G3-PLC Alliance

Enabling the smartest grid...together

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Getting right the communication backbone to address today and tomorrow's Smart Grid applications

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G3-PLC is a protocol for power line communications providing effective, efficient and secure communication

Cost-effective infrastructure		Long range communication	Real-time communication
International open ITU standard	Supports IPv6	Secure	
	High robustness	High data rate	Evolutive
Routing		Plug and play solution	

G3-PLC Alliance : a major role in the international development of G3 technology

- The G3-PLC Alliance is a consortium **created in 2011** to standardize and promote worldwide the G3-PLC technology for Smart Metering, Smart Grids, Smart Appliances and Industrial Applications

- G3-PLC is an **international standard** published by ITU and adopted worldwide

- G3-PLC Alliance operates a **certification program** to build **interoperability** among G3-PLC adopters with the involvement of two Labs (TUV-Japan and LAN-France)

- G3-PLC Alliance takes part in the main Smart Grid events in order to **promote the values, benefits and applications of the G3-PLC technology** which contributes to achieve its rapid adoption

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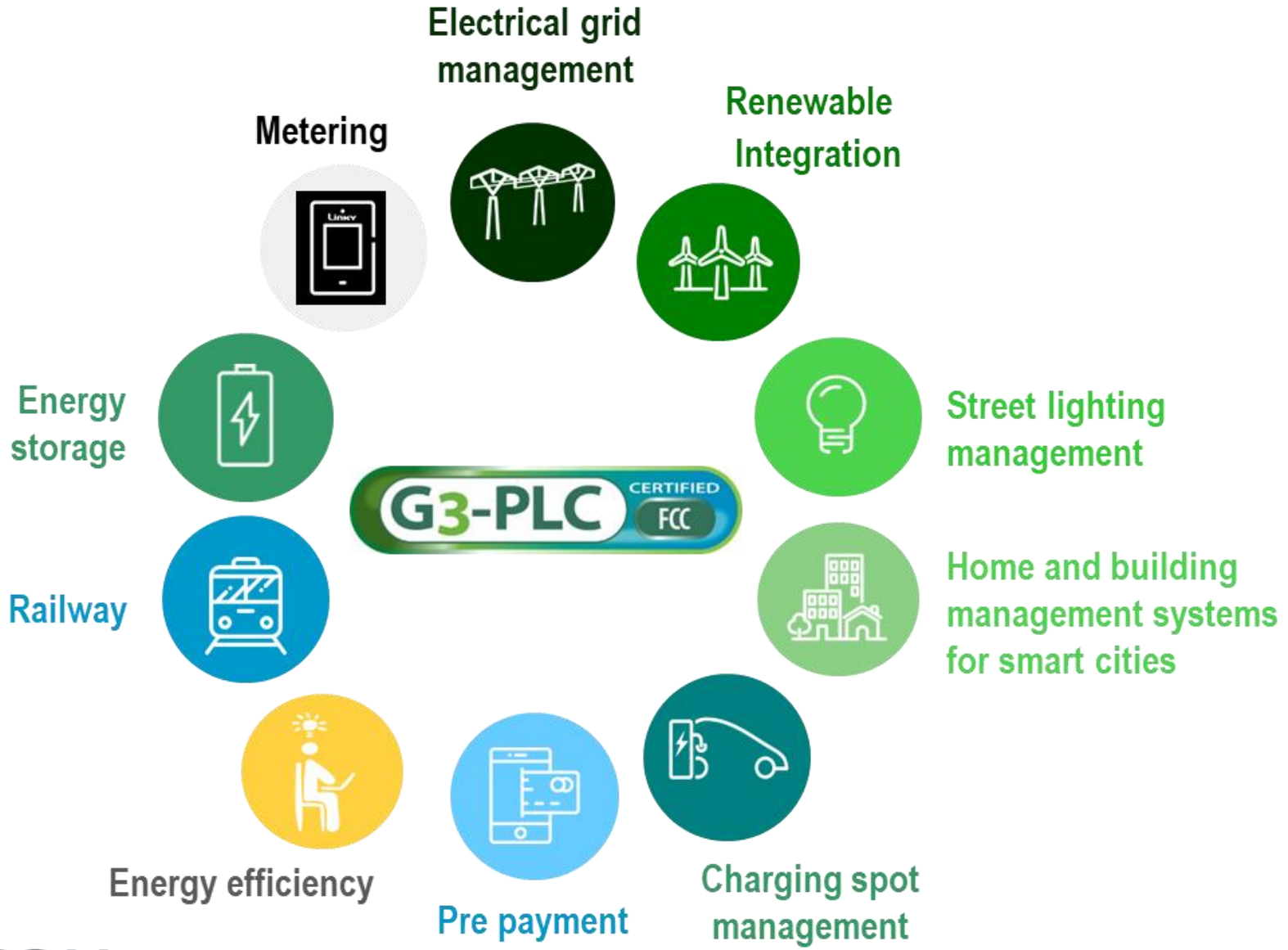
Main G3-PLC applications



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G3-PLC Alliance

Over 90 members from more then 30 countries today!

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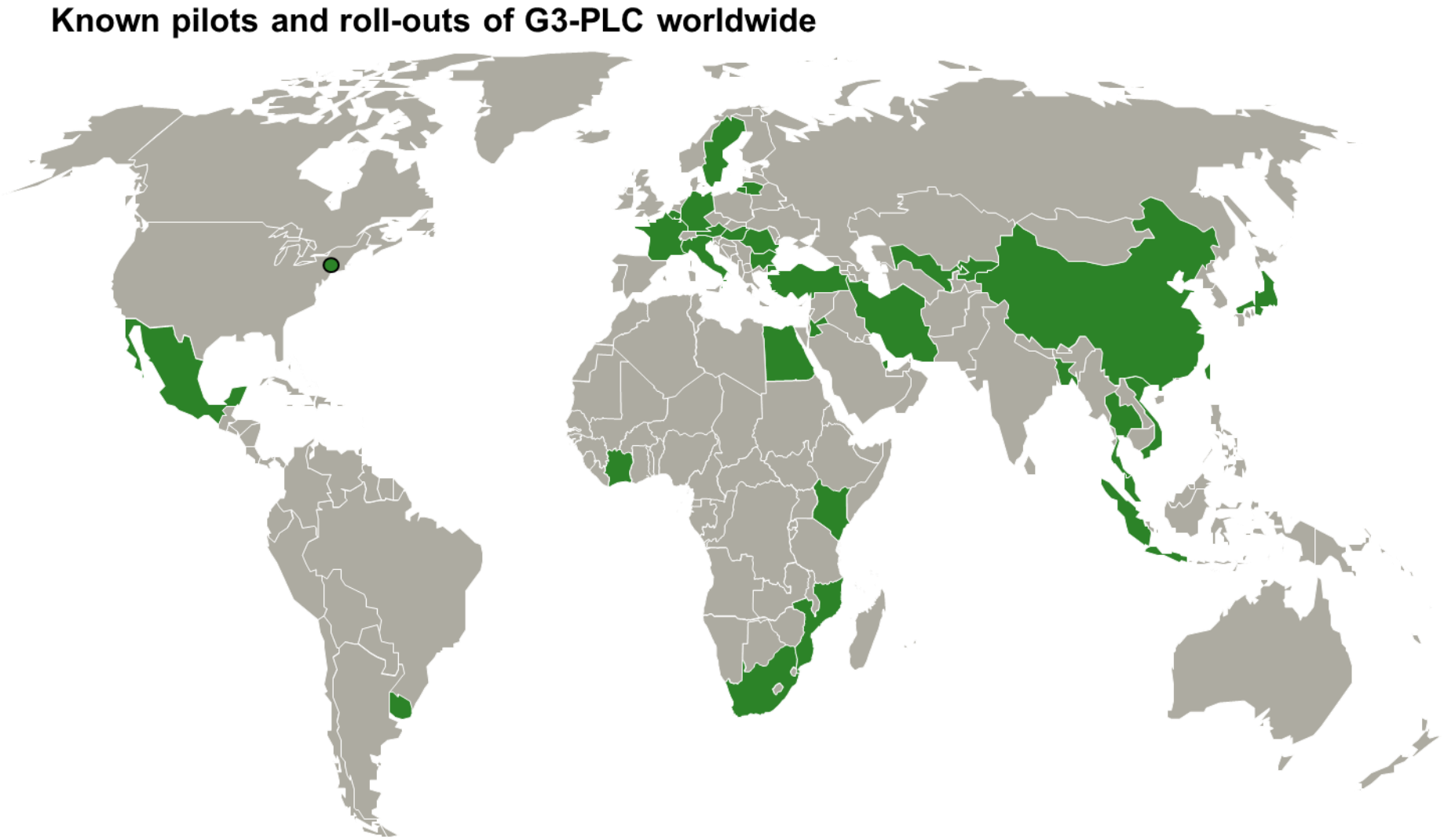
G3-PLC Alliance

Currently, we have over 30 million G3-PLC products in operation in more then 30 countries worldwide



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Sagemcom in the Energy at a glance

No.1 (ELEC) & No.1 (GAS)
in EUROPE - MIDDLE EAST - AFRICA

SMART GRID

Infrastructure

Micro & OffGrid

GRID & INFRASTRUCTURE SOLUTIONS

SMART METER

Electricity
Gas & Water

SMART IoT

E-V, ,Asset O&M,
Predictive Maintenance

ENERGY BUSINESS LINE

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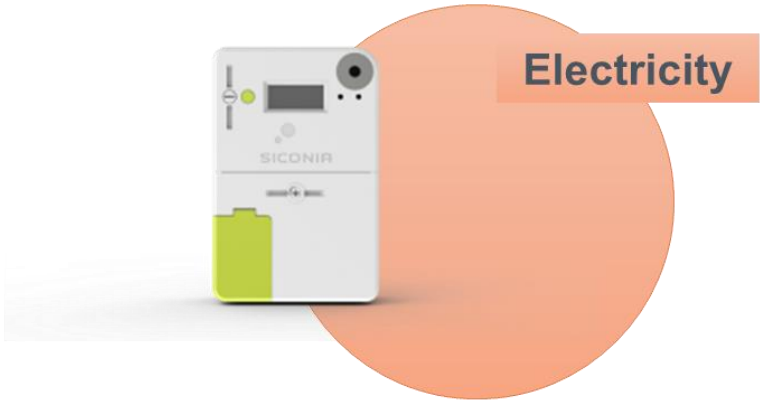
Electricity Metering in numbers



+65m
Meters Installed

+10m
Manufacturing Capacity / Year

+30
Projects Completed

P2P / PLC / RF
Standard technologies

some of our customers:

ENEDIS L'ELECTRICITE EN RESEAU · fluvius. · ELLEVIO · AMC · ENEXIS · Energa · EVN · IBERDROLA · enel · TENAGA NASIONAL

PRODUCT RANGE :

RESIDENTIAL · INDUSTRIAL · NETWORK · SOFTWARE

SICONIA™ SOFTWARE SUITES

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AMI Software Solutions in numbers

SICONIA™
SOFTWARE SUITES

+ 50
Projects Delivered

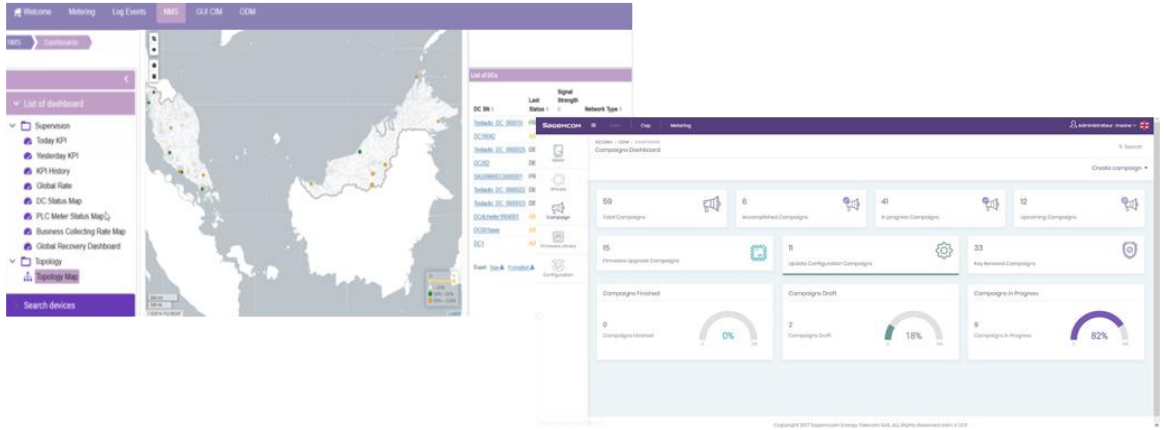
+ 20
Years Software Experience

+ 20m
Meters Monitored by Siconia

Interoperability
Baed on standards

some of our customers:

fluvius. luxmetering ELLEVIO EVN e·on Germany GRDF TENAGA NASIONAL



HEAD-END SYSTEM

METER DATA MANAGEMENT

NETWORK MANAGEMENT

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Examples of recent developments in G3-PLC applications

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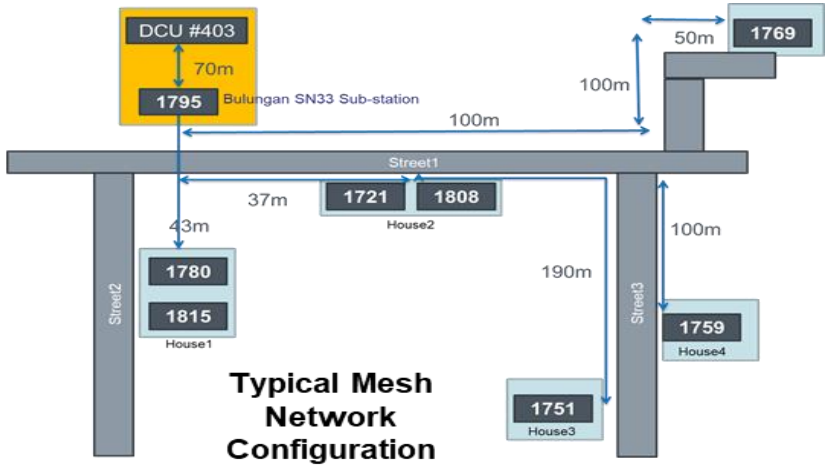
Making use of the FCC Band to improve the robustness

Typical South-Asian overheard electrical distribution network

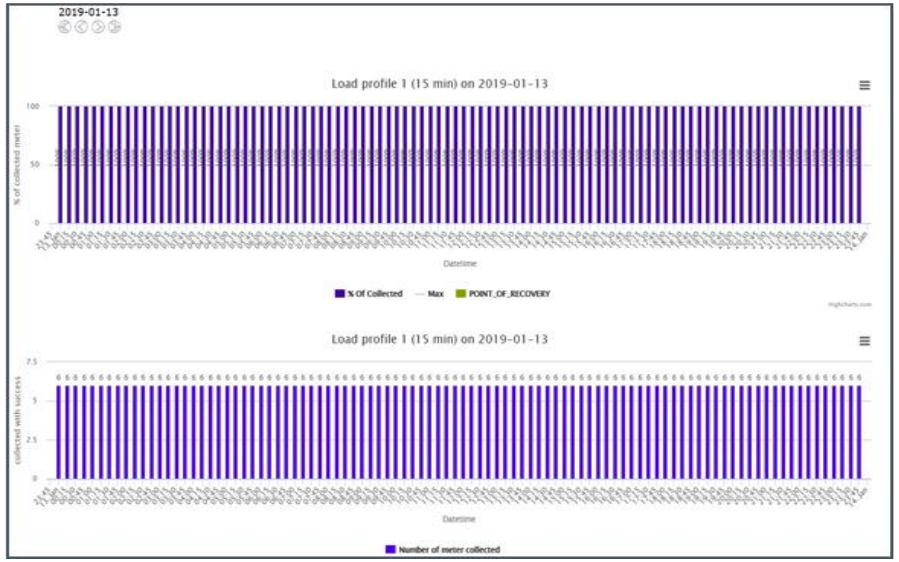
DCU installation in a substation

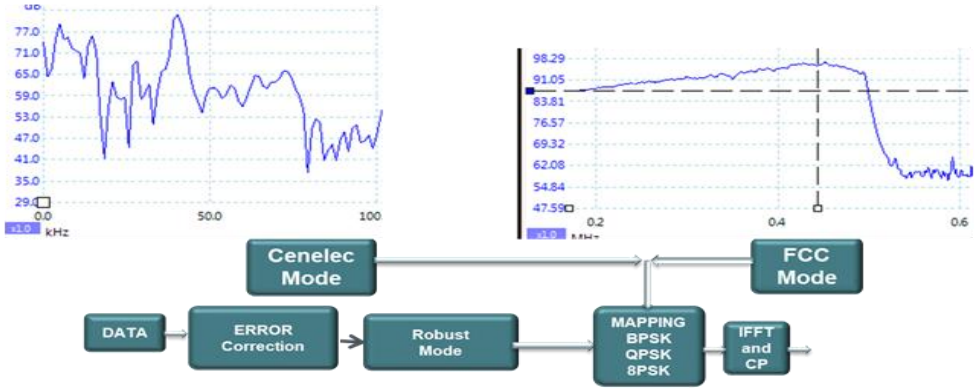
Meter installation



Typical Mesh Network Configuration

Typical Report of Central System 100% of data collection





Sagemcom monitors data and if they are noisy in Cenelec A band for a period of time then the entire network is switched to FCC mode.

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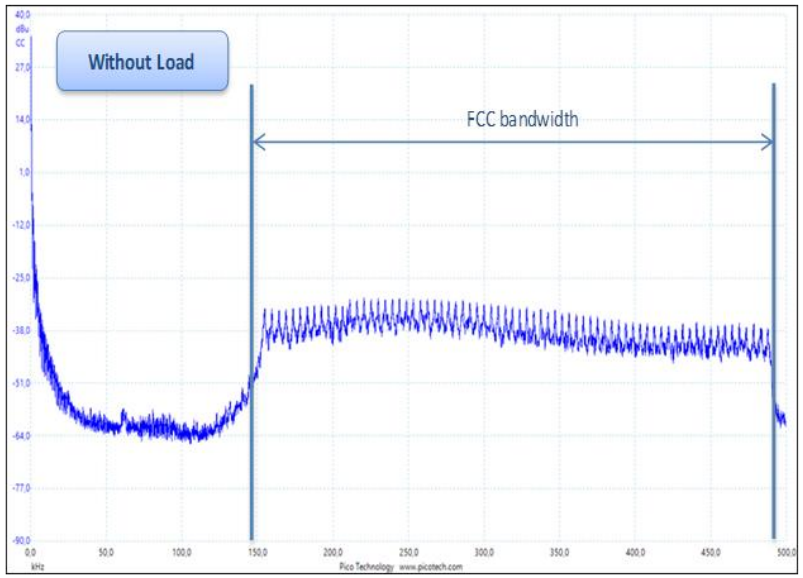
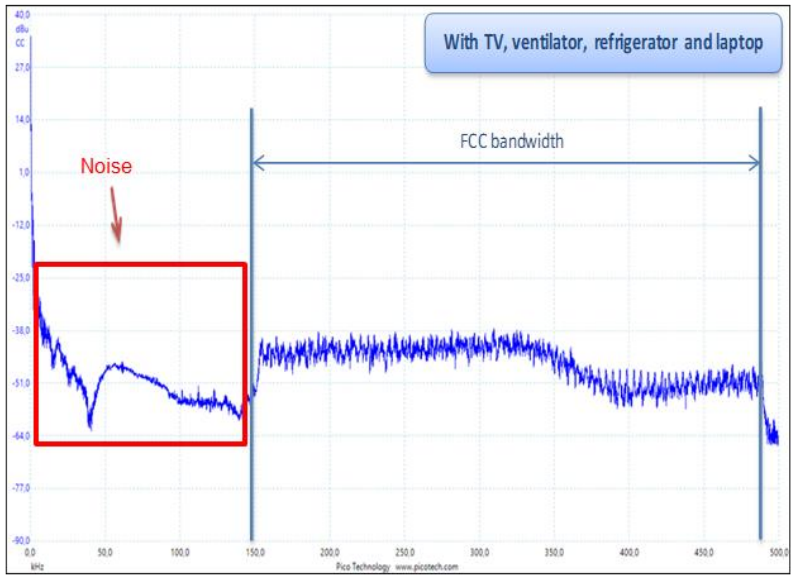
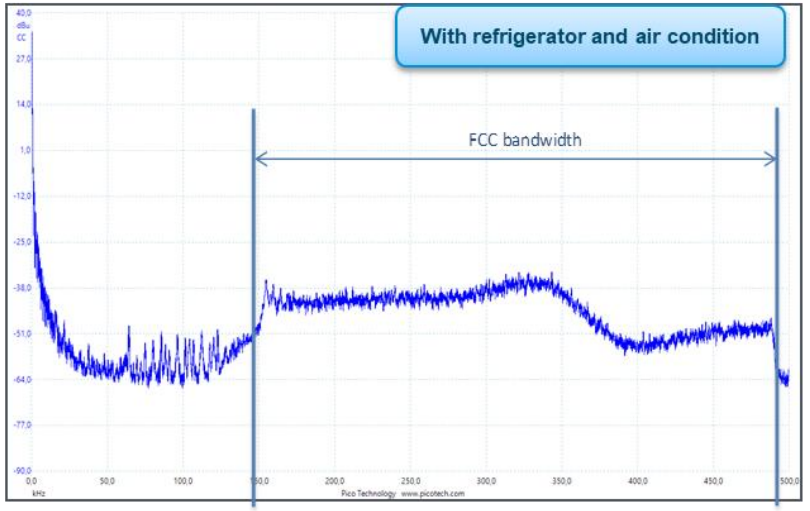
Neutralizing household equipment noise

- Noise effect due to common housholds equipement

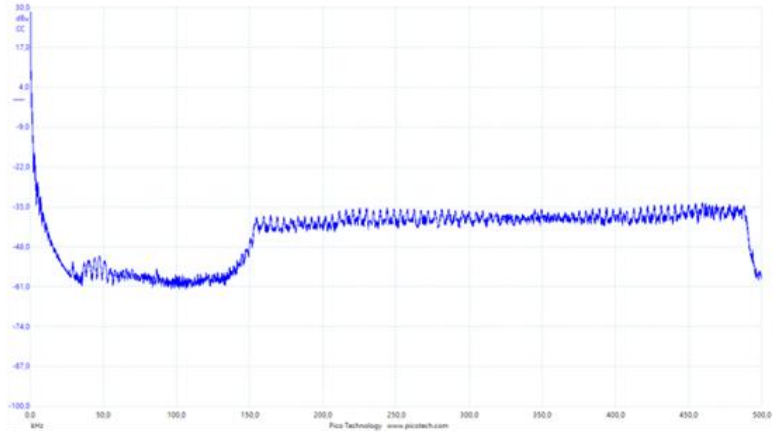






Solar panels effect in the field

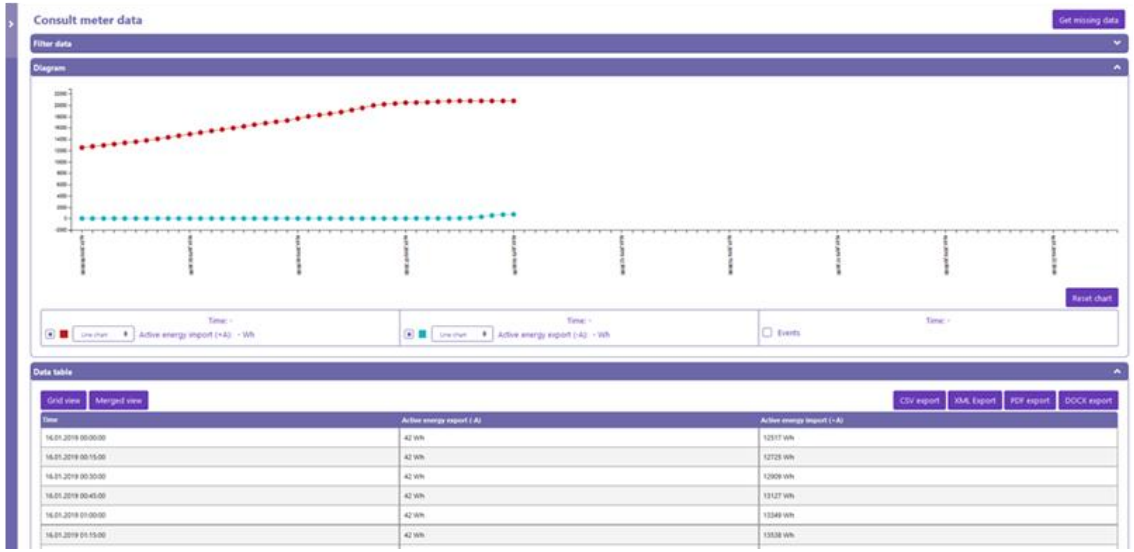
- Measure as performed with Spectrum analyser & PLC sniffer with PV installed ➔ the figures show:
  - the PV installation does not disturb the PLC signal
  - 8PSK modulation is used for communication



Data available in Central System

Data from the meter connected to PV has been correctly retrieved ➔ this shows :

- PLC communication worked well during both night & day
- Export & Import energy registers have been measured by smart meter



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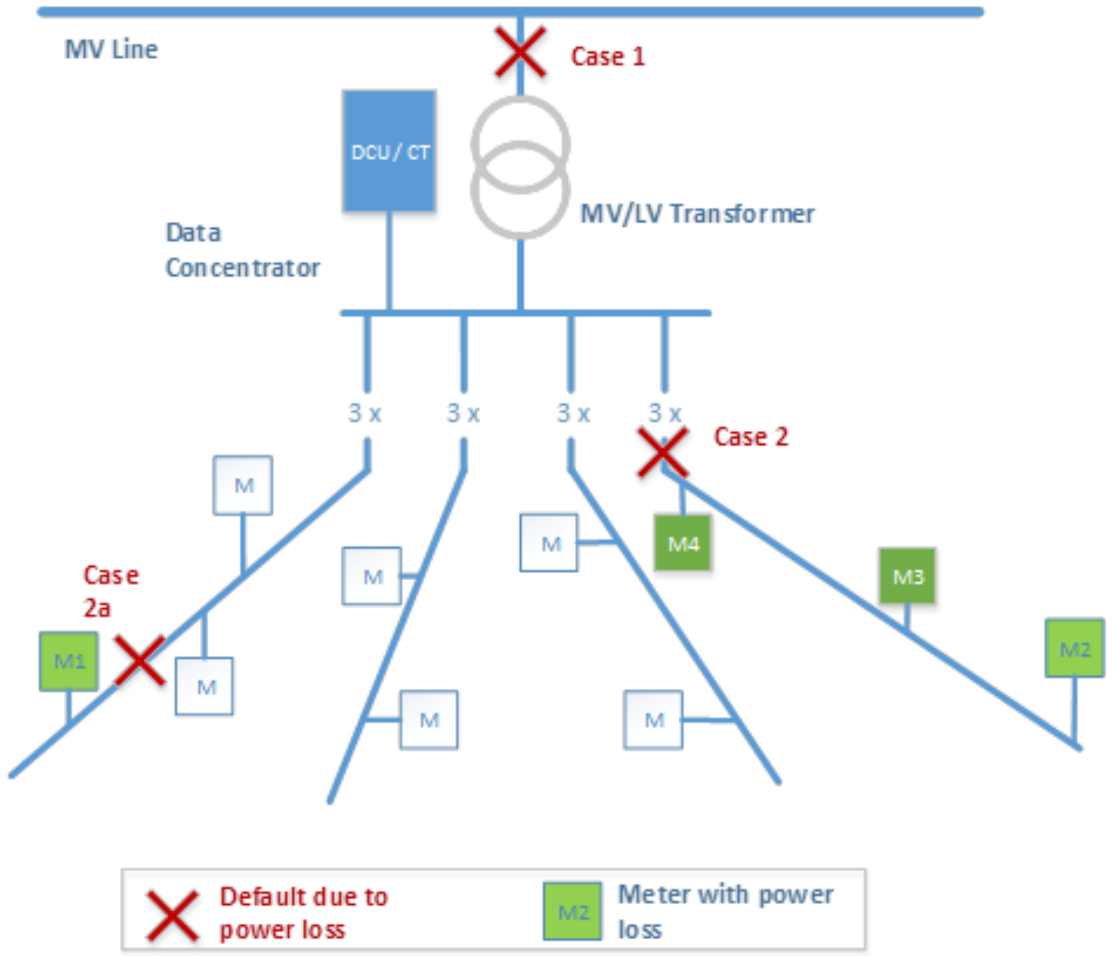
Out Management Notification – Design description

- Due to nature of power outage, several approaches are adapted to monitor and notify power outage by Sagemcom.
- Case 1
  - When the power loss occurs at substation the DCU with CT meter capability detects loss of voltage and current and uses its internal battery power to transmit power outage anomaly through cellular link.
- Case 2
  - Reports power outage within a cluster of meters which is suitable for the feeder outage management and it minimizes power outage report into the few messages.
    - Reduces network flooding from redundant massages.
- Case 2a
  - Uses similar approach as case 2 but detecting single meter.



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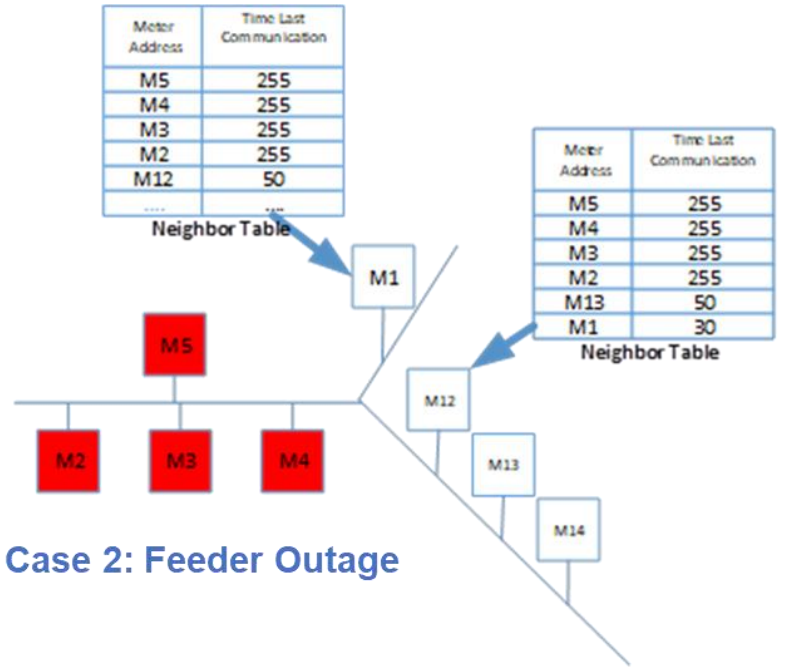
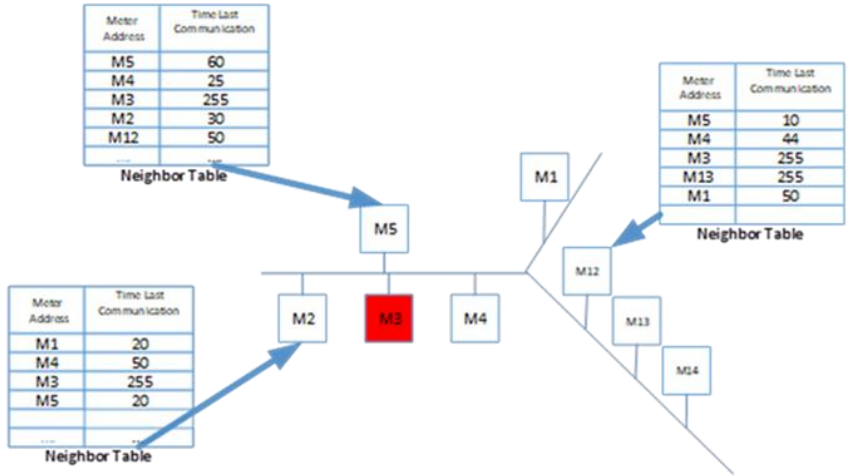
Detecting Case 2 and Case 2a

- G3-PLC uses **distributed mesh routing** where each node has **autonomous awareness** of its surrounding meters condition
- Each meter stores surrounding meter addresses and time lapses from the last communication in its **Neighbor Table**
- When duration of the last communication exceeds the norm, the surrounding Meters report the anomaly about missing meters to the DCU
- Illustration of Case 2 :
  - When duration of the last communication with meters M2,M3,M4 and M5 reaches beyond the norm, Meter M12 and Meter M1 reports the anomaly about these meters to the DCU.
- G3-PLC's autonomous awareness of its surrounding can also **monitor each meters condition** by including additional steps into their last gasp process
- Illustration of Case 2a:
  - DCU uses this information to initiate route discovery to M3 to verify the lack of communication is not resulted from bad PLC communication.
  - If route discovery failed, the DCU report power outage to head-end system.



Case 2: Feeder Outage



Case 2a: Single meter Outage

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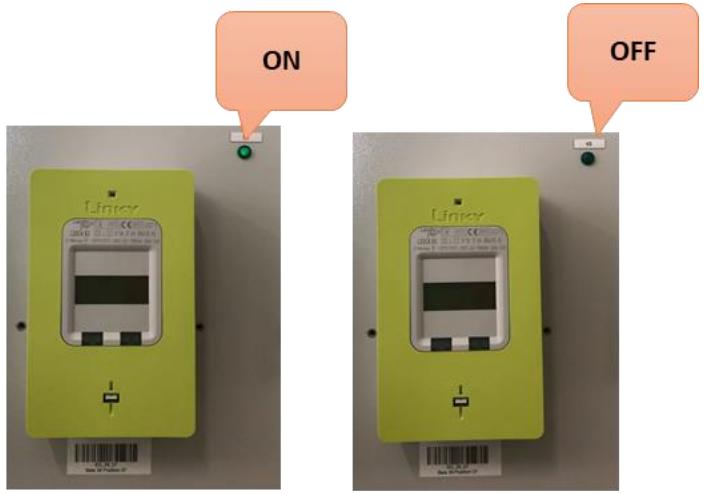
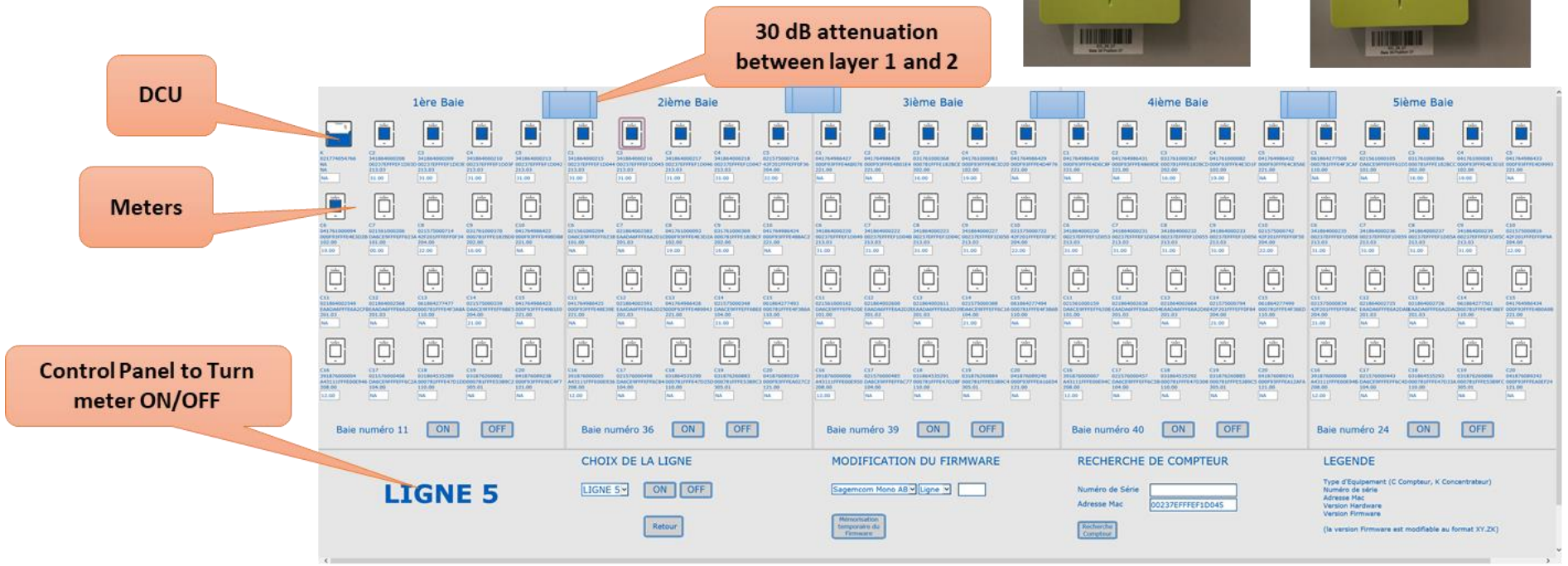
Empirical implementation

- The test is implemented in Enedis Lab for Linky project where there are 120 meters distributed in 5 layers.
  - There is an attenuation of 30 dB between each layer.
- Control Panel turns meters to ON or OFF position for Last Gasp detection.





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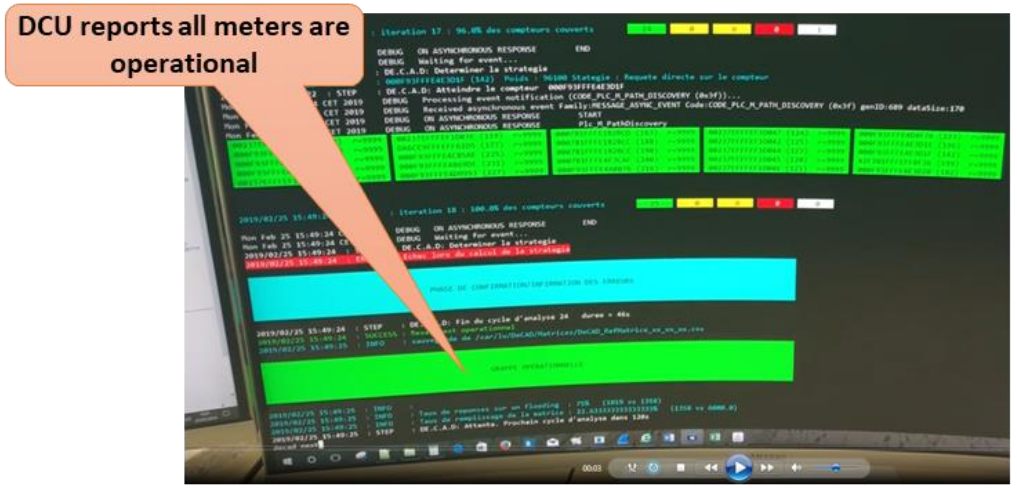
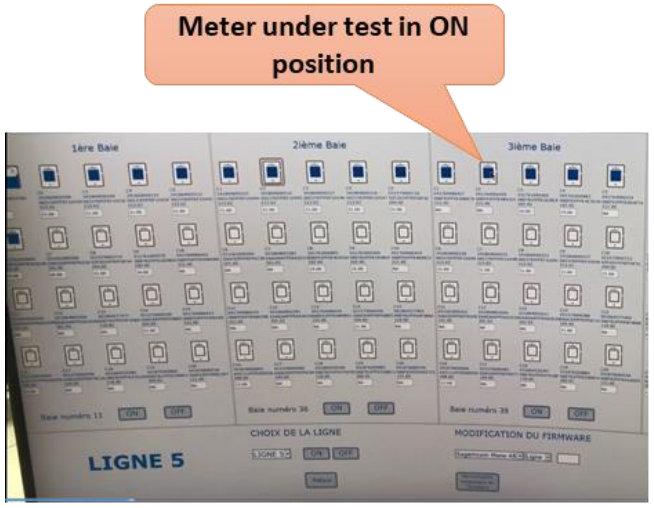
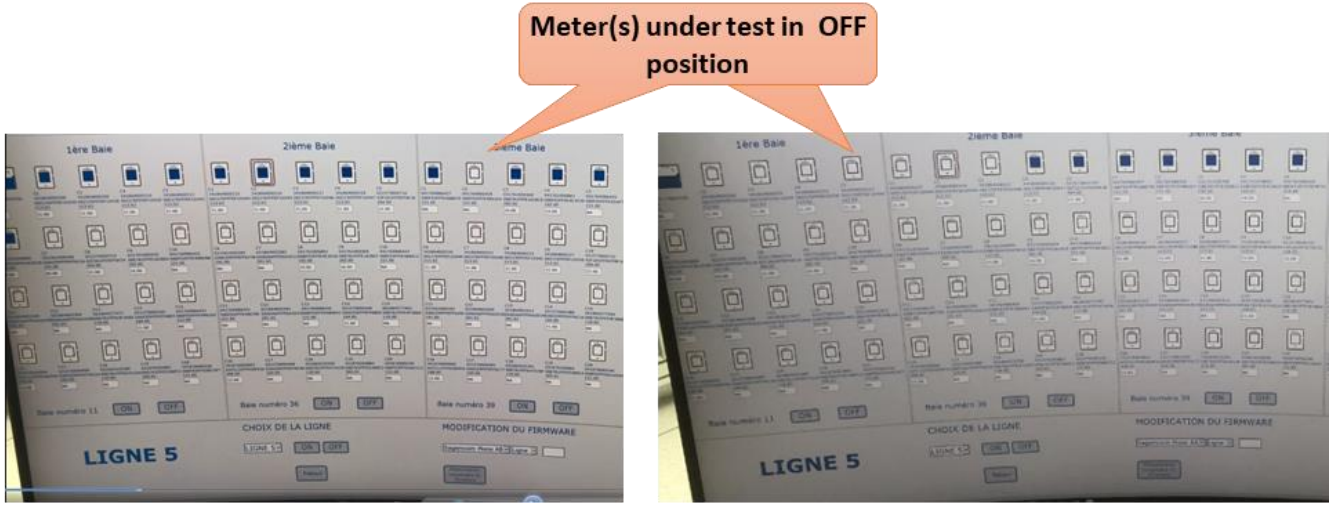
Lab illustration

1. Monitor DCU to report state of all meters
2. From Control Panel we turn one or several meters to OFF position

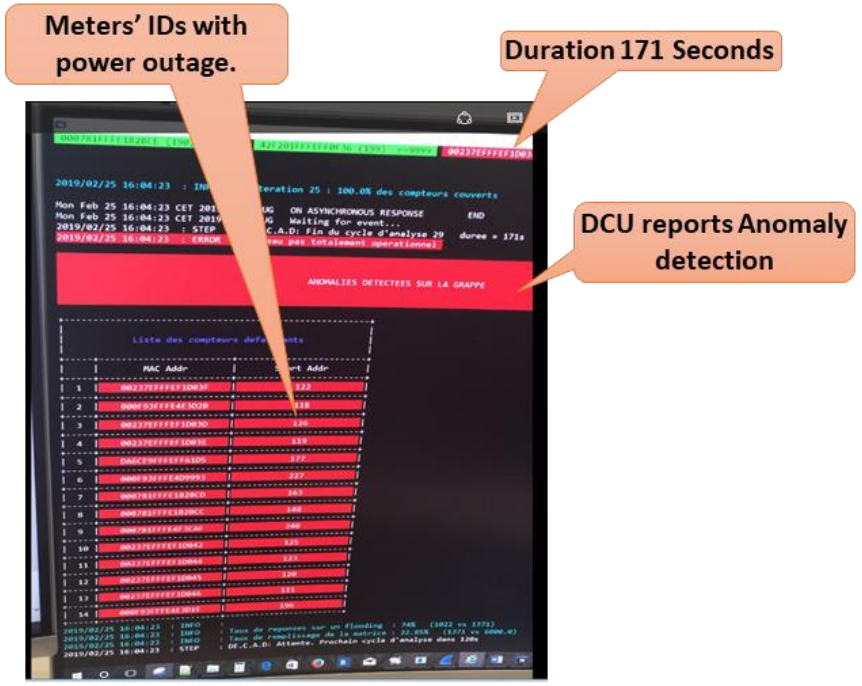




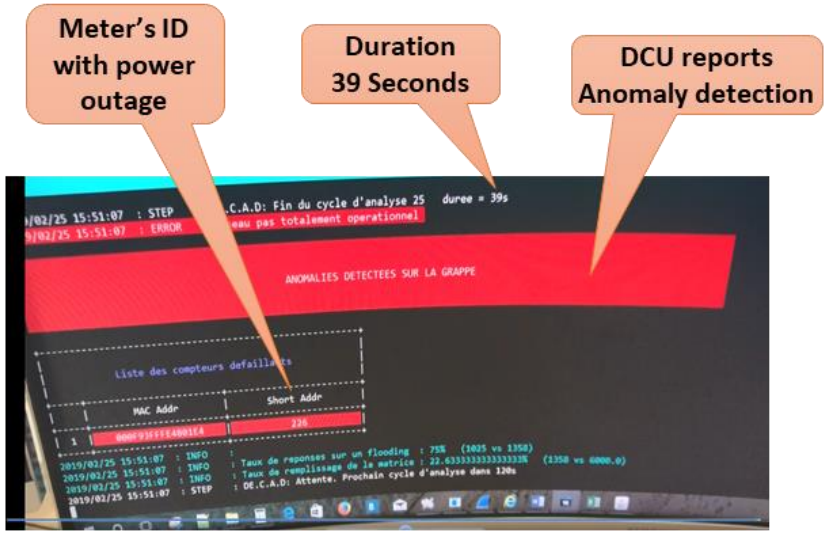


Test configurations

- Upon turning a meter(s) in OFF position. DCU starts receiving anomaly detection from neighboring meters.
  1. DCU initiates a route discovery to verify the meter is offline
  2. DCU reports anomaly detection



Feeder Outage Detection



Single Meter Outage Detection

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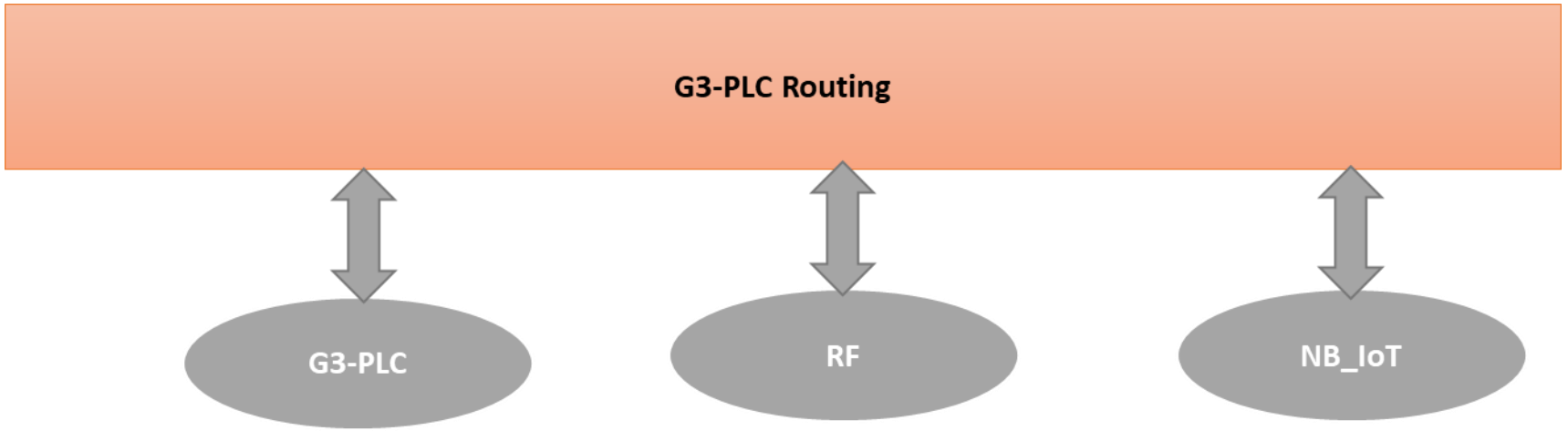
G3-PLC support Multi Communication Devices

- Hybrid Use case
  - More restrictive DSO's requirement
    - KPI reequipment changes from 9x% towards 99+%.
  - Faster response time
- No communication technology can offer a consistent 99% KPI
  - Hybrid solution using two communication can provide higher KPI consistently.
- C3-PLC routing is based on distributed intelligence allowing the support of several commination technologies under single routing platform.
  - Today G3-PLC is supporting PLC and RF SRD simultaneously.



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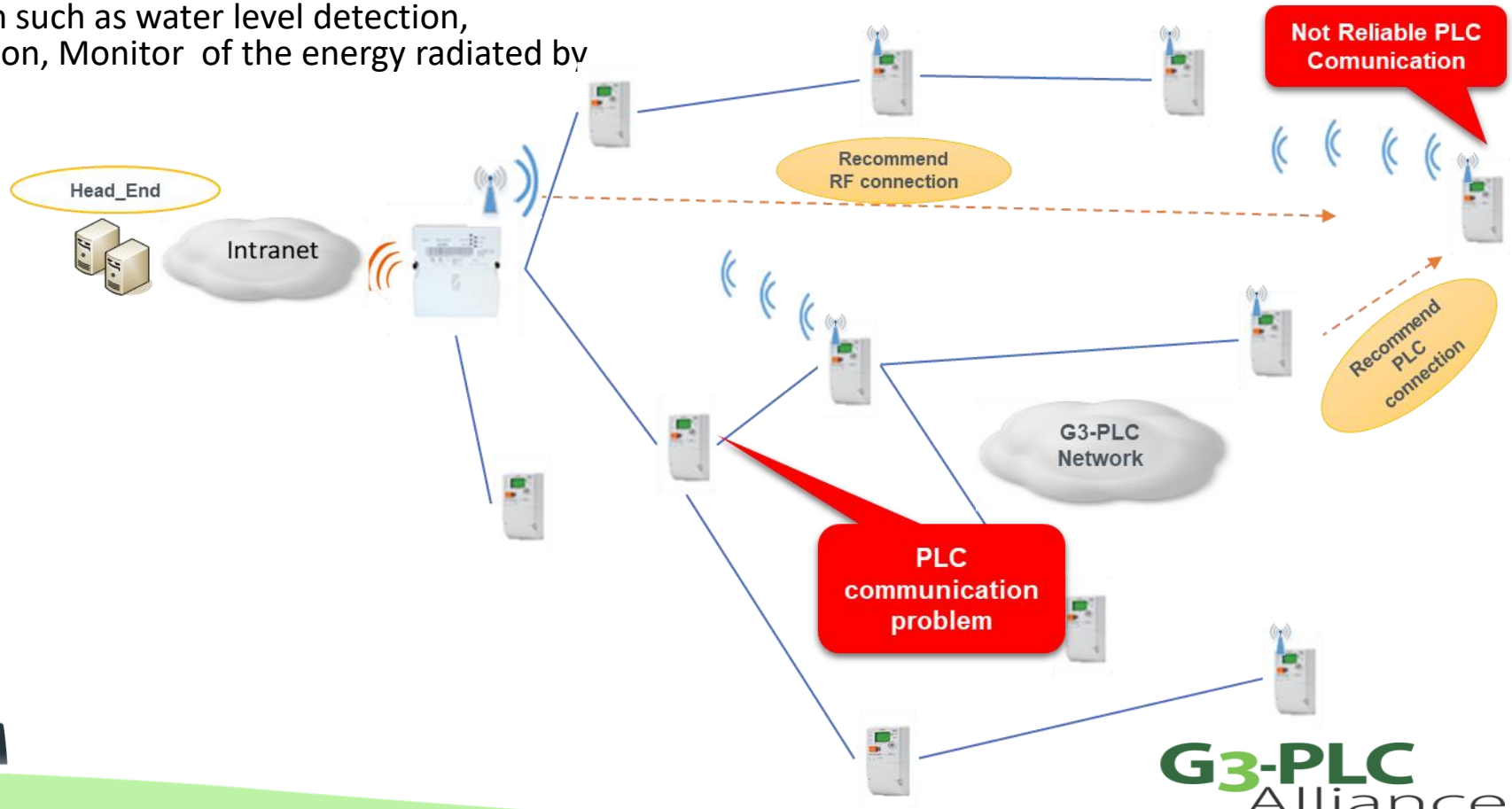
PLC and RF Homogenous Network

- The proposed design adapted RF devices to work seamlessly within G3-PLC network.
- Network makes the decision to use RF or PLC as best connection to DCU
- It provides higher KPI
- Offer new services such as establishing multi energy network.
- It can also offer smart city application such as water level detection, greenhouse gas emissions/ air pollution, Monitor of the energy radiated by cell stations, WiFi and other devices



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G3-PLC is a powerful communication backbone for the Smart Grid

- G3-PLC has proven its robustness in the 30+ million AMI nodes already deployed worlwide
- Immunity to electrical network signal pertubations has been increased by covering mutliple frequency bands (Cenelec, ARIB, FCC)
- Built-in features are enabled through sophisticated software analysis to address DSOs critical electrical applications (Outage management, Phase detection, Network wiring mapping, …)
- Its robust routing mechanism enables multiple physical media communication technologies (RF, Cellelular, PLC) to operate simultaniously for mission critical services.

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