

Millisecond level precise distributed generation monitoring for optimized renewable energy resources (RES) operation and maintenance

Vertical Use Case

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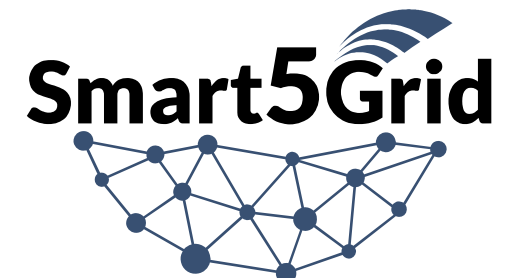
VIVACOM



UBITECH
digitizing energy



OTC
GROUP OF COMPANIES



Demonstration of **5G** solutions for
SMART energy **GRIDS** of the future

SUMMARY

Vertical Use Case MLPDGM



- About our company Entra Energy
- Background | Energy Sector Transformation
- Vertical Use Case Objectives
- Vertical Use Case NetApp VNFs
- Vertical Use Case Design
- Data flow diagrams
- Conclusion and next steps

Our passion | Our business domains | Our investments | Our network

Entra Energy

Transforming the energy sector

Vivid technology and social trends shape the future of the energy sector. Entra Energy's purpose is to bring this future now, by providing smart solutions for the transformation, digitization and democratization of the energy sector.

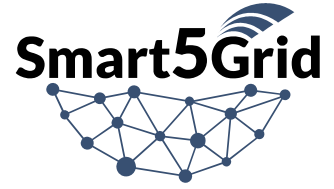


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Background | Energy Sector Transformation

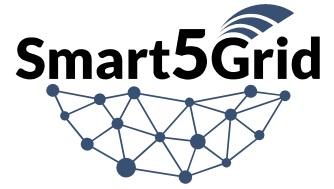
Problem statement | Challenges | Society



- ❑ Climate change & Energy independence (vs dependence on Gas and imported resources),
- ❑ Energy price (LCOE) drives an increase in RES production share
- ❑ Significant shift in energy production and consumption
 - ▣ Production: geographically distributed RES, variable in nature, many in number, small in size owned by non-professionals
 - ▣ Consumption: many industries go digital (e-transportation, industry 4.0, etc.); consumer to prosumer shift



Background | Energy Sector Transformation



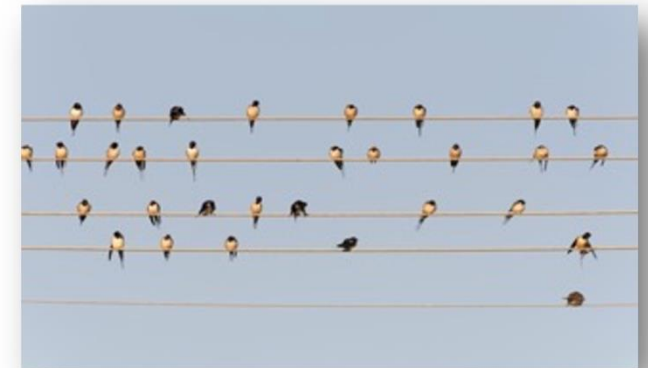
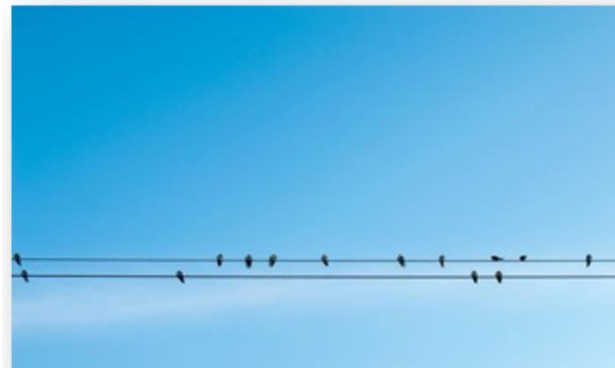
Problem statement | Challenges | Grid | Infrastructure

❑ Change and Challenges

- ❑ capacity
- ❑ visibility
- ❑ predictability
- ❑ balancing
- ❑ congestion management

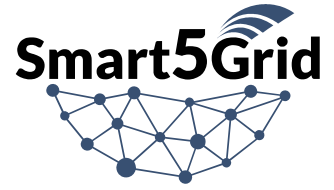
❑ 5G Addresses:

- ❑ connection density
- ❑ Cost



Background | Energy Sector Transformation

Problem statement | Challenges | End user

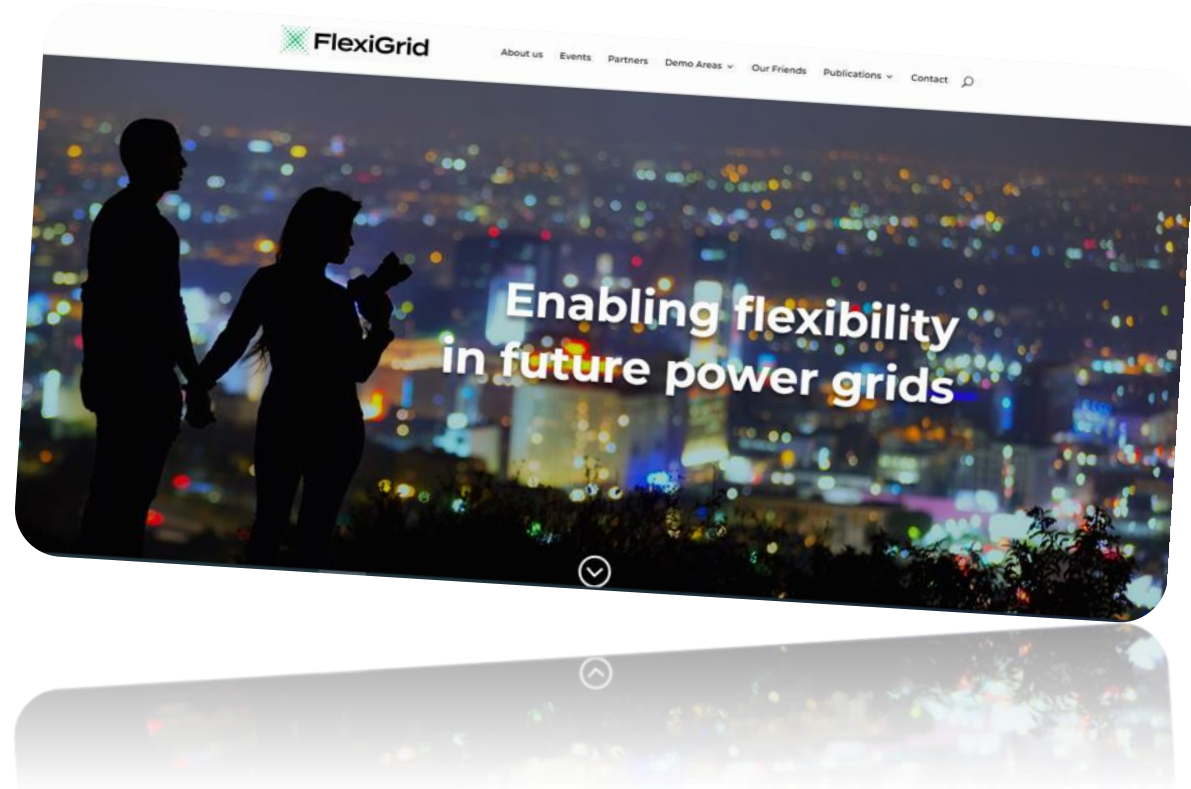


❑ Energy Management

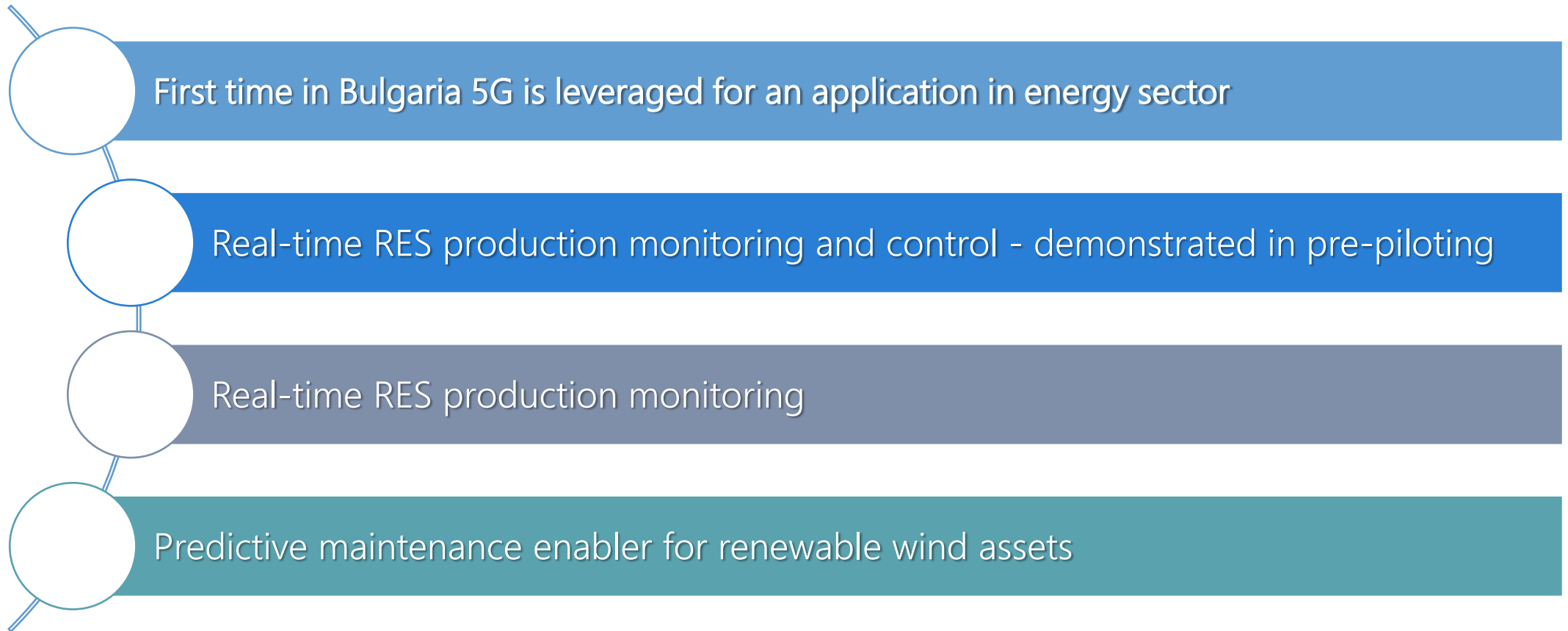
- ❑ Increased visibility
- ❑ Improved availability
- ❑ more accurate forecasting
- ❑ Enabled energy flexibility exchange

❑ Technology advancements

- ❑ Telecommunication
- ❑ IoT
- ❑ blockchain



Vertical Use Case Objectives



Vertical Use Case NetApp VNF



NetApp#1

*Predictive
Maintenance
Enabler*

- This NetApp *enables predictive maintenance capabilities* to the wind farm owner, by gathering measurements from SCADA system and sensors of different energy, environmental and technical parameters such as wind speed, active and reactive power, rotational speed, alarm status etc. allows for capturing *the performance of key components* of the wind turbines, and thus offering the wind farm owner information regarding the asset performance, and the power system operator information about the operational availability of the asset.

NetApp#2

*Real-time
production
monitoring*

- This NetApp provides *real-time data monitoring with a millisecond latency of the wind farm key parameters – organized in 3 groups: energy, technical and environmental*. The data collection process follows similar approach as the previous described NetApp. It will also provide a bidirectional communication (and control function, demonstrated in HIL demo T3.4), base for integrating the assets in future Flexibility Services market. This will foster the development of innovative observability models for power system operation, where TSOs gain insight in lower voltage levels of the grid.

Additional control applications to
investigate potential impact
(in pre-piloting demonstration)

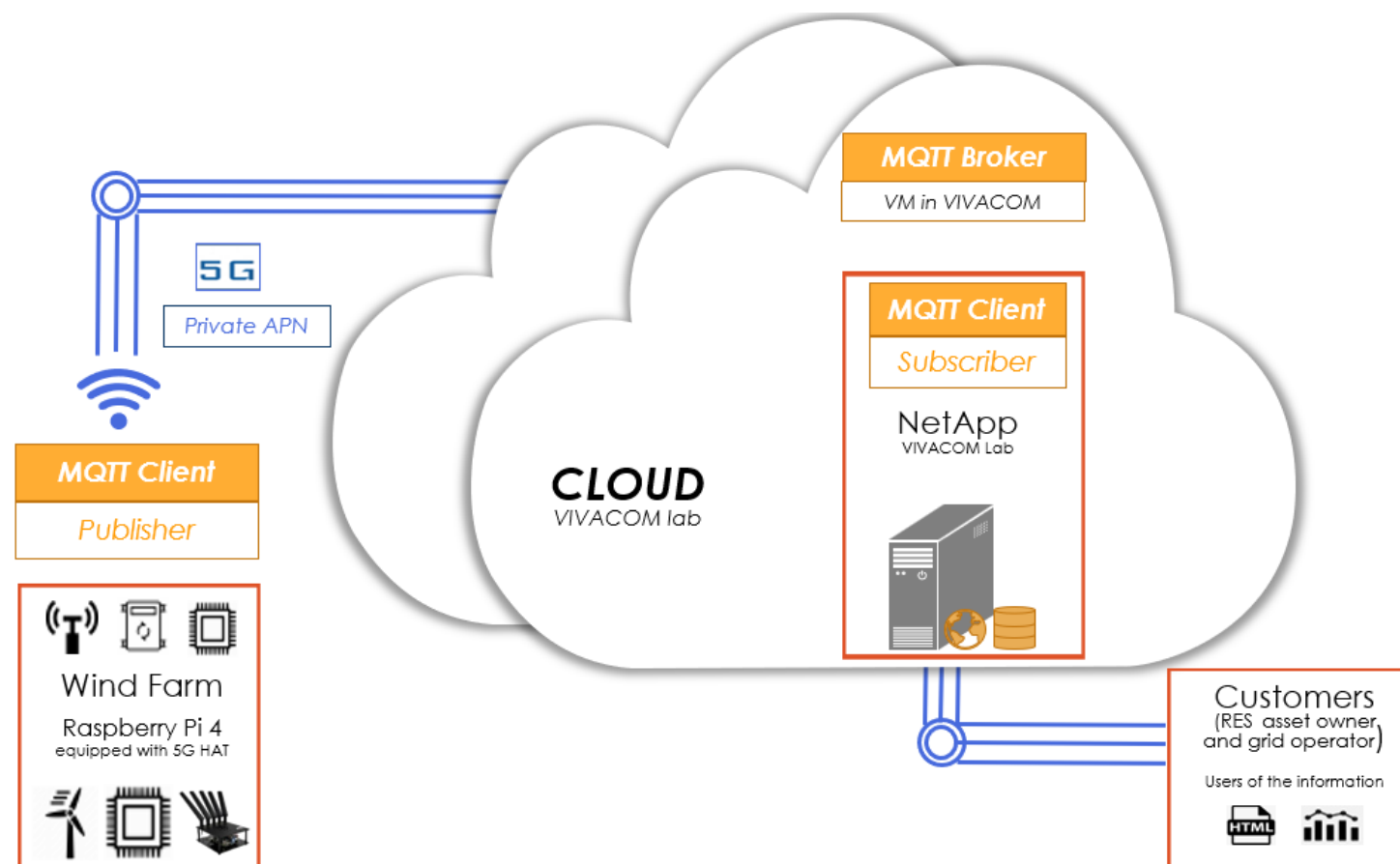
- Control Application#1: Coordinated fast frequency support by DERs through 5G
- Control Application#2: Ramping rate compensation by DERs through 5G

Vertical Use Case Design

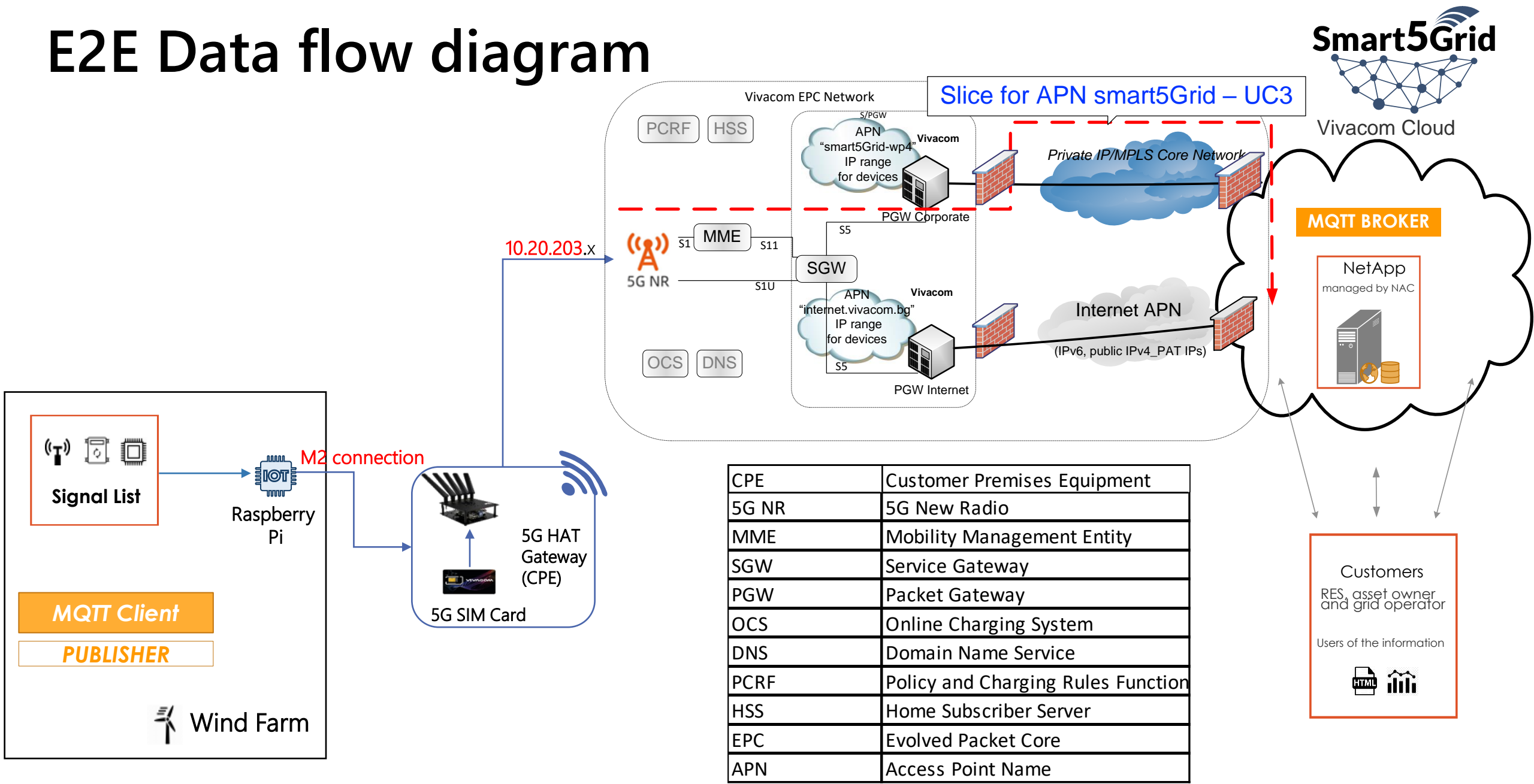
How we address the challenges in Smart5Grid Vertical Use Case



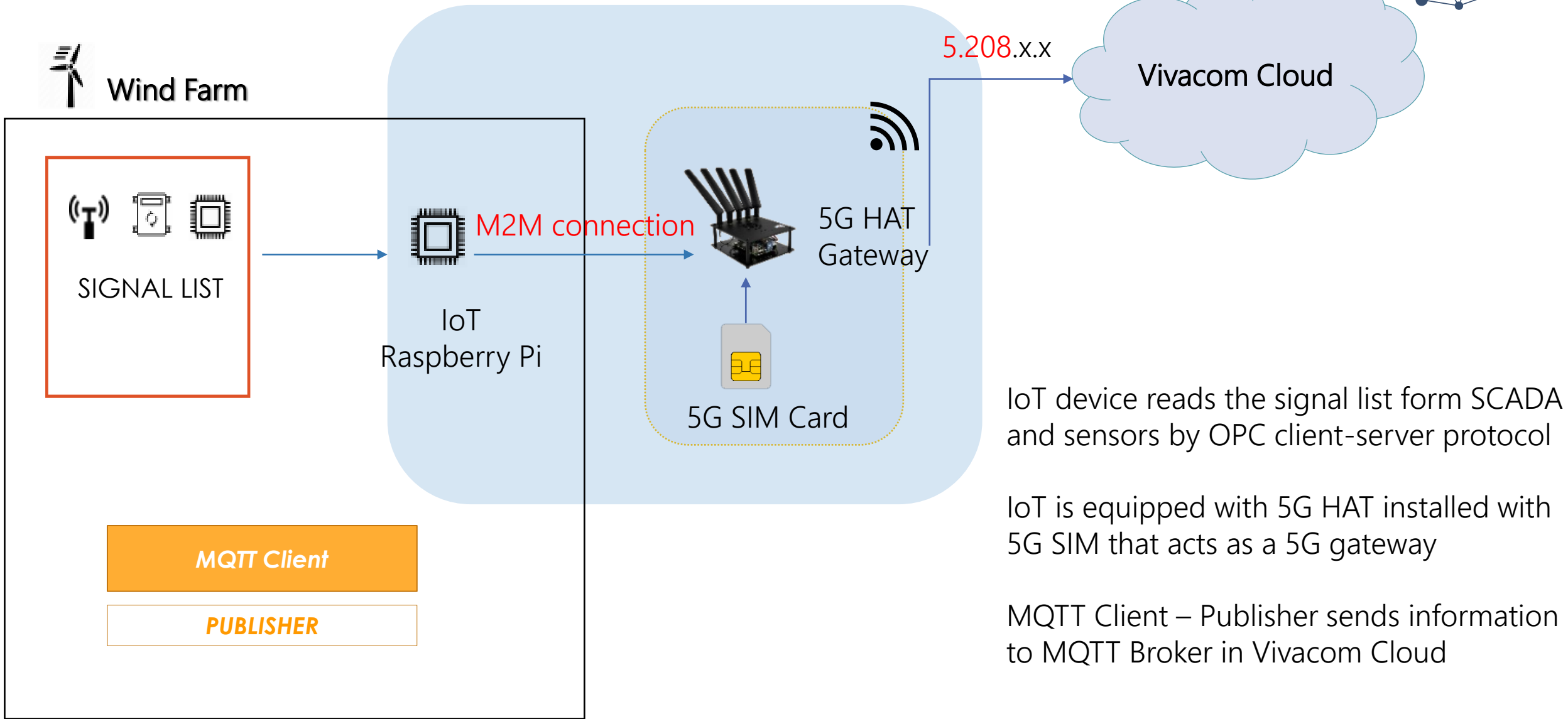
- ❑ Demonstration of an ultra-reliable and with low-latency 5G network in the energy domain in the laboratory environment, replicating the on-the-field implementation which is not yet in place
- ❑ MQTT protocol will be used for the IoT data exchange between the Raspberry Pi4 equipped with 5G HAT module and the server hosting the NetApps, which is in the VIVACOM cloud
- ❑ MQTT Broker, UC3 NetApp all installed on virtual machines in Vivacom cloud and NAC will be connected via Internet



E2E Data flow diagram



Data flow SIMPLIFIED | Wind farm perspective

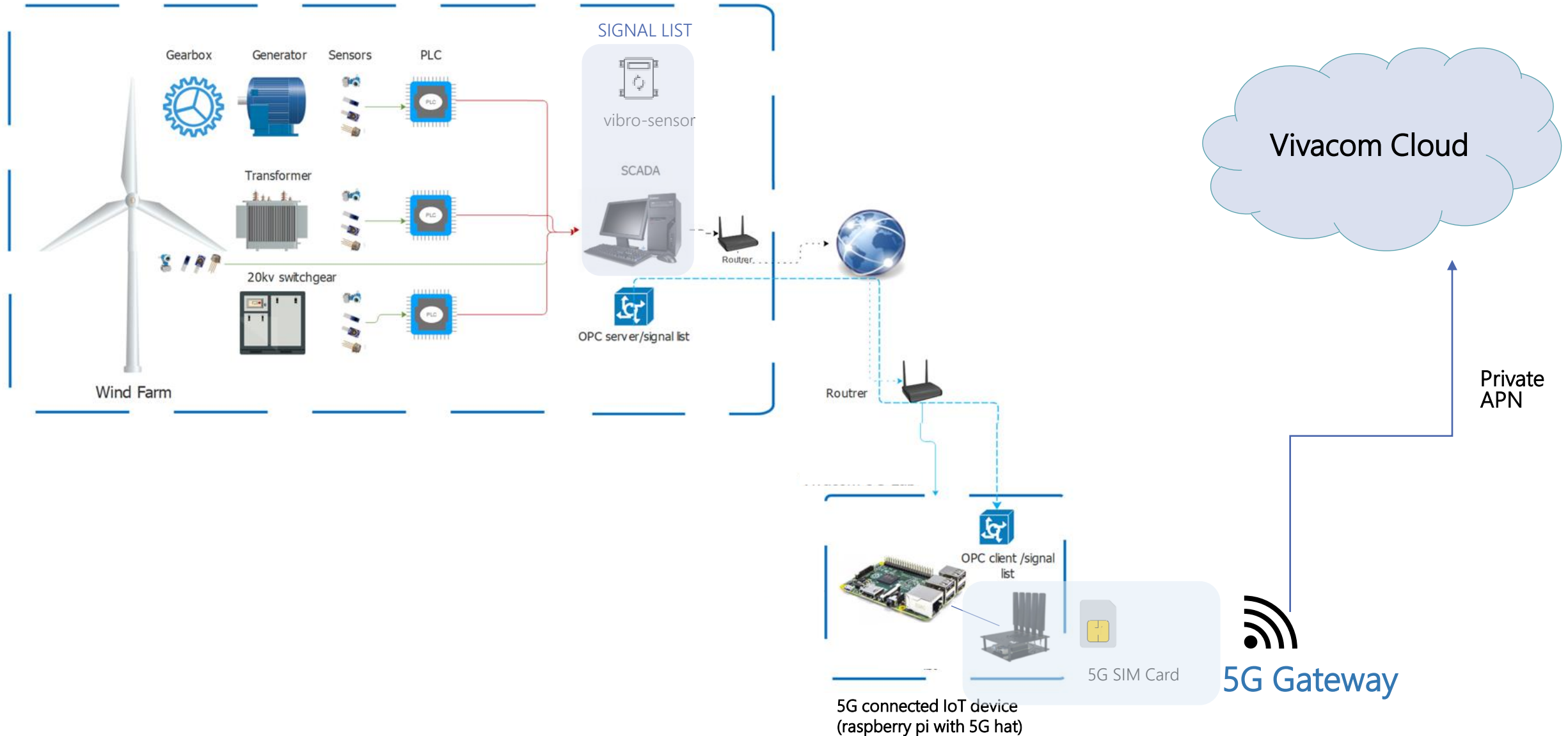


IoT device reads the signal list from SCADA and sensors by OPC client-server protocol

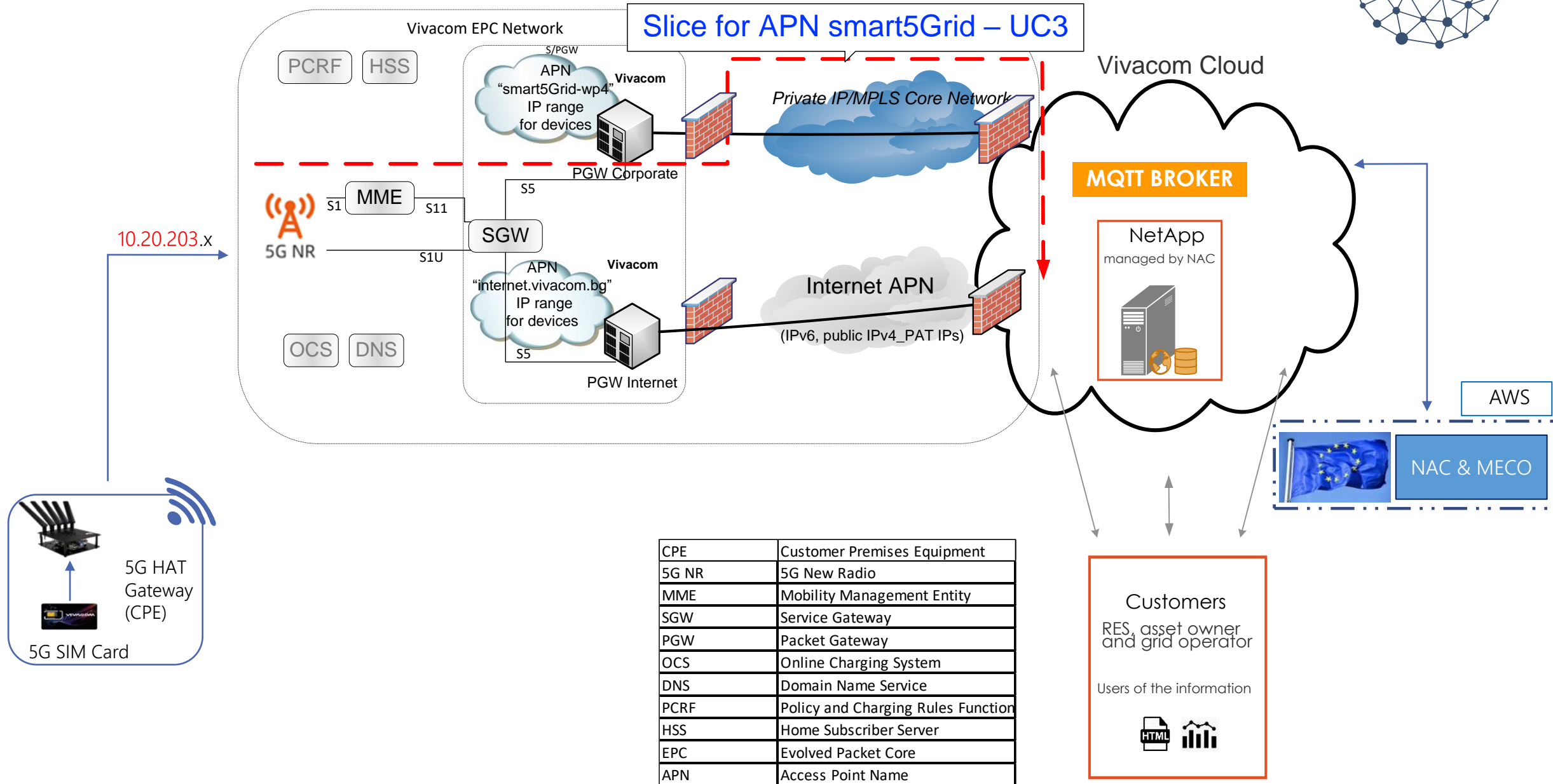
IoT is equipped with 5G HAT installed with 5G SIM that acts as a 5G gateway

MQTT Client – Publisher sends information to MQTT Broker in Vivacom Cloud

Data flow DETAILED | Wind farm perspective



Data flow network topology | Telco perspective



**Happy to answer any
questions you may
have!**



Thank you

Wishing all a very interesting and fruitful conference!