Smart5Grid

Demonstration of **5G** solutions for **SMART** energy **GRID**s of the future
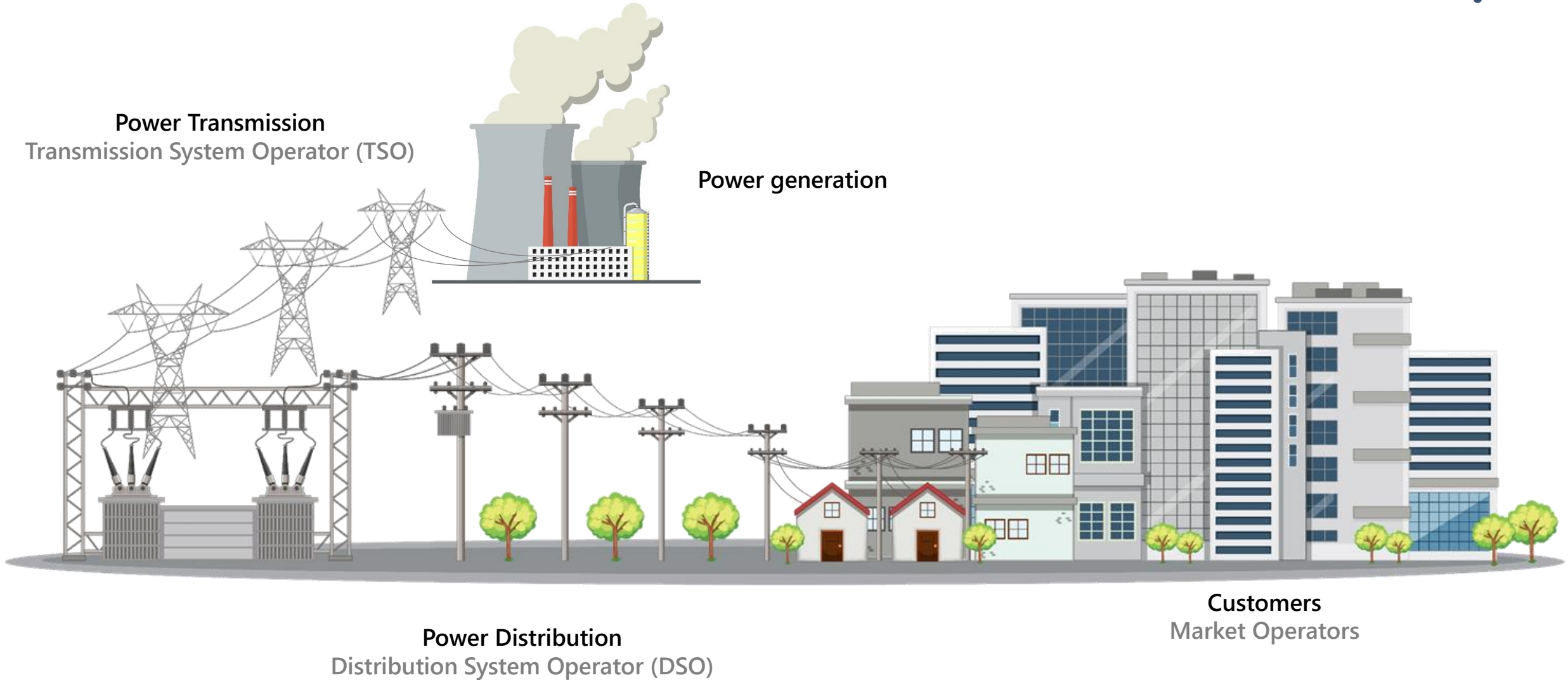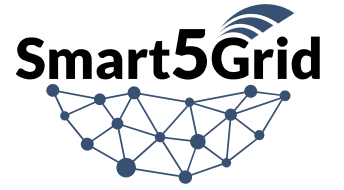
5G PPP
The 5G Infrastructure Public Private Partnership

Energy Vertical
Traditional grid

Smart5Grid

Power Transmission
Transmission System Operator (TSO)

Power generation

Power Distribution
Distribution System Operator (DSO)

Customers
Market Operators

Energy Vertical
Smart grid – A first introduction

Smart5Grid

High Voltage grid

Medium Voltage grid

Low Voltage grid

Country border

Aggregator

Aggregator

Power generation

Power Transmission
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Customers
Market Operators
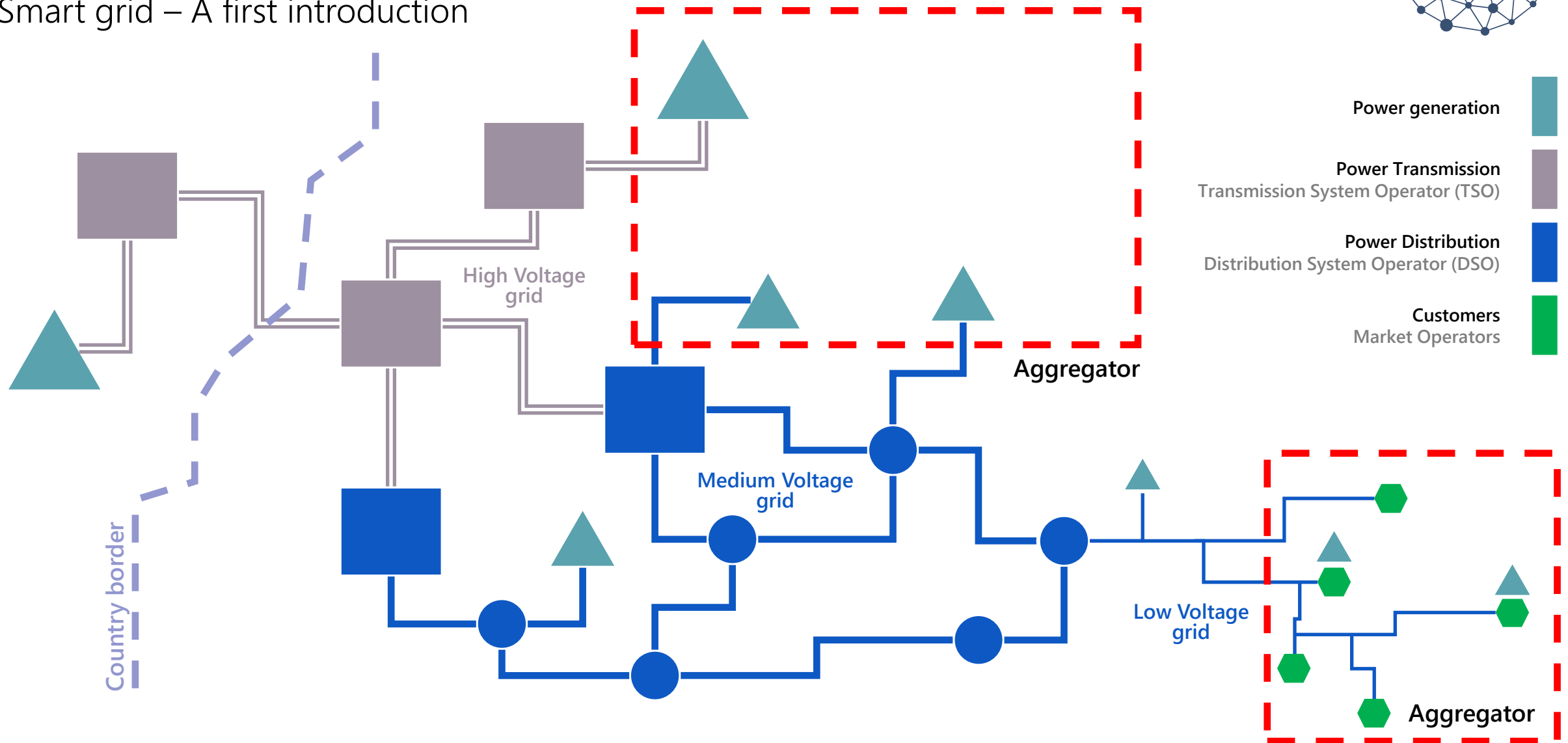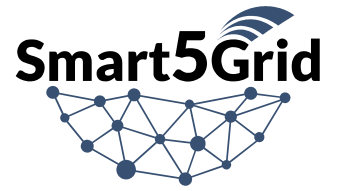
How we arrived here today?

H2020 ICT-41-2020 Call for proposal: challenges, scope and impact
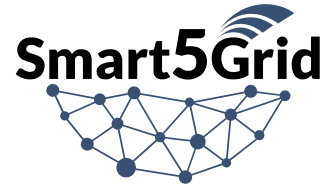
Smart5Grid

Specific vertical sector

Open Source repository

NetApps

50% of SMEs

Third party markets

Smart5Grid Overview

Demonstration of 5G solutions for Smart energy GRIDs of the future

Smart5Grid aims to revolutionize 3 fundamental functions of the modern smart grids:

1. Secure and Low-latency Communications
2. Real-time Management and Control
3. Remote and Detailed Monitoring

Through the adoption of the proposed 5G network architecture and the developed NetApps, Smart5Grid will contribute to modern issues faced by the power grid operators (Smart Grid Operators, Distribution System Operators/Transmission System Operators, Energy Service Providers, Energy Aggregators, etc.) such

- as-Fault Detection
- Inspection of Power Utility's Assets
- Management of Wide Area Measuring and Protection Systems
- Real-time Wide Area Monitoring.

Project Start

1 January 2021

Project Duration

36 Months

Consortium composition

24 Partners (50% SMEs)

2 Linked third parties

From 7 EU Countries

Total Budget

€ 8.248.750,00

Total Grant

€ 5.999.987,50

Smart5Grid

Demonstration of **5G** solutions for **SMART** energy **GRID**s of the future

Smart5Grid

GENERAL INFORMATION

THE CONSORTIUM

24

EU PARTNERS

covering 7 countries

DURATION

3 YEARS

TOTAL BUDGET

8M€

Consortium Composition

24 partners, 2 Linked Third-parties, 13 SMEs

Smart5Grid

Coordinator

TELCOs

Tech Companies

Universities/Research institutions

DSOs

(Linked third-parties of Enel GI&N)

TSOs

SMEs

Structure of the project
Overall project plot

Smart5Grid

Kick-Off

Use cases

NFV automatic testing and validation framework

Roadmap for third party experimentation

Market analysis, business models and exploitation

Integrated 5G network facility and open repositories

Technology Readiness Evolution for NetApps Development

Impact creation

Finalization of goals and results

Open 5G Platform Architecture and Technical requirements

Four advanced 5G real-life demonstrators

Liaison and Interaction with 5G-PPP Program

Objective #1

To specify the critical architectural and technological enhancements from **previous 5G PPP Phases** needed to fully enable an **open experimental platform** for the Energy vertical

Objective #2

To design, deploy, operate, and evaluate in real world conditions the **baseline system architecture and interfaces** for the provisioning of an integrated, open, cooperative, and **fully featured 5G network platform, customised for smart energy distribution grids**

Objective #3

To develop an **open NetApp repository**. In conjunction with the 5G network facility, the **Open Service Repository** will have access to network resources and it will be used to develop and accommodate NetApps, providing rapid access and execution environment to **developers**, **third parties**, and **SMEs** from the energy vertical sector

Objective #4

To develop **high-performance NetApps** that will support the ambitious Smart5Grid energy-oriented use cases

Objective #5

To provide a Validation and Verification (V&V) experimentation framework for NetApp **automatic testing**, **certification**, and **integration**

Objective #6

To realise **four advanced 5G real-life demonstrations** over a wide set of energy related use cases. To exhibit that performance has been conforming to **5G PPP KPIs**

Objective #7

To conduct a **market analysis** and to establish new business models. Detailed techno-economic analysis and road mapping towards exploitation and commercialisation by industry partners and **SMEs** are also of high priority for the project

Objective #8

To ensure **maximisation** of **Smart5Grid impact realisation** of the **5G vision** by establishing close liaison and synergies with 5G PPP Phase-2 and 3 projects and the 5G PPP. To pursue extensive dissemination and communication activities, as well to assess the perceived impact from the stakeholders and the wider community

Impact Creation

Expected Impact as mentioned in the Call

Smart5Grid

1. Testing and validation of NetApp solutions on top of a 5G virtualized experimental environment with different implemented functions and vertical-specific configurations

2. NetApps secure interoperability beyond vendor-specific implementation across multiple domains and availability of related standards or reference implementations

3. Open-source repository of network applications that can be further leveraged by other developers

4. Creation of third-party markets for start-ups and SMEs. 50% of SMEs are targeted for this action

5. Relevant 5G PPP KPI: Service creation time in minutes

6. Generation of results that may be appropriate for transfer towards an incubator or a start-up, either within the project or outside of the projects in follow up actions

Impact Creation
Added Value to Key Stakeholders and other impacts

Smart5Grid

1. Competitive Advantage for SMEs, Telecom Operators, Neutral Host Providers
2. Open-source repository of network applications that can be further leveraged by other developers
3. Competitive advantages for DSOs/TSOs, Energy Service Providers, Smart Grids Operators and Vertical Industries
4. Benefits for Academia and the Research Community
5. Impact on the telecommunication market
6. Environmental and Socio-economic impact
7. Impact on standardisation

Main expected outcomes

and opportunities

Smart5Grid

- Open NetApp Repository
- Test and validation facility

Italian Demo | Olbia
Automatic Power Distribution Grid Fault Detection

Spanish Demo | Barcelona
Remote Inspection of Automatically Delimited Working Areas at Distribution Level

Bulgarian Demo | (Southern region)
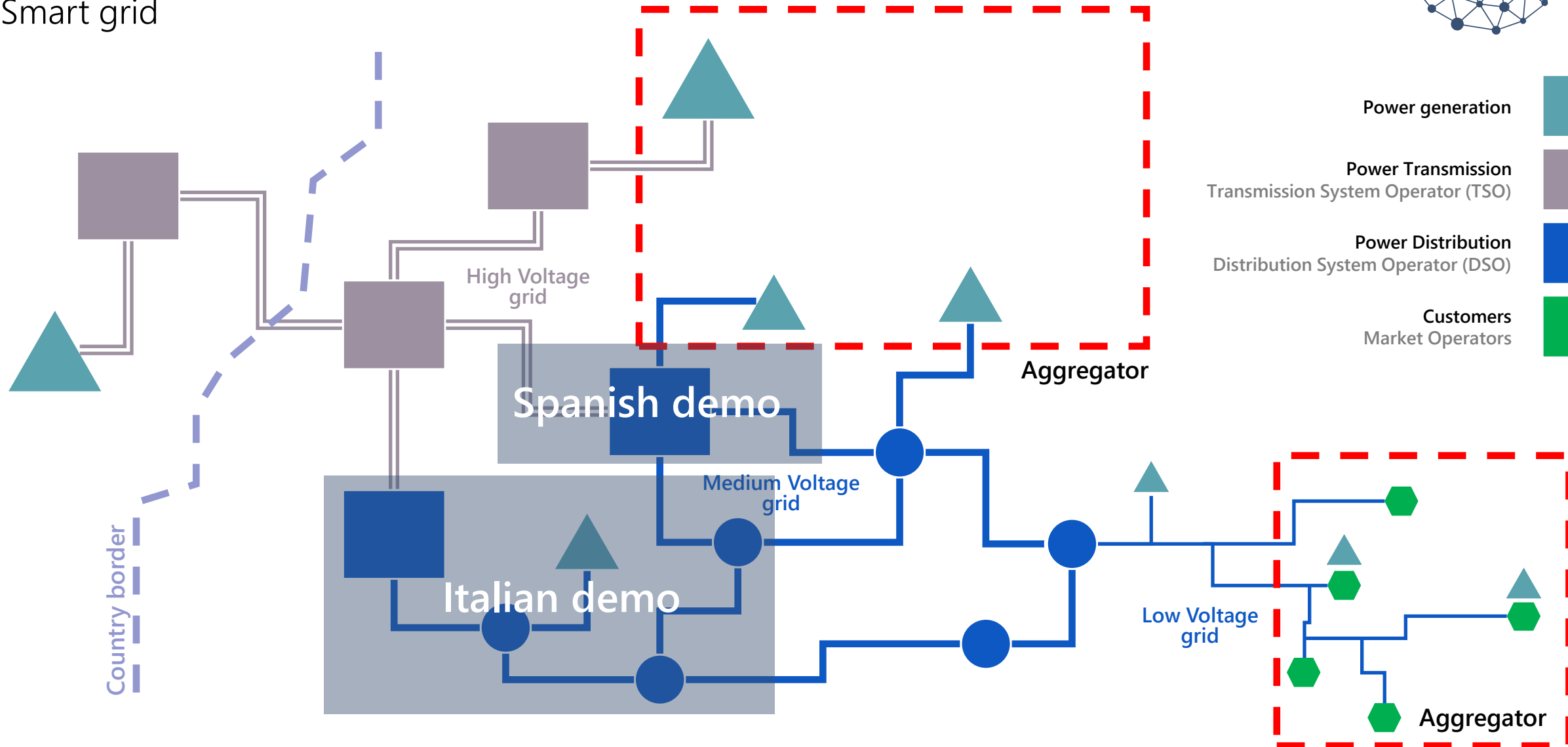Millisecond Level Precise Distribution Generation Control

Bulgarian-Greek Demo | (Cross-border)
Real-time Wide Area Monitoring

Energy Vertical
Smart grid

Smart5Grid

Power generation

Power Transmission
Transmission System Operator (TSO)

Power Distribution
Distribution System Operator (DSO)

Customers
Market Operators

Aggregator

High Voltage grid

Spanish demo

Medium Voltage grid

Italian demo

Low Voltage grid

Country border

Aggregator

Use Case 1 - Italian demo

Smart5Grid

Automatic Power Distribution Grid Fault Detection (DSO - Operations)

One of the most advanced grid automation systems for grid-fault detection, isolation and grid reconfiguration was developed and it is able to fulfil the self-healing feature of smart grids. Monitoring the availability and performance of the communication layer of several interconnected grid faut-detection systems is crucial for identifying the root-cause in case a grid fault is not properly cleared.
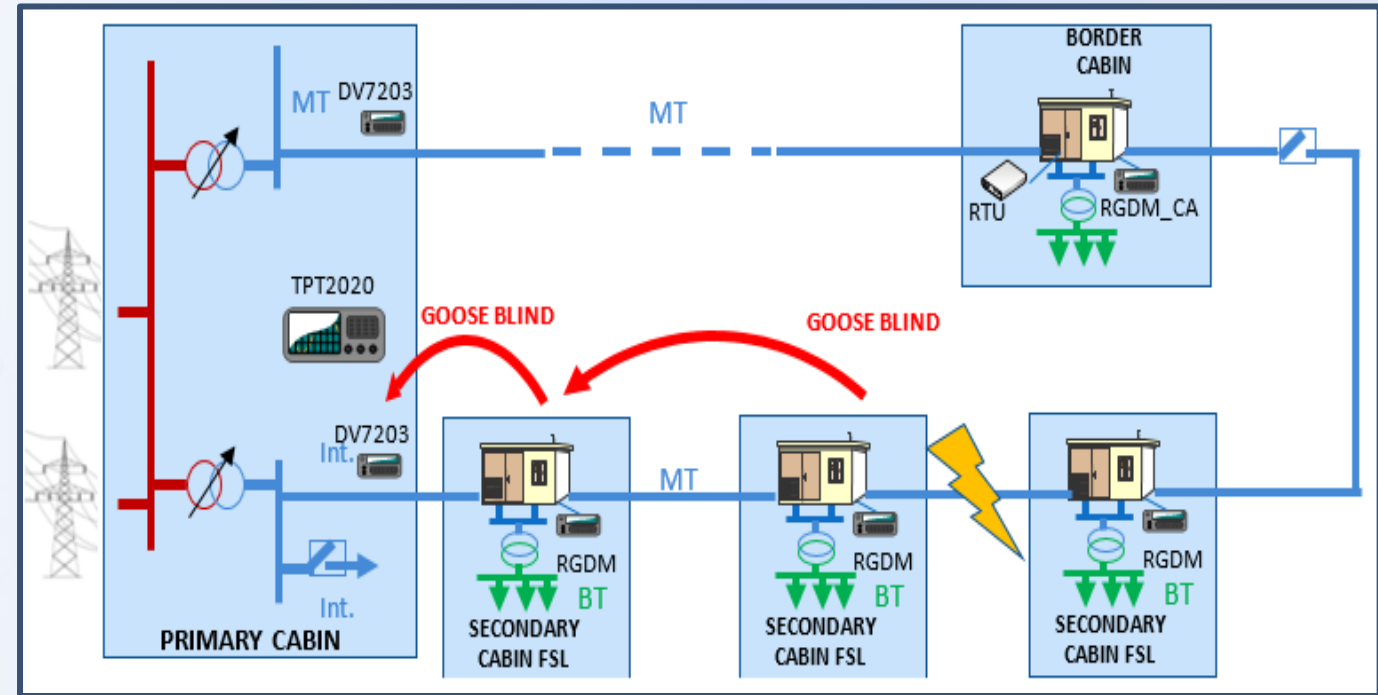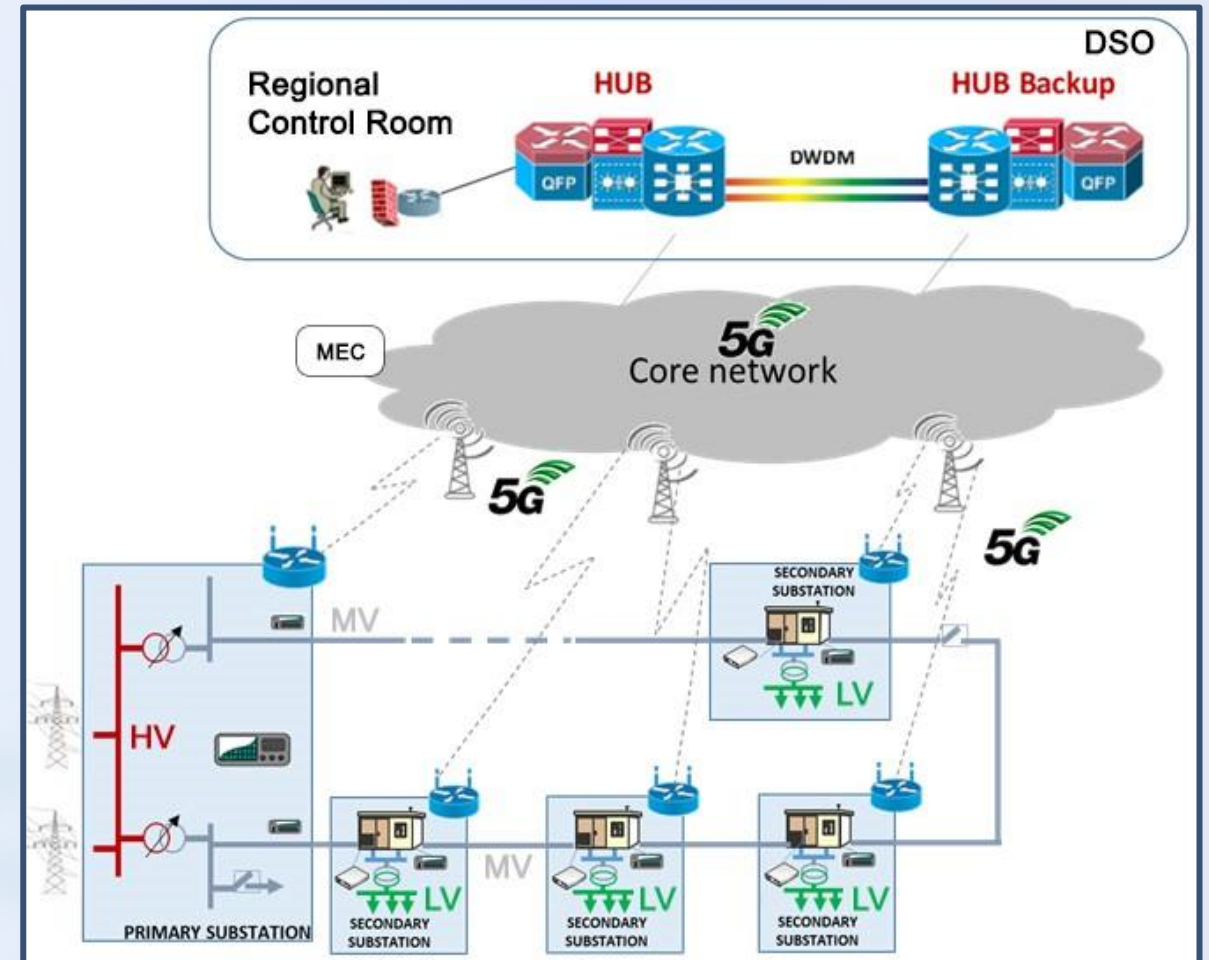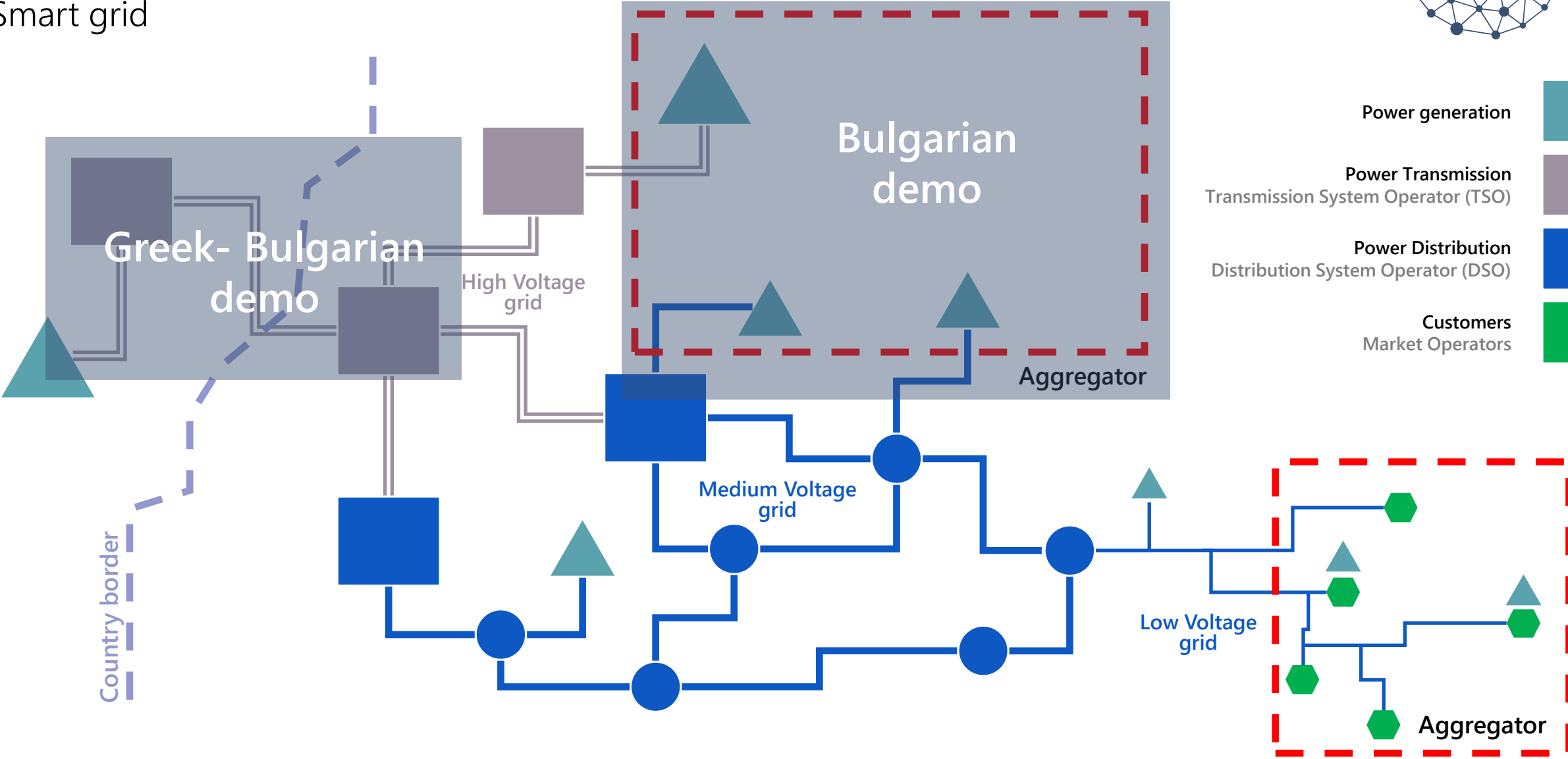
Use Case 2 – Spanish demo

Remote Inspection of Automatically Delimited Working Areas at Distribution Level (DSO - Safety)

Worker's safety in High Voltage (HV) or Medium Voltage (MV) power substations is of paramount importance for any DSO. An automated waring system would enhance the safety protocol procedures making use of 5G enabled portable sensors such as Internet of Things (IoT) and cameras with embedded tracking functions and Artificial Intelligence (AI) recognition systems.
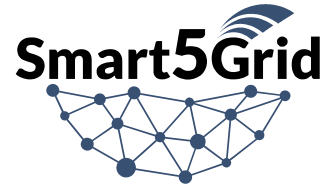
Energy Vertical
Smart grid

Smart5Grid

Bulgarian demo

Greek- Bulgarian demo

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Country border

Aggregator

Use Case 3 Bulgarian demo

Smart5Grid

## Millisecond Level Precise Distribution Generation Control (Aggregator)

Smart5Grid will enable the connection of thousands of Medium Voltage (MV) and High Voltage (HV) level decentralised RESs units and their inverters, to a platform with installed 5G communication protocols, which will allow their aggregation and control in millisecond rates
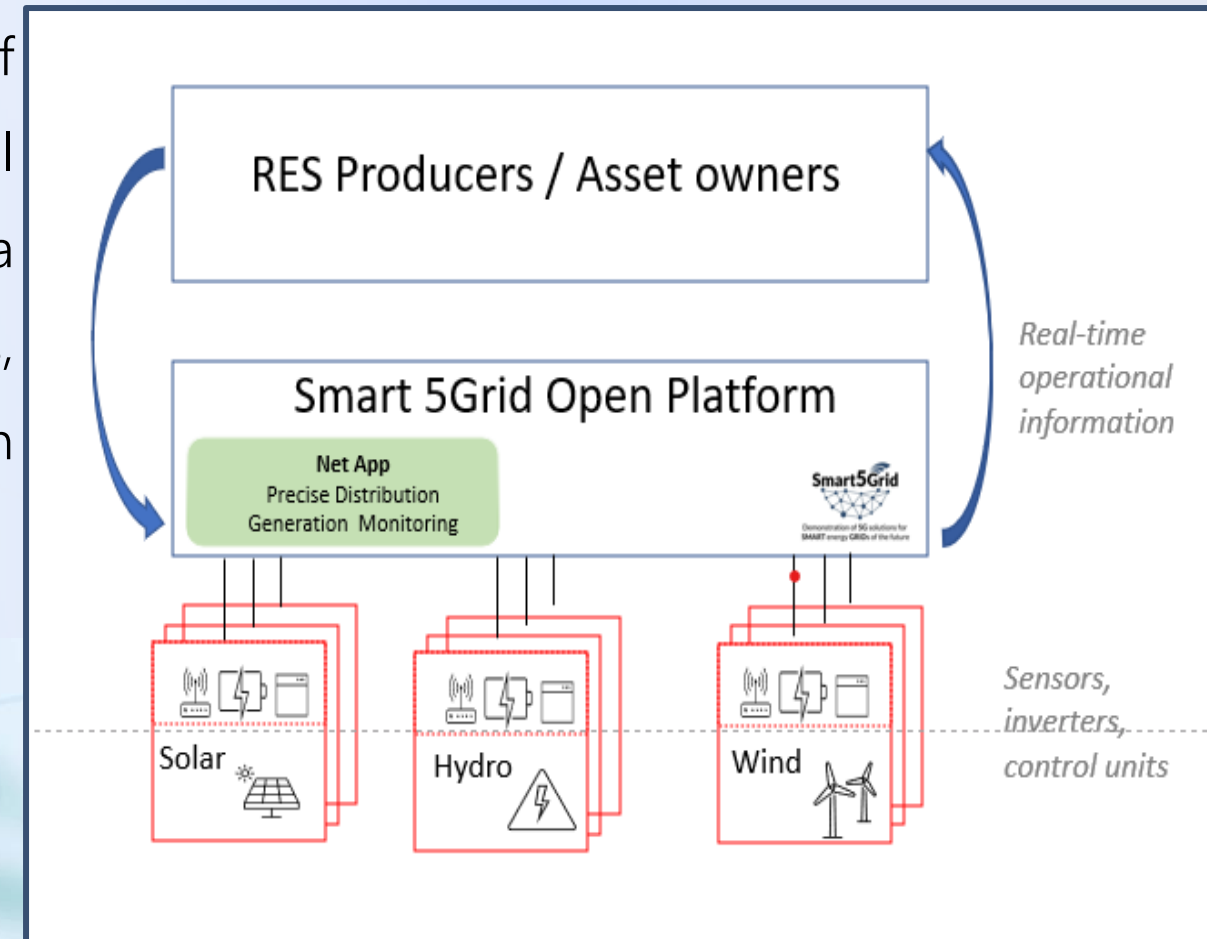
Use Case 4 Bulgarian-Greek demo

Real-time Wide Area Monitoring (TSO-TSO)

Smart5Grid aims to demonstrate the 5G virtual PDC capabilities for serving the Wide Area Monitoring of end-to-end electricity networks: from Distributed Energy Resources at Medium Voltage level operated by DSOs, to High Voltage level operated by TSOs, as well as inter-TSO cross border Regional Security Coordination.
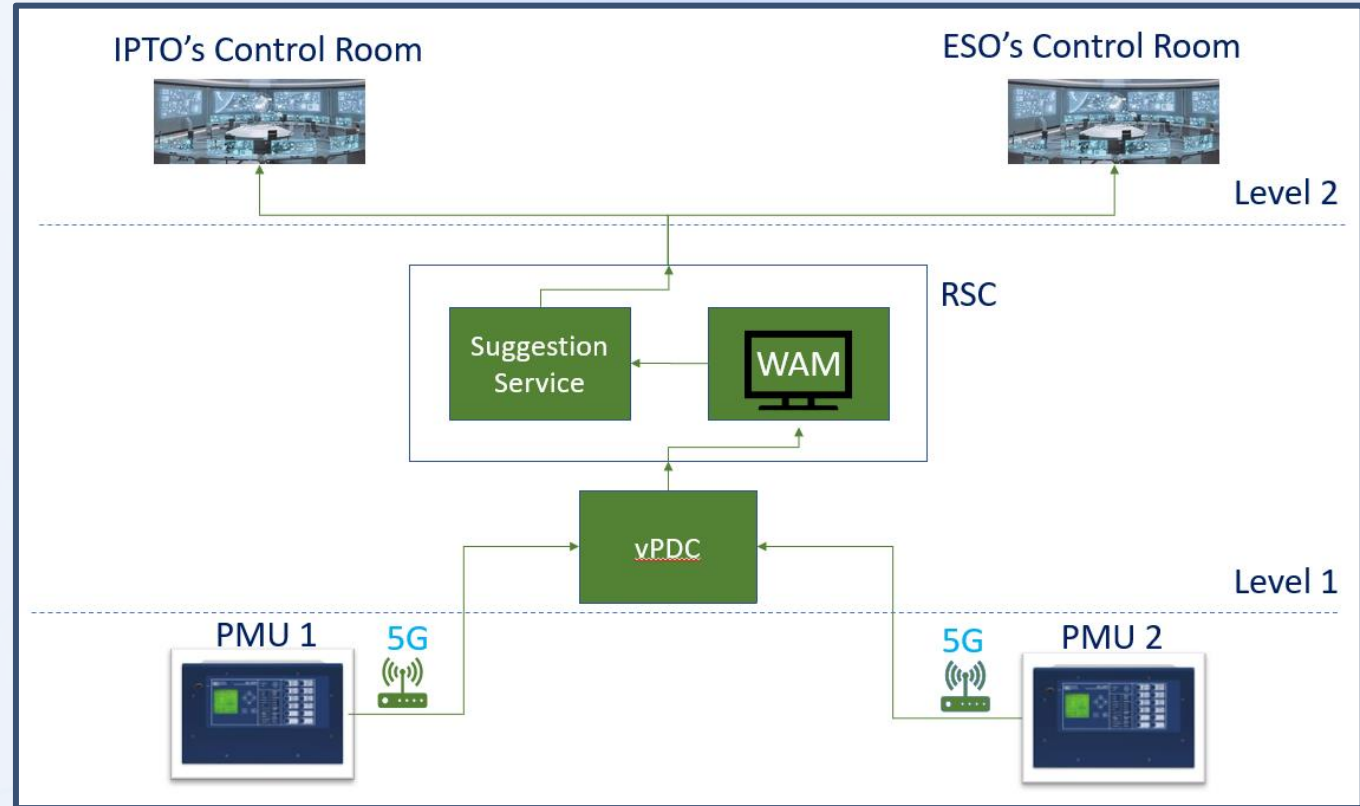
Conclusions

Main project elements and expected results
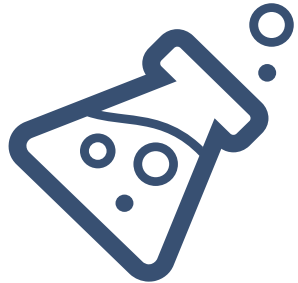
Smart5Grid

Open NetApp
repository

NFV automatic testing
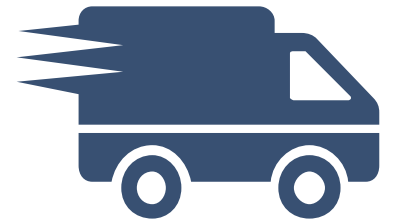and validation framework

Four advanced 5G real-
life demonstrators

Roadmap for
third party experimentation

Liaison and Interaction
with 5G-PPP Program

Impact creation
and exploitation

Follow us!
Check out our Communication Channels and **stay tuned!**

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