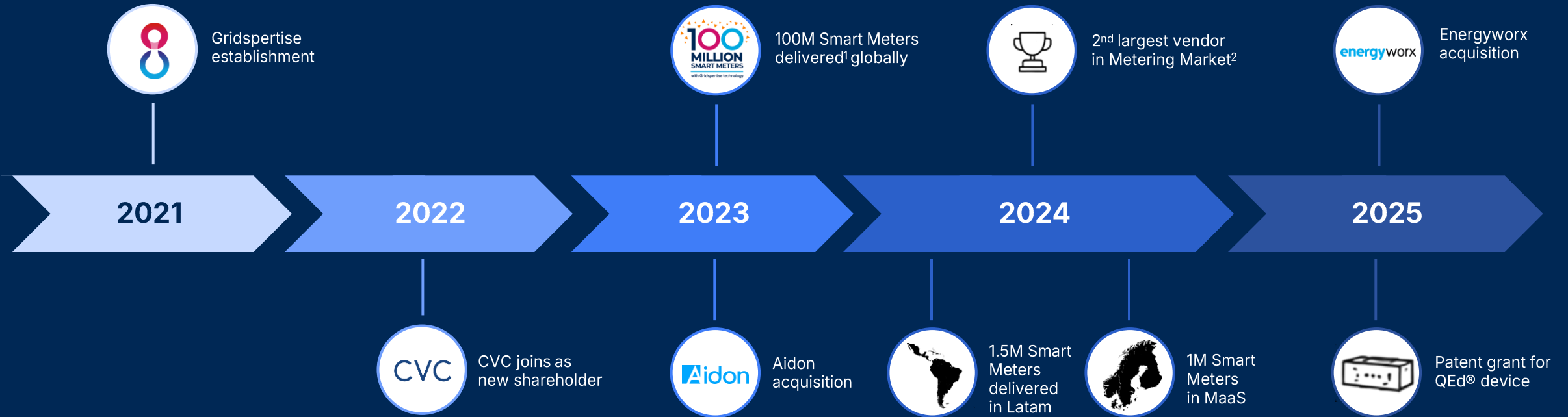
INTERNAL

Our Global Presence



1. Gridspertise, Aidon and Energyworx, Dec. 2025.
2. Cumulated Gridspertise, Aidon, and Energyworx customers (Dec. 2025).
3. Cumulated Smart Meters delivered with Gridspertise (2001 – Dec 2025) and Aidon (2004 – Dec. 2025) technology.
4. Energy metering points in Aidon's Metering Service, Jun. 2025.

Key milestones



1. Cumulated Smart Meters delivered with Gridspertise technology (2001 – 2023) .

2. Northeast group, Global Electricity Metering Market Dataset (2024-2033).

Global R&D and customization centers footprint



Smart Meter Lab – Milan

State-of-the-art metrology development and testing facilities underpin development of intelligent meter equipment used globally



Smart Grid Labs (MV – Milan, LV – Bari)

Real time emulations of grid topology and control room environment enabling stress test simulations and rapid product innovation



Smart Meter and Grid Lab – São Paulo

Localized technical and customization development activities across meter and grid domains for our clients



R&D Center - Jyväskylä

Research and development activities for designing new products, processes, and technologies improving the smart metering offer



Customization Centers – Vantaa

Devices assembling according to customer requirements and loading of their configurations and application software, close to mass roll-out customers

Legenda



R&D Centers



Customization centers



99 Patents¹



90 Proprietary SW and FW¹



72 Trade Secrets¹

1. Gridspertise and Aidon, Dec.2025.

Solutions to address the advanced needs of utilities



Grid Management Software

Acquiring events and measurements from grid edge devices, enabling remote control of grid components, and managing outages restoration

Grid Edge solutions

Edge computing solutions, with virtual apps and future feature expansion capabilities

Smart Meter Software

Enabling full metering use cases, and providing data validation, estimation, and billing calculations

Smart Meter Devices

Advanced multi-tech, multi-protocol devices with FW intelligence

Our Promises

- We commit to **2 key promises**, aiming to deliver value in terms of **efficiency, sustainability** and **reliability**:
- We deliver the maximum value out of our customers' smart meter investments
- We maximize the resilience, operational efficiency and hosting capacity of our customers' grids

Our value propositions

- Supporting efficient smart metering and grid deployment through planning, execution, technical design, and compliance services
- Enhancing operations via system integration, software and firmware management, remote support and monitoring
- Driving performance improvements with advanced consulting, automation setup, and data-driven quality and losses analysis

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09:30 – 10:00

- Insights on business models and regulatory enablers for digital grid investments

Q&A session

Market analysis

Trends reshaping grid operations and requiring advanced digitalization



Trends	Description	Implications
Distributed Resources and Reverse Flow	50%+ of RES distributed by 2030	Need to upgrade the grids to sustain distributed generation paradigm (e.g. control / monitoring of distributed flexible resources; transformer rating adjustment)
Climate Resilience	75x increase in extreme weather events	Improved observability of network assets (e.g., IoT to monitor weather conditions across grid; status of substations/feeders ¹)
Aging Infrastructure	50%+ Europe's distribution grids are more than 40 years old	Need to refurbish grids with future-proof devices increasing automation performance and enabling future use cases (e.g. flexibility)
Grid stability & reliability	Higher value of loss load due to increasing electrification (es., Heat pump, EV charging)	Update grid management systems (e.g. advanced fault location, preventive maintenance)
Cybersecurity Raising relevance with network digitalization	Over 1,000 cyber attacks per week on European utilities in 2022 ²	Higher cybersecurity level required especially in communications between central operations and peripheral nodes

Digitalization and edge computing will be key enablers for future-proof grids

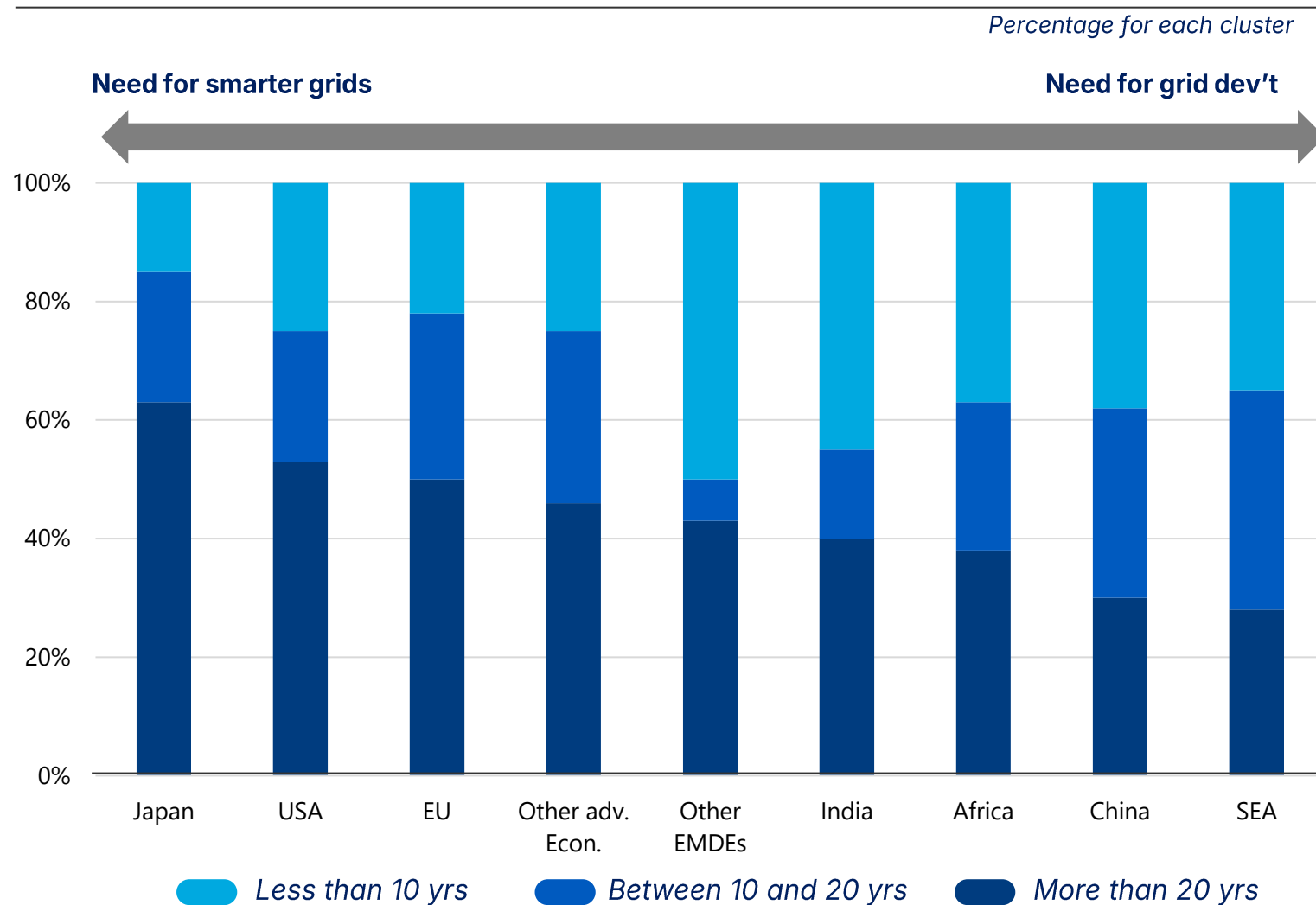
1. E.g., environmental sensors and/or electric parameters monitoring within substations.
2. Rapporto Strategico Ambrosetti Enel 2024 - Il ruolo della distribuzione elettrica p.23.

Aging Grids

What are the challenges aging grids are facing today?

Context

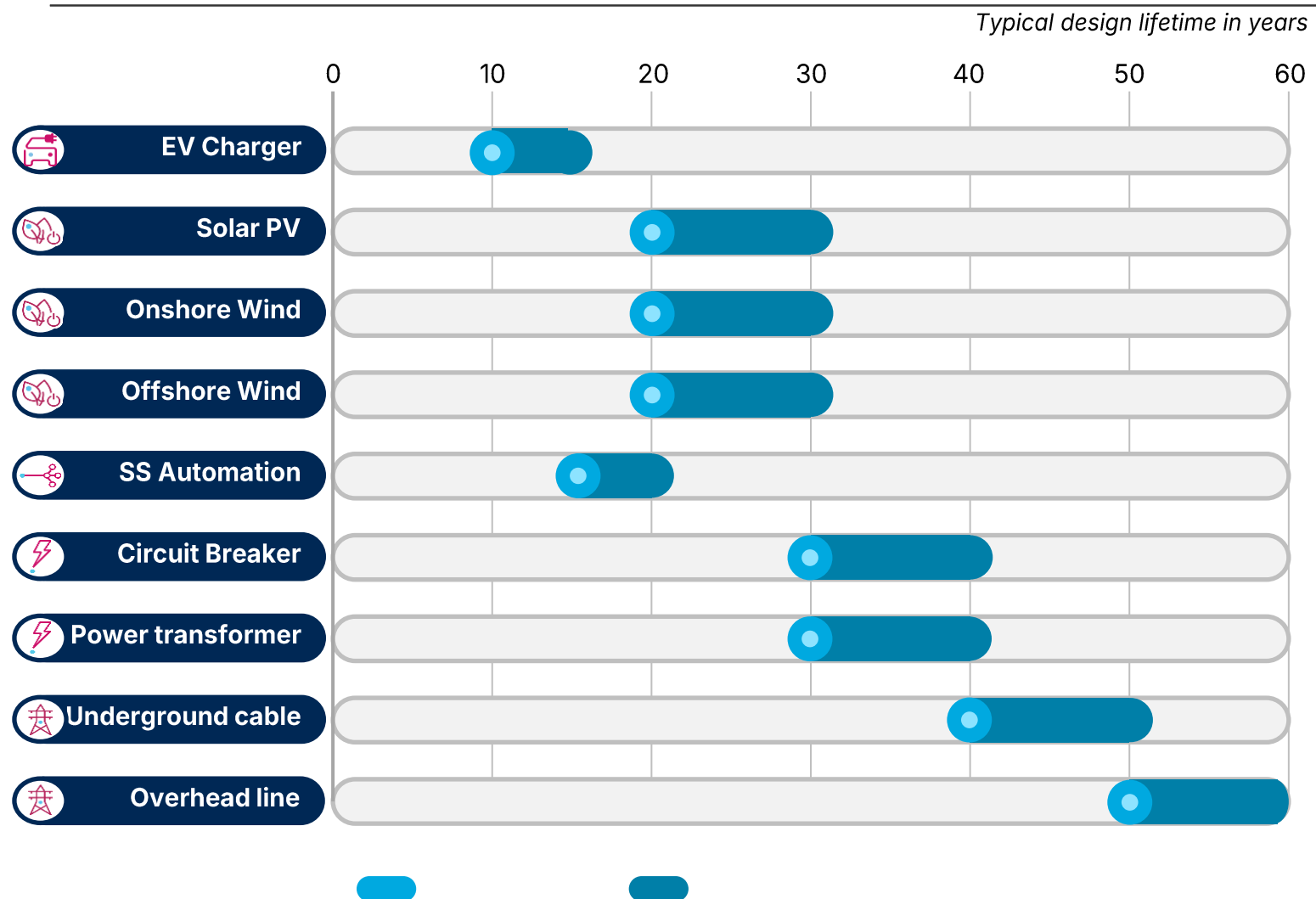
Share of grid length by age by country region, 2021



- In **advanced economies** early electrification led to older grids
- On average, EMDEs have **newer grids** due to recent network developments
- Among the EMDEs, countries like **India** and **China** are pushing **investments to replace legacy grids** and increase reliability and hosting capacity
- Advanced economies are struggling to enhance grid reliability because of **pre-existing constraints** (e.g. old designs, planning in urban spaces, legacy systems)

Context

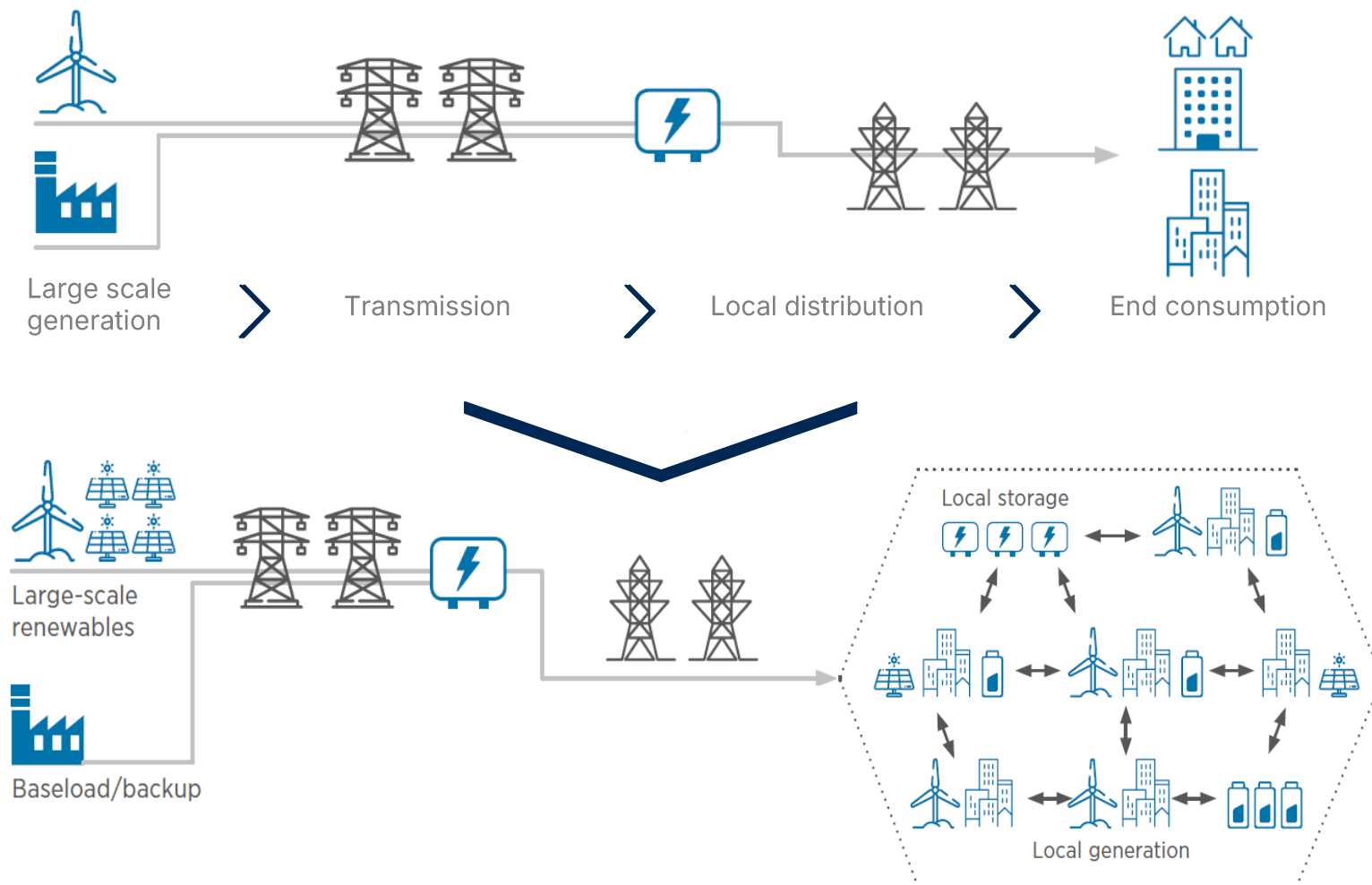
Indicative design lifetime for electric grids assets



- Electricity grids are expensive assets that are often in service much longer than the equipment they connect
- Lifespan can be extended with **proper maintenance and service**
- Asset health can be damaged also by operating them **over their rated capacity**
- Ageing assets increase **safety and reliability risks** (insulation material degradation, faults, short circuits, outages)
- **Digital equipment** have much shorter life (15-20 yrs) and much faster innovation cycles

Market Evolution

Changing role of DSOs



DSO's Traditional Role

- Centralized structures organized around classical supply chain elements (generation, TX, DX)
- Customers at end of supply chain

Disruptive Trends

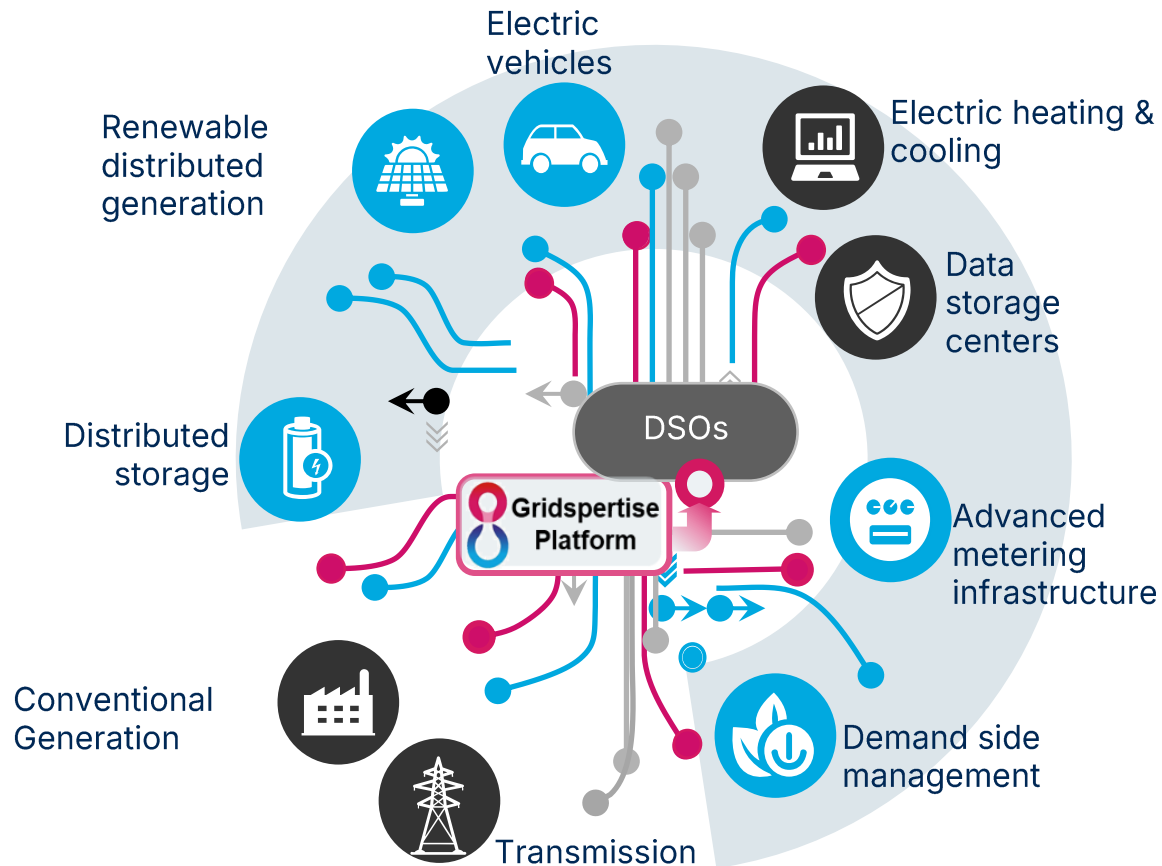
- Decentralized energy resources
- Emergence of new market participants
- Flexibility markets

Opportunities to be sized

- Optimization of DX networks operations
- Curtailment grid investments

Role of DSOs

Distribution operators' new paradigm



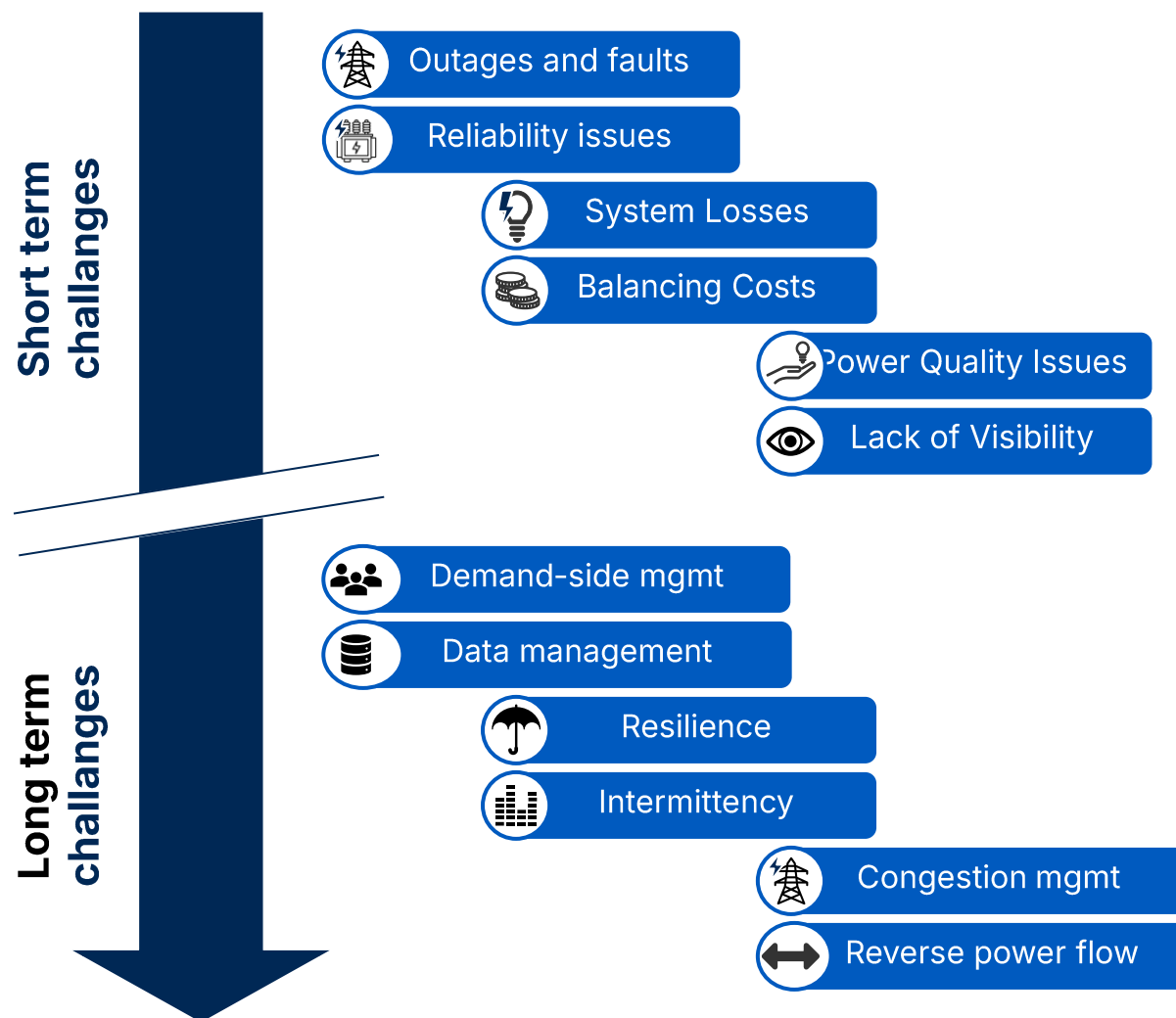
DSOs role into the new grid scenario

- Connection/disconnection of DERs
- Planning, maintenance and management of networks
- Management of outages and network failures
- Energy Billing

+

- Peak load management through DERs
- Congestion management
- Support to other market operators: TSOs, energy markets
- Introduction and determination of locational price signals
- Establishment of local flexibility markets (like bilateral long-term markets)

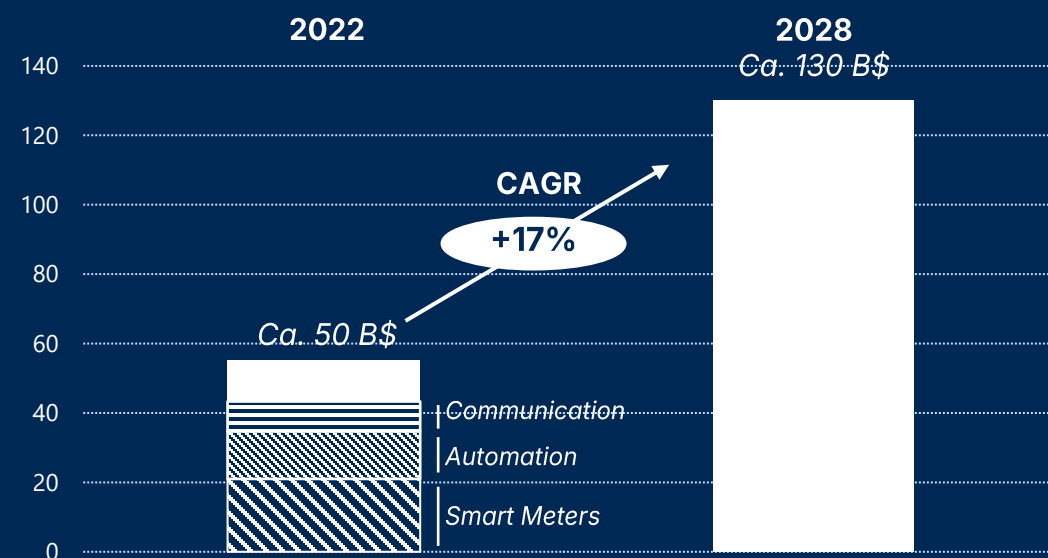
The imperative for digitalization



Digitalization of distribution grids offers several upsides for DSOs:

- Enhanced grid visibility and control
- Improved reliability and resilience
- Optimizing Grid operations and efficiency
- Increasing Asset Health
- DER Management
- Reduced Operation Costs and Non-Tech. Losses
- Regulatory Compliance and Reporting
- Enabling Innovation and Research Opportunities

Investments into digitalization (World-wide, billion USD)



Global Smart Meter penetration by region

North America

- US SM penetration rate ~ 79% - 2023
- 2023 Total number of metered electricity connections was 182 million – 165M US and 17M Canada

**Average NA
Penetration 2023: 80%**

Latin America

- In Latam the largest deployments in Brazil (São Paulo) and Mexico
- Uruguay only 1.6M electricity users, achieved a SM penetration rate of 80% in March 2024.
- Costa Rica has also an ambitious nationwide smart metering rollout ongoing

**Average LATAM
Penetration 2023: 6.5%**

Europe

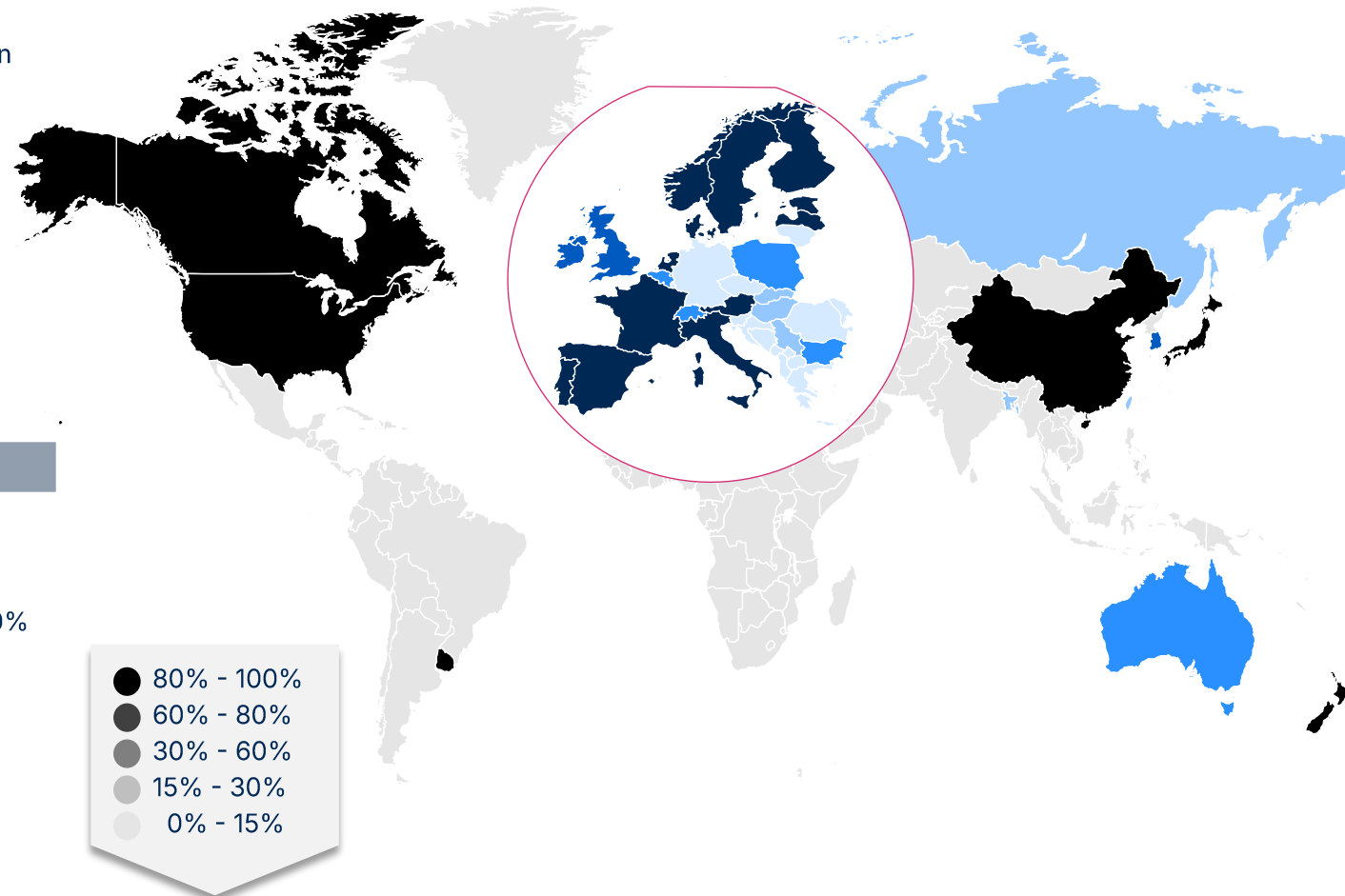
- SM is one of the technologies covered by EU energy policies through mandatory nationwide rollout.
- Most countries have started and/or completed their 1st waves of rollouts
- Some countries have launched the second wave: Italy, Spain, Finland and Sweden (1st gen SM are coming close to the end of their service lives)

**Average EU
Penetration 2023: 60%**

Asia Pacific

- China, Japan, South Korea and Taiwan have led the adoption of SM technology in Asia-Pacific with ambitious national rollouts and today accounts for 93% of the installed base of SMs in the region
- India and Bangladesh will constitute the fastest growing market in Asia-Pacific with ambitious governmental initiatives now in place

**Average APAC
Penetration 2023: 61%**

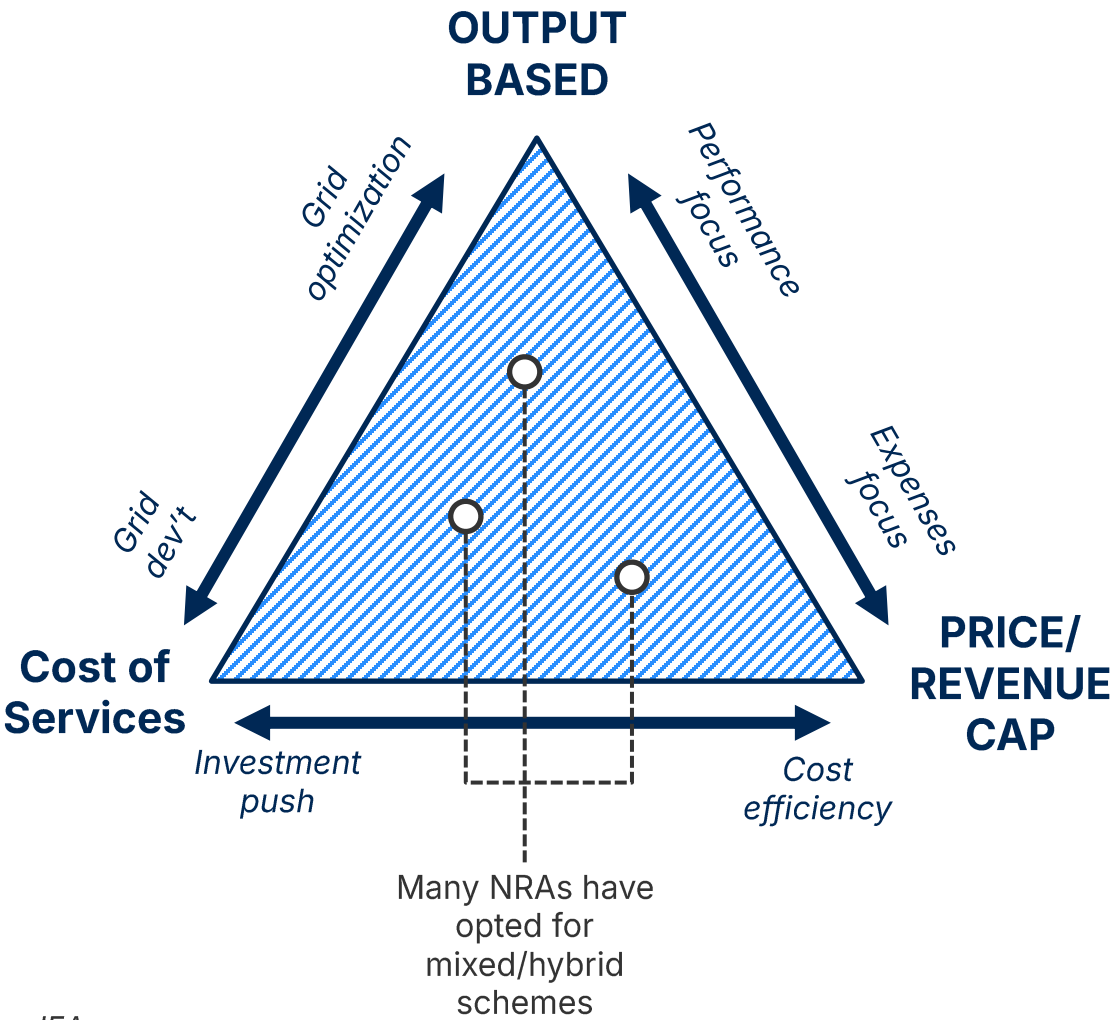


Regulation

What role does the regulatory framework play when it comes to digitalization?

The impact of digitalization

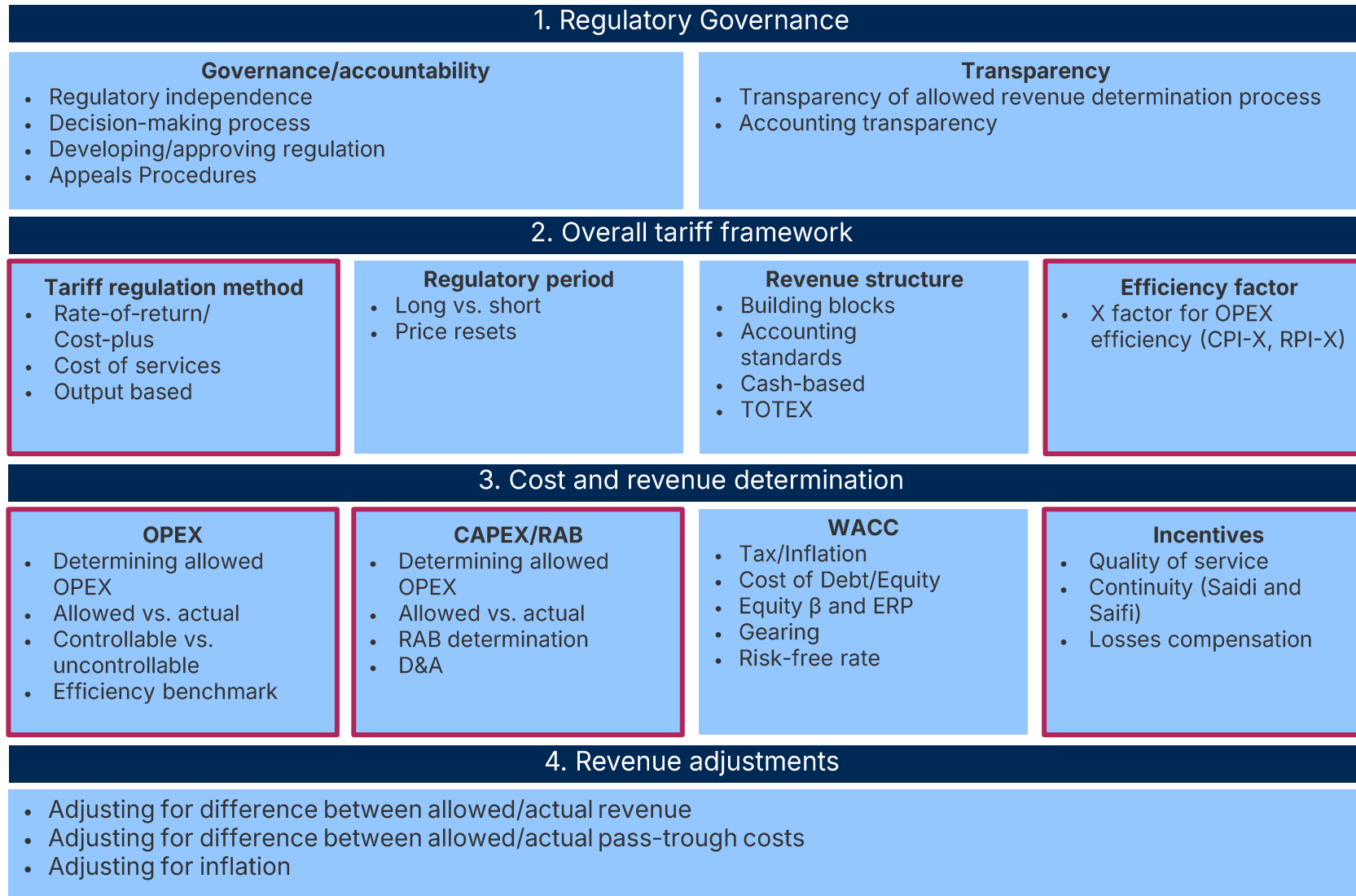
Regulatory frameworks features (indicative)



Regulatory frameworks impacts (indicative)

	Cost-of-Service	Revenue/ Price Cap	Output-based
Cost recovery	●●●	●●	●●
Cost minimization	●	●●●	●●
Planning Optimization	●	●●	●●●
Performance and operational efficiency	●●	●●●	●●●
Innovation	●	●●	●●●
Quality of Service	●	●●	●●●
Cost/price alignment	●●	●●	●●●
Digitalization impact	●	●●	●●●

The impact of digitalization



 Topics impacted by digitalization

- Regulation as **"soft-spot"**
- Trade-off between achieving **overall cost efficiency** and **push for investments**
- Digitalization impact many aspects at the same time, both concerning **cost optimization** and **incentivization**
- Leveraging digital expertise can bring to **all-over-the-board positive change** and **extra revenues**
- Regulation reforms should encompass **formal and substantial changes**: enhance governance, improving cost recovery, aligning tariffs to utilities costs and pushing for improving service

Regulation Benchmark and main challenges faced...

General Regulation	Italy	
	Main info	
	Regulation Type	Output-based (TOTEX)
	National Authority	ARERA
	Nr. of DSOs	138
	Nr. of end users	36 M

Regulated Revenues Framework	
Grid assets' Remuneration scheme	CAPEX and OPEX are under a TOTEX framework, split into fast-money (recovered directly) and slow-money (capitalized in RAB, recovered via 6.0% real pre-tax WACC). Digitalization and software, like LV/MV monitoring, are included in RAB.
AMI Remuneration Scheme	Smart meters are included in RAB under the TOTEX framework . Lifecycles are 15 years, and penalties are applied for poor KPI performance.
AMI recognition in tariffs	Year N+1: recognition in RAB. Year N+2: depreciation impact on tariffs. 15 years useful life.

Efficiency Sharing Mechanism
Efficiency sharing applies to both CAPEX and OPEX under the TOTEX framework. The base for the efficiency gain is the difference between the actual (current year) TOTEX and the reference TOTEX (determined yearly), representing either an out- or an under-performance. The result is the split between DSO's efficiency gain and efficiency sharing with end customers using a dedicated parameter.

Metering Infrastructure Regulation	Main info	
	Metering Responsible Party	DSOs
	AMI ownership	DSOs
	Tech specs Issuing Authority	ARERA
	Tech specs Supporting Authority	CEI (Comitato Elettrotecnico Italiano)
	Nr. of Installed AMI	35 M

Smart Meter Rollout Mandate
Italy completed its first nationwide rollout of smart meters in 2011, and the second-generation rollout (SM2G) is ongoing , focusing on enhanced functionalities and higher data granularity. The second rollout includes improvements in communication technologies and data processing.

AMI Architecture
Italy uses a centralized architecture where data concentrators at MV/LV substations collect data from smart meters and send it to central systems. The DSO is responsible for data collection and management.

Communication Protocol
According with new network security requirements set by the regulator for the second-generation meter, the main adopted communication technology are dual PLC (Meters & More) and RF (169 MHz) .

* Sources: Berg Insights, ACER (European Union Agency for the Cooperation of Energy Regulators), CEER (Council of European Energy Regulators), Enel ReBook, Internal Gridspertise Research.

Regulation Benchmark and main challenges faced...

General Regulation	 Germany		Regulated Revenues Framework		Efficiency Sharing Mechanism	
	Main info		<div>Grid assets' Remuneration scheme</div> <div>Revenue cap = non-controllable and controllable costs + bonuses + CAPEX top-up + quality elements, adjusted by CPI-X. Digitalization assets and software are in RAB with a 3-5 years lifespan. Nominal pre-tax WACC 6.1%.</div> <div>AMI Remuneration Scheme</div> <div>Unbundled AMI sector, with metering point operators (MPO) managing AMI systems under the 2023 Digitalization of the Energy System Act. Smart meters are funded by consumers and DSOs via regulated fees.</div> <div>AMI recognition in tariffs</div> <div>Fees for MPOs to recover AMI Capex, Opex and operators' marginality. Payment start in the installation year.</div>		<p>The Authority carries out its efficiency benchmarking based on the cost examination (TOTEX) and before the start of each new RP for electricity network operators. The efficiency benchmarking involves assessing the operators' individual costs against the services they provide and determining each operator's cost efficiency compared to the other operators.</p>	
	Regulation Type	Revenue Cap				
	National Authority	BNetzA (Bundesnetzagentur)				
	Nr. of DSOs	900				
	Nr. of end users	50 M				
Metering Infrastructure Regulation	Main info		Smart Meter Rollout Mandate		AMI Architecture	
	Metering Responsible Party	Metering Point Operators (MPOs)	<p>Germany's smart meter rollout is ongoing, with a legal mandate aiming for 95% coverage by 2032. However, deployment has been slower than expected due to complex regulatory frameworks and higher security requirements. The rollout focuses on privacy and security concerns with advanced smart meter gateways.</p>		<p>Germany adopts a decentralized architecture, where smart meters connect to Smart Meter Gateways, acting as secure intermediaries between the meter and the utility. The architecture places a strong emphasis on data privacy, encryption, and cybersecurity protocols.</p>	
	AMI ownership	Metering Point Operators (MPOs)				
	Tech specs Issuing Authority	BNetzA				
	Tech specs Supporting Authority	BSI (Federal Office for Information Security)				
	Nr. of Installed AMI	> 5 M				
					Communication Protocol	
					<p>Germany primarily uses DSL and cellular communication protocols (GPRS/3G/4G) to ensure secure data transmission. In some areas, PLC is also utilized, but data protection and privacy remain central to the communication strategy.</p>	

Regulation Benchmark and main challenges faced...

General Regulation	<div></div> <div>Chile</div>		Regulated Revenues Framework		Efficiency Sharing Mechanism	
	Main info		Grid assets' Remuneration scheme	Valor Agregado de Distribución (VAD) as core of the distribution tariff, set by CNE every 4 years, based on price benchmarks of efficient "Empresa Modelo," serves as the benchmark for CAPEX and OPEX remuneration.		
	Regulation Type	Price Cap Model	AMI Remuneration Scheme	Smart meters are capitalized into VAD in specific cost category., ex-ante authorization by the regulator is required.		
	National Authority	Comisión Nacional de Energía (CNE)	AMI recognition in tariffs	According to the last 2019 Regulation, AMI is included in end users' tariffs. Cost recognition is charged directly in end users' bills, via a dedicated rental fee from the installation.		
	Nr. of DSOs	31	No mechanism for checking on costs and profit-sharing ex-post are in place. However, Empresa Modelo references are reviewed each cycle based on previous cycle costs (efficiencies included).			
	Nr. of end users	7,4 M				
Metering Infrastructure Regulation	Main info		Smart Meter Rollout Mandate		AMI Architecture	
	Metering Responsible Party	DSOs	No Gov't rollout mandate, AMI deployment is left to DSOs to decide, on a voluntary basis.		Decentralized architecture, with DSOs managing installations and data collection, according to current regulation	
	AMI ownership	DSOs				
	Tech specs Issuing Authority	CNE				
	Tech specs Supporting Authority	Superintendencia de Electricidad y Combustible (SEC)				
	Nr. of Installed AMI	0,6 M				
		Communication Protocol				
		As of today, all AMI installation utilizes PLC communication (M&M or G3).				

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10:00 – 11:30

- Overview of AMI features and technology
- Deployment experience
- Business models
- Unlocking full value for customers and use cases
- Cybersecurity and data management/governance

Q&A session





Gianni Ceneri

CTO and Head of New Product
Development

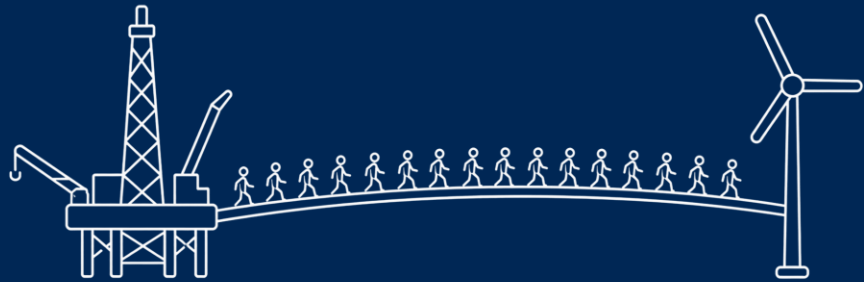


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The key elements of the energy transition

INTERNAL

Fossil-based energy
sources phase-out



Ramp up of
Renewables

Networks empowerment
and resilience



Grid Digitalization

Decarbonization



Sustainability

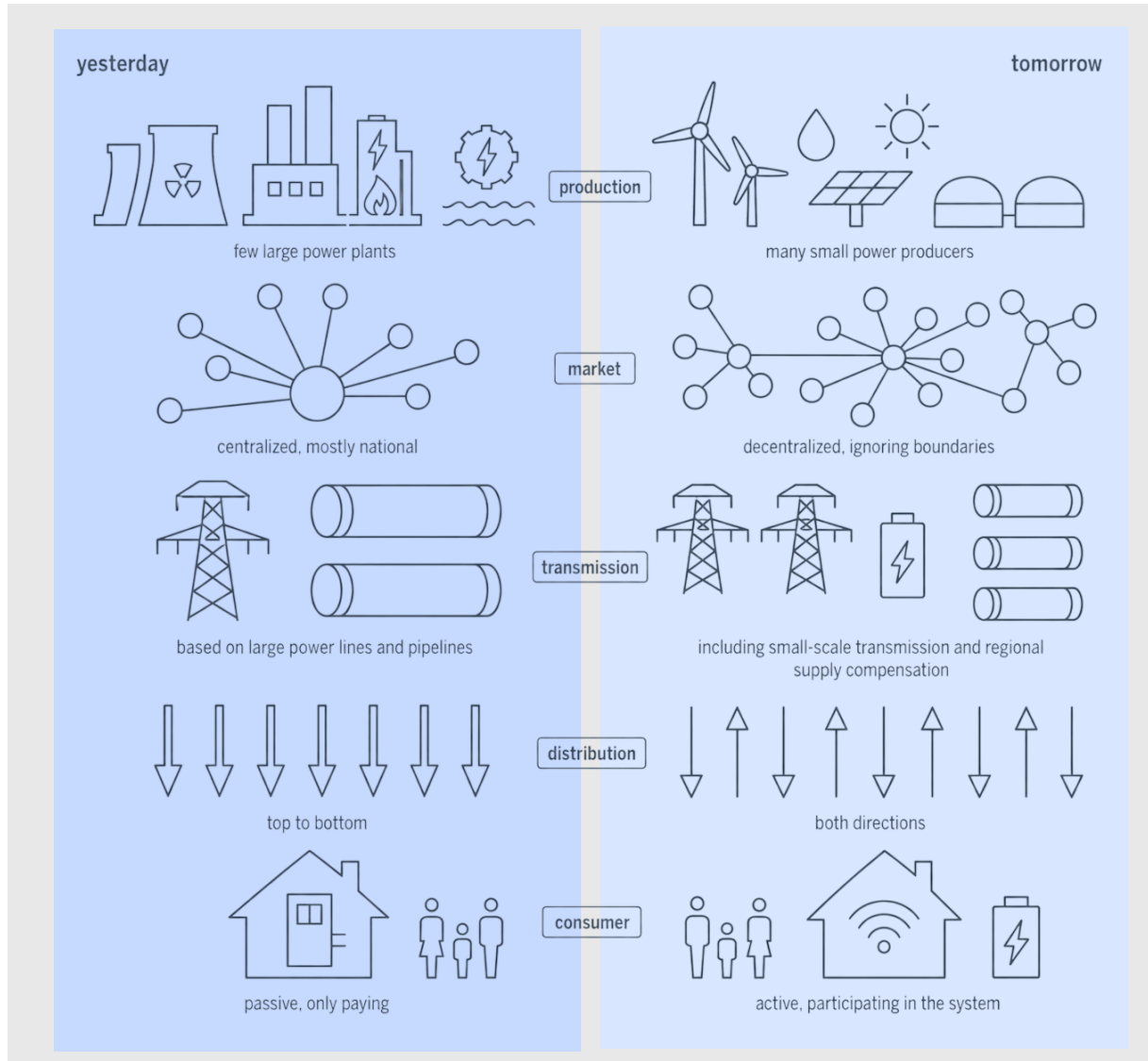


Urbanization

Electrification

**Greater awareness
and energy efficiency**

Grids evolution requires substantial investments...



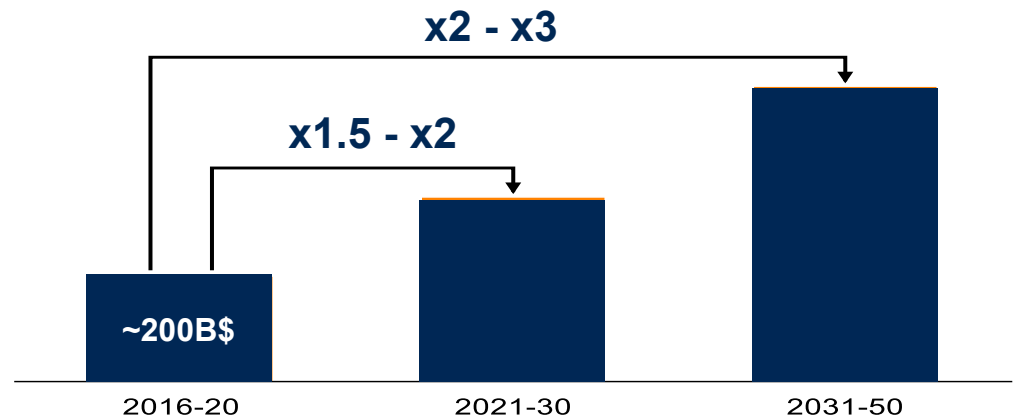
Implications for DSOs

Expanding smart grid investments in order to:

- improve **grid resilience** (SAIDI/SAIFI reduction)
- facilitate **dispatching** of distributed generation
- compress **reaction times** to support network reconfiguration and fluctuating bidirectional flows
- Overall improve **operations & services performance** to final users
- Enable digital interaction with all stakeholders

Average global yearly DSO investments

B\$/year



A new ecosystem enabled by smart technologies

Smart Metering

- Open Meter
- Multi channel
- Multi services

Broadband Communication

- Ultra-broad Band
- Optical Fiber
- 5G MVNO

Edge computing

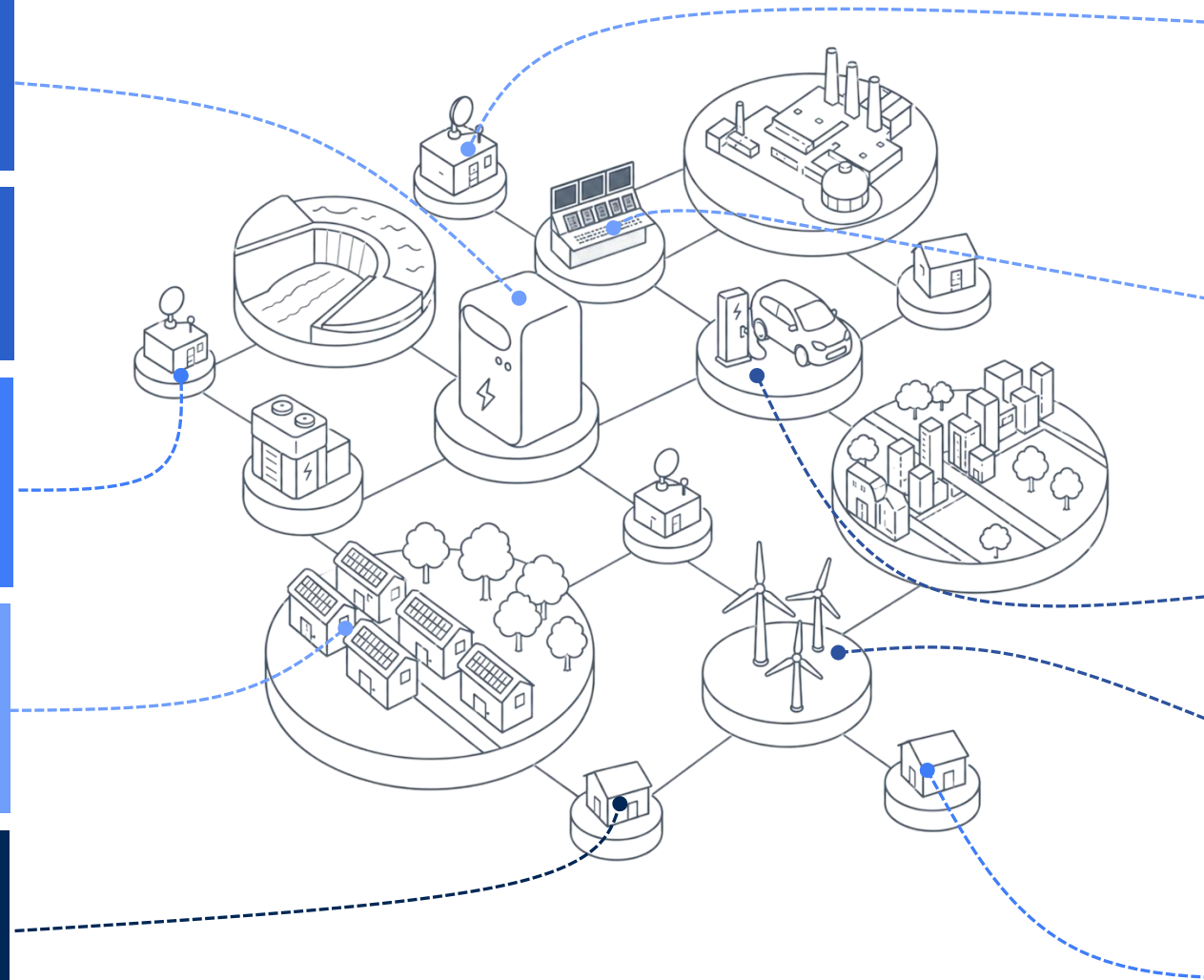
- Device Virtualization
- Artificial Intelligence
- Machine Learning
- Cybersecurity

Active Demand and Flexibility

- DSO Services
- Energy-Box
- Load Balancing
- Chain 2, Chain 3

Work Force Management

- Active Safety
- Smart Wearable Devices
- Augmented Reality
- Virtual Reality



Secondary Substations

- Sensor Networks
- Big Data
- IOT
- Urban, Environmental & Energy Data

Grid automation & remote control

- Smart Fault Selection
- MV Network Automation
- LV Network remote control
- Distribution management system

Electric Mobility

- Fast-Charge
- Vehicle-to-Grid
- Load Shaping
- Storage Distribution

Renewables Integration

- RES Dispatching
- Forecast
- Storage

Cloud Computing and Data

- Artificial Intelligence
- Machine Learning
- Big Data

Evolution of energy meterings

disruption



Traditional energy meter

Basic energy measurement
In-field reading with operators
No value-added services to customers



Automatic Meter Reading

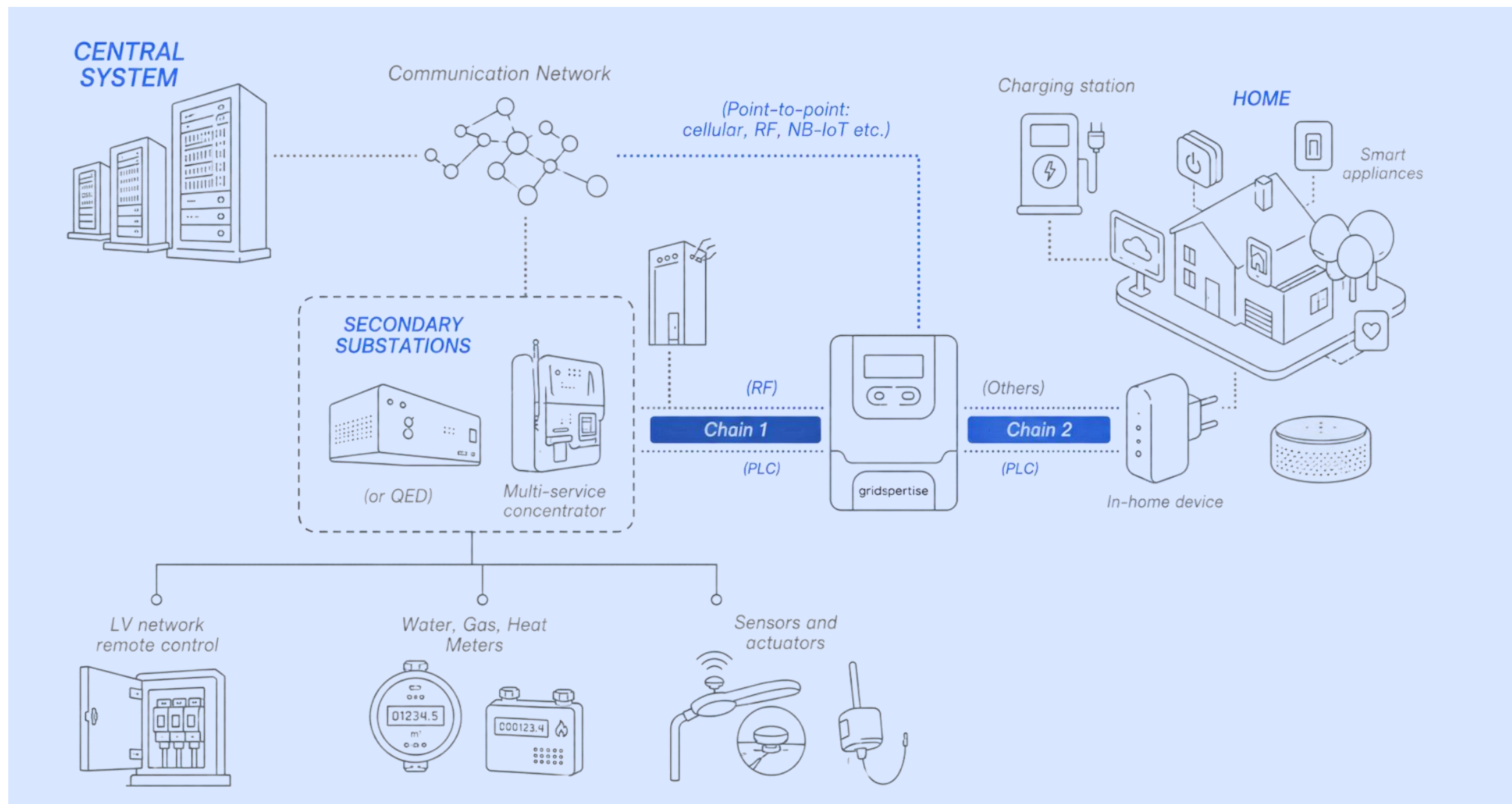
Improved energy measurement
Basic **remote reading** of information
No value-added services to customers



AMI (Advanced Metering Infrastructure)

Advanced energy measurement
Remote **reading and control**
Extended new market opportunities

Advanced Metering Infrastructure architecture



From the first generations of Smart Meters...

2001

2008

2017

2018

2019

2020

2021

2022

2025

1st generations of Smart Meters

Telegestore



Cervantes



End customers

- Invoices on real consumption
- Remote contract mgmt.
- Multiple/Tailored tariffs
- Greater awareness

Regulator

- Sector development
- Improved quality of Service (technical & commercial)
- Enabling free market

Others



Decrease expenses for field operations

- Remote readings
- Remote work orders
- Lower switching costs
- Lower meter maintenance and consumption

Revenue Protection & Cash collection

- Loss detection
- Energy balance
- Stimulates bills and payment culture

Customer Service

- Better accuracy
- Increased billing reliability
- Lower claims management
- Lower customer service costs
- New flexible tariffs

Logistic optimization

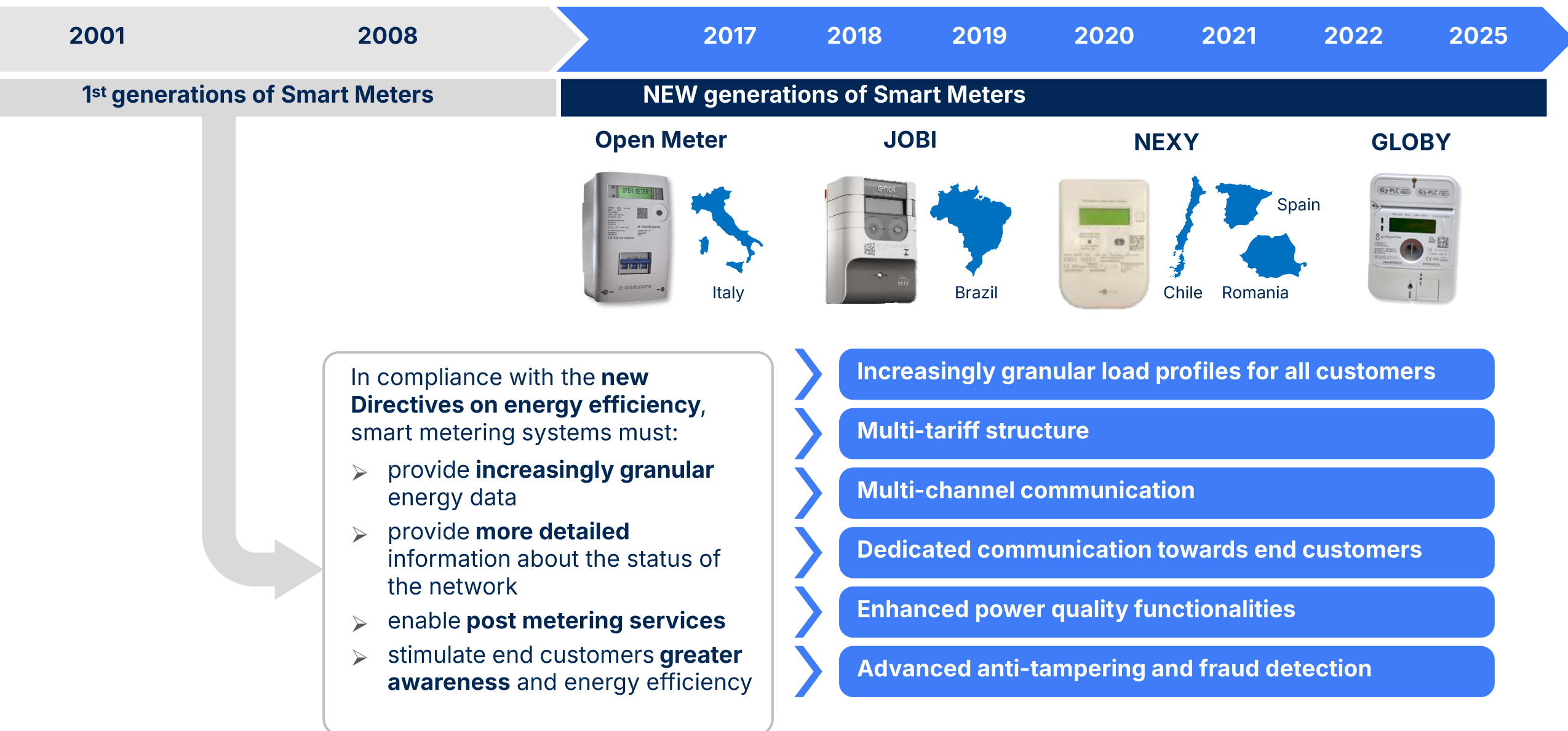
- SKUs/ warehousing
- Transportation optimization
- Purchasing & logistic
- CO₂ emission reduction

DSOs




>> Yearly savings around 450M (Telegestore project)

...to the new generations



Benefit to the whole society

Solution to support the modernization of the electricity grid

- Reliable electricity metering **remotely managed**
- Invoices on **actual consumption** and **advanced tariff** to choose
- **Bi-directional metering** supporting RES generation
- Customer **physical security improvement**
- Cutting-edge **cybersecurity**
- **Near real-time consumption information and alarms** enhancing energy efficiency
- **Advanced functionalities:** customer over-voltage protection (POP), pre-payment

- **Advanced Grid Sensor** monitoring grid parameters
- Support to **network planning** and **outage management**
- Reduction of **non-technical losses**

- **Modernization of infrastructure**
- Enabling **free-market development** with custom offers
- Support **energy transition** towards **distributed generation** and **active demand response**
- **Sustainability:** circular-by-design industrial devices
- Increased **quality and reliability of energy supply**

- **Industry 4.0 development**
- **Employment** enabling new 3rd party businesses
- Support to **new business models** and to an **electrified culture**
- **Energy efficiency** and **CO₂ emission reduction**



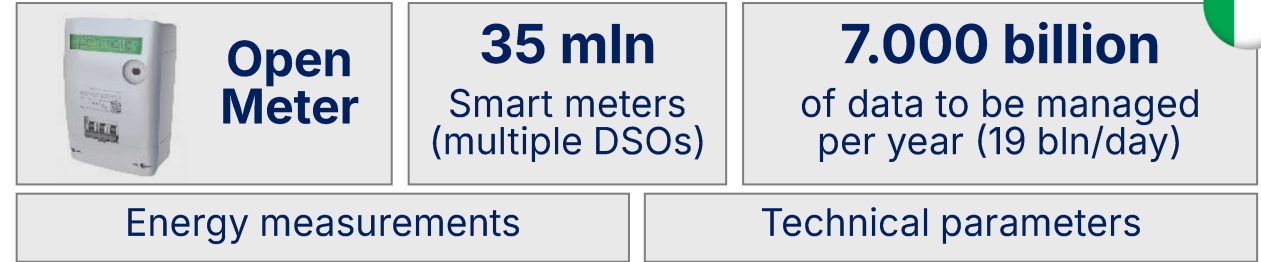
Valuable information for planning the network



Asset Owner

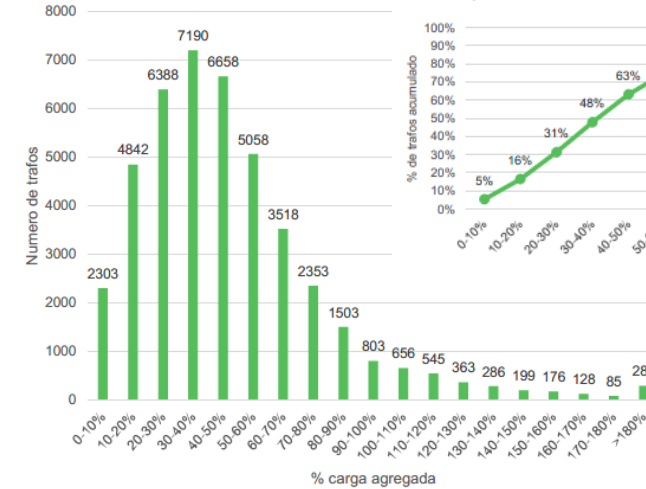
Network Engineering and Planning

- **Support to network planning** thanks to the systematic acquisition of technical parameter from all PODs (Point of delivery)
- **Increasingly granular data (15' samples)** to support Distribution Management Systems, LV network calculations and **identification of critical issues**
- **Advanced monitoring of MV/LV transformers** (direct motoring and balancing through smart meters aggregated consumption)
- **Sensors' data collection** (electrical, temperature, environmental) local and remote
- **RES observability**

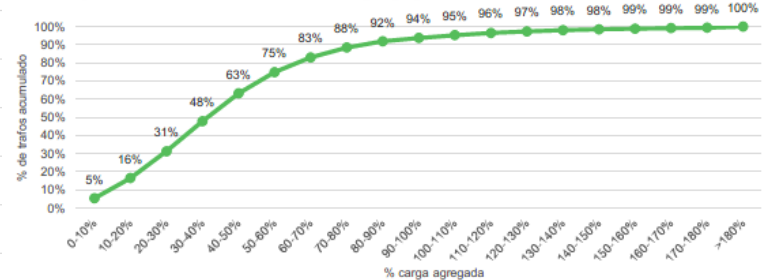


Monitoring of MV/LV transformers

Histograma de carga agregada



Porcentaje de trafos acumulados hasta nivel de carga agregada



43 k
Monitored transformers
(and relative smart meters)



Key enabler for Smart Grids and DSOs new role



Asset / System Operator

Increased Operating Efficiency

- Enhanced work orders success rate thanks to optimized algorithms and multiple communication channels (e.g., PLC plus radio)



**Open
Meter**

96%

acquis. rate
within 24h

6 mln

Work orders
per year

95%

Success rate
within 4h



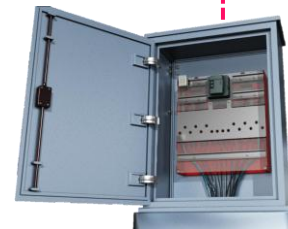
Synergy with Network Operation & Automation

- Feeding the LV network management system with tech data coming from the meters for an **efficient grid management**
- LV anomalies real-time detection (**Last-Gasp**) and support to **fault isolation** on LV network
- Support to **DERs integration** (es. voltage regulation)



Last gasp

Sensors



Last Gasp & synergies with LV network Operations

- Last gasp information feed the **LV SCADA** and allow Network Operators to **locate and identify the portion of the LV network affected by a fault**
- Trough the AMI infrastructure can be collected valuable **information about the status of the LV network** (cable temperature, street cabinet condition/opening etc.)

Key enabler for new services/platforms



Smart stakeholders

Multi services enabler

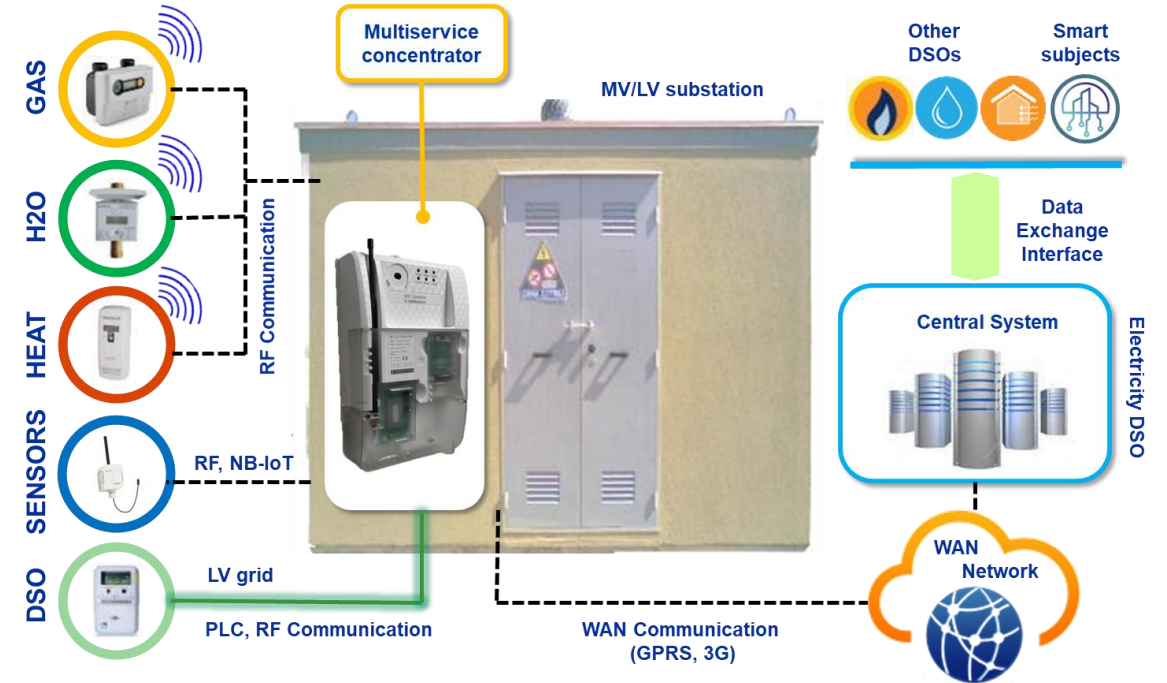
- Support to **multi-metering** (Sensors, Gas Meter, Water Meter, Heat Meter)
- Third-parties leverage on the metering infrastructure to enable and managed their services
- **Support to Smart Cities management:** public buildings energy management, smart lighting, bus stops, parks etc.
- Cross analytics allowing advanced urban planning
- Support for emergencies management

New smart subjects support

- Key **enabler for new flexibility platforms** and services
- Key enabler for the development of **energy communities**



Multi-services infrastructure



- Several pilots have been launched mainly by leveraging on the RF W-MBUS 169 MHz communication (gas, water), and currently some DSOs are acquiring their data through the AMI infrastructure
- In some pilots, PLC has been used to collect data from smart lighting nodes

Open infrastructure for new Smart subjects



Customer engagement

Advanced energy and ancillary services

- Increasingly granular energy data enable:
 - market operators to introduce new offers with **dynamic pricing**, based on **customized tariffs**
 - new services/platforms** e.g., those linked to distributed generation, e-Mobility and flexibility

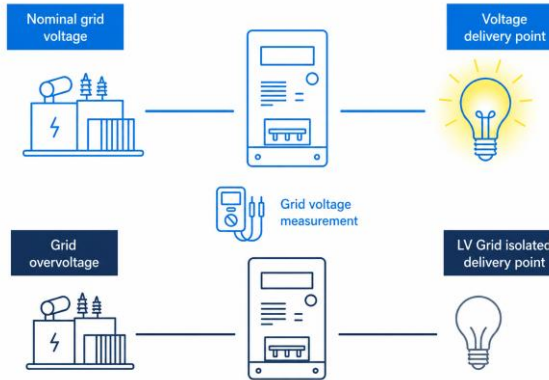
Advanced Functionalities

- Prepayment**
- Permanent over-voltage protection (Pop)**

Smart Home & Active Demand Support

- Near-real time communication towards end customer** by means a dedicated channel (Chain2)
- 17 use cases** for stimulate a **greater awareness, energy efficiency** and enable demand-response services and home automation

Permanent Overvoltage Protection



- POP devices are able to disconnect an electric system from the LV grid whenever a permanent overvoltage is detected in order **to avoid the connected loads get damaged**
- The **re-closing** of the switch-disconnector inside the meter is **forbidden** until the voltage falls back into the **allowed range**



Open Meter

Chain2 full
released in 2021

17
Use cases enabled

99%
Daily success rate



Open protocol



DLMS UA



In all new smart meters

Load curve collection

Pushing customer awareness forward



ENEL Energia – Ore FREE

New energy supply offer for free market Italian customers **based on OPEN METER** features:

- Customers can choose **3 hours per day at which energy is free** (only the energy component of the tariff)
- Offer can be **managed from APP** delivering **hourly consumption information**



OPEN METER as the enabler factor for an innovative and customer-oriented offer

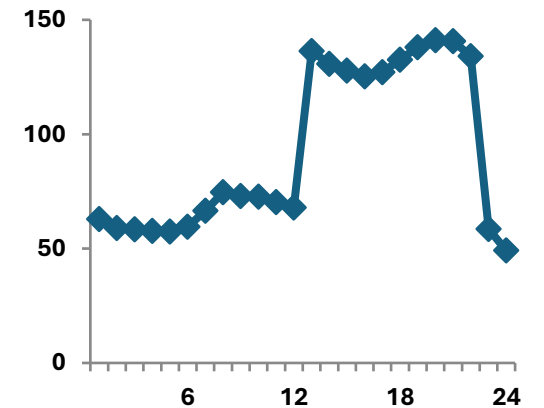


Billing Based on hourly-grained Load Curve

Voluntary Price for Small Customers
(Precio Voluntario para el Pequeño Consumidor)

- Tariff for customers with contractual power **up to 10kW**
- Hourly price published by **Red Eléctrica de España**
- Since **October 1st 2015** traders have to bill based on hourly consumption

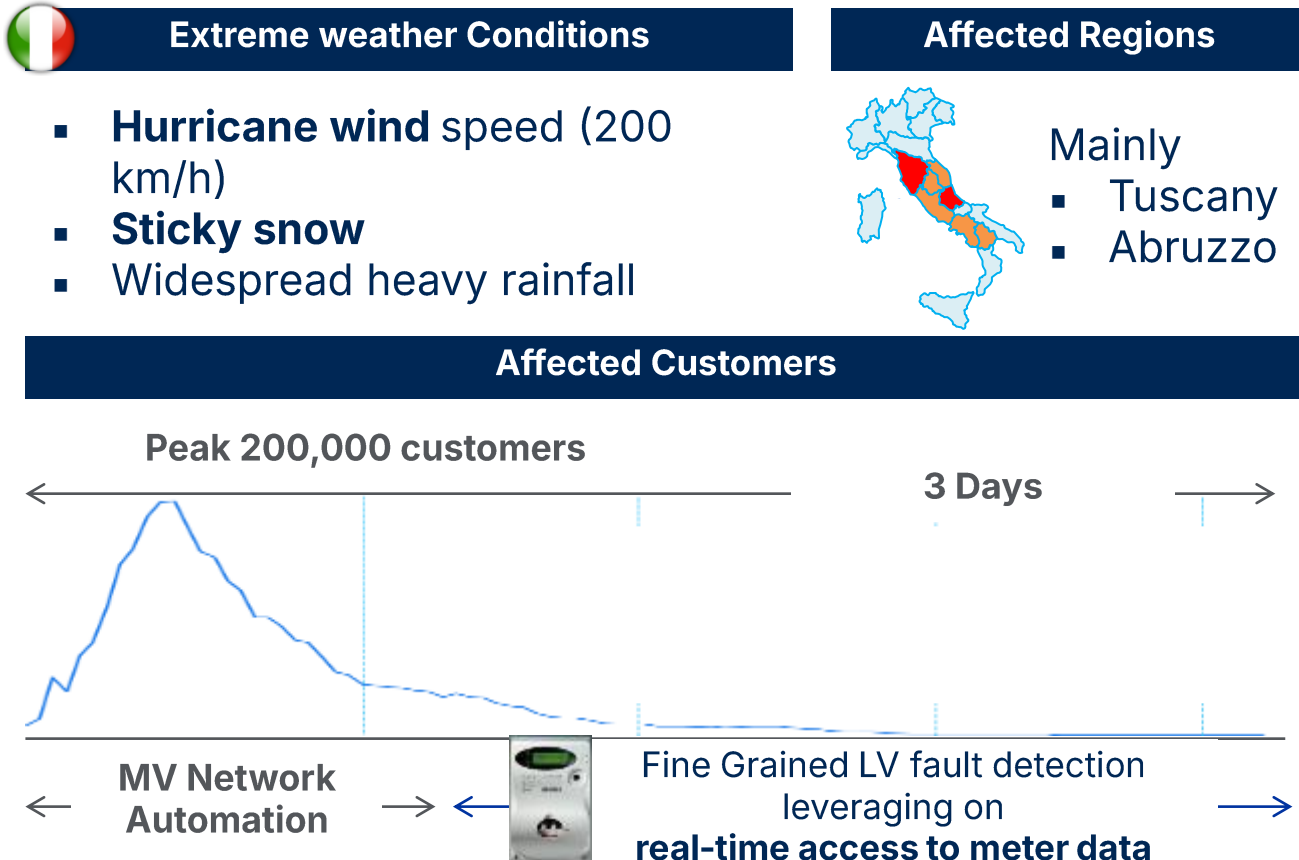
Hourly price (€/MWh)



more than 15 GB/month of billing relevant data collected from the field

Resilience

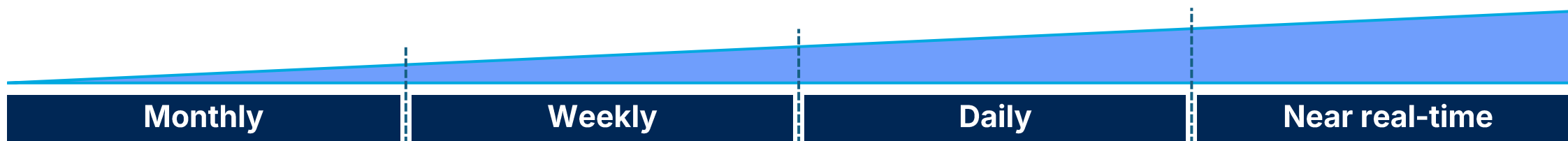
Atmospheric events



Fine-grained monitoring of the Low Voltage Grid

Chain 2 takes customers engagement to the next level

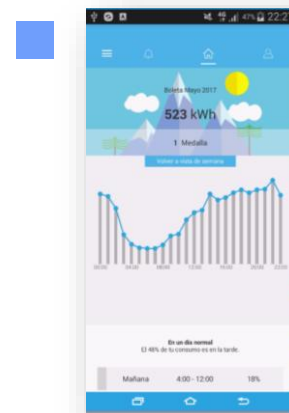
The higher the frequency of energy data sharing, the more advanced the services that can be enabled and **greater** the **awareness** and **energy efficiency** achievable



- Weekly or monthly readings will never be able to tell you how much energy you're using at different times throughout each day



Web platforms and Apps, especially if fed with daily load curves*, increase customers engagement, can notify consumption alert and integrate energy efficiency algorithms



- Hourly load profiles in the monthly billing offer granular but delayed energy data

NEW!

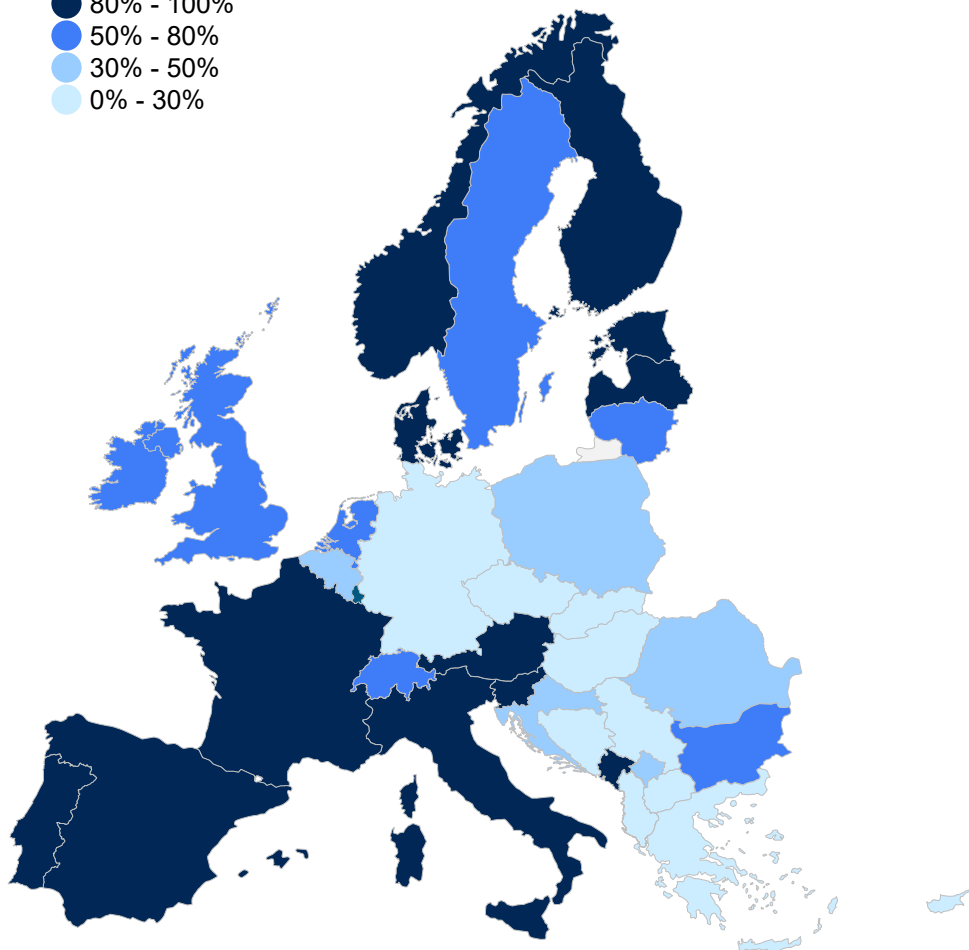
Chain 2 tech

- Dedicated communication channel towards the customer to provide near real-time data directly from the meter
- Multiple use cases can be enabled according to local regulatory framework

(*) energy data usually referred to the day before

State of the art (2025)

- 80% - 100%
- 50% - 80%
- 30% - 50%
- 0% - 30%



Country	Regulatory drive	Penetration	Current roll-out waves																		
			<'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30>				
Germany	Mandatory	4%		1st wave																	
Poland	Mandatory	44%								1st wave											
Netherlands	Mandatory	88%		1st wave					Finalization ongoing					2nd wave				>>			
Belgium	Mandatory	49%			1st wave																
Finland	Mandatory	100%		2nd wave																	
Czech Rep	Not mandatory	6%			1st wave																
Denmark	Mandatory	100%		1st wave									2nd wave				>>				
Estonia	Mandatory	100%		1st w.										2nd wave				>>			
Lithuania	Mandatory	58%						1st wave													
Austria	Mandatory	97%		1st wave												2nd w.				>>	
Norway	Mandatory	100%		1st wave												2nd		>>			
Ireland	Not mandatory	79%			1st wave																
Sweden	Mandatory	100%			2nd wave																
Spain	Mandatory	100%						2nd wave													
Italy	Mandatory	100%		2nd wave												3rd		>>			
Greece	Mandatory	14%			1st wave																
France	Mandatory	97%		1st wave																	
Portugal	Mandatory	97%		1st wave																	
Romania	Mandatory	35%			1st wave																
Malta	Mandatory	94%		1st wave																	

Defined
Expected

MaaS can deliver multiple benefits for DSOs along the full metering Value Chain

Benefit	Description
 Operational efficiency	<ul style="list-style-type: none"> Scale-driven standardization of technology, configurations, processes and SLAs reduces complexity, risk and total cost of ownership, while improving performance and operating quality Minimizing internal skill requirements and vendor coordination, with a single point of contact streamlining cloud, connectivity, HES/MDM and field operations
 Financial & cash optimization	<ul style="list-style-type: none"> Subscription-based, pay-per-meter models can reduce upfront investments, offer smoother and more predictable cash flows over the roll-out period, and may allow capitalization costs traditionally treated as Opex¹
 Strategic Focus	<ul style="list-style-type: none"> Redirect focus from metering complexity and investment risk to more core activities, delivering outcomes and intelligence
 Quality, Performance and Compliance	<ul style="list-style-type: none"> SLA-based quality commitments ensure defined performance levels, measurable outcomes, and accountability, shifting operational risk and guaranteeing consistent service quality over time Systematic management of regulatory compliance and cybersecurity allow to streamline operations while safeguarding critical operations throughout the lifecycle
 Accelerated time to market	<ul style="list-style-type: none"> Reduction in time to roll-out smart meters thanks to replicable system design, development and integration as well as turn-key service delivery

¹The option requires in-depth regulatory and financial assessment, to be evaluated on a case-by-case basis

GSP has experience and track record on key MaaS building blocks to deliver value to DSOs

OUR CREDENTIALS

Aidon MaaS full offering deployed in 150+ DSOs

- Aidon experience in full MaaS package in Nordics with 10Mn+ installed meters and users operations
- Full MaaS offering incl. System design, meters HW, installation, operations and troubleshooting

Fully operational HES in Spain with 12Mn+ users

- BeatSuite (PLC M&M) operating in Spain collecting data from 2014-21 smart meters roll-out
- Globy HES to be deployed in Brazil as evolution of BeatSuite HES

Operational services already offered to Enel in Brazil

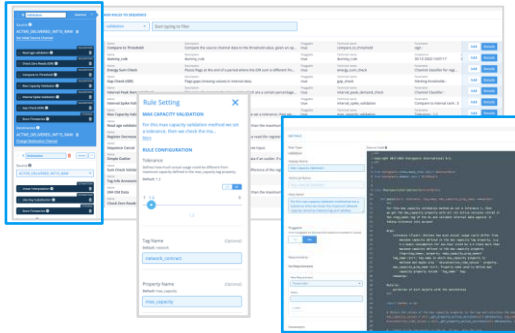
- Remote troubleshooting (i.e., issue rooting, remote remediative actions, and remote coordination of on-field technical teams) already provided in Brazil
- Enel São Paulo platform integration & migration, supporting 2M meters

Advanced engineering services for AMI systems

- Advanced data mining services to design and implement data collection, analysis and control models, leveraging AMI as a driver for Enel
- Feasibility studies and assessments for new technology implementation (e.g., Enel São Paulo)

Data Management Platform enables the flexible configuration of energy balances to detect losses

Flows with rules to automate data processing



Configurable dashboards to track outcomes



Customer clustering based on usage patterns, tracking deviations from cluster pattern



Relative loss scores based on voltage/usage comparison



Use cases

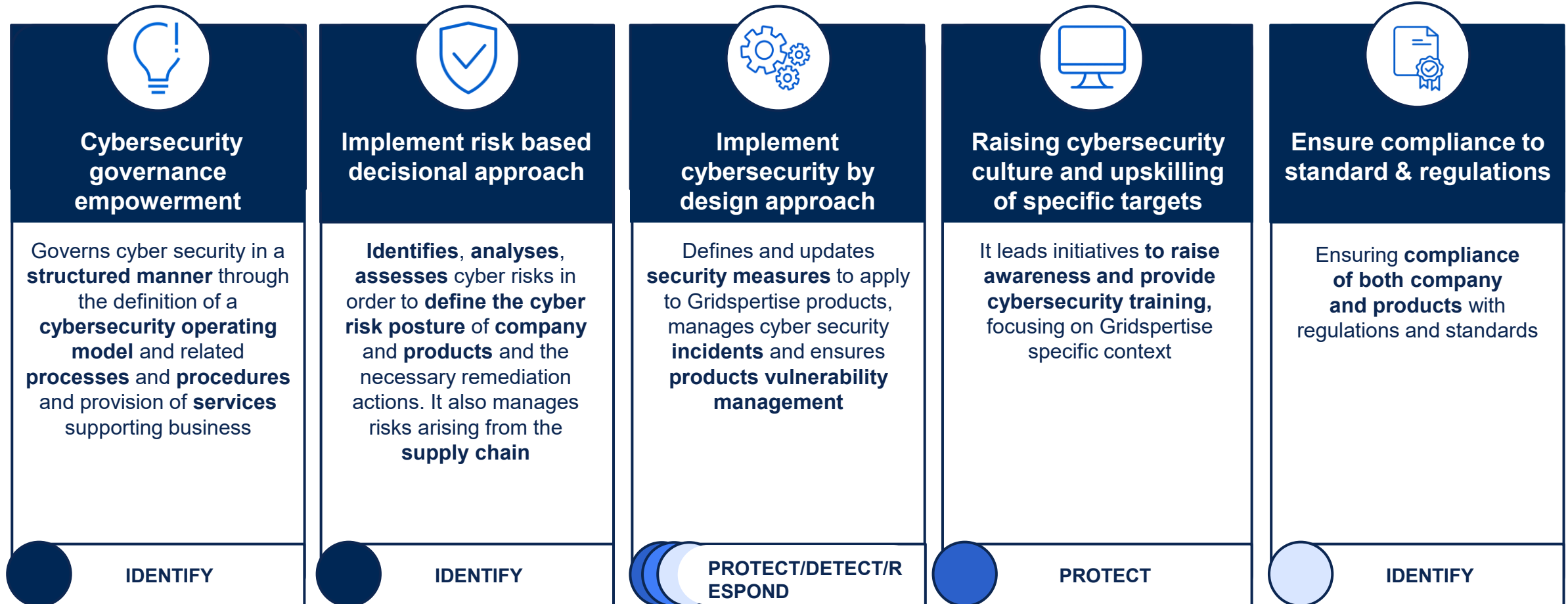
AMI VISIBILITY

1. **Anomaly detection** using relative loss score per endpoint, e.g., comparing patterns in smart meters with energy usage to flag irregular behaviors
2. **Energy balance per area**, computing losses per feeder/transformer using energy usage per meter, master data and SCADA measurements.
3. **Consumption anomaly detection**, clustering customers based on historic energy usage, comparing real-time usage with cluster pattern, detect deviations

LIMITED VISIBILITY

1. **Area prioritization**: Calculating yearly losses on primary substation level, combining with yearly/quarterly reads from analog meters, cleaned up and profiled. Prioritizing MV areas for inspection/smart meter rollout based on losses
2. **C&I metering malfunction detection**, identifying measuring errors based on load patterns and expected usage profiles

Cybersecurity Strategy Pillars



National Institute of Standards and Technology Framework



Sustainability as a key driver

Energy Transition Accelerators

Gridspertise is committed to ensuring sustainability in technology development and operational processes, carefully selecting options that minimize footprint on both people and planet.



Corporate Certifications



Gridspertise is committed to the SBTi's near-term targets¹ of reducing absolute Scope 1 and 2 GHG emissions by 54.6% by 2033, based on figures from 2023. Gridspertise also commits to ensuring that 70.0% of its own emissions, as well as those of its customers, suppliers and end users, will have science-based targets by 2030.



Gridspertise achieved the Gold Medal Ecovadis on ESG rating, ranking in the top 5% of global companies



ISO 14001:2015
Environmental management system



ISO 27001:2022
Information technology - Security techniques -
Information security management systems

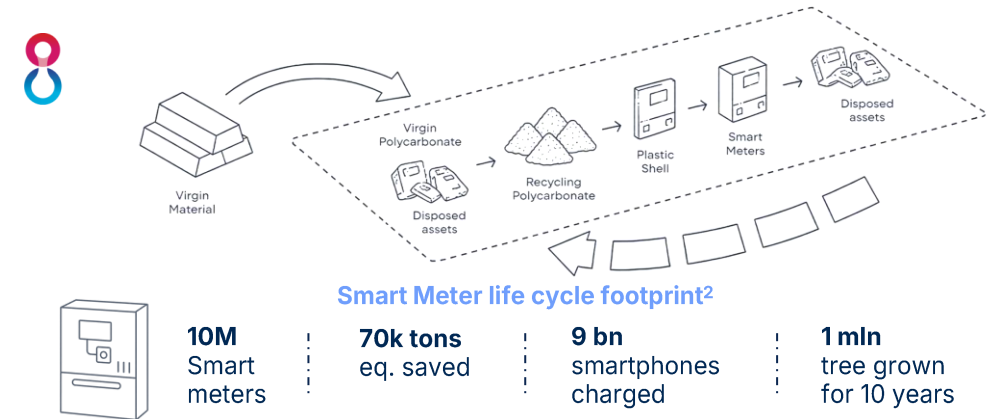


ISO 37001:2016
Anti-bribery management system

ISO 45001:2018
Occupational health and safety
management system

ISO 9001:2015
Quality management systems

Circular Smart Meter



²According to the 2020 Life Cycle Assessment of Smart meters produced in Italy, the use of recycled polycarbonate for cover production reduces about 6% (7 Kg CO₂ eq.) of the overall Global Warming Potential impact.

Sustainable supply chain

In Gridspertise's commitment to sustainability, the entire supply chain is involved to pursue a common goal, through:



1. The adoption of a **Supplier Code of Conduct**.
2. **ESG criteria** in **scouting** and **qualification** to evaluate our supplier's readiness in sustainability
3. **Sustainability K-factors** to reward the most sustainable suppliers in our tenders
4. **Specific contract clauses** on **sustainability** to be agreed and respected
5. Continuous improvement of **suppliers** and their **sustainable performance**
6. **Alignment with SBTi criteria**

¹For more information on Gridspertise's SBTi targets: <https://sciencebasedtargets.org/target-dashboard>

01 Journey of Gridspertise

02 Business models and regulatory enablers – international experience

03 Gridspertise - Advance Metering Infrastructure

Lunch

04 Gridspertise - Grid digitalization and automation

Agenda

13:15 – 14:15

- General overview of grid digitalization technologies
- Benefits for stakeholders
- Identifying and Managing DERs
- Advanced grid automation solutions
- Innovations on LV network
- Cybersecurity

Q&A session





Paolo Bassani

Head of Grid Value Proposition



Scan to discover more

Why Grid management has become so complex



Distribution System Operators (DSOs) are facing unprecedented challenges
The energy transition, digitalization and climate change are transforming the Grid like never before

Key drivers of complexity



Energy transition acceleration

Rapid increase of DERs
(solar, wind, storage)

EV charging
proliferation

Prosumer and active
customer participation

2-way power flows
and grid volatility



Digitalization & data explosion

Massive growth of data
from grid edge

Need for real-time visibility
and advanced analytics

Integration of IT/OT
systems and cybersecurity
requirements

More devices, protocols
and system integration



Urbanization & demand growth

Rising electricity demand
and peak loads

Aging infrastructure in
many network areas

Limited space for new
assets and upgrades

Need to deliver high-
quality power to all
customers



Climate change impacts

More extreme weather
events (storms, floods,
wildfires)

Increased frequency and
duration of outages

Infrastructure stress
and accelerated aging

Need for climate-resilient
grids and faster recovery



Regulation & stakeholders

Higher reliability and power
quality expectations

Decarbonization and
sustainability targets

Stricter regulations and
reporting requirements

Affordability and social
equality



Operational complexity

Heterogeneous assets
and legacy systems

Siloed tools and
fragmented processes

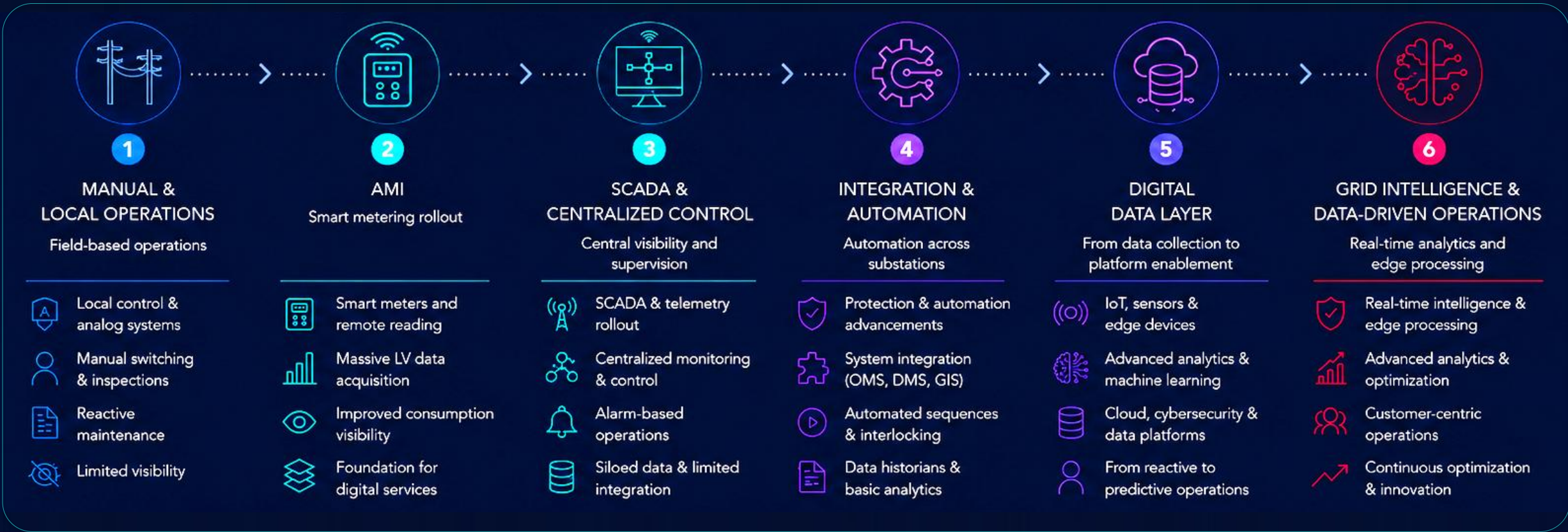
Skilled workforce
shortage

Need for end-to-end
coordination and
automation



A more dynamic, distributed and unpredictable grid requires
smarter tool, integrated systems and data-drive operations

The journey from traditional Grid to data-driven operations



GRID MANAGEMENT FOUNDATIONS



Provides a nominal (static) understanding of the grid (basis of a digital twin)

GRID MONITORING



Provides historical and real-time visibility of the grid status and the condition of its assets

GRID OPTIMIZATION



Provides actionable insights and recommendations to optimize operations, planning and losses

GRID CONTROL & AUTOMATION



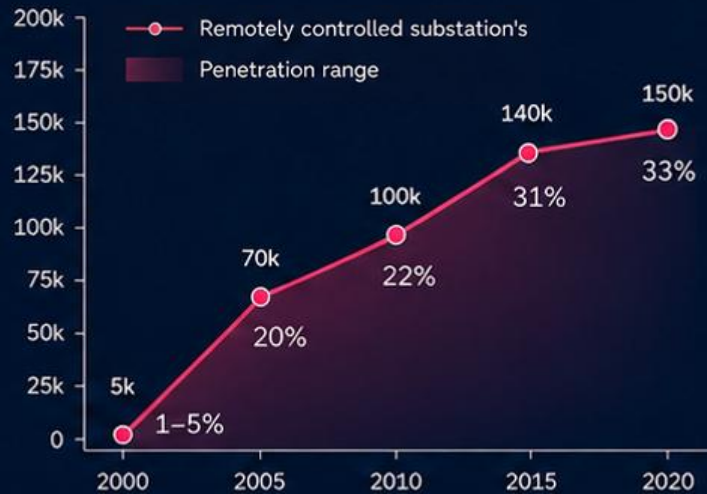
Enables remote intervention, automated operations and flexibility management



Grid automation journey in Italy (e-distribuzione)

1

GROWTH OF REMOTELY CONTROLLED SECONDARY SUBSTATIONS



15%

Remotely controlled & automated substations

89%

Remotely controlled & automated MV feeders

2

SAIDI EVOLUTION OVER TIME

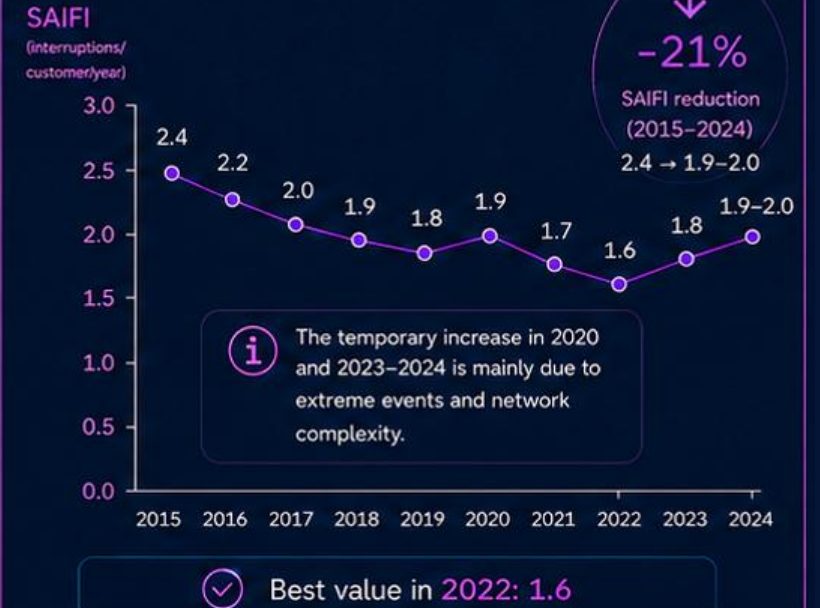
Strong reduction in outage duration thanks to remote control and automation



3

SAIFI EVOLUTION OVER TIME

Significant reduction in interruption frequency



KEY ELEMENTS

Sensors

Fault passage indicators

Remote Terminal Units (RTU)

Motorized Switchgears

Protections

Advanced Edge Devices

KEY TAKEAWAYS



Strong reduction in SAIDI
From 128 min to 45-50 min
(-68%) in 24 years



Lower cost per customer
-35%
from high levels to significantly lower
(vs baseline)



Remote control & automation
as key enablers
Continuous investments in
technology and digitalization



Better quality for customers
More reliable network,
faster restoration,
higher service quality

... and in Romania (Retele)

1 AMOUNT OF MV REMOTE CONTROLS

Significant growth over time

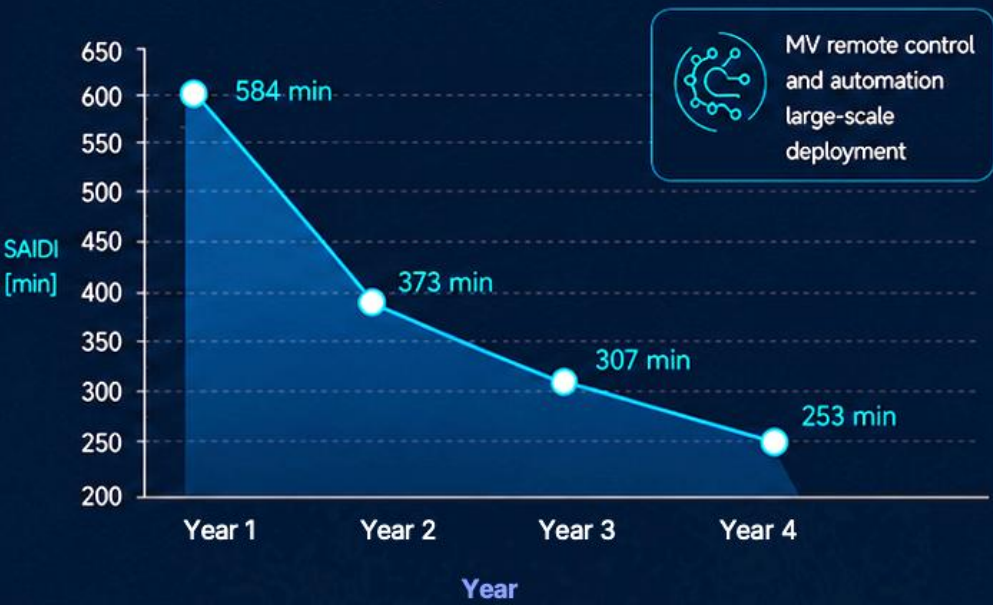


KEY IMPACT



2 PERFORMANCE: SAIDI

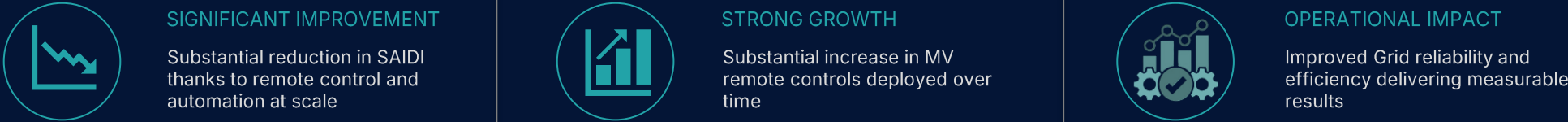
Substantial reduction in outage duration



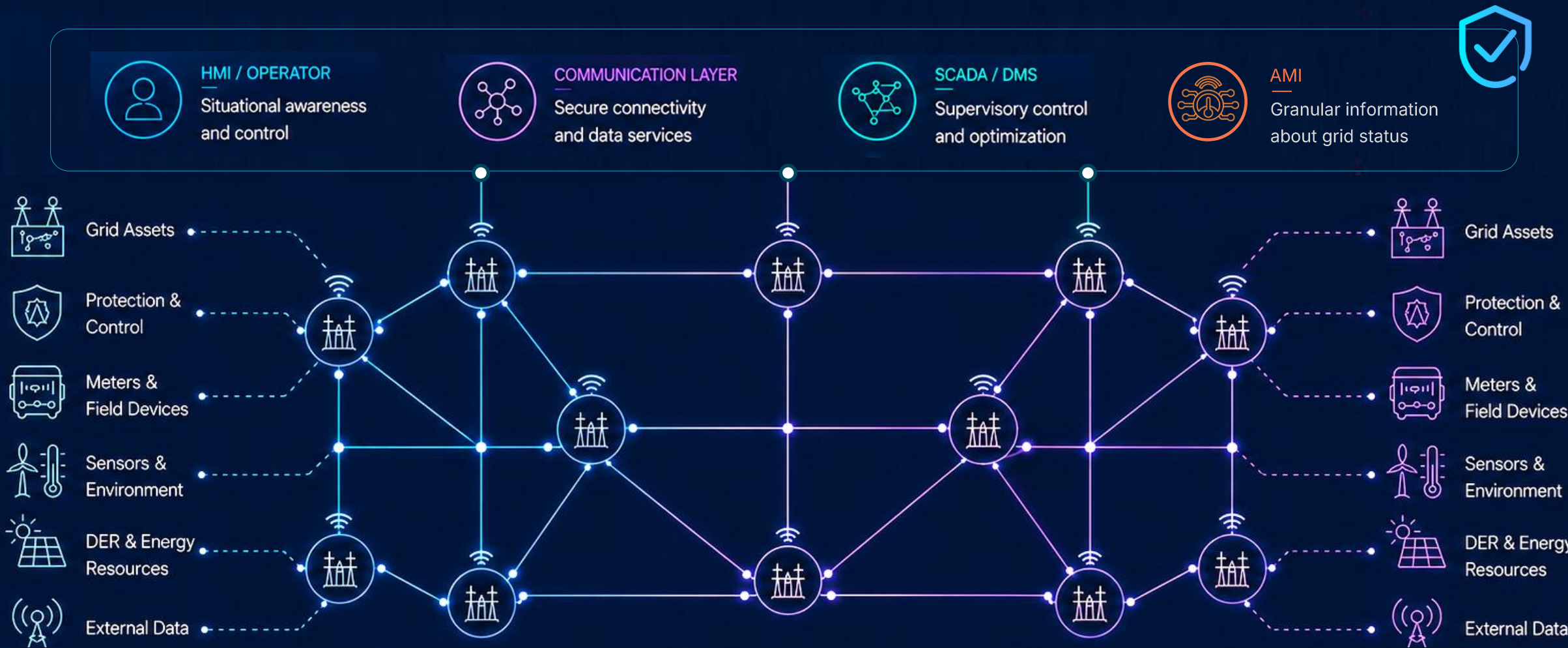
KEY ELEMENTS



KEY TAKEAWAYS

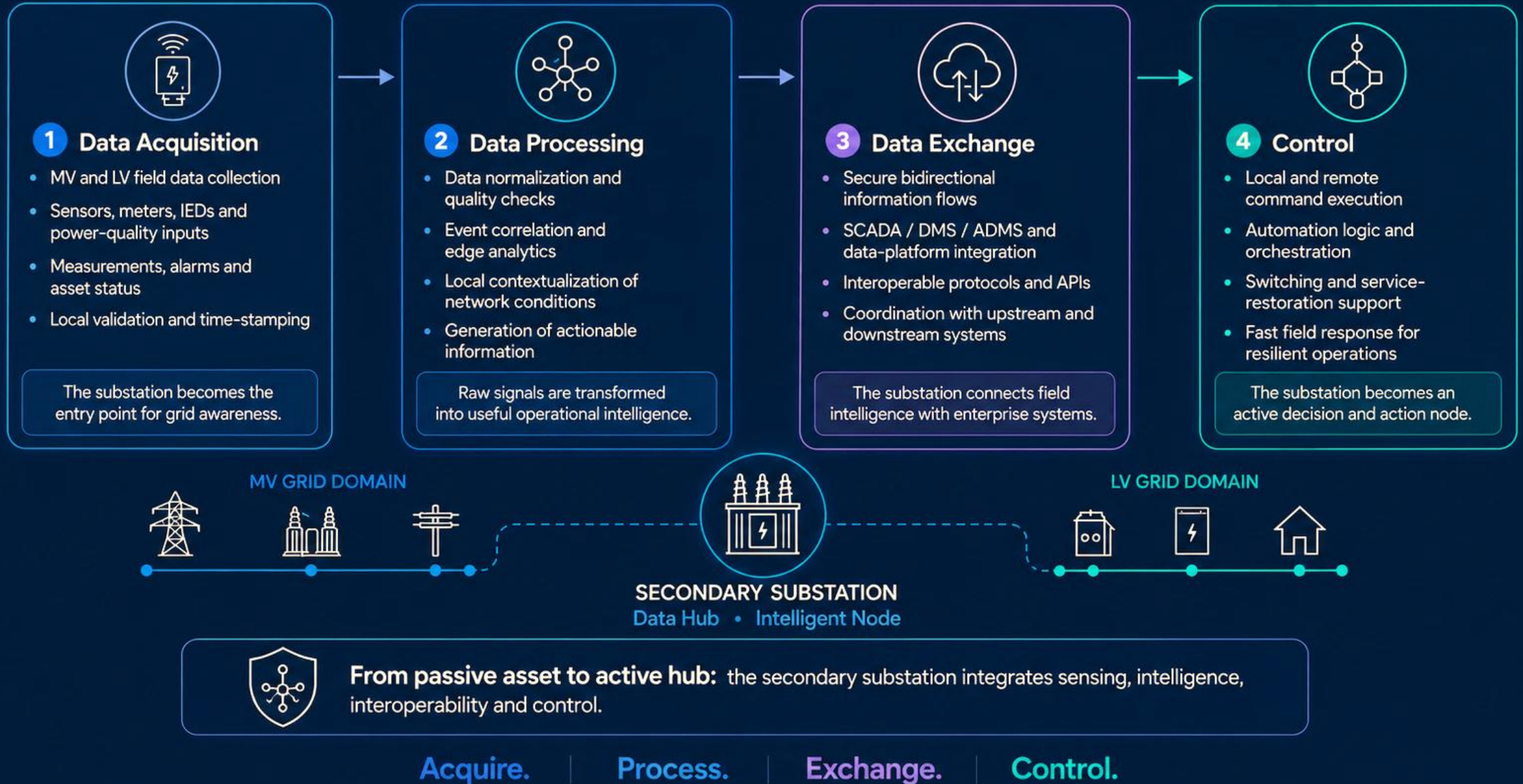


Grid 2.0: from Grid to Intelligent Network



 Empowering the Network: where **Data** flow, **Intelligence** grows

Secondary substation as an Intelligent Node



The shared value of Smart Grids Digitalization

1 INTELLIGENCE IN ACTION

Grid digitalization turns data into operational intelligence.



Real-time visibility of grid conditions

Live monitoring of network status, load, and power flows.



Health monitoring of assets & systems

Continuous assessment of asset health and performance.



Alerts & event prioritization

Intelligent alerts with severity scoring and prioritization.



Analytics & insights to detect issues and opportunities

AI-powered insights to uncover anomalies and optimize performance.



Historical data for reporting & compliance

Trusted historical data for audits, reporting, and compliance.



Automated actions & recommendations

Smart workflows and recommendations that drive proactive responses.



Digital intelligence enables faster, better, and more proactive decisions.

2 USE CASES & BENEFITS OF GRID DIGITALIZATION



1. Reliability & Power Quality

Detect issues early, reduce outages, improve power quality.



Higher service continuity



2. Asset Performance Management

Monitor asset health, predict failures, optimize maintenance.



Lower OPEX & longer asset life



3. DER & Energy Management

Integrate DERs, balance supply and demand, support decarbonization.



More grid flexibility



4. Operational Efficiency

Automate operations, reduce manual work, optimize resources.



Faster interventions



5. Loss and Revenue Protection

Detect losses, reduce revenue leakage, and protect revenues through digital grid intelligence.



Better traceability



6. Customer & Grid Resilience

Faster restoration, better communication, stronger resilience.



Improved customer experience



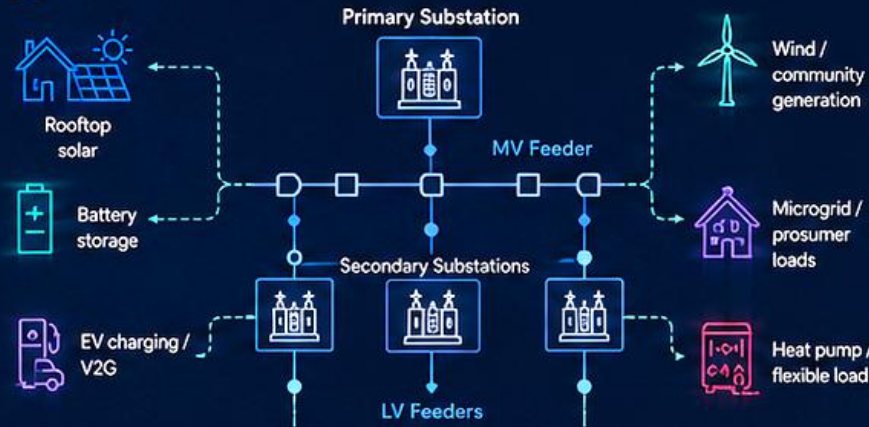
Digitalization creates measurable value across reliability, efficiency, flexibility, and resilience.



From data to decisions. Smarter operations. Stronger grids.

DER integration and Hosting Capacity across the Grid

1. How DER are hosted in the grid



EU, 2025

600
GW

DER cumulated installed capacity

1.000
GW

DER new capacity waiting for connection*

(*) 48% waiting for technical issues (i.e. grid congestion) and a relevant share due to permitting

2. What happens as DER penetration increases



3. Tools to manage the trend



Distributed solar accelerates

Storage scales rapidly

Flexible demand becomes system-critical

Global DER trend — next 20 years



Indicative trajectory based on IEA / IRENA outlooks for distributed PV, batteries and flexible demand.



As DER adoption accelerates, grid hosting capacity becomes a **strategic capability** — enabled by **digital intelligence**, **flexibility** and **active network management**.

Technical losses in a more complex distribution Grid

1 DER & Renewable Growth



- More generation connected at MV/LV level
- Higher variability on feeders

2 Bidirectional Power Flows



- Reverse flows in high production periods
- More dynamic loading and voltage profiles

3 Technical Loss Exposure



- Losses depend on operating conditions
- Congestion and imbalance can increase losses

4 Need for Active Control



- More MV/LV visibility
- Local intelligence and coordinated control

What This Means for the Grid

- ✓ Higher DER penetration increases grid complexity
- ✓ Bidirectional flows can raise technical losses
- ✓ Losses depend on real-time network conditions
- ✓ Active network management is required

Evidence & Regulatory Context



Technical studies

High DER penetration can create reverse power flows and voltage issues



ARERA

Distributed generation and network losses remain active regulatory topics



Grid operation

Non-programmable RES require more visibility and control tools



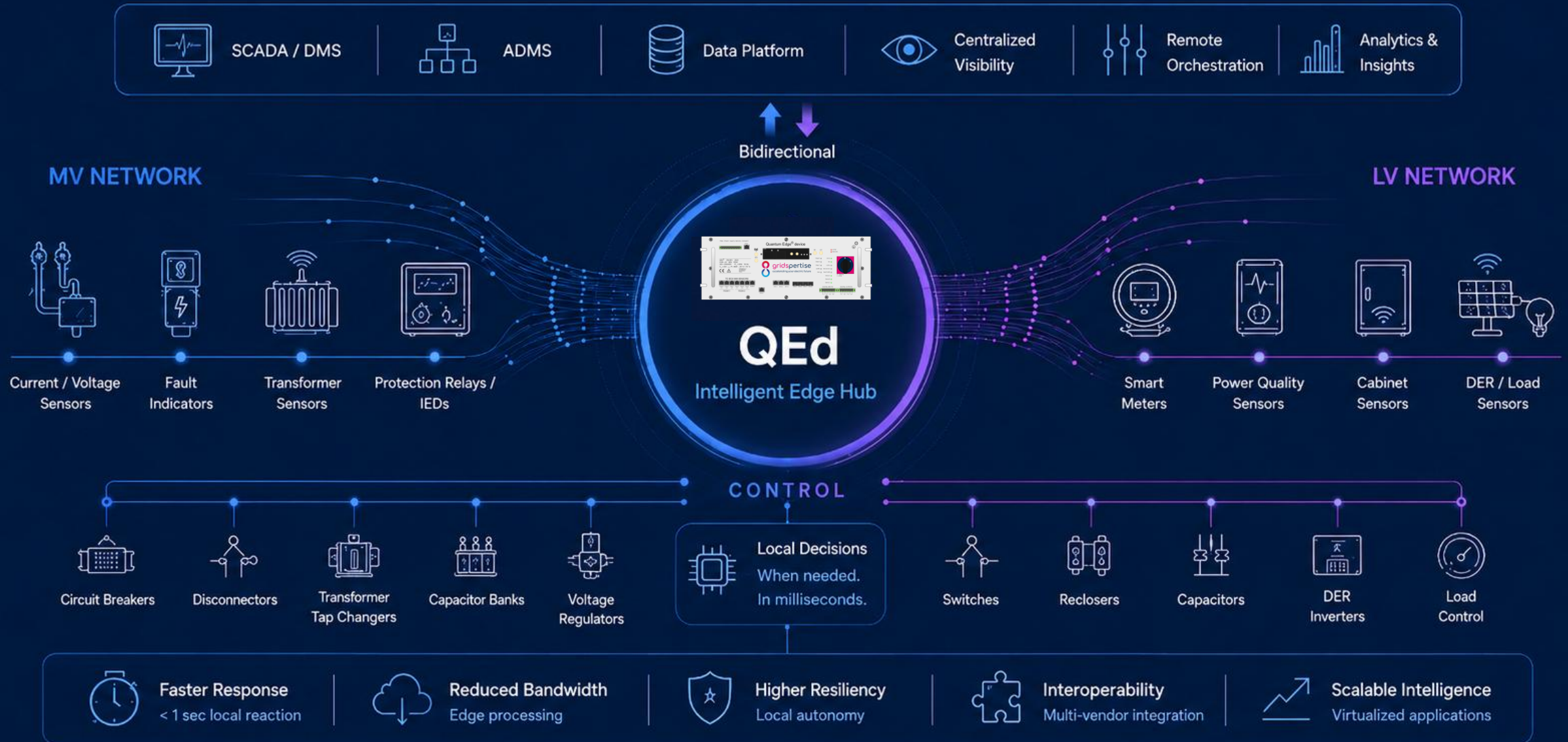
IEA

Modern digital grids are essential for secure energy transitions



Technical losses are no longer just an efficiency KPI — they are an **operational outcome**.

QEd: the intelligent Grid Edge Hub by Gridspertise



Acquire. Understand. Decide. Act.

QEd: less hardware, more intelligence, greater impact

Substation traditional technologies



Hardware footprint



Larger footprint
Multiple devices
and cabinets



Complex wiring
Many connections
and i/O points



Higher complexity
More components,
configuration and
maintenance

VS.

QEd solution



Hardware footprint



Compact all-in-one
Single device,
minimal space



Simplified wiring
Fewer connections,
streamlined
architecture



Lower complexity
Easy installation,
configuration
and updates



Edge-computing



Virtualization



Open approach

-70%

Hardware footprint

From multiple
dedicated devices
to a single
edge platform



-50%

Commissioning effort

Less wiring, fewer
integrations and
easier lifecycle
management



+90%

Commissioning effort

Fewer on-site
interventions and
faster response
to events



Future-proof scalability

Software defined evolution
enabling new functionalities
and use cases without
adding new hardware



QEd: use cases across the Grid



- Over 1.500 QEd already installed in Italy
- Plan to install around 70.000 devices
- Virtualized IEDs and applications enabling a wide range of use cases
- Continuous innovation leveraging the QEd platform



1

MV/LV Remote control

Remotely operate switches and reclosers to improve response time and safety.



2

Metering concentrator

Collect and manage data from smart meters and field devices efficiently.



3

OLTC Tap Changer

Optimize voltage regulation and extend asset life with automated tap control.



4

PMU

Real-time visibility of grid conditions for advanced monitoring and analytics.



5

Technical / Non technical LOSS reduction

Identify and mitigate losses to improve efficiency and revenue protection.



6

SAIDI/SAIFI Reduction using FLISR

Detect, isolate and restore faults automatically to reduce outage duration and frequency.



7

On Site WORK reduction

Reduce field interventions and operational costs through automation.

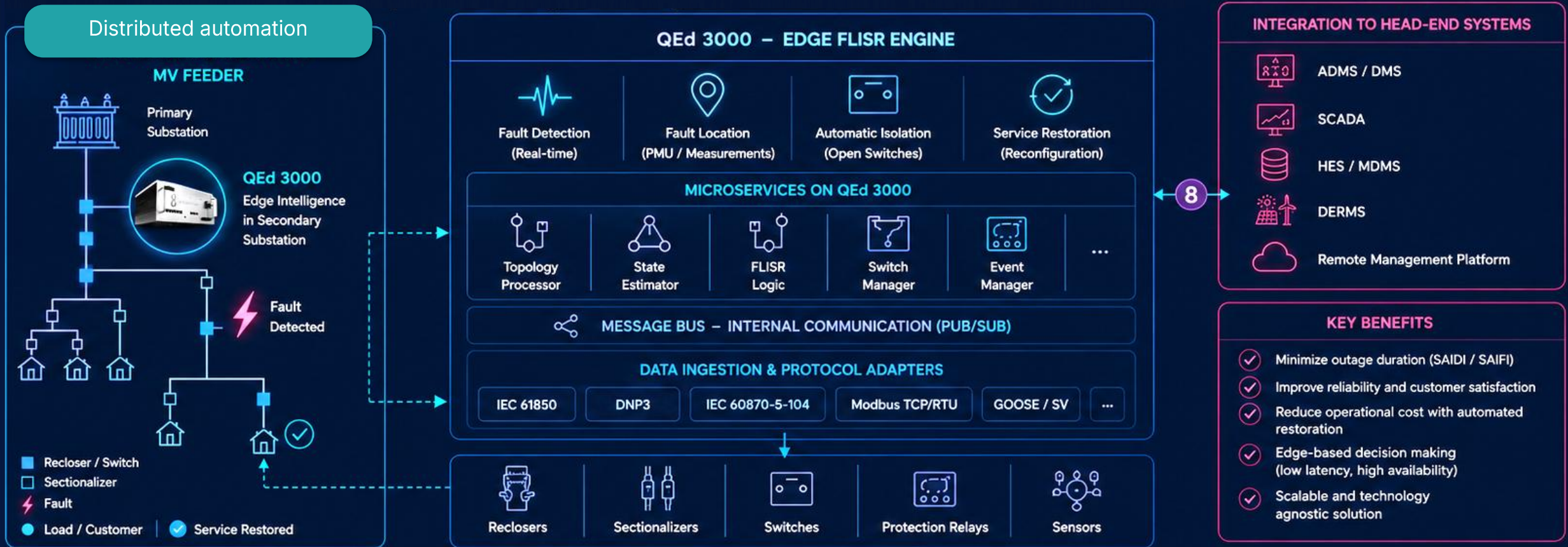


8

Centralized Operation

Operate and supervise the grid from a central control room with full situational awareness.

QEd: empowering the most advanced self-healing solutions



FLISR IN ACTION



Fault Detection
Real-time detection by IEDs / Sensors



Fault Location
Compute fault location using measurements



Automatic Isolation
Open the nearest switches to isolate the faulted section



Service Restoration
Reconfigure the network and restore power



Edge Intelligence. Fast Restoration. Stronger Grids.

QEd 3000 brings advanced FLISR capabilities directly to the edge, enabling autonomous actions and resilient operations for modern distribution networks.

Integrated LV Grid intelligence

1 QED1000 EDGE

Advanced Transformer Station Monitoring System



2 SSB

Smart Secondary Branch Electronic Breaker System



3 LV Grid Manager

Advanced Platform for LV Grid Monitoring and Management



SENSING & EDGE INTELLIGENCE

Real-time data acquisition and local processing



LV AUTOMATION & NETWORK CONTROL

Remote switching and fault isolation



CENTRALIZED VISIBILITY & OPTIMIZATION

Analytics, control and decision support



LV digital twin & GIS topology



Alarm & incident management



Advanced analytics & insights



Remote control & FLISR



Non-technical loss detection

How it works

- 1 QED1000 EDGE** collects real-time data from transformers and multi-feeder sensors and performs edge analytics.
- 2 SSB** enables remote sectionalization and switching to isolate faults and restore service to healthy areas.
- 3 LV Grid Manager** provides complete visibility, advanced analytics and control of the LV network.

KEY BENEFITS



Reduced SAIDI / SAIFI

Lower outage duration and frequency



Faster Fault Isolation

Automated detection and sectionalization



Improved LV Observability

End-to-end visibility of assets and network status



Lower Operational Costs

Optimized operations and better planning

Security principles and governance





01

Security by Design and SecOps

- Security by Design principles
- SecOps operational model
- Integrated security lifecycle
- Continuous operational security approach



02

Risk-Based Approach

- Comprehensive cyber-risk assessments
- Technical countermeasures
- Organizational countermeasures
- Procedural countermeasures
- Exposure and impact reduction



03

Hardening & Incident Management

- Periodic configuration reviews
- Interface hardening
- Authentication mechanism reviews
- Early security event detection
- Incident containment & investigation
- Regulatory-aligned communication procedures
- NIS2-oriented approach



04

Environment Separation & Control

- Separation of development, test and production environments
- Separation of duties
- Technical controls
- Non-technical controls
- Protection against unauthorized modifications



05

Governance & Continuous Improvement

- Ongoing governance and oversight
- Regular reviews and updates
- Alignment with evolving threats and regulatory requirements



IEC 62443 principles



NIST Cybersecurity Framework



SecOps governance



NIS2-aligned processes



GRIDSPERTISE is committed to maintaining a security posture appropriate to the criticality of a regulated distribution metering environment.



Specific security requirements, audit rights, and reporting obligations submitted by the customer will be evaluated and, where agreed, incorporated into the contractual framework governing the service.



Scan to discover our solutions
and stay connected with our
grid experts