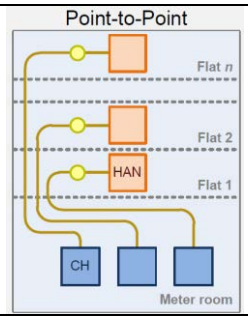
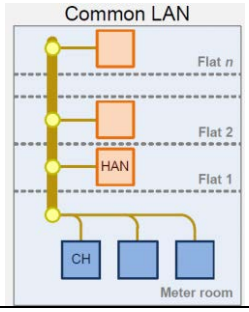
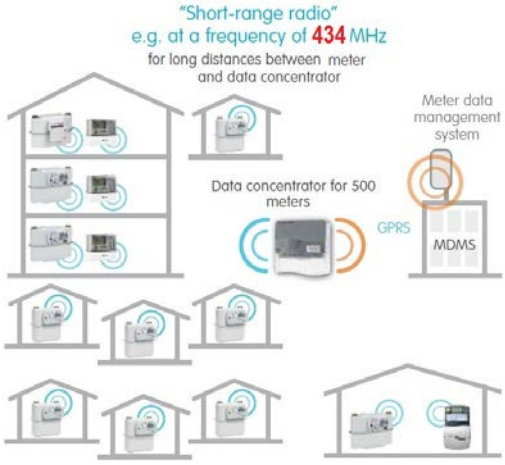
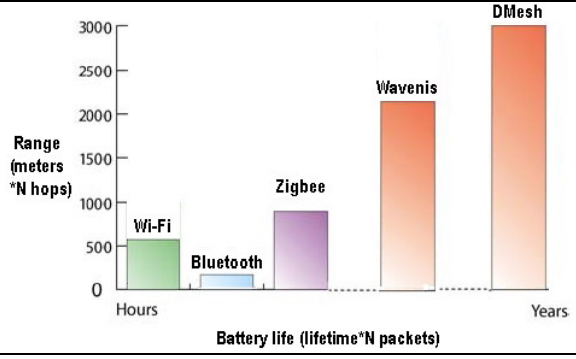
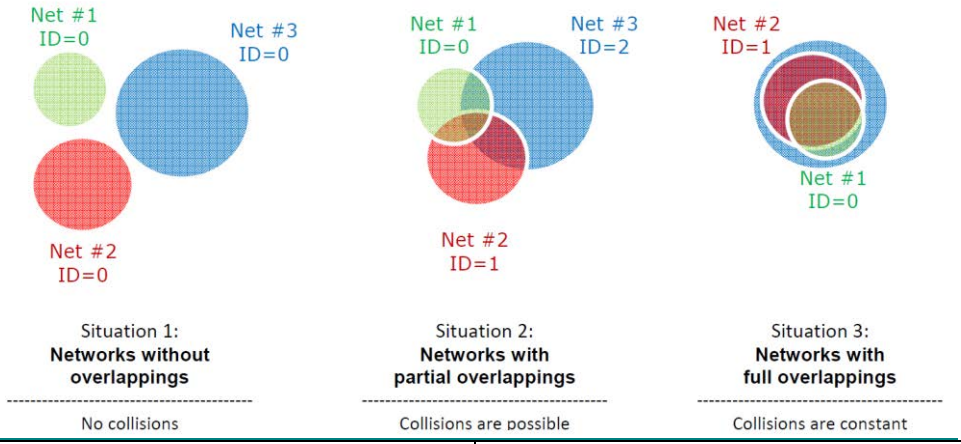
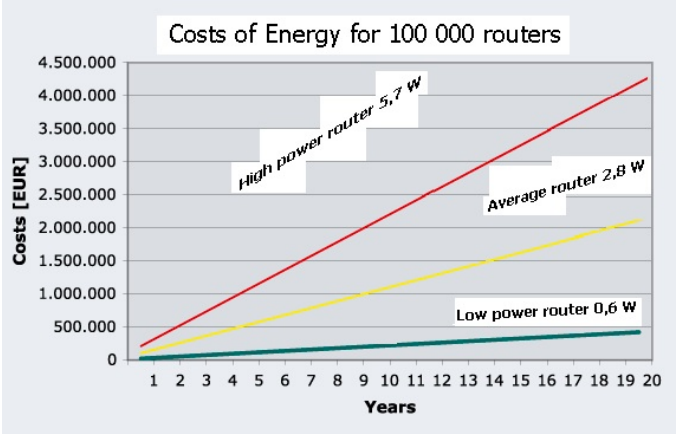
EURO-LINK & DVJ-COM
Explanation to Challenge Questions

1 How do you propose to further demonstrate to stakeholders that your solutions can meet the performance requirements for a GB SMETS2 HAN? What do you think the next steps should be? Background: The programme and stakeholders would like to determine the next steps required to enable a decision on the selection of appropriate technologies and some proof of concept technology trial might be necessary.	1. Familiarization with the technology (how it works) on existing model. 2. Overview the data from existing and previous projects. 3. Launching of a PILOT PROJECT in UK.
2 Does your technology support a point-to-point connection between the meter room and the HAN, or will all HANs in a building be routed over a common LAN? Background: Where a point-to-point connection is used, each supplier can take responsibility for the HAN for an individual consumer. A shared LAN requires one party to be responsible for installation, commissioning and maintenance, though equipment costs may be lower. Some technologies may support both architectures, so consideration should be given to meeting the bandwidth limitations in question 2 in determining the best solution architecture.	DMesh technology supports both architectures. The metering data are transmitted wirelessly through the common DMesh network, so the network could be easily setup to collect the data for a single supplier (ex. electricity) or for multiple suppliers through common DMesh LAN (electricity, gas, water). 'In-home-display' may be connected only point-to-point to domestic meters. As a cheaper solution the home computers, smart phones, PDA could be used to display the data through the common LAN. Some companies refuse to use the home displays - see "Cisco abandons home energy console". http://www.metering.com/Cisco/abandons/home/energy/console
 	
	The recommended number of metering points in the same network is 150 -240 pcs, maximum 500. The technology has the capability to use the radio-modules as repeaters (one data packet could be transmitted through 30 repeaters), so the low powered radio signals could cover medium and long distances. The area covered by a single network, will vary from 2 km (in town area) up to 10 km (in multi-floors buildings area).
	
	

3 Confirm how you would demonstrate the capacity of proposed solutions to support the required bandwidth taking into account sources of interference from other smart metering devices using the same HAN, including neighbor-network interference (e.g. crosstalk) Background: Please state if there is a limit on the maximum number of flats that may be supported meeting this core requirement, and also if the network may not be 100% available due to temporary interference. Please consider the potential for interference from competing devices both now and in the future, such as domestic power line adaptors in use employing the DS2 standard (500k devices), and future deployments of communication technologies that may be anticipated.	DMesh technology is designed to work in conditions of multiple overlapping wireless networks (see pictures below). In case of partial overlapping networks, (situation 2) the technology allows up to 16,000 configuration options, and for complete coverage of networks (situation 3), the technology permits up to four configuration options. The best confirmation would serve the data, which were collected on a regular bases during last 6 years from networks with different interferences. A good example of network performance with complete overlap could serve one of our project in Makeyevka - Ukraine, which connected 287 flats in 7 buildings, 5 levels each. First network connected 152 metering units from several flats of all 7 buildings. Later when the second network was launched, it included the remaining 135 flats from the same 7 buildings. Each network was set-up individually, so when the second network was launched, both networks were working in normal regime. The recommendation for similar projects would be to connect 4 buildings to the 1-st network, and the remaining 3 buildings to the 2-nd network. However, because the networks were set-up in different periods of time, the customer decided to build the overlapping networks. Both networks work perfectly. Similar situations could be when different suppliers (gas, electricity), will decide to build and maintain their own network for the same customers. We have examples of partial overlapping projects in Moldova.
	
4 Describe the potential for the technology to interfere with or be affected by other existing systems in the premises, e.g. consumer video streaming For example, there may be up to 1.5m broadband power line adaptors in use in the UK today by consumers, including 500k employing the DS2 standard2. In the PLC narrow band spectrum, consumer devices from baby monitors to home automation equipment have been used for many years. The license-exempt radio bands are used for a variety of purposes, including home automation.	DMesh technology is designed to use FHSS (Frequency-hopping spread spectrum) method of transmitting radio signals, as well to make multiple attempts to obtain the data from each radio-module. All these together allow to retrieve the data from any environment and in the presence of wideband and narrowband interferers.
5 Detail the expected need to install network repeaters / range extenders / additional wiring/ other devices such as filters either in shared spaces in buildings, in consumer flats or external to the building, and the power consumption of these devices. Background: Any equipment installed in shared spaces in buildings will require the permission of the building owner, and the power consumed will be centrally metered. Any equipment permanently installed in the flat will consume power that is metered by the consumer's electricity meter, and this would need to be accounted for in the consumer's bill.	One of the strength of DMesh technology is that the radio-module (powered by battery) is designed to work as a repeater as well, and is able to pass through itself up to 1500 data packets a day without reducing the battery life. In a densely populated area (with multi-level buildings), there is no need to install repeaters, if the network covers 80% - 90% of all properties. In rural areas 1-2 repeaters could be required for 20-30 homes. As a repeater we use a standard radio-module (powered by battery), without the function to collect data. For remotely located homes, a separate network is recommended with its own concentrator (GSM / GPRS data transmission). The concentrator is the ONLY device, which requires external power. However, its consumption is so small (1.5 - 1.8 watts) that it is below the sensitivity threshold of the standard electricity meter. During 2 months of the testing period, the electricity meter Landis@Gyr didn't register any pulse. A new prototype of a concentrator, powered by solar cell is under development which will permit us to eliminate "the headache" with the connection to external power. Where the router and the repeater with external power are used, the cost of electricity could exceed the cost of equipment.



6 What assurance regimes are in place / planned to ensure that implementations of the proposed solutions from different suppliers will be interoperable? Background: To avoid any one supplier having a monopoly on providing a technology to the Smart Metering Implementation Programme, the stakeholders would like assurance that the technology can be provided from more than one source and that these sources can supply interoperable technology.	* Compatibility with different metering hardware: Radio-module D100FC is compatible and could be installed with any metering devices (gas, water, heating, electricity), equipped with a pulse output from any manufacturer. In addition this module could be easily set up and connected to a metering controller for long distance connection-disconnection. * Compatibility and flexibility with different communication hardware: Our communication modules are developed based on processors and transceivers, manufactured by TI (Texas Instruments), and supports several types of processors and transceivers, allowing to work in the frequency range 315, 433, 868, 915, 2400 MHz (see link Elster-Instromet Profiles 1/2013). We recommend to use the frequency 433 MHz. The advantage of the our system (BALANCE): when one or more components (processors or transceivers) is removed from production there are still enough choices of other components to be used in the manufacturing of our modules.

Comparison of wireless technologies for Smart Metering

	Range	Data rate	Total bandwidth	Output power	Antenna size (λ/4)
2.4 GHz	Short	High	Large	Low (max. 10 mW)	3.1 cm
868 MHz	Medium	Medium	Small	Low (typ. <30 mW)	8.6 cm
169 MHz	Long	Low	Medium	High (max. 500 mW)	44.3 cm

	* Compatibility at data exchange level Data between concentrator and server is exchanged in accordance with the IP - protocol. The communications protocol is open and can be provided (free of charge) to third part companies (offering services for data collection, billing and analysis), to be used in their own software. This is an additional benefit of the BALANCE system. * Openness to expand modular range: We are open for cooperation with the manufacturers of all metering equipment. Our flexible approach allows us to adapt our modules in accordance with the specific requirements. Most of the leading metering equipment - ITRON, Landis@Gyr, Elster, Kamstrup, Sensus have such capabilities and some companies are being contacted for negotiation. The advantage of the BALANCE system - it can work with any smart device, for which the communication protocol is provided. * Providing a license for the production of communication equipment: DJV-COM could provide license for manufacturing of communication equipment on "screwdriver technology" principle - provides a complete set of technical documentation, and a full list of suppliers (with their addresses and contacts) of electronic components, hardware and software for 100% testing of all parameters of the devices and provides as well support and upgrade of the technology and software.

DMesh
open standard alliance

DJV-COM was founded in 2007 by a team of professionals with extensive experience in microelectronics, power-line communications, wireless system design and development of communication protocols. Our original goal remains unchanged today: to offer a wireless platform capable to satisfy technical-economic requirements in AMI low-power wireless networking markets. This goal is part of an ambitious ongoing project to establish D-Mesh technology as a worldwide standard. The D-Mesh Open Standard Alliance will be launched in Q4 2017.

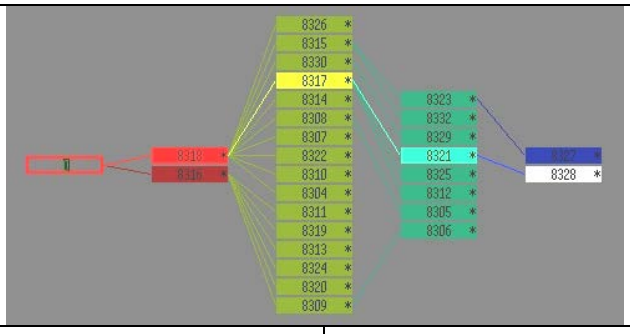
7 (For technologies that utilize radio communications between 863 and 876 MHz). Describe the advantages and disadvantages of your technology compared to a ZigBee 868/870 solution in this frequency range. Background: The Smart Metering Implementation Programme is working together with stakeholders to develop a ZigBee implementation working in the 863–876 MHz band, which overlaps with the technology proposed. The ZigBee 868 technology is targeting a 114dB link budget and sufficient capacity to operate SMETS compliant IHD links in converted and low- rise flat scenarios.	The preferred frequency for DMesh network technology is 433 MHz but it could also support 315, 868, 915, 2400 MHz frequencies. In similar environmental conditions, the frequency 433 MHz is targeting 120 - 122 dB, which is 6 - 8 dB better than ZigBee 868 technology, the fact that allows to increase the coverage area up 2 times. Our point of view is that ZigBee technology is designed for a wide range of tasks, so it CANNOT be optimal in these types of projects. DMesh technology is a modern alternative and is optimized to work in the AMR/AMI/AMM systems.

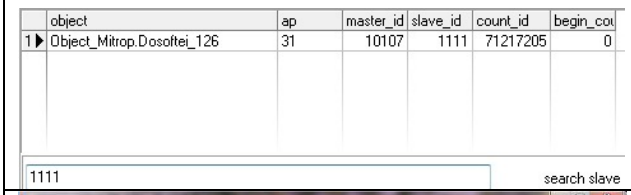
$$PL = 20\log\left(\frac{4\pi}{\lambda}\right) + 10n\log(d)$$

n - coefficient
d - covered distance

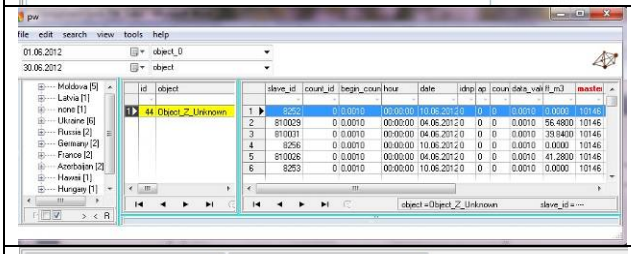
For $n = 2$	1 м	2 м	10 м	20 м
400 MHz	24 dB	30 dB	44 dB	50 dB
900 MHz	32 dB	38 dB	53 dB	58 dB
2400 MHz	40 dB	46 dB	60 dB	66 dB

8 In the eventuality that the electricity meter is required to disconnect electricity supply to the premises please describe whether and how your technology would be able to maintain communication with HAN devices in the home. Background: Power line communications requires an unbroken connection between the communications hub and the home. When a meter disconnects a consumer (e.g. a prepayment consumer with exhausted credit), the consumer will need to be able to use HAN- connected devices to view their meter data, send a code to add credit, activate emergency credit and enable supply.	DMesh technology does not require any external power, so any power disconnection will NOT affect the functionality of the network devices: radio-module D100FC, concentrator and Home User Display (could be a laptop or smart-phone). User could arrange the payment, to update the info, to contact the supplier even without external power. In the event of a line accident or power cut at consumer premises (an unintended shutdown) radio-module will "inform" the supplier about the accident (a signal about the status is sent to the server), so the supplier can take the following actions. Another advantage is that the supplier could remotely connect / disconnect the supply as well as making a repetitive data and status request to the metering unit.
9 Detail the maintenance and remote monitoring which can be offered by the technology in order to support it during its operational life. Background: During the life of the service there may be various problems which could arise for example due to equipment failure or tamper, unexpectedly high interference problems or high loading of the network which could cause transient or persistent degradation of service. How would your technology alert and diagnose these problems without first having a need to visit the customer?	The system BALANCE is designed to collect and monitor the data from metering unit (consumption), information about hardware status and faults, battery life. The standard information packet is transmitted once a day, however there is the possibility for unscheduled data request. HardError - hardware error Magnit - magnetic field / short-circuit at the pulse input Pulse0Error - line cut at the pulse input Pulse1Error - bad contact NetLost - state of the network search BatteryError - low battery voltage Restart - restart radio module ChangeUserInfo - software update or change the user ID The software "PW" (an integral part of the BALANCE system) - is a friendly user interface, which allows to monitor and analyze the data from the entire network, to "communicate" with each unit of hardware, to send request for connection / disconnection of the supply or unscheduled request about consumption and hardware status. An additional feature is to display the network tree - useful to identify the appropriate placement of the concentrator inside the network (the minimum number of levels of data routing), as well to identify problematic areas, where additional repeater will be required (for ex. in rural areas). Another feature is that all faults and accidents are summarized and displayed per network and per project for easy maintenance planning. This info could be shared via e-mail or SMS to maintenance team and to the responsible personnel.

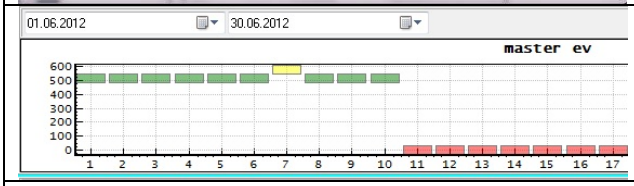




The "QUICK SEARCH" function - is the ability to quickly find the radio module in the hardware database by its serial number or by serial number of the metering device. This allows to avoid the errors during hardware registration and network configuration.



Filtering options - to view and analyze the data from the entire network or from a specific device linked to a physical address, as well as the concentrator ID.



Option «masters» - shows the status of the concentrators, the flags of the errors or accidents (error description). The analysis of these errors, helps to identify the problems with concentrators and absent external power.

10 Can you provide evidence to of your experience in installation and commissioning equipment utilizing the proposed technology, and how the process is impacted by the technology?

Background: Adding additional network infrastructure to a smart metering installation implies extra installation and commissioning steps. What additional steps may be required and what does the technology provide by way of diagnostics to assist the installer?

D-Mesh - is a third generation AMM system.

The technology is used since 2007 in Ukraine and Moldova. We have 2 big projects under negotiation - in Russia and Armenia for 40,000 and 650,000 radio-modules respective.

In Ukraine - radio-modules were installed to over 2,000 gas metering points in Odessa, Mariupol, Makeyevka, Pervomaisk - Donetsk region and Kiev region.

Some of our customers use our server (FREE OF CHARGE) to store and access their data. A customer from Odessa preferred to use the server from Kiev, while the customer from Makeyevka preferred to have their own server. Data are stored in MySQL database, the server runs on Linux. The software represents a desktop application, running on Windows OS.

In all projects the hardware (radio-modules, concentrators and pulse sensors) were installed by customers' staff, following our instructions, long-distance advice and support.

In Moldova - we provide our technology to MoldovaGaz (the local monopolist gas supplier) since 2007 and supplied them over 33,000 radio-modules, to be installed in 600 projects in different types of buildings. There was NOT requirement for any repeater in multi-floors buildings. Some hardware was installed by outsourced companies, specialized in gas meters installation (usually new buildings), others were installed by ourselves - where meters already exists.

We are HARDWARE and SOFTWARE SUPPLIER (NOT installers), even so it took to us about 2 min to connect the radio-module to 1 gas meter.

In some projects the battery lifetime exceeded 6 years and radio-modules stopped working. With regards to this, new batteries were ordered and now they replace the old ones.

The installation process DOES NOT require special skills and could be easily done by any qualified technician. As we described earlier, 2 persons during 8 hours could manage to install the radio-modules to over 150 metering units. The diagnostics is done remotely as soon as the device is connected. And all these devices will start NEXT DAY to transmit the data to the server.

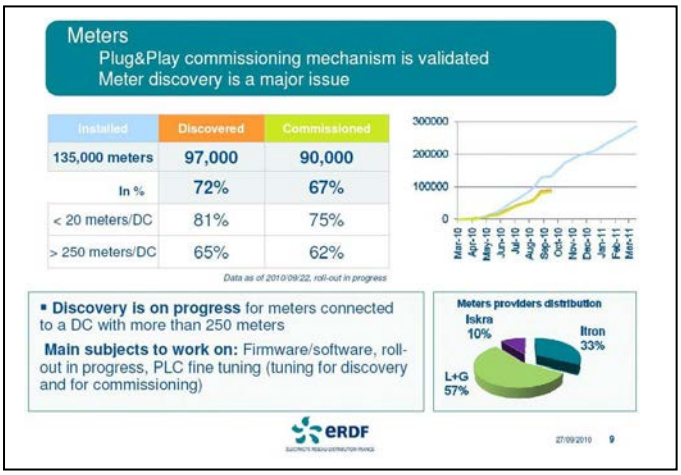
Unlike many others, system BALANCE based on D-Mesh technology allows to make a quick calculation for project cost (equipment, installation and operation). This year Armenia-Gas addressed many companies to estimate the costs for 650,000 metering points. Leading companies of metering equipment fail to provide such calculations, while for us it took about 3 hours.

11 What typical challenges do you believe you will encounter during the install and operation of the HAN and how would these challenges be addressed? Background: Housing surveys performed in the UK demonstrate that there is a wide range of building types, including low-rise and high-rise apartments, with different metering topologies for both gas and electricity utilities. Do you have evidence of experience of deploying your technology in different environments representative of the different challenges that may be encountered in a UK smart metering deployment?	During installation process several difficulties could arise: 1) The concentrator of the network needs to be installed in the metering room or in a common area and requires an external power supply (220v). If it is installed in a new building, the installation and connection to power supply could be included in the project. In old buildings, the concentrator could be installed in the metering room or in an area close to common electricity supply (stairwells). With the mass deployment of the technology, it may be necessary to make a separate agreement with electricity supplier and to pay for electricity at an average flow rate of the concentrator - 1.8 watts.
	Now we have new model of concentrator, powered by a solar panel, which excludes any external power connection. Today, some of our customers, use the solar panel system to power the existing concentrators (solar panel + charger + battery) with a peak power of about 3W: 6-12V / 0.5A. 2) The radio-modules may have a bad coverage while installed in basements and underground areas. For such cases an external antenna is required to be connected to radio-modules.
12 Do you have experience that you can share of dealing with the commercial aspects of deploying solutions where infrastructure equipment is shared between consumers and installed in communal spaces? Background: A number of solutions proposed indicate that in some or all deployment there is a requirement to install equipment in spaces other than the consumer's flat or utility metering rooms	The answer to this question is described in p. 11 (p.1) The concentrator of the network needs to be installed in the metering room or in a communal area. If it is installed in a new building, the installation and connection to power supply could be included in the project. In old buildings, the concentrator could be installed in the metering room or in an area close to common electricity supply (stairwells).

SUMMARY

- We have a **ready complex solution** (hardware and software) which could be quickly installed in existing metering equipment and start collecting and displaying data the next day.

- We have a **protocol**, suitable **to communicate with different types of metering hardware** (gas, electricity, water, heating) and works during 5-7 years with a A-battery.

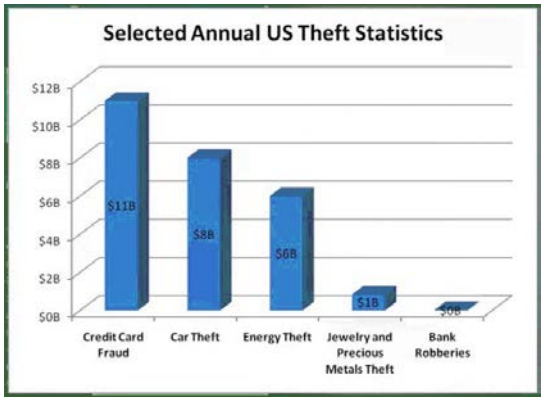


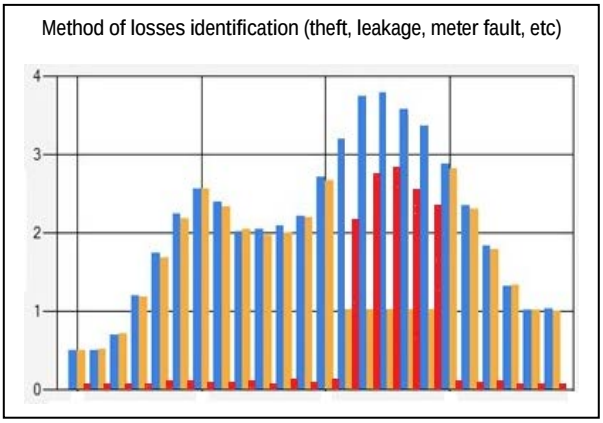
- We are able to do a **quick estimation of the project cost** with an **accuracy of 5%-10%.**

- Our hardware (radio-modules) require **minimal resources for installation**: 2 persons during 8 hours, could connect to the network (install the modules) 150 metering units.

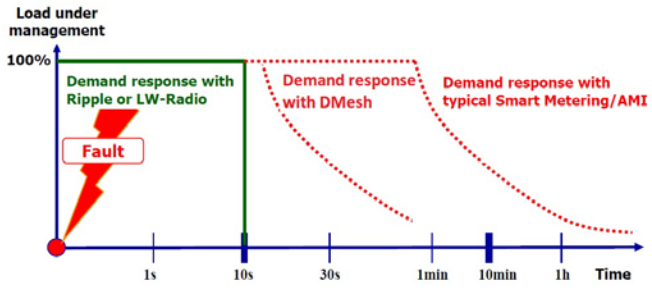
- We provide **FREE OF CHARGE the software and all updates**. In certain circumstances we could provide **free data storage, analysis and recommendations**,
- We guarantee the **accuracy of data** readings. The customer would receive daily the data backup, with every 1 hour meter readings, data validation checks, network monitoring, loss detection.

- Our system permits to **collect 100% of data**, to make the respective analysis and to **identify the failures and mistakes, leakages, losses and theft**.
In USA, the energy theft is on the third place of thefts (after Credit Cards frauds and Car thefts). Up to 25,000 cases of electricity theft are detected by the industry in Britain each year with the cost of such theft estimated at around £200 million, or approximately £7/year per household. Our system help to identify the losses and save up £7/year per household. In other words **the cost of implementation of DMesh technology (system BALANCE) could be covered by savings on losses during 5-10 years !!!.**
https://www.metering.com/new-rules-proposed-to-tackle-electricity-theft-in-britain/





DMesh **supports Load Management** (analog to Ripple Control), which allows remotely to disconnect the secondary power consumptions and to reduce the load during peak-hours. Disconnecting during peak hours the floor heating, central heating, hot water in boilers and swimming pools, air-conditioning, extra lighting - not only saves money but also offloads power during peak congestion and avoid accidents.
The response time of the network is 10 - 60 seconds, which favorably differentiate the DMesh from the standard Smart Metering/AMI systems and to manage the load on a pre-approved schedule and in real time.
http://nepa-ru.com/Landys+Gyr_files/load/02_web_load_present_en.pdf



National Grid proposes demand side balancing to ward off possible blackouts in Britain
http://www.metering.com/National/Grid/proposes/demand/side/balancing/to/ward/off/possible/blackouts/in/Britain
Ofgem said that more than 2 GW of installed generation capacity will be withdrawn in the near future. These withdrawals, principally of coal and oil generation, are due to age and European environmental legislation. However, while wind is expected to grow, no new conventional plant is expected before 2016.

Our system also permits:

- Remotely to **upgrade the firmware** for network hardware (radio-modules and concentrators).

- To **notify** the consumers about their supply usage **via e-mail and SMS**

- To **identify the technical losses** in the networks of 0.4 kV (110 – 220V), assign them to customers, and **to make recommendations to reduce them 2 - 3 times**.

We plan to:

- allow the users to **set-up the desired consumption** and to get alerts when the real consumption is higher than the forecasted.

- allow the users remotely to **manage the consumption** of electricity and heating (**partial disconnect / connect**), using their mobile device.

- provide the consumers with **online personalized tips** on actions they can implement **to reduce the consumption** and respectively the cost of utilities.