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G3-Alliance

Enabling the smartest grid...together

Hexing's Experiences and Insights with G3-PLC Technology

Oliviu Burlacu

2025-04

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About HEXING

About US

Hexing was founded in 1992 and is listed on the Shanghai Stock Exchange (603556).

As a leading provider of smart and green energy products and solutions, Hexing is committed to making electricity green and easy to access.

Hexing's core businesses involve smart metering & distribution products in electricity and water industries, renewable energy products, IoT communication network products, and solutions for global residential and C&I customers, as well as global utilities.

Business Scope

Renewable Energy

Smart Grid

AIoT

Smart Water

Hexing Global Presence

A Growing Globalization, a Localized Organization, a Touch Point Wherever You are.

Romania
HEXING TECHNOLOGIES EUROPE S.R.L.

Brazil
HEXING BRASIL HOLDING LTDA

Pakistan
KBK Electronics (Pvt) Limited

Indonesia
PT Hexing Technology

Netherlands
HEXING EUROPE B.V.

South Africa
HEXING ELECTRICAL SA (PTY) LIMITED

Kenya
Hexing Technology Company Limited

Bangladesh
Bangladesh Smart Electrical Company Limited

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Evolution of PLC Technology in China

Evolution of PLC Technology in China

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1 **2009**
Narrowband PLC concludes technical validation and initiates commercial rollout.

2 **2014**
Narrowband PLC attains comprehensive field application
Broadband PLC enters technical investigation phase

3 **2017**
SGCC achieves full narrowband PLC coverage (>99%)
SGCC broadband PLC standard release year

4 **2020**
State Grid initiates comprehensive replacement of narrowband PLC with broadband PLC, advancing full-scale deployment and application.

5 **2021**
SGCC Hybrid BPLC+RF standard release year

6 **2022**
SGCC advances Hybrid BPLC+RF deployment
Hexing winning contracts and executing deliveries.

7 **2024**
SGCC continues Hybrid BPLC+RF deployment
CSG initiates Hybrid BPLC+RF tendering.

International Chipset Manufacturers Partners

Eastsoft 鼎信通讯 TOPSCOMM HiTrendtech RISECOMM 瑞斯康

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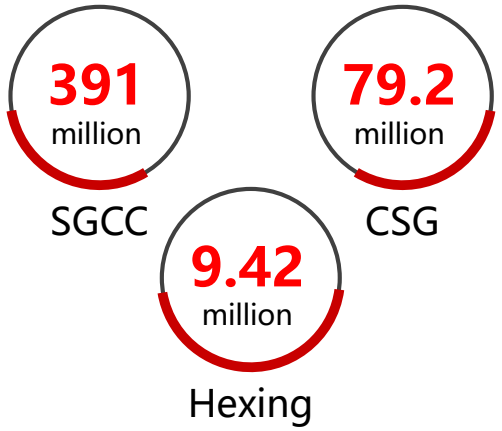
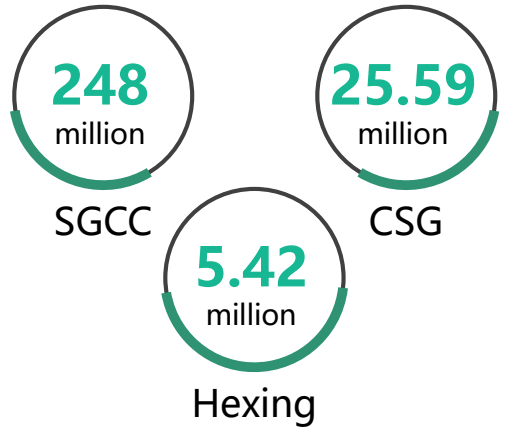
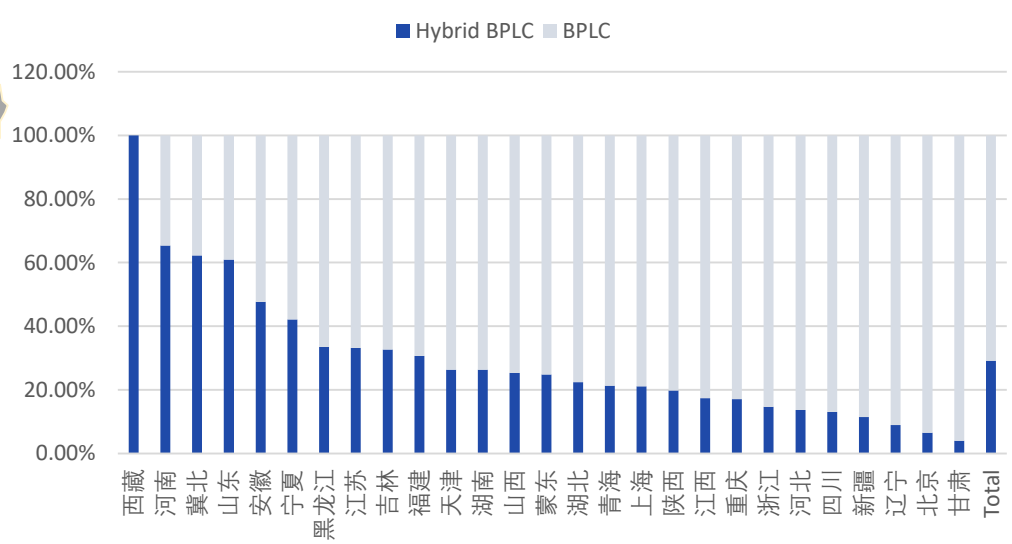
Application of BPLC and BPLC+RF Hybrid in China

BPLC meters

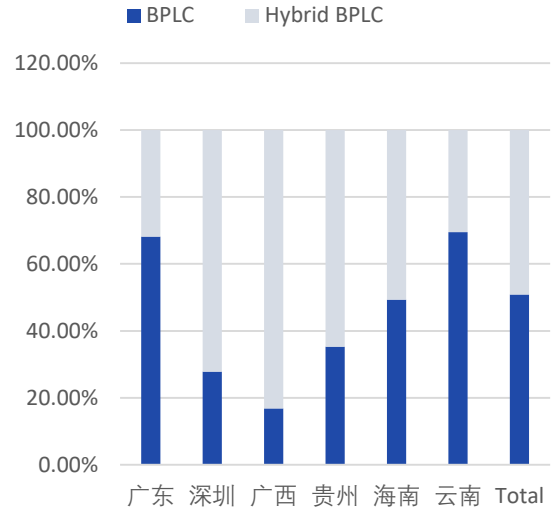


Hybrid BPLC+RF meters





SGCC BPLC/ Hybrid BPLC+RF ratio



CSG BPLC/ Hybrid BPLC+RF ratio

Reading success rate:

- Daily load profile > 99.6%
- 15-minute load profile > 98.6%

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Hexing's Experiences with G3-PLC Technology

Evolution of G3-PLC Technology in Hexing

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2015

1

G3-PLC Products launch &Market promotion, Introducing **Semtech** solution
Completed the **first** **CENELEC-A** certification in July 2015.

2016-2019

2

Semtech delivered volume reaches approx. 0.93M units primarily distributed across **Bulgaria, South Africa, Kyrgyzstan, Tajikistan, Mauritius** markets

2020

3

G3-PLC Products launch &Market promotion, Introducing **Vango** solution
Completed **FCC** certification in September 2020.

2021-2022

4

Vango deliveries reached approx. 1,86M units primarily distributed across **Uganda, Cameroon, South Africa, Kenya, Brazil** markets

2023

5

G3-PLC Products launch &Market promotion, Released **Renesas** solution.

2024

6

CENELEC-A certification in March 2024.

Renesas delivered volume reaches approx. 0.4M units primarily distributed across **Romania and Chad** market.

Completed the first **Hybrid FCC+RF** certification in September, 2024.

Introducing **VertexCom Hybrid G3+RF** solution

VertexCom delivered volume reaches approx. 10000 units

2025

7

Completed **Hybrid CENELEC-A G3+RF** certification in January, 2025.

International Chipset Manufacturers Partners

SEMTECH

Vango

VertexCom

RENESAS

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Focus on the Application of G3 Hybrid

With G3-PLC hybrid support, overall communication performance is enhanced, significantly improving both **communication success rate** and **data collection reliability** in field deployments.

2

Certification and interoperability: Hexing is the first company to receive the **1ST G3-Hybrid FH Certificate** from the G3-Alliance

1

3

G3-PLC Hybrid mode provides a more **efficient, flexible, high-speed, stable** and **reliable** dual-channel communication network and **cost-effective** solutions for **smart grid**, **smart city** and **industrial applications**

Focus on the Application of G3 Hybrid

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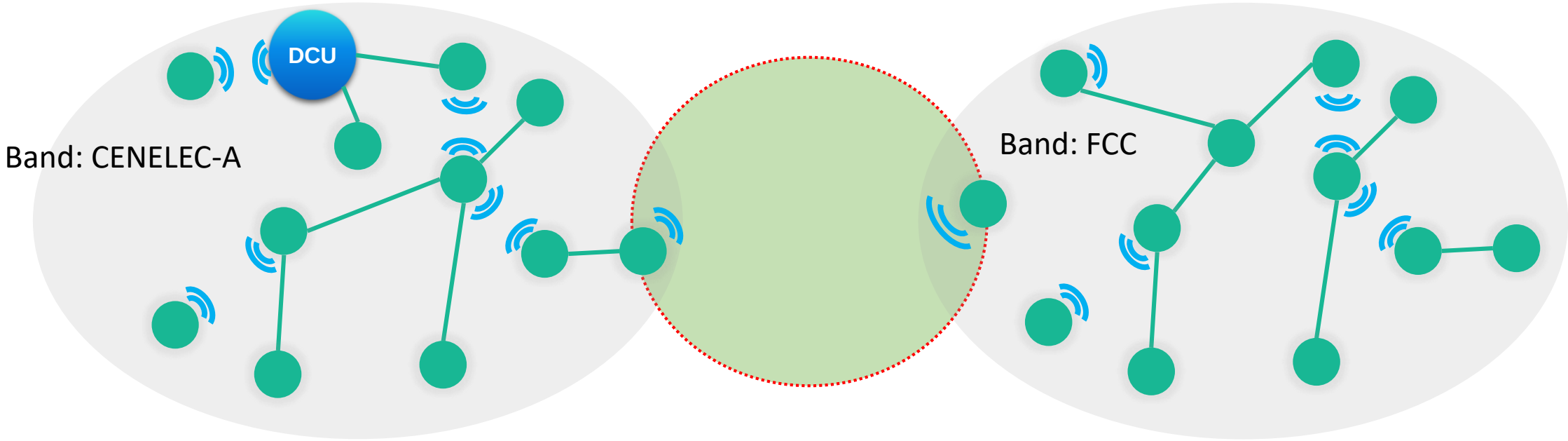
G3 Hybrid Technology, expands product applicability to more complex operating environments ensuring.

G3-Hybrid



PLC link

RF link

DCU G3-Hybrid Pan Coordinator

G3-Hybrid device

FCC+CENELEC-A full frequency

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Case Study - Bulgaria G3-PLC AMI Project

Project information

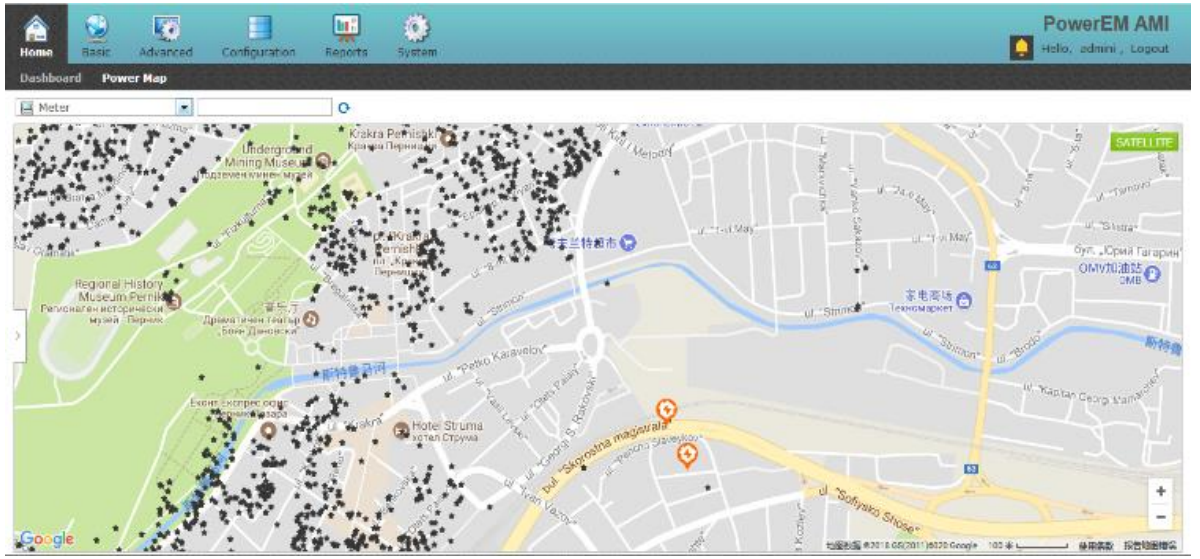
- CEZ Electro in Bulgaria
- 2017.4~ 2019.10
- Meter: 363,000 pcs
- System: 3rd party MDC system

Hexing Solution

- Communication network: DCU+G3-PLC
- Application system: 3rd party MDC system
- Smart meter

Highlights and commercial value

- > 98% reading rate
- 19%--10% loss reduction
- 100% payment rate
- Product interconnection



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Case Study - Bulgaria G3-PLC AMI Project

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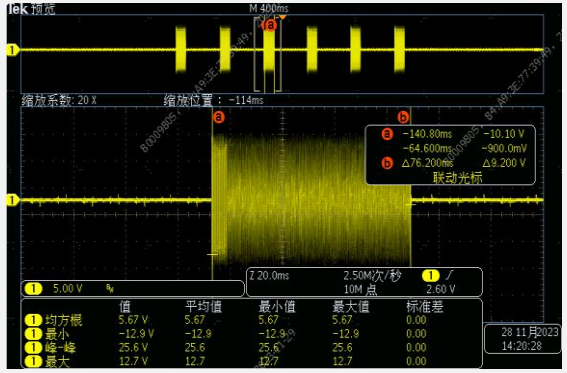
Buried Line PT

Transmitter

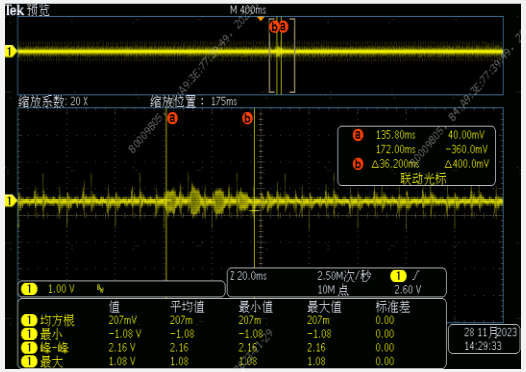


Buried Cables

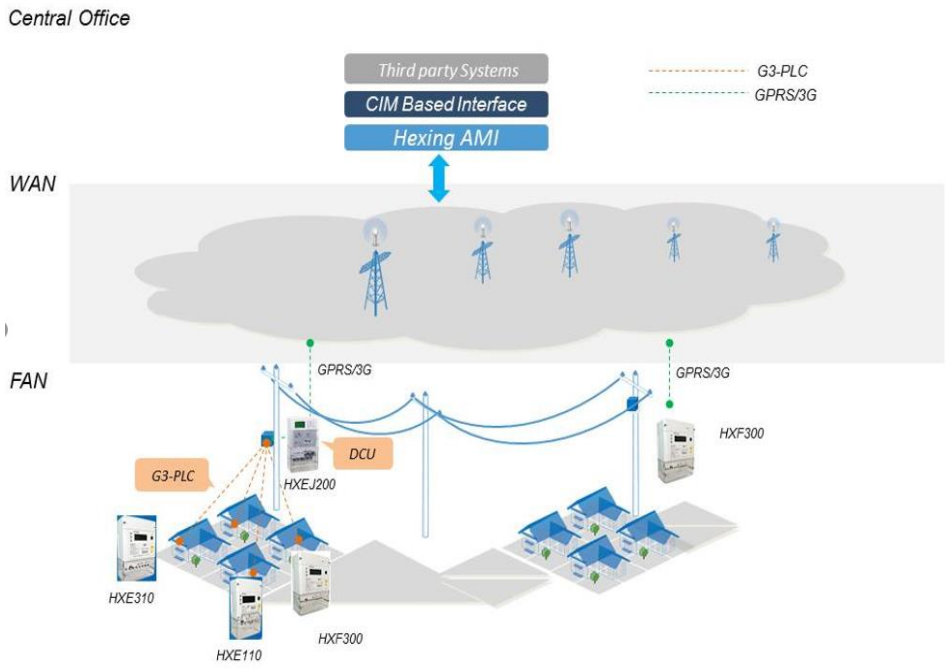
Length 50 meters

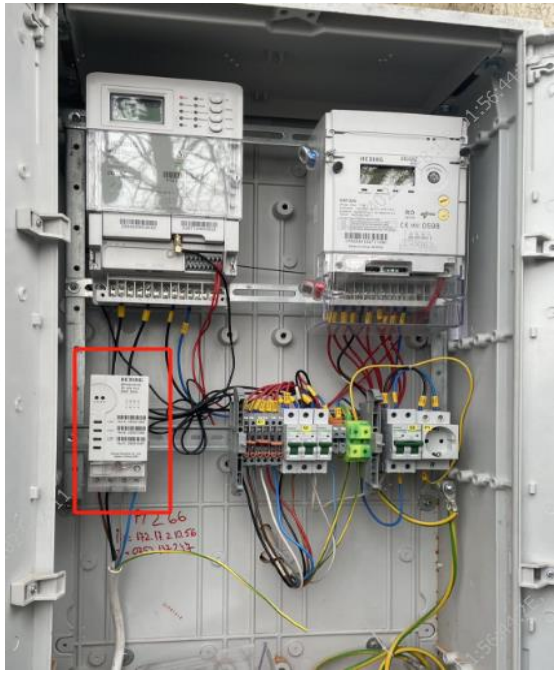
5.27 V

0.21 V



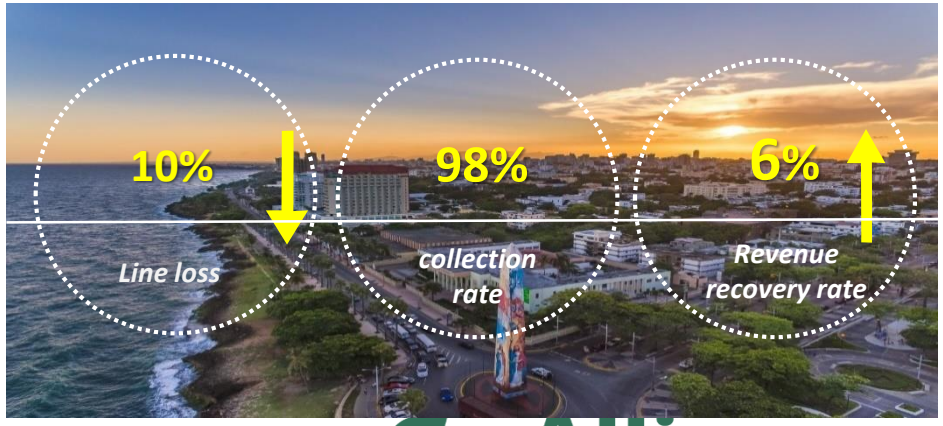
Receiver





1.Performance improvement with installation of the 3 phase repeater

2. Use the fast network access mechanism for slave node



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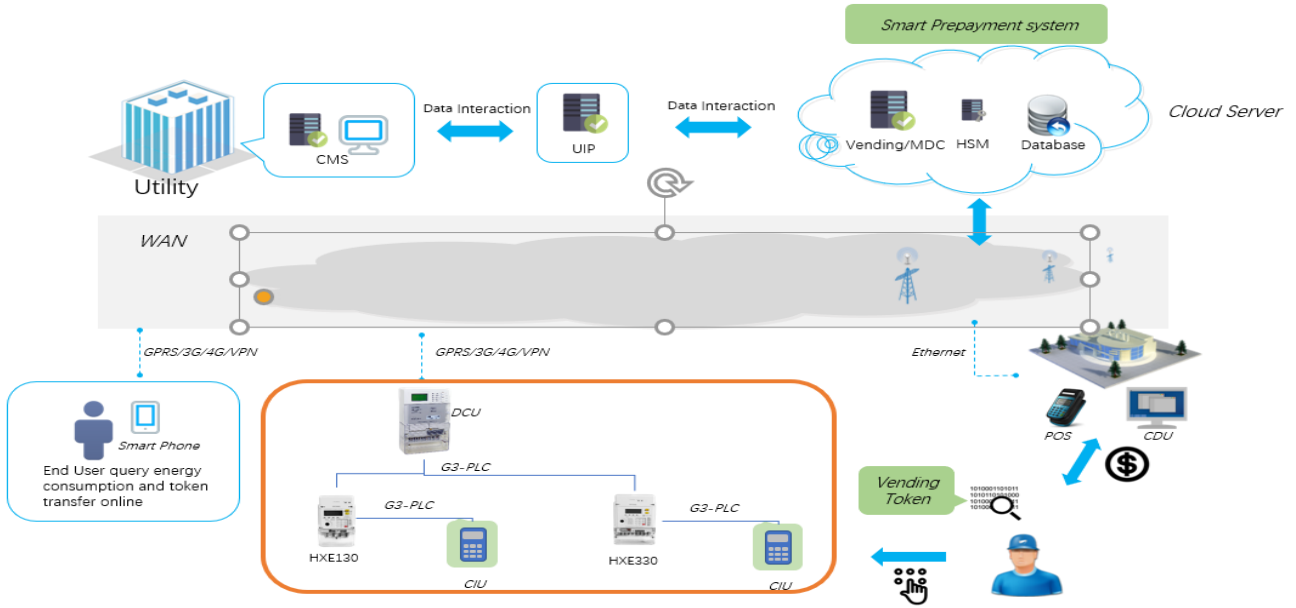
Case Study - Ghana G3-PLC AMI Project

Project Information

- Meter: 100,000 pcs Prepaid,
- System: Vending, MDC, Billing, and Transaction Platform (Hexpay)
- Integration: e-GIS, e-Billing, Oracle Finance system, USSD, Mobile Money and meters from 3rd suppliers



Key Feature

- Smart Prepayment Meter
- Open Protocol Platform
- Vending System with STS and CTS Mode
- Billing System for Legacy Meter and Large Consumer
- Unified Information Platform
- Multiple Electricity Purchasing Channels

99%

collection rate

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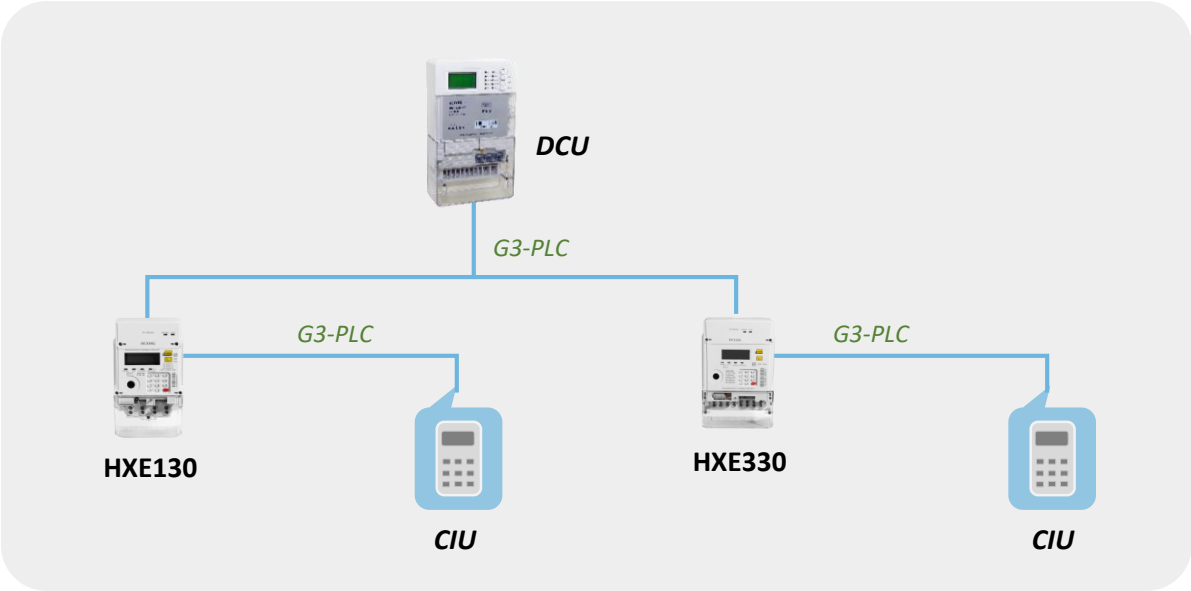
Case Study - Ghana G3-PLC AMI Project

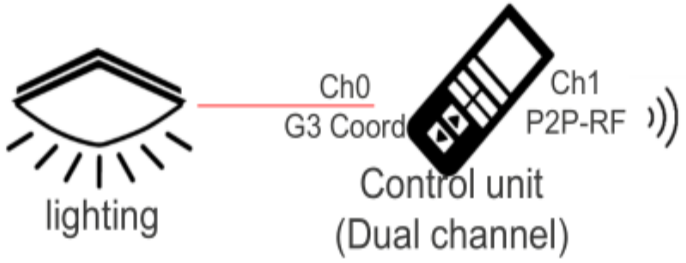
CIU (Customer Interface Unit)

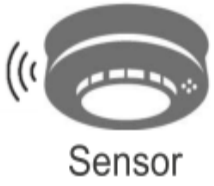
Local communication with the meter
Meter could simultaneous communicate with DCU and CIU.

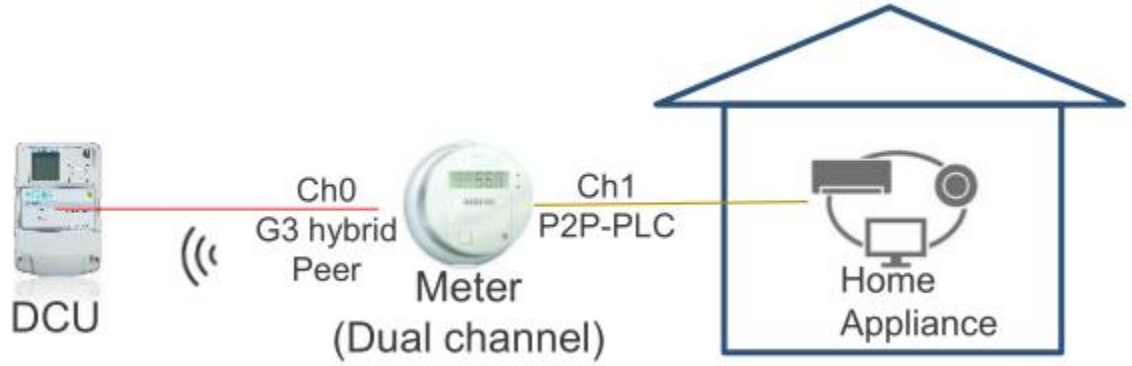


CIU application

1. It usually used EUI64 addresses for communication
2. It can communicate with LBD or LBS
3. It can be used as an onsite maintenance tool







Recommendations for G3-PLC Technology

Recommendations

The following are some technical difficulties that we have summarized during the real-time process of the project.

To distinguish the media type of source data and its signal display method

Add mediatype attribute in ADPM-DATA.indication primitive

Enhance field maintenance capabilities

Adding Beacon.request-like command for full-band broadcast device discovery

End-to-end interoperability

Add an attribute id in Table 9-51 of stardard ,support LBD get current PLC band from LBS

Recommendation 1

Table 9-54 – Parameters of the ADPD-DATA.indication primitive

Name	Type	Valid range	Description
NsduLength	Integer	0-1280	The size of the NSDU, in bytes
Nsdu	Set of octets	–	The received NSDU
LinkQualityIndicator	Integer	0x00-0xFF	The value of the link quality during the receipt of the frame.

add mediatype attribute

Add mediatype attribute at the standard level, appoint the media type of this data source

Recommendation 2

Industry Pad

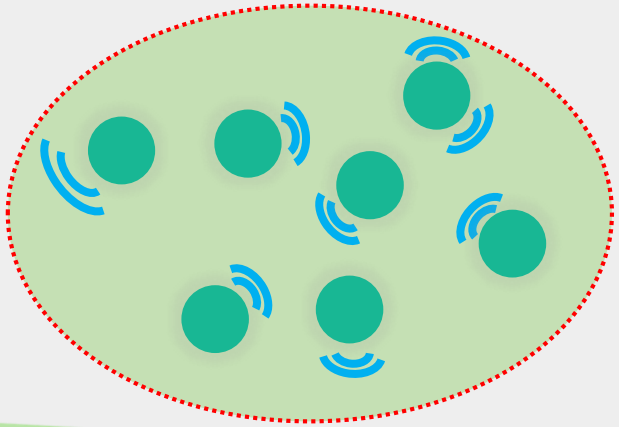
G3-PLC RF Dongle

HoppingEnable = True

NOA app

RF Dongle Broadcast to search target device via Extended command(similar beacon.request) in all frequency bands

HoppingEnable = True



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Recommendation 3

Table 9-51-Parameters for embedded EAP message			
Attribute	Attr_ID	Type	Attribute deseription
GMK	9	P	Provides a GMK key. Upon receipt, the key is installed in theprovided key identifier slot in macKeyTable.Constituted of the following fields:id (1 byte): the key identifier ofthe GMKgmk (16 bytes): the value of the GMKNote: Several GMK parameters may be embedded in one EAPmessage, to provide multiple GMK to the device.
GMK-activation	10	P	Indicates the GMK to use for outgoing messages (settingadpActiveKeyIndex).If the key identifier points to an invalid key, the change is notapplied and a Parameter-result with “Invalid parameter value’ isreturned.Constituted of the following field:id (1 byte): the key identifier of the active GMK
GMK-removal	11	P	Indicates a GMK to delete (making the targeted key invalid).Note: Removing an already invalid key is not considered an error.Constituted of the following field:id (1 byte): the key identifier of the GMK to delete
Parameter-result	12	D	Indicates the result of the application of parameters:Constituted of the following fields:result (1 byte): can take the following values:0x00:Success

Add current PLC band of LBS

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G3-PLC Hybrid LBD support automatic frequency band switching between CENELEC-A and FCC, during bootstrapping process of LBD via RF, suggest send the current LBS PLC frequency band in message 3.

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Thank you

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Web：www.hxgroup.com E-mail：market@hxgroup.com Tel：+86-571-28020769

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