



**Ralitsa Rumenova**

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# Millisecond Level Precise Distribution Generation Monitoring and Control Network Application

Vertical Use Case



The 5G Infrastructure Public Private Partnership



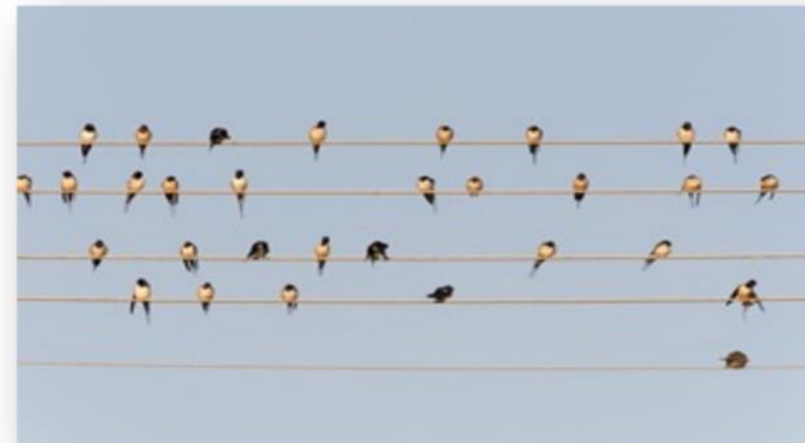
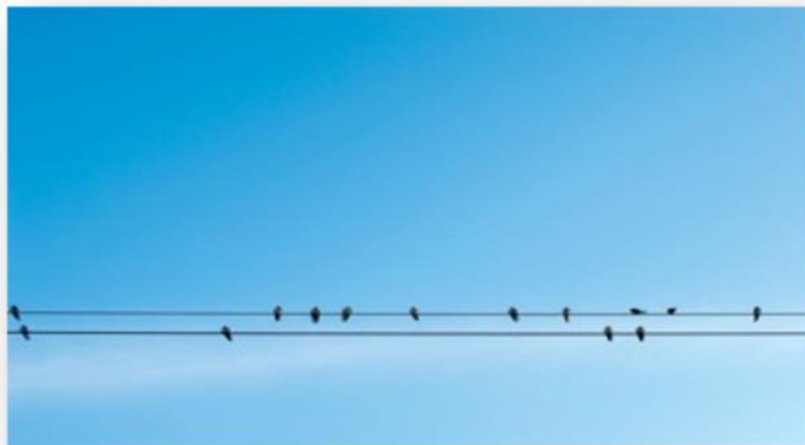
Demonstration of 5G solutions for  
SMART energy GRIDs of the future

This project has received funding from  
the European Union's *Horizon 2020*  
*research and innovation programme*  
under grant agreement n° 101016912



# Energy Sector Transformation

complex, decentralized, democratized, volatile, digitalized





# msec Level Precise DER Monitoring Network App



**Smart5Grid**

s5g Administrator

**Devices**

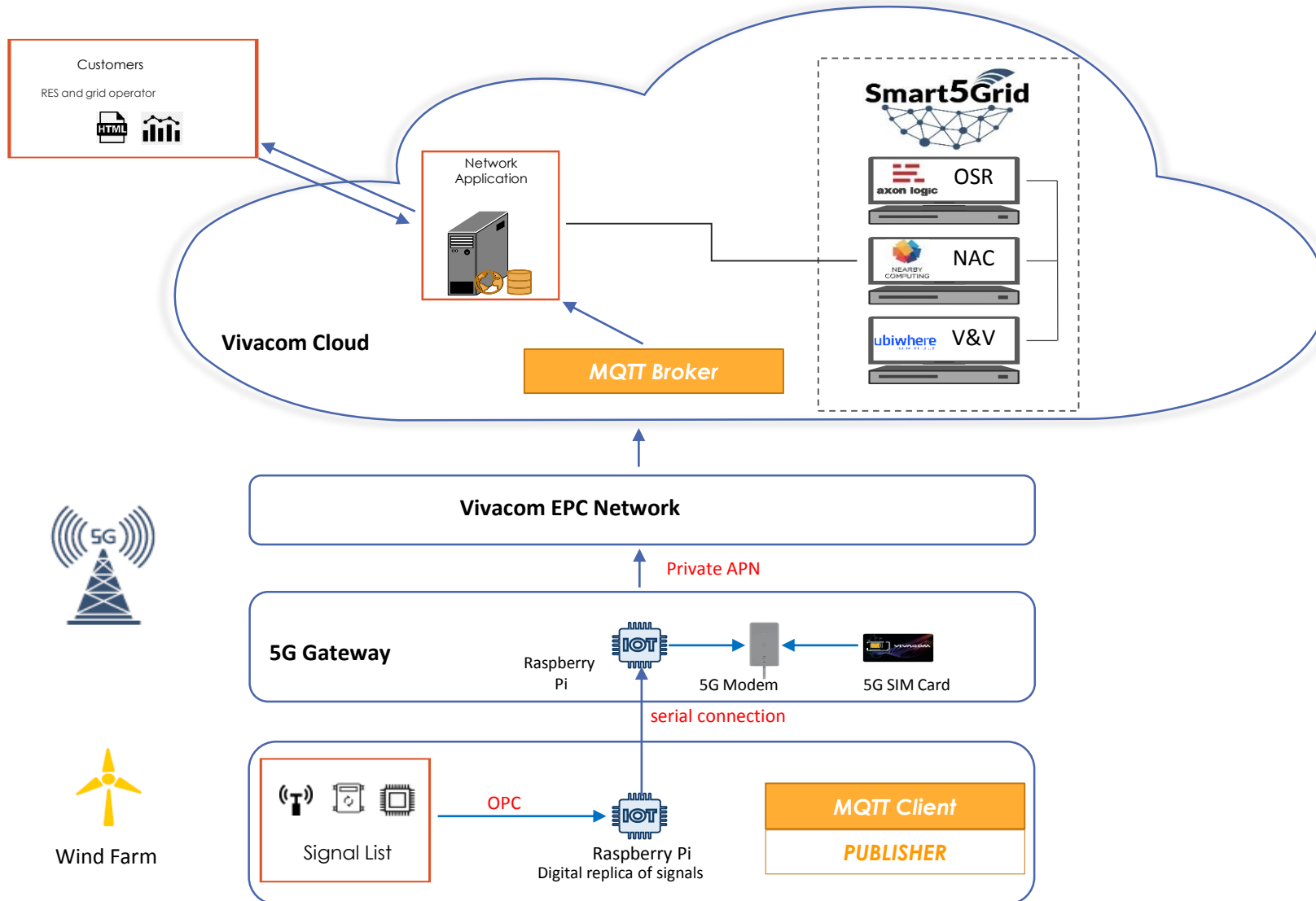
3 Registered Devices

- WIND** (Wind Turbine)
  - Host: 212.72.214.236 Port: 30583 Protocol: MQTT
  - Topic: Aris/full,Vibro/full Location(lat,lon): (42.775758, 26.309964)
- HYDRO** (Hydropower Turbine)
  - Host: 212.72.214.236 Port: 30583 Protocol: MQTT
  - Topic: Hydro/full Location(lat,lon): (41.723833, 24.042109)
- SOLAR** (SC test solar data)
  - Host: 212.72.214.236 Port: 30583 Protocol: MQTT
  - Topic: Solar/full Location(lat,lon): (43.819635, 25.980048)

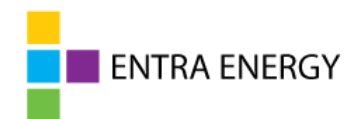
- ▶ real time monitoring of RES
- ▶ multiple type of RES support & easy new streams integration
- ▶ multi-technology devices support
- ▶ different performance parameters
- ▶ multiple users support RES team, Grid operator
- ▶ Innovative 5G solution in energy vertical



# Solution architecture



**VIVACOM**



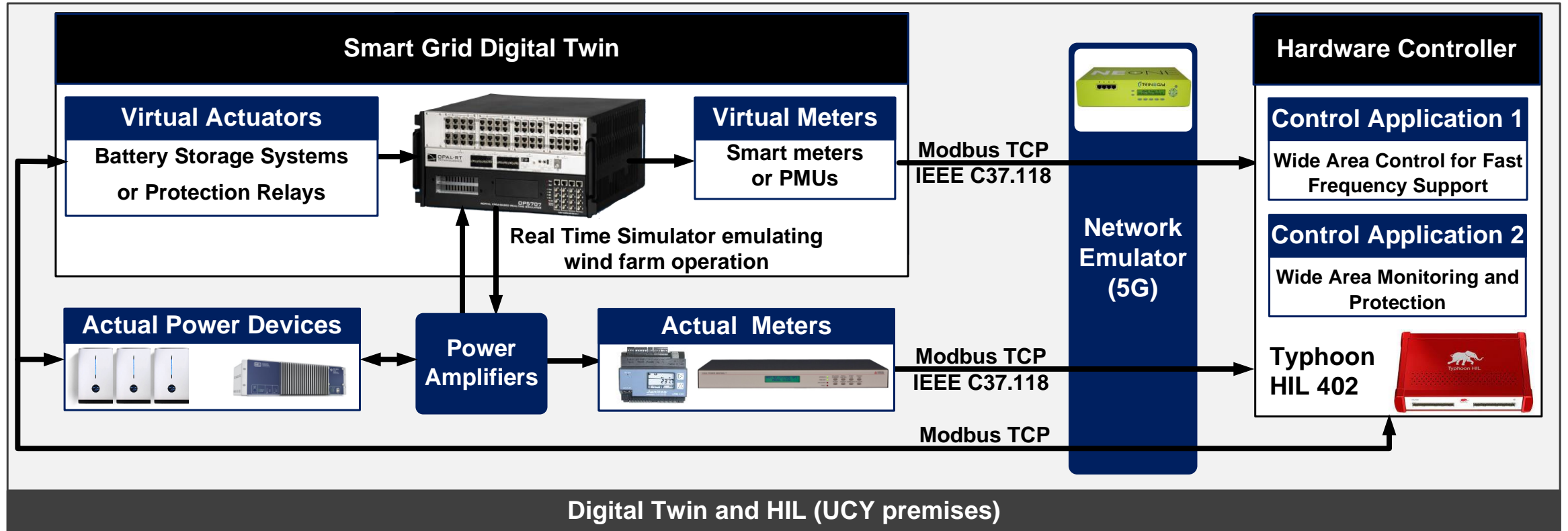
# Distributed Generation Monitoring and some further steps forward...



- ▶ **Simplified alarm functionality** lowers fault reaction time and asset operational downtime
- ▶ **Predictive maintenance enabler VNF** – as a first “must have” step toward predictive maintenance
- ▶ **MQTT Broker VNF service** - for quick and easy integration of different sources or services (e.g. sensors, BMS, etc.)
- ▶ **Enhanced control application**, showcased in hardware-in-the-loop demonstration, performed by Lenos Hadjidemetriou from UCY, validates the critical role of 5G for grid stability control

# Enhanced control application

Wide area control for fast frequency support

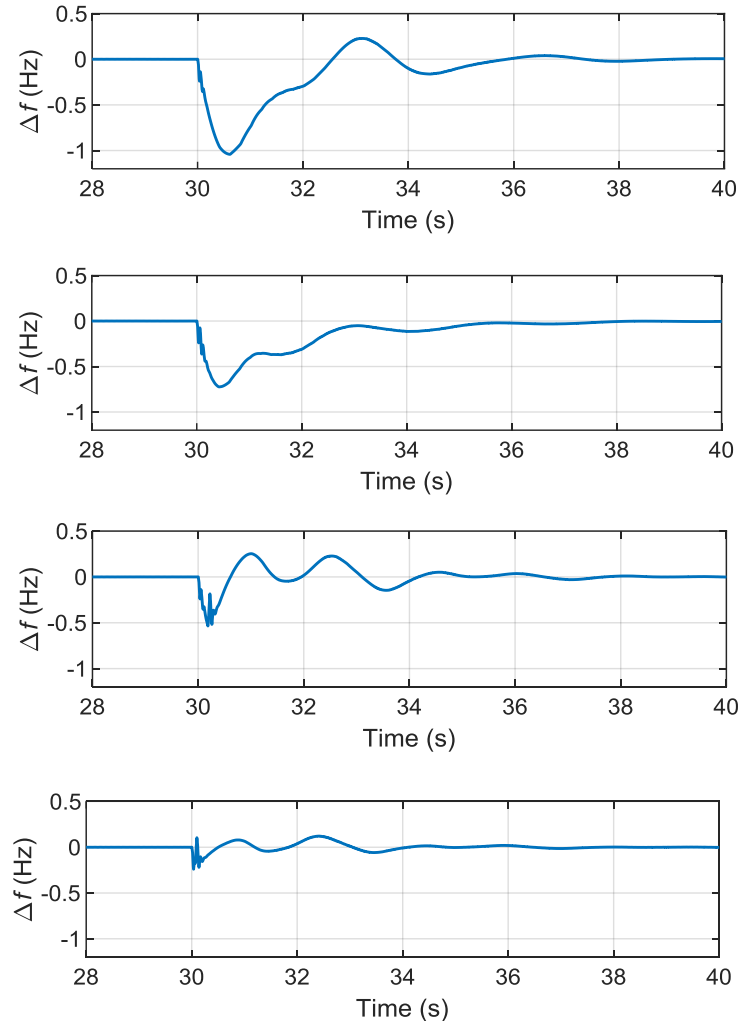


Testbed architecture using digital-twin of power grids, a hardware network emulator, and a hardware controller in a Control-Hardware In the Loop (HIL) configuration

# Enhanced control application

Wide area control for fast frequency support

- ▶ No support
- ▶ Droop & virtual inertia
- ▶ Wide area control (4G)
- ▶ Wide area control (5G)



Baseline

State-of-the-art

Improvement in  
the frequency  
stability

77%

69%

Proposed controller using 5G



# Stay tuned...



The **energy sector is transforming on a high speed**, from centralized to “democratized” ecosystem, involving many, distributed players with alternated roles.

This requires development of scalable solutions that:

- ▶ **Guarantee the needed priority and security for the critical infrastructure operation**
- ▶ **Provide scalable, cost-effective solutions for the mass energy sector digitalisation and flexibility for the Smart grids of the future.**

**Telecoms, technology developers and energy professionals unite forces and play critical role** for developing and providing the needed infrastructure to support future Smart Grids.

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Thank you!



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