Nessum for the German Smart Meter Rollout

Netze BW‘s experiences with Broadband Powerline

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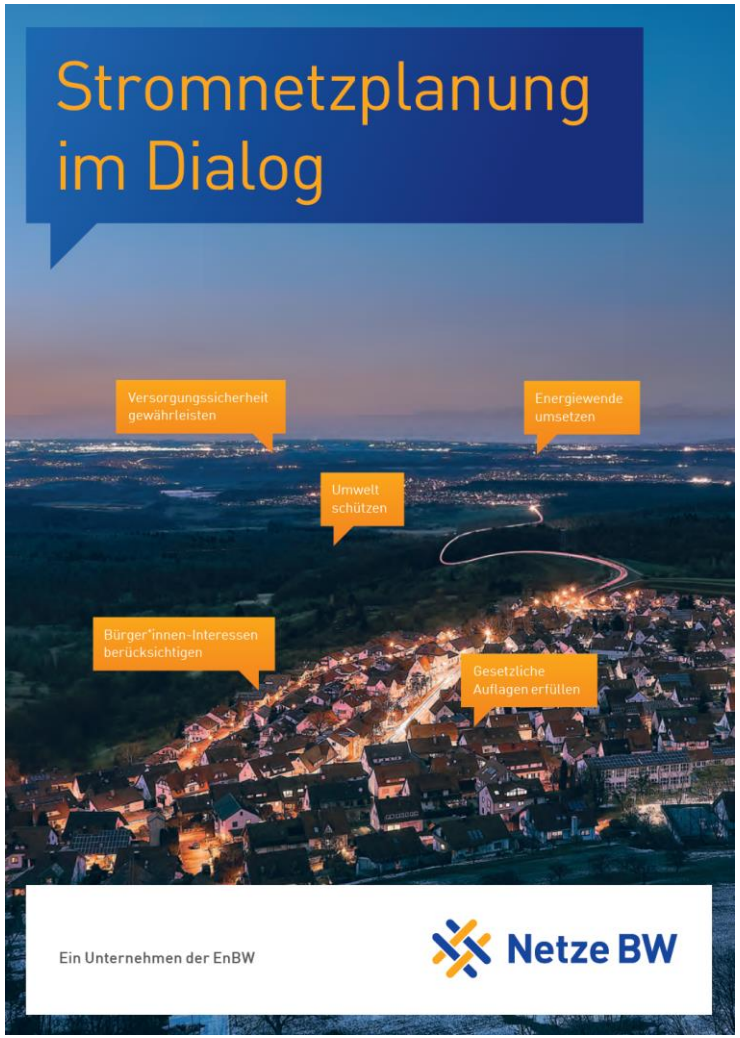
Rolling out Smart Meters as a Rural DSO in Germany
Netze BW‘s experiences with Broadband Powerline



Netze BW is a DSO covering large areas of the German South-West

Most of the covered area is rural (with some mid-sized towns)

The German Smart Meter approach includes Smart Grid use cases
(such as: remote control of controllable devices)

Smart Grid use cases require a high level of security
and there is no security without sufficient data rates (and latencies)

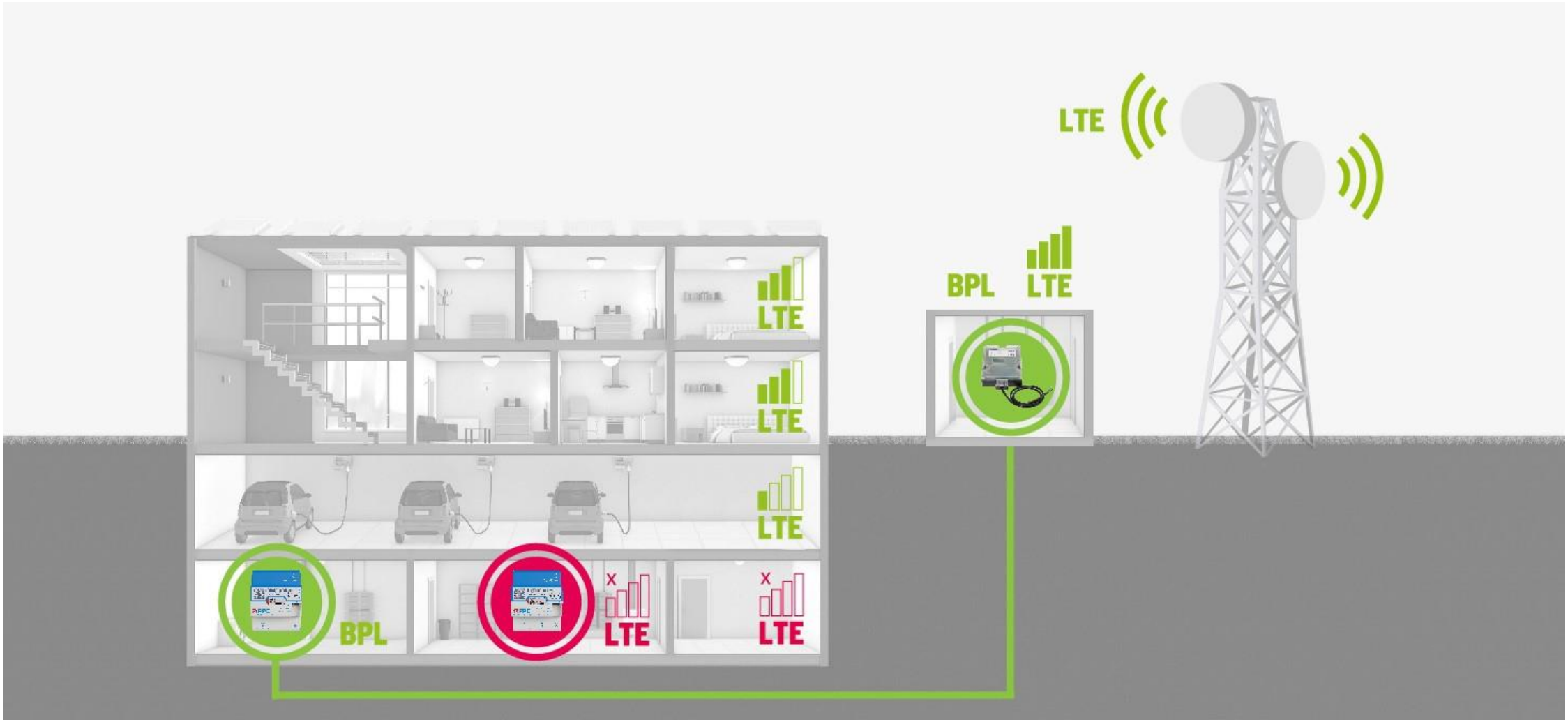
The „go-to“ solution (a 4G modem integrated in every SMGW) only brings you so far if there is **not enough reception in the basement**

→ **Therefore, Netze BW had to look for alternatives to 4G / LTE**

Source: https://assets.ctfassets.net/xytfb1vrn7of/1s5AGMOmCo8z50nJQ4nwZ0/111027371609136648 28fe5ee670c3da/Broschu__re_Stromplanung_im_Dialog.pdf

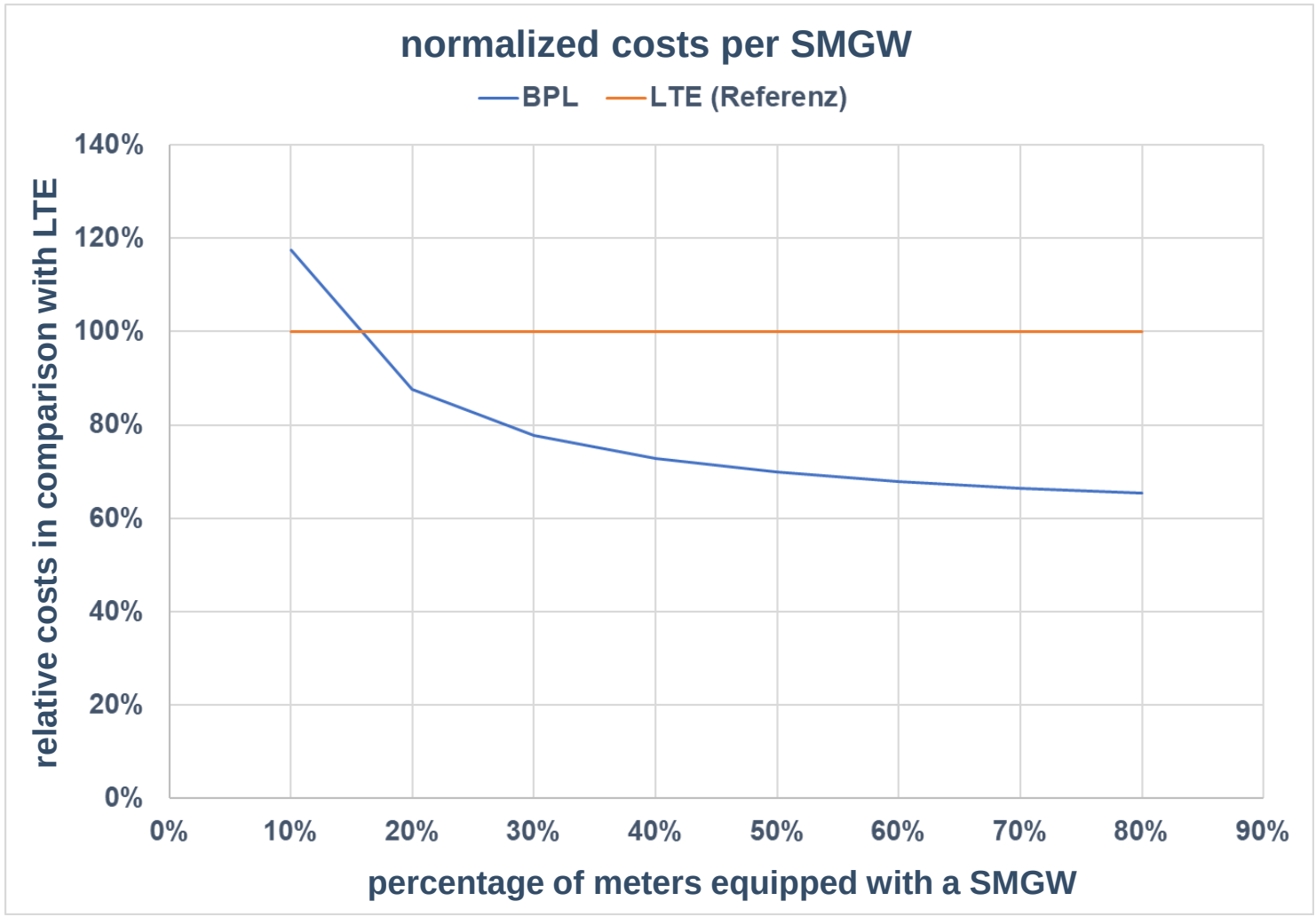
So… maybe use BPL for the Smart Meter Rollout?

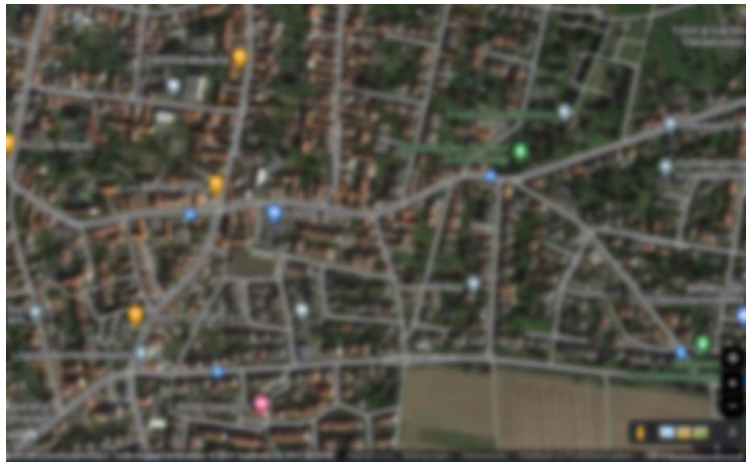
BPL enables communication, where LTE reception is missing



What about the cost then – LTE must be cheaper, isn‘t it?

Calculation for a typical small town: the more devices, the cheaper BPL gets





LTE :

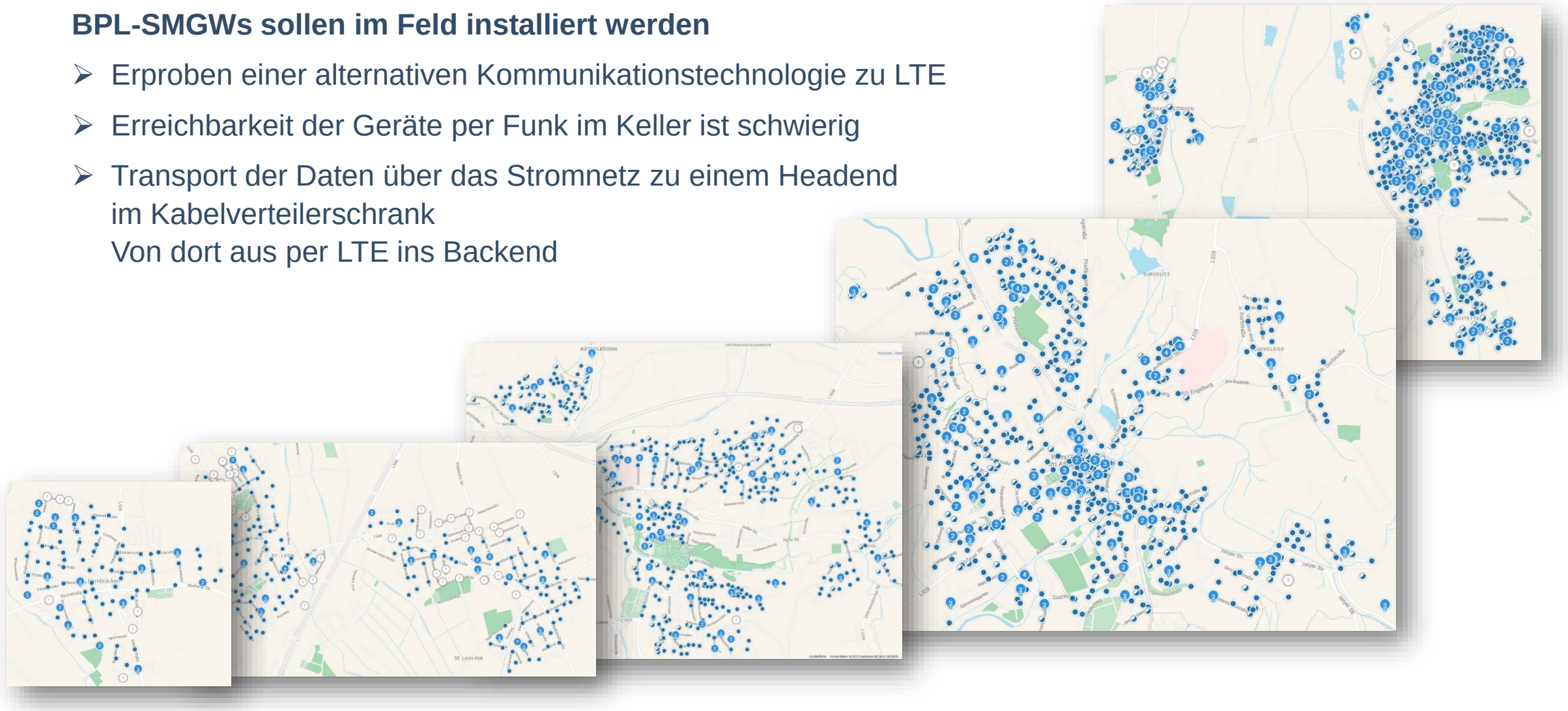
BPL :

Broadband Powerline pilot projects in 5 communities
Starting with IEEE 1901-2010

PPC
Power Plus Communications

BPL-SMGWs sollen im Feld installiert werden

- Erproben einer alternativen Kommunikationstechnologie zu LTE
- Erreichbarkeit der Geräte per Funk im Keller ist schwierig
- Transport der Daten über das Stromnetz zu einem Headend im Kabelverteilerschrank
  Von dort aus per LTE ins Backend

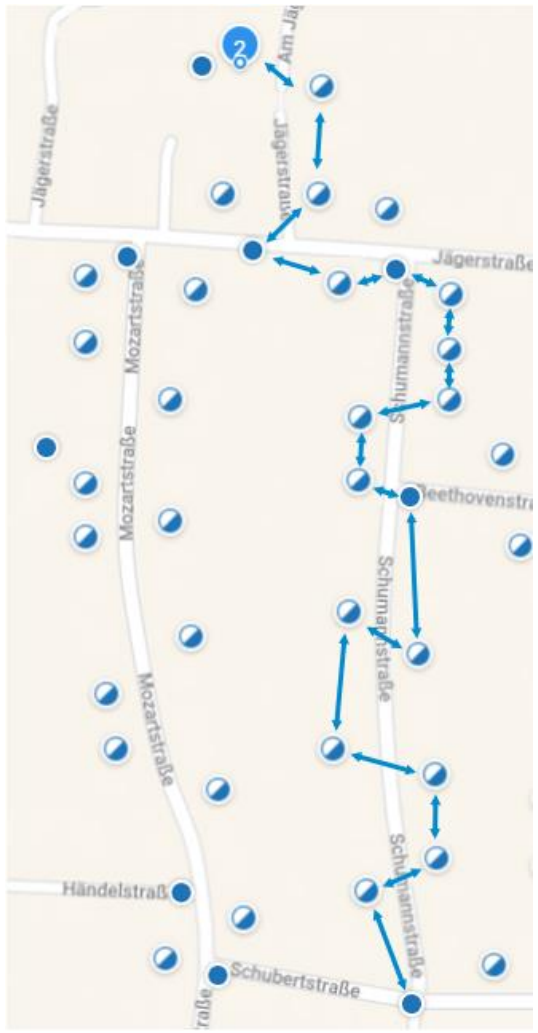


Rolling out smart meters using Broadband Powerline Communication

Typical 2-phase approach of German DSOs

Phase 1 of a typical BPL project is the installation of Headends and Repeaters – forming the **„communication network“** which Smart Meter Gateways can use to communicate with the backend.

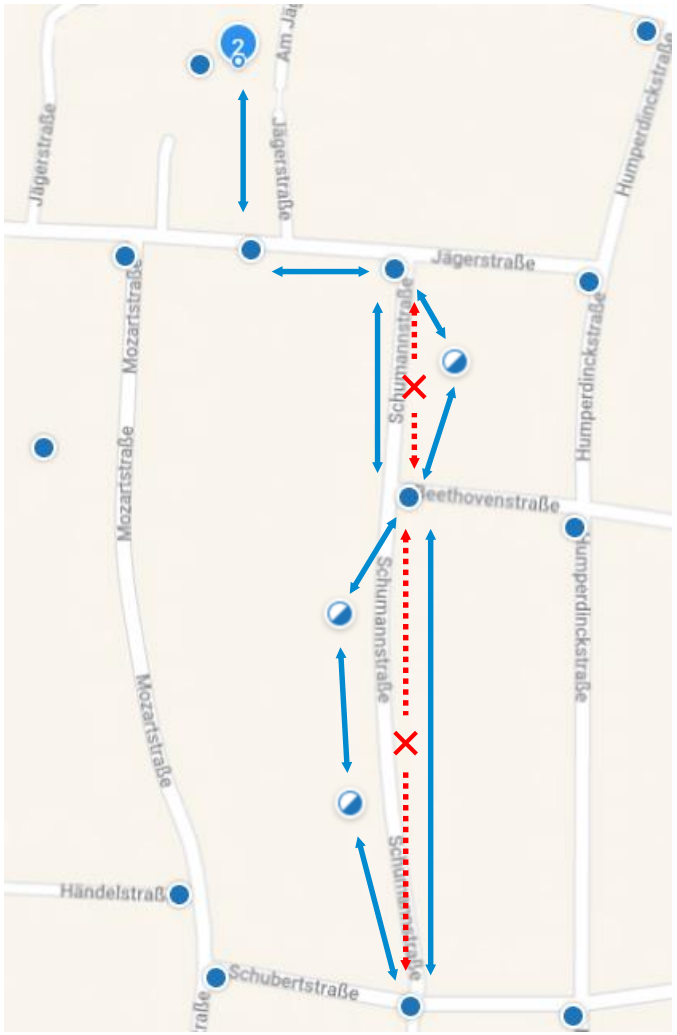
In **Phase 2**, Smart Meter Gateways are installed. They use the previously established communication infrastructure to send metering data and receive control messages



Phase 1: Installing Headends and Repeaters (IEEE 1901-2010)

You want to make sure, the communication network is ready – but what if it isn‘t?

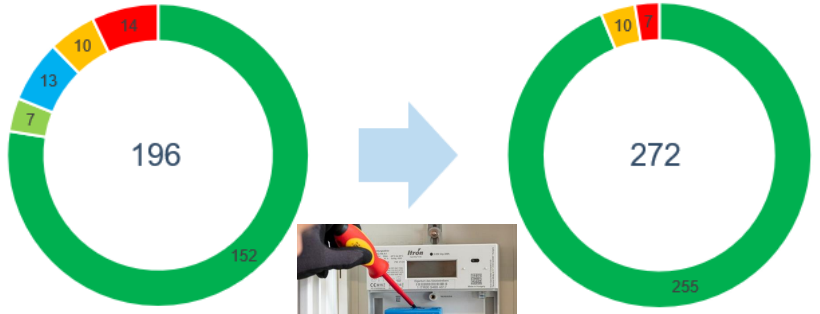
So Netze BW did what PPC had told them, installed a Repeater in every street cabinet and then waited for the LED to stop flashing and go to constant green…



But not every connection could be established – what now?

PPC said: Don‘t worry, BPL SMGWs also act as repeaters, so the network will get stronger with every installed device

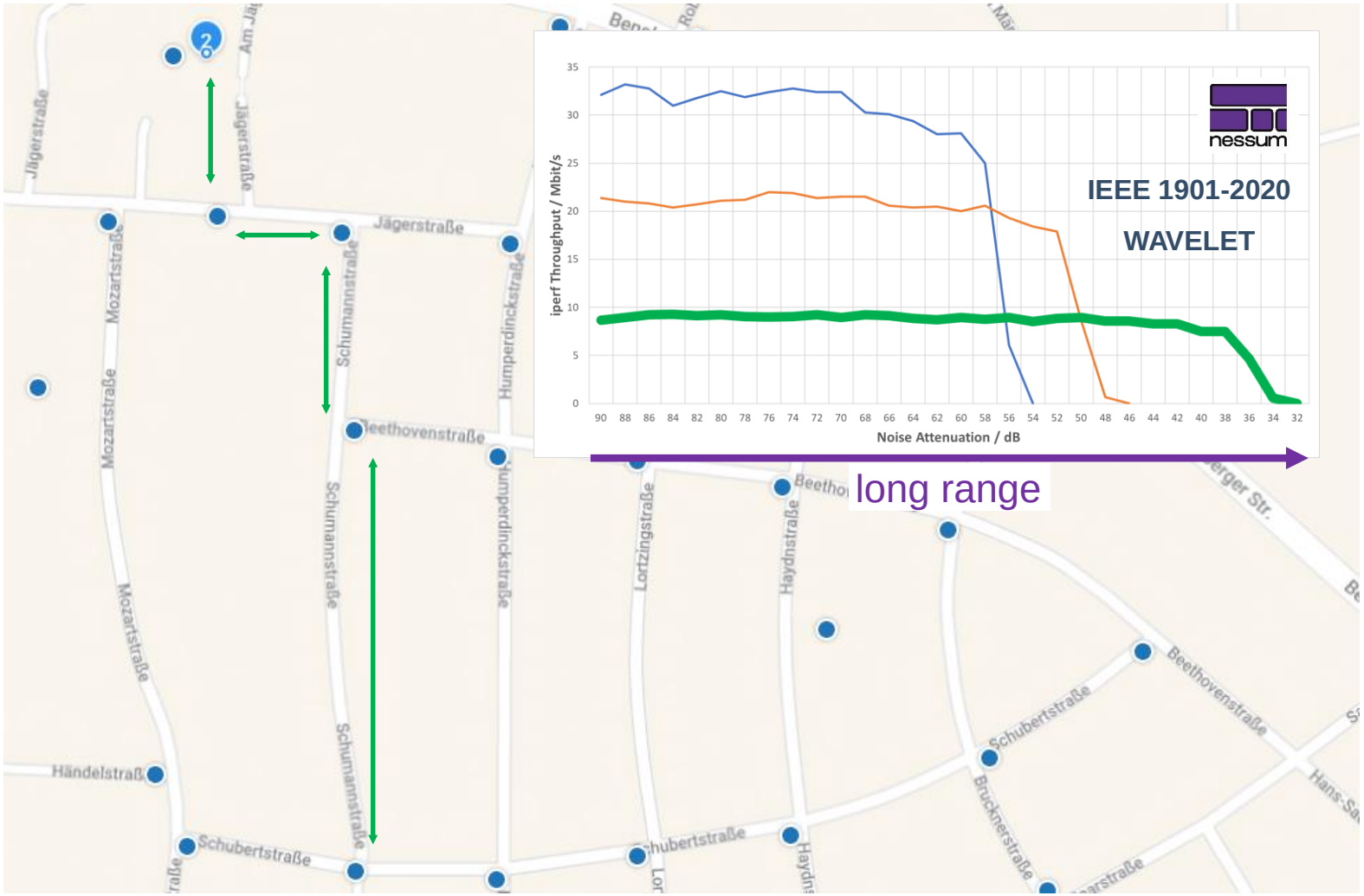
Actually, Netze BW was able to observe just that: the more BPL SMGWs they installed, the more devices came online:



Phase 1: Installing Headends and Repeaters (IEEE 1901-2020 / nessum)

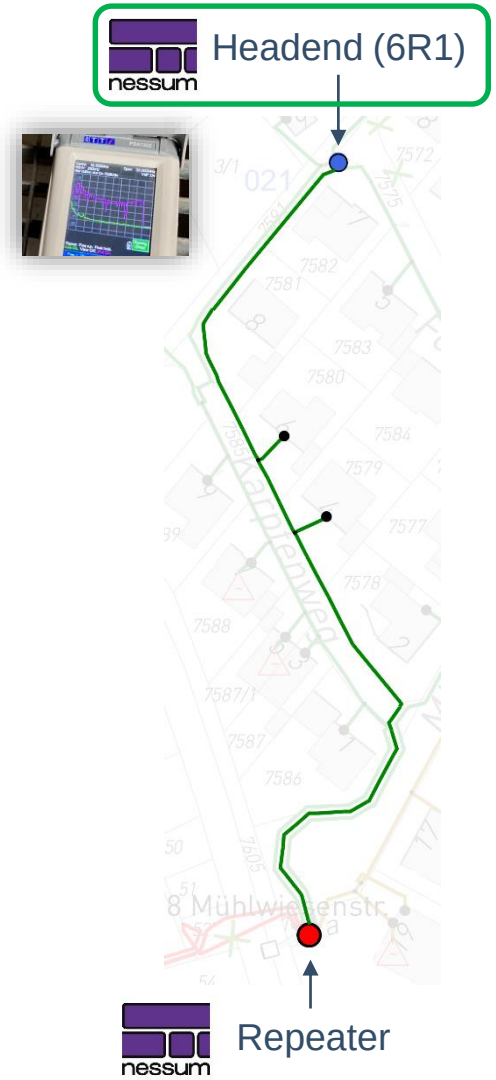
Better safe than sorry: bandplan X4 covers long distances effortless

Phase 1 of every BPL project is the installation of Headends and Repeaters – forming the **„communication network“** which Smart Meter Gateways can use to communicate with the backend.

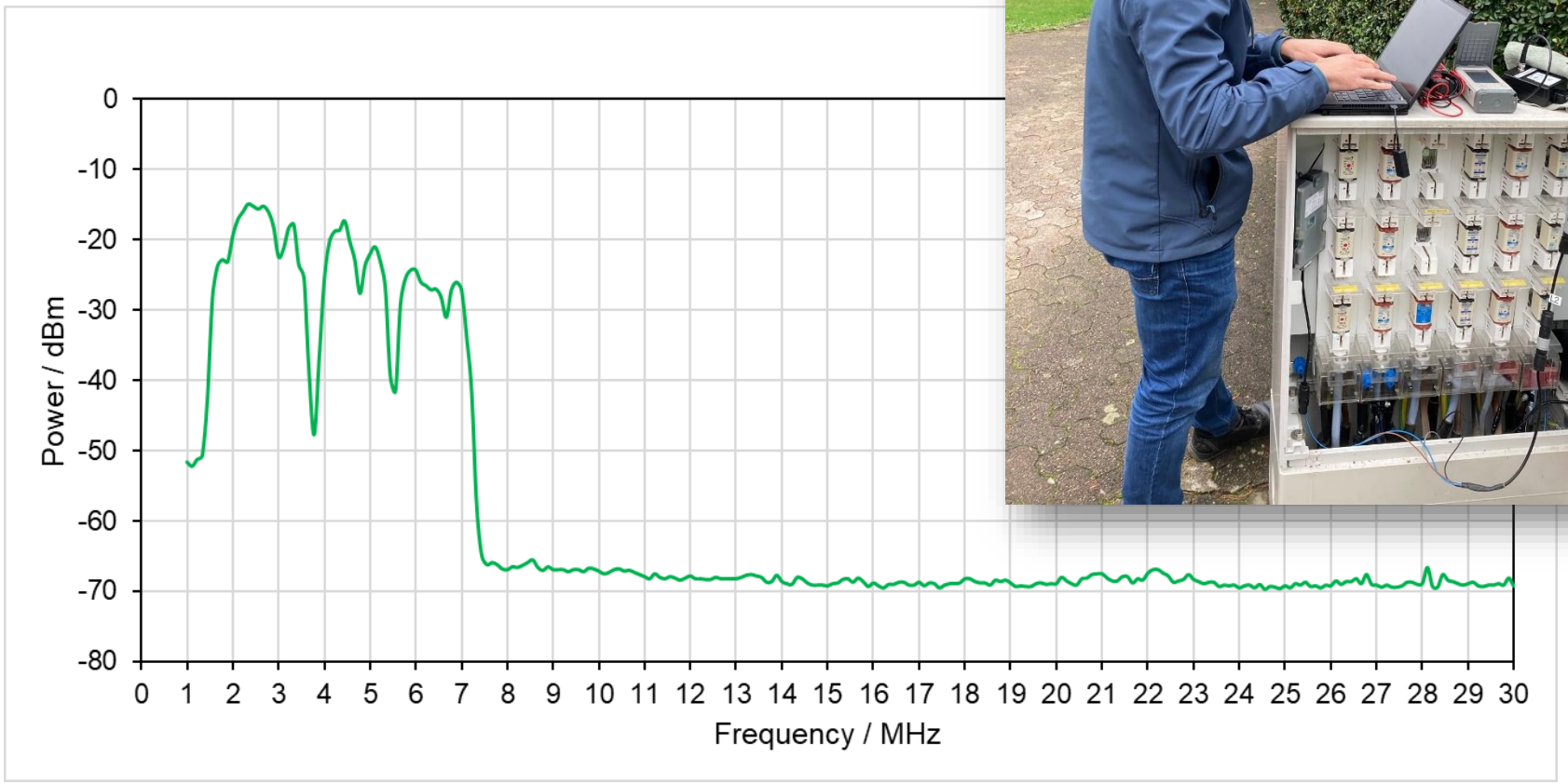


Testing the theory in the field (with the first prototypes)

Swapping IEEE 1901-2010 devices for IEEE 1901-2020 (nessum) devices (in X4)



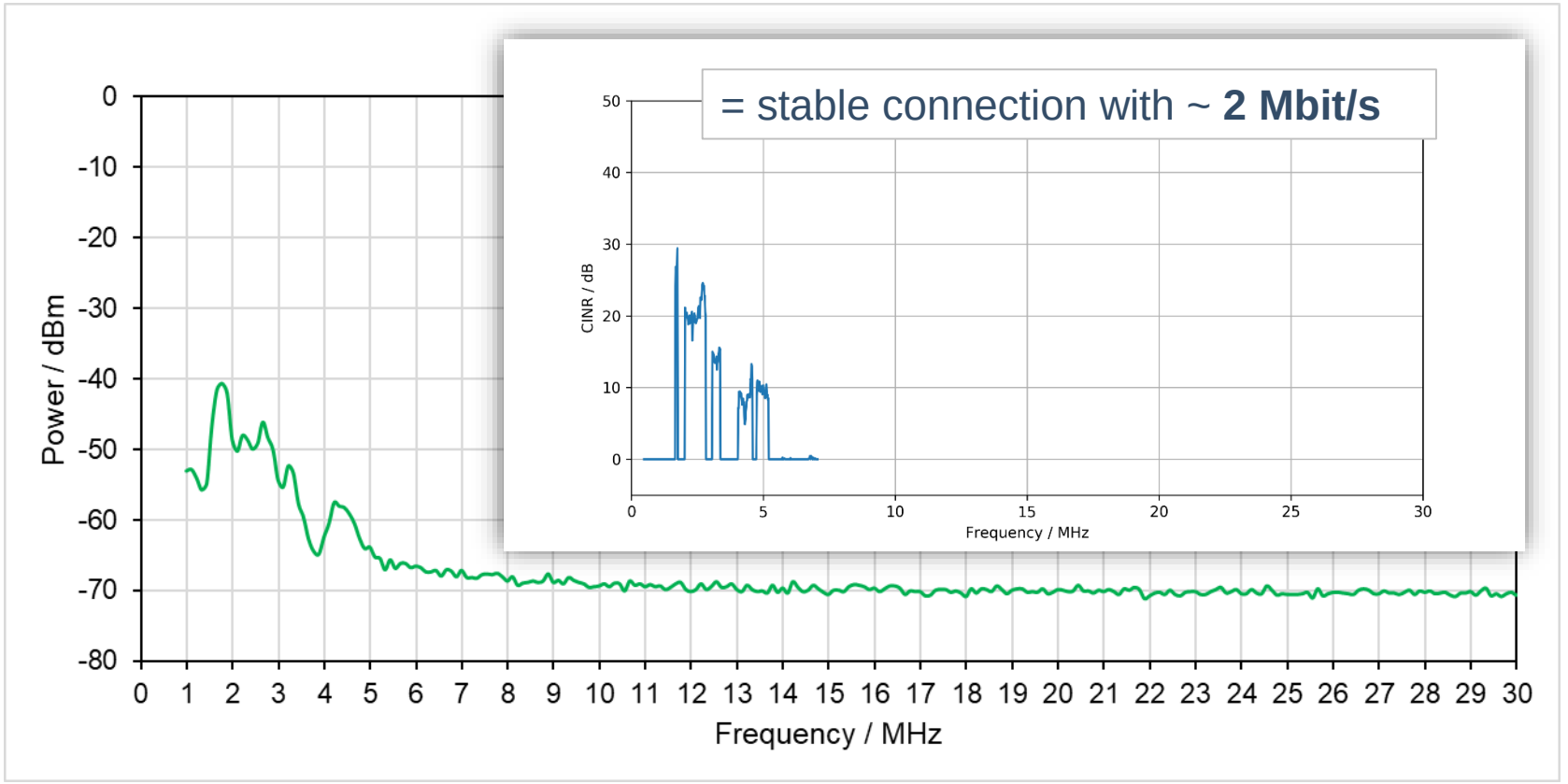
Signal level at the **Sender** (= Headend):



Testing the theory in the field (with the first prototypes)

Swapping IEEE 1901-2010 devices for IEEE 1901-2020 (nessum) devices (in X4)

Signal level at the **Receiver** (= Repeater):



Proof in first ongoing field tests since January 2024

Mini-network with 1x BPL Headend (LTE) and 3x BPL Repeaters

IEEE 1901-2020

WAVELET

nessum

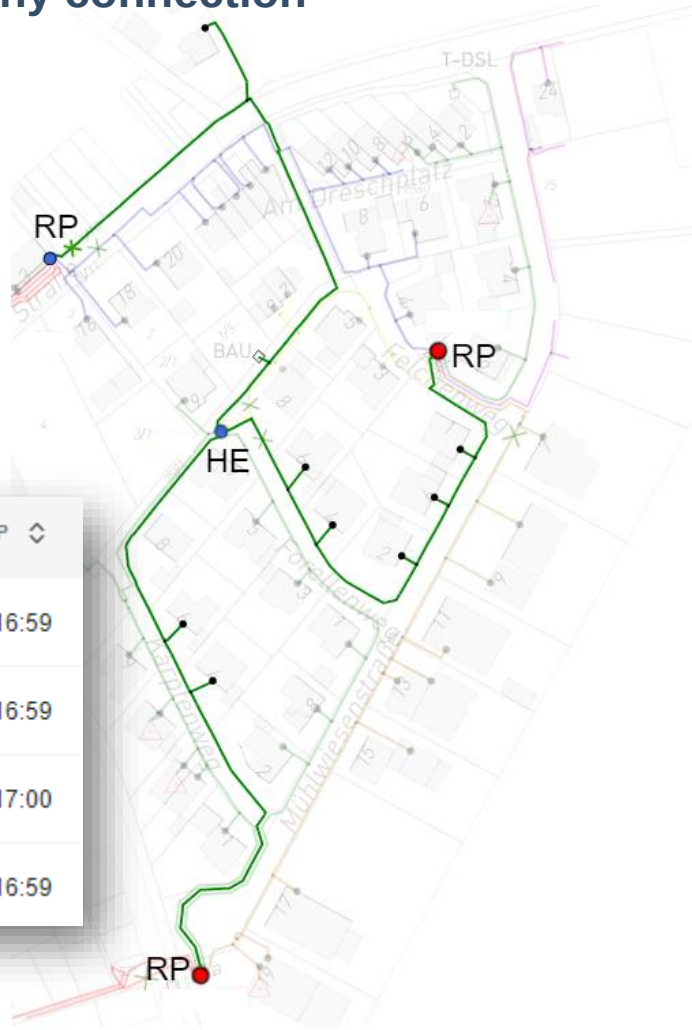
PPC Power Plus Communications

Installation at cable links, where IEEE 1901-2010 devices could not establish any connection

Performance of IEEE 1901-2020 / nessum devices:

- throughput in the Mbit/s range (bandplan: X4)
- high reachabilities (s.u.)
- low latencies (s.u.)

	GERÄTENAME	IP-ADRESSE	PING (MS)	ERREICHBARKEIT	LETZTER TRAP
	Kein Name vergeben	2a0b:f400:3140:8a10:225:18ff:fe00:a895	97 ms 13.05.2024, 15:38	99.5 % 13.05.2024, 17:00	13.05.2024, 16:59
	Kein Name vergeben	2a0b:f400:3140:8a10:225:18ff:fe00:a897	94 ms 13.05.2024, 15:38	99.9 % 13.05.2024, 17:00	13.05.2024, 16:59
	Kein Name vergeben	2a0b:f400:3140:8a10:225:18ff:fe00:a899	100 ms 13.05.2024, 15:38	100.0 % 13.05.2024, 17:00	13.05.2024, 17:00
HE	*Kein Name vergeben*	2a0b:f400:3140:8a10:225:18ff:fe00:a893	74 ms 13.05.2024, 15:38	100.0 % 13.05.2024, 17:00	13.05.2024, 16:59



Phase 2: Installing Smart Meter Gateways (IEEE 1901-2020 / nessum)

Ensuring sufficient throughput for a growing number of devices with bandplan X1

In **Phase 2**, Smart Meter Gateways are installed. The number of devices per BPL cell (as well as the need for throughput) increases while the average distance between two repeaters decreases. It is time to switch to bandplan X2 or bandplan X1.

First field tests ongoing. Preliminary result: Switching from X4 to X2 doubles the max. throughput between two devices

PPC‘s nessum products for Smart Metering
Integrating both Socionext and MegaChips

BPL Headend (LTE)

2-in-1 solution, equipped with a 4G modem

CAT IV, IP64, plug-in SIM (in the casing)

BPL Repeater (Sensor)

Additional value: 3-phase voltage metering

CAT IV, IP67, automatic bandplan selection

BPL Smart Meter Gateway

Fully Certified (BSI, PTB)

Integrated Power Supply & BPL module

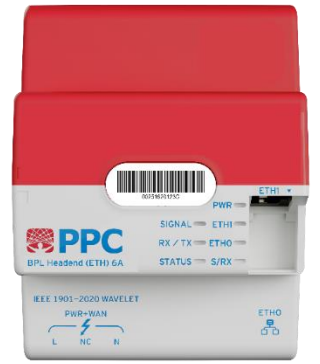
Repeating functionality

Automatic bandplan selection

PPC‘s nessum products for use cases beyond Smart Metering
Integrating both Socionext and MegaChips

BPL Headend / Repeater (ETH)

- Integrated Power Supply & BPL module; Automatic bandplan selection (for RP)
- 3 Interfaces (2x ETH, 1x RS485); DIN Rail form factor



Use Case: Expanding a city‘s fibre network at the edge

Example: District heating in a large town in Eastern Germany

Use Case: Establishing local communication for "energy communities"

Example: Solar production takes place at your neighbours' roof, but you have the storage in your basement

Use Case: Building up new network infrastructures for many end nodes

Example: EV charging in an underground garage with hundreds of vehicles

What comes next at Netze BW?

Pilot installation of nessum devices in a community of ~15.000 inhabitants:

- ~ 30 Headends
- ~ 300 Repeaters
- ~ 3000 Smart Meter Gateways

Specialty:

With the above mentioned ~ 3000 SMGWs Netze BW tries out a smart meter „full rollout“

The objective is to examine the benefits of a high density of smart meters in regards of smart grid use cases (grid obervability and control)

What comes next at PPC?

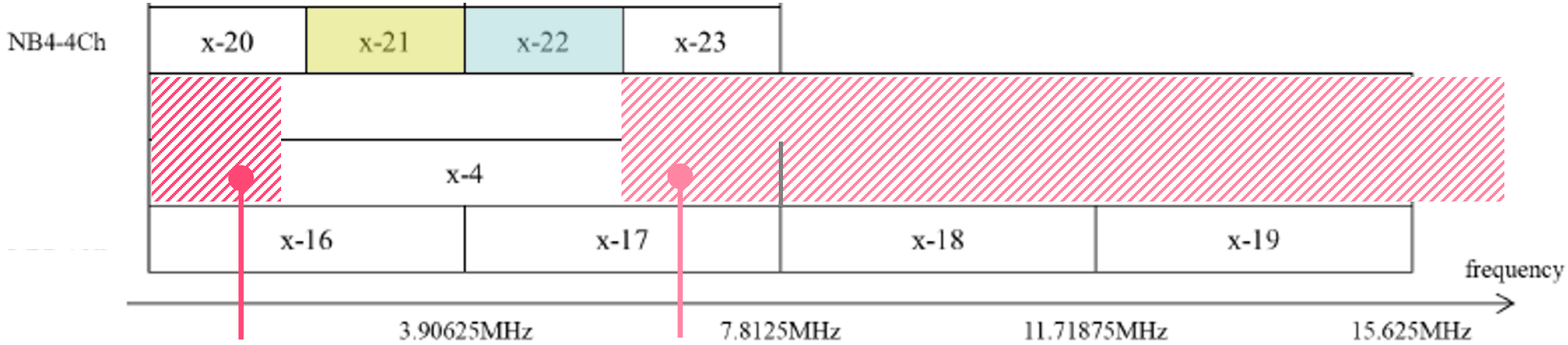
Target: 100% installation success with nessum devices

Bandplan **X4** is great, but it **has its weaknesses** when used in world regions where IEC 50561-1 is mandatory, because everthing below 1,6 MHz is excluded – so you already lose carriers at the low end.

When trying to get connection over very long cables, you will lose carriers at the high end until you don't have enough carriers and there is no connection at all.

Can the extended flexible channels from IEEE 1901c-2024 (Chapter 19) be the answer?

With the requirement of 50561-1 compatibility (>1,6 MHz), **X21 and X22 seem especially interesting!**



unusable due to 50561-1

unusable due to low pass behaviour of very long cables

Thank You!　有り難い.　Danke!　　Merci!

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