Technologies and Infrastructures for optimizing the performance of networks in the ICT sector

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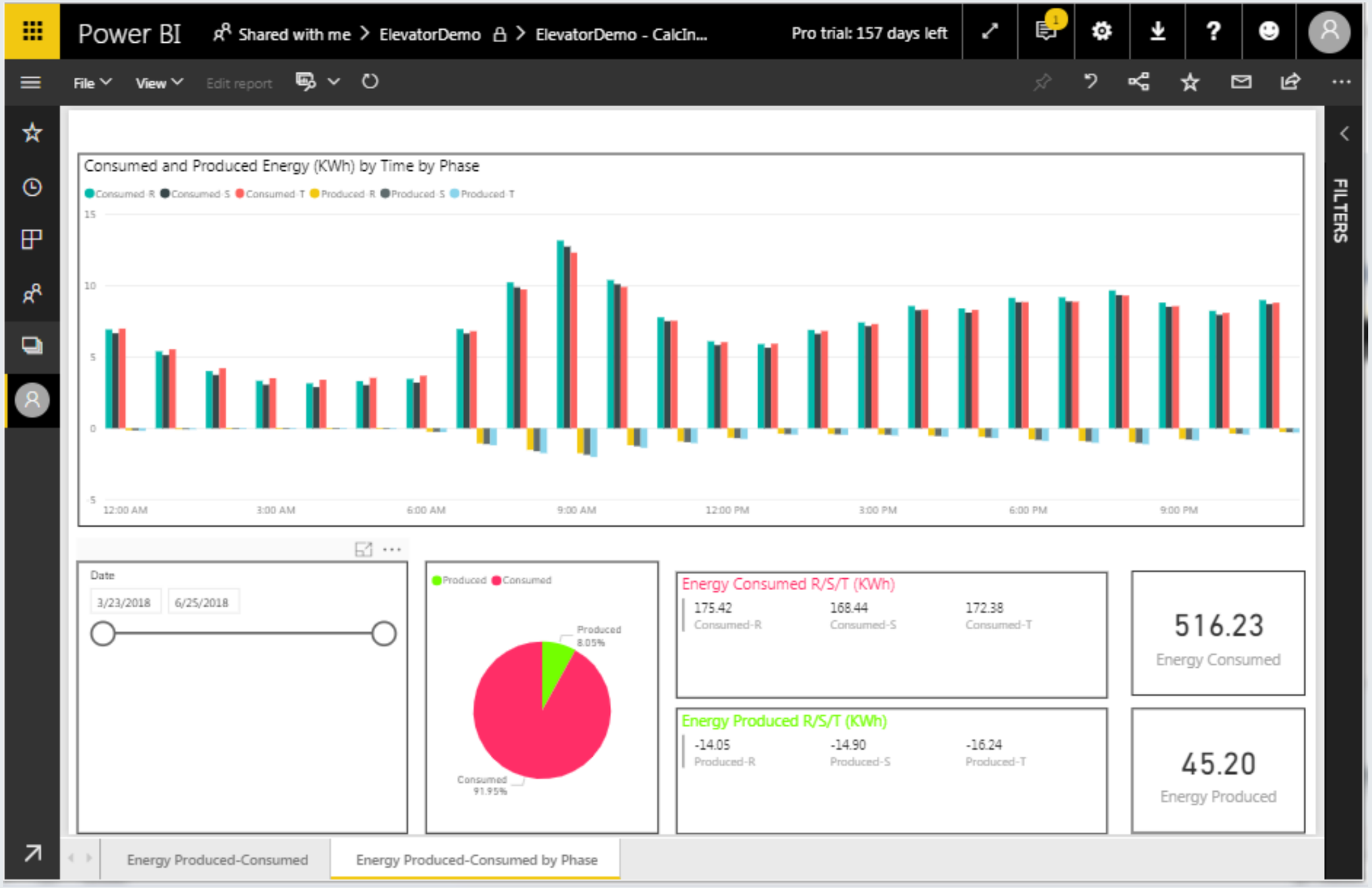
Energy Efficiency made Easy using new technologies and Infrastuctures (e.g. NB-IoT)

You can’t Manage what you can’t



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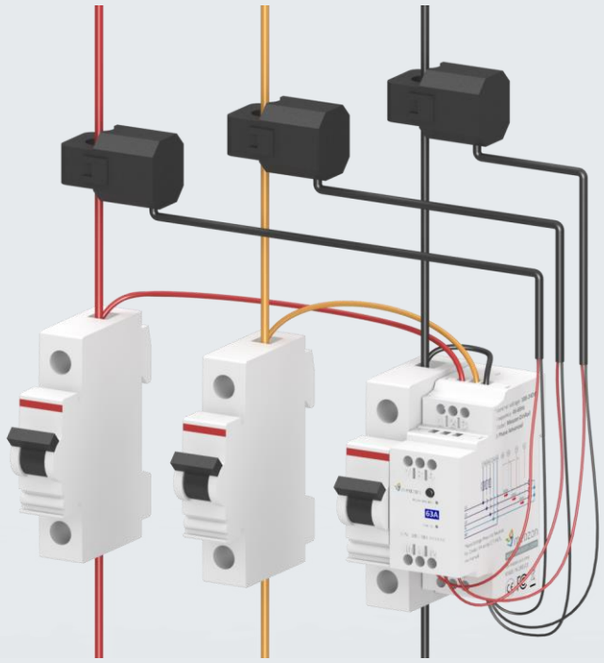
Our Value

Energy digitalization transformation, using IoT & cloud technologies

1. Innovative embedded microelectronic design
2. Wireless energy submeters & controllers
3. Built-in intelligence & communication
4. Small, easy to install & maintain
5. Low Total Cost of Ownership
6. Only winner of DOE wireless submeter challenge



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Industry recognition

	Energy Manager Today	Product innovation award (March 2018). To be announced officially on May 2018
	US Department of Energy	recognized Meazon as the only winner in energy submeter challenge (2017)
	European Commission	recognized as a high quality project proposal in a highly competitive evaluation process (2017)
	T-Mobile hub:raum	selected Meazon as NB-IoT application pilot partner (2017)
	LG	selected Meazon as one of the most promising technologies in energy efficiency (2016)
	Shell	Selected Meazon as finalist in US Great Lakes innovation competition (2016)
	SXSW Eco	Selected Meazon as a startup show case finalist (2015)
	Energy Manager Today	Product innovation award (2015)
	European Utility Week	Product innovation award (2015)

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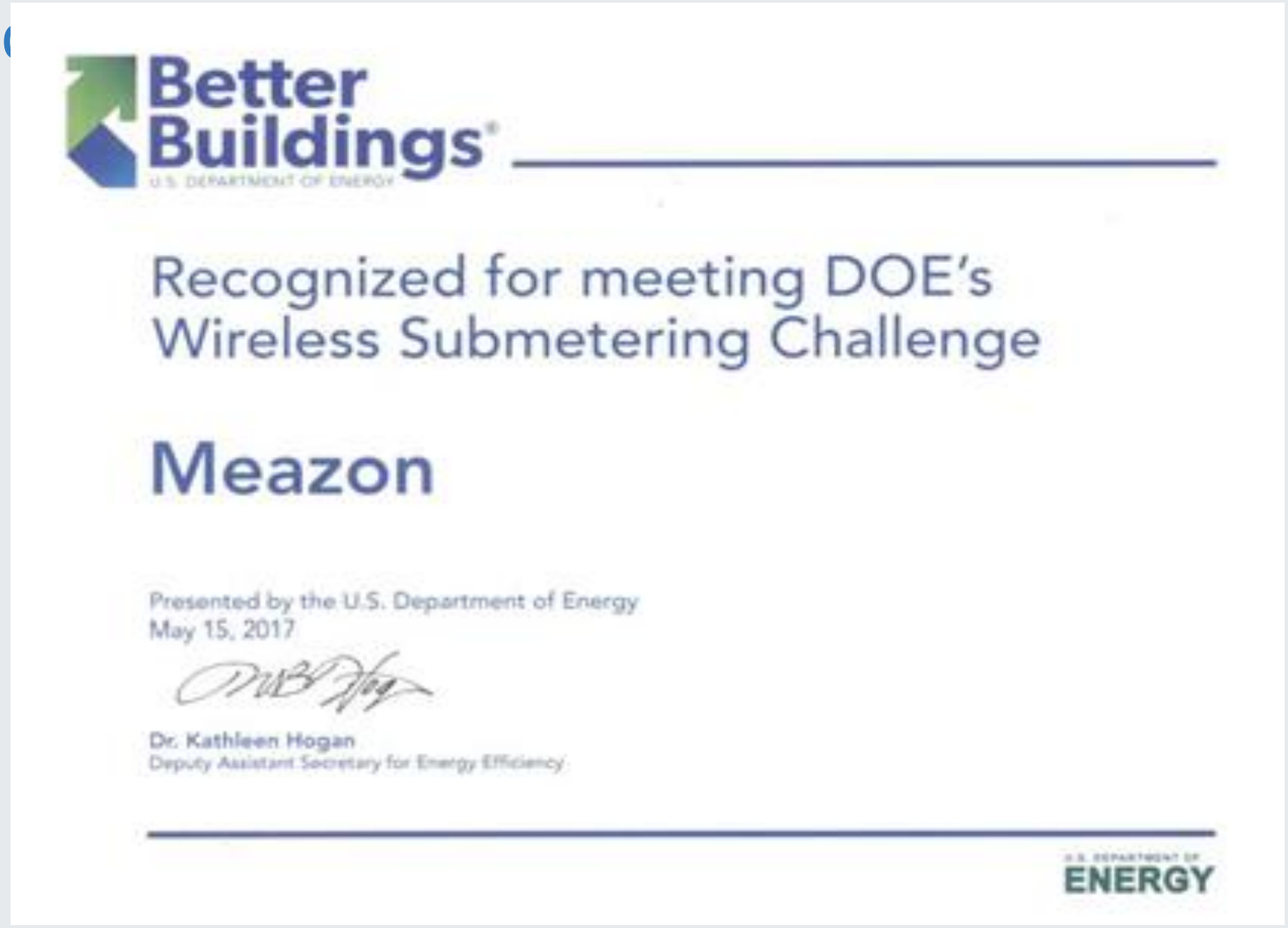
Meazon was recognized by the US DoE on May 15, 2017 for their exemplary performance in meeting the specifi



https://www.energy.gov/eere/buildings/wireless-metering-challenge

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Reducing electricity consumption of all US commercial buildings by 2% can save $1.7 billion annually.

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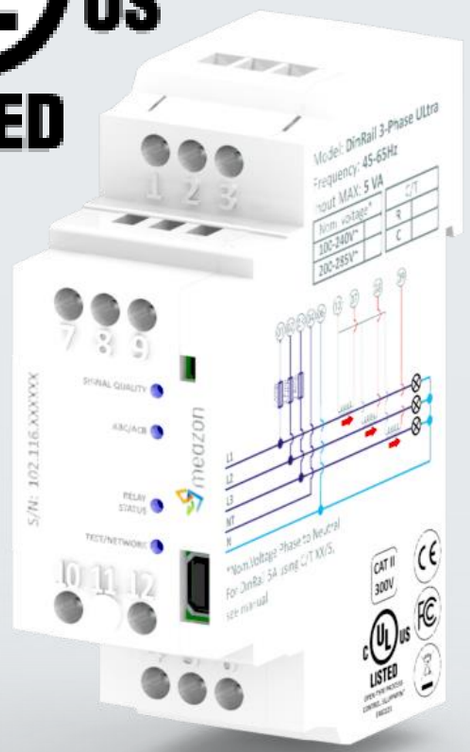

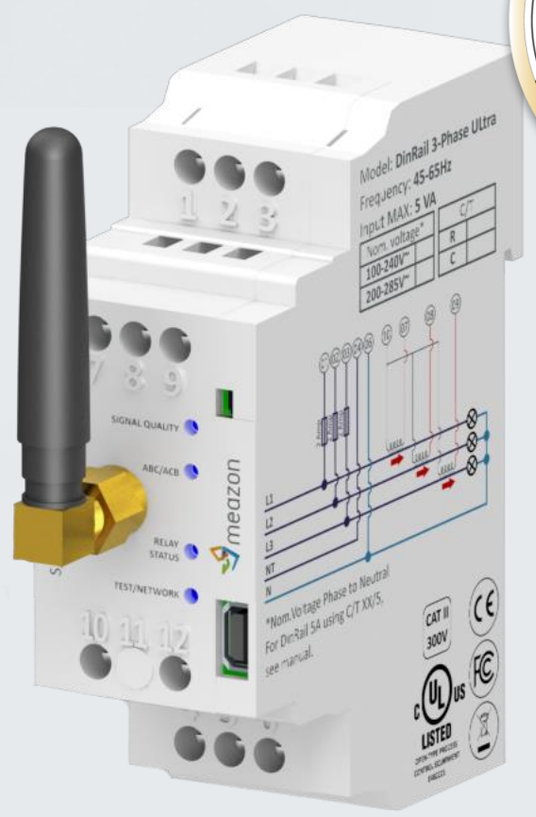

ENERGY MANAGER TODAY
PRODUCT & PROJECT
AWARDS
TOP PRODUCT OF THE YEAR 2018

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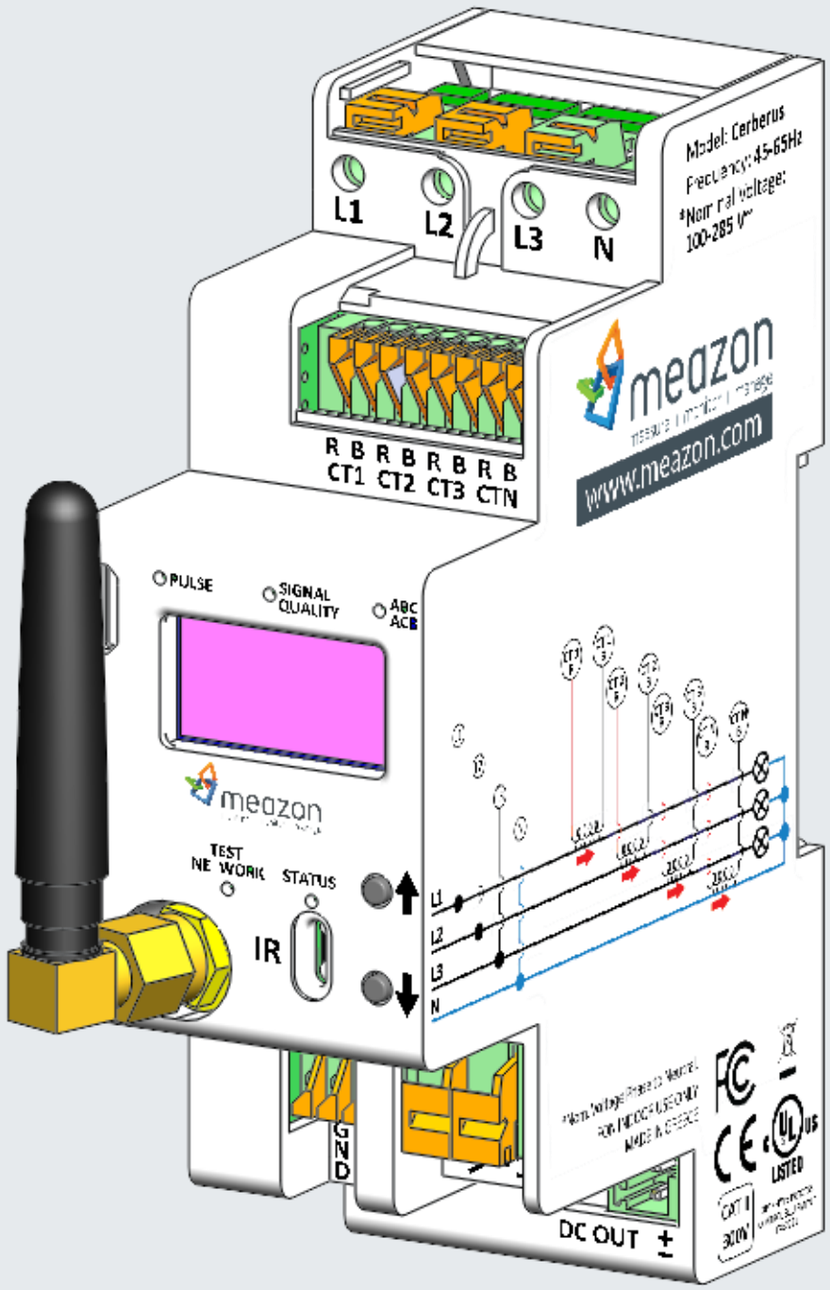
Billing-grade NB-IoT energy meter & water flow meter



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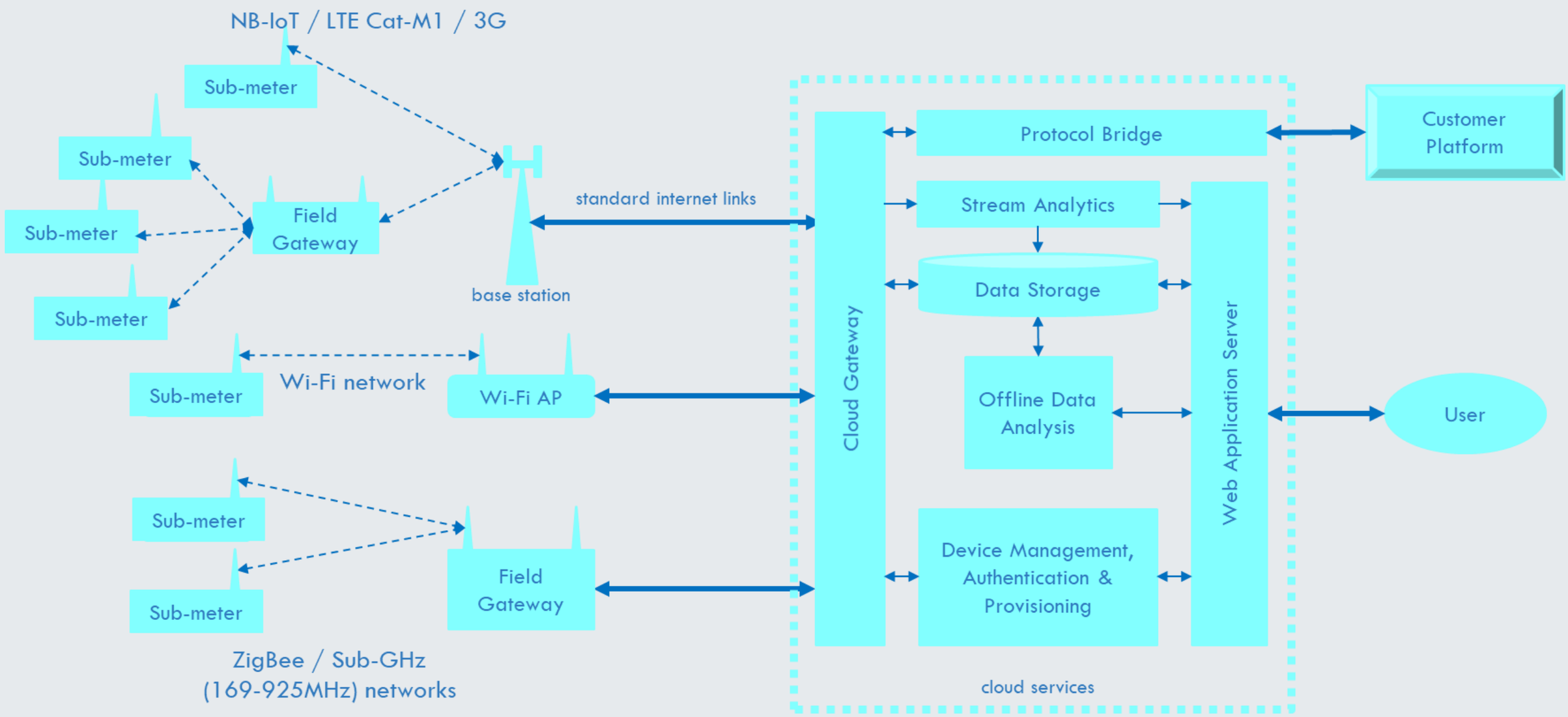
Meazon architecture



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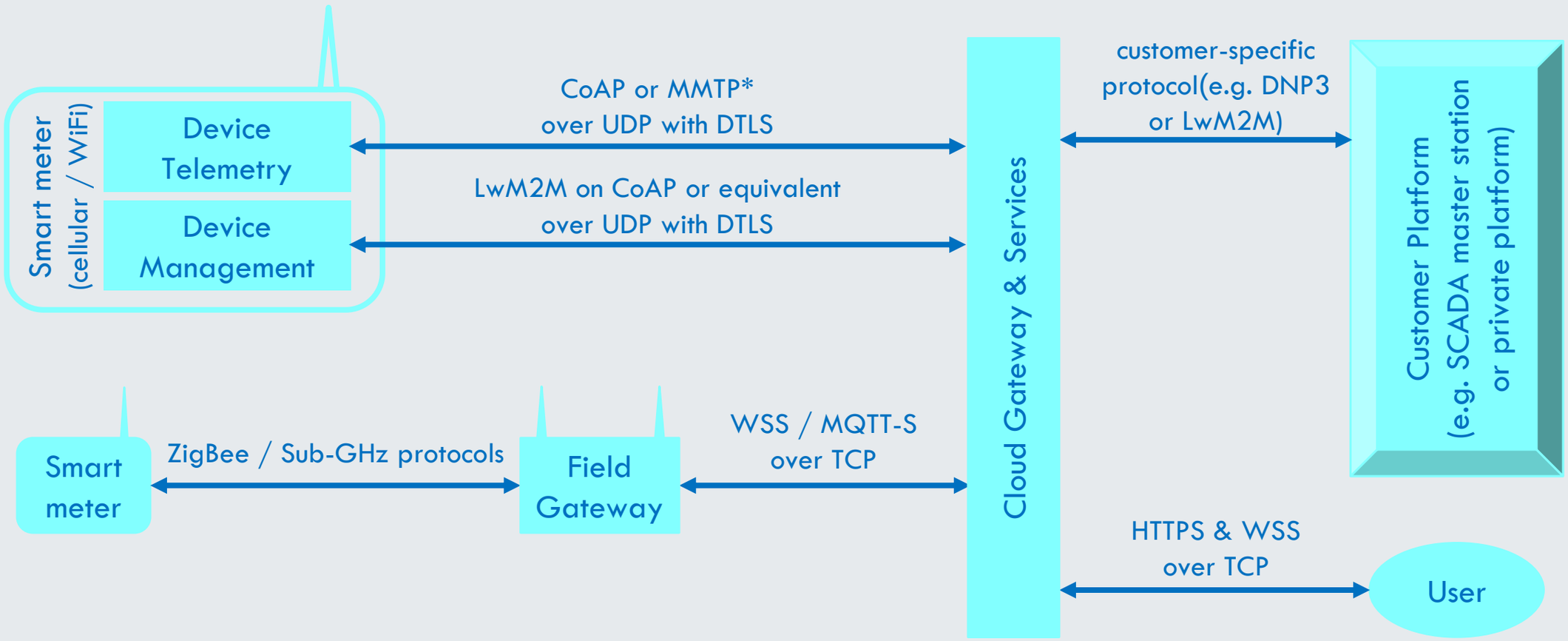
Meazon cloud IoT engine

- **Reliable** collection of metering data
- **Scalable** communication and cloud resources
- **Flexible** device provisioning & management
- **Open** to connect to customer platforms
- **Secure** across devices and users

* MMTP (Meazon Measurement Transfer Protocol)
- Reliable, lightweight application protocol
- Minimizes the required payload length for Meazon sensors' measurements
- Uses UDP for transport and DTLS for security



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Security

- **All-around security** (device – gateway – IoT platform – applications – users & administrators)
- **TLSv1.2** with revocable X.509 certificates (PKI) over TCP
- **DTLSv1.2** with pre-shared keys or asymmetric through raw public keys over UDP
- **Digitally signed FOTA upgrades**
- **Secure device storage** on the eUICC for private keys (secure device identity)
- **User authentication & authorization** with OpenID/OAuth or username-password based with 2FA
- **Blockchain-based PKI** for unique and secure identities
- **Consortium blockchains** for secure sharing and verification of sensitive data in multi-partner projects

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Encryption

- Advance Encryption Standard (AES)
  - Block size and a key size of 128 bits
  - **Announced by NIST (National Institutes for Standards and Technology, U.S. Department of Commerce) in 2001**
  - Used for the encryption of top secret information in USA from 2002
- **Galois Counter Mode (GCM) for Block Ciphers Symmetric Key Algorithms**
  - **Provides both data authenticity (integrity) and confidentiality**
  - **Throughput rates for high-speed communication channels with reasonable hardware resources**
  - **Combines Galois field multiplication with the counter mode of operation (block cipher to stream cipher)**
- **AES-GCM-128 is available in the security core, which is integrated to our processor, providing speed and safety**

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Encryption

- Measurements are both sensitive and personal data so in need of protection
- Breaking AES-GCM (128 bit key) with brute-force would approximately take 1.02×10^{18} years !
- Even with other methods there would be needed 38 trillion terabytes of data, which is more than all the data stored on all the computers on the planet in 2016 !
- Side channel attacks are the only real threat but every form of them require physical access to the chip and the ability to run programs on the same system or platform that is performing AES.

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Current deployment plan

- **Public cloud** (cloud gateway, IoT platform, app services, analytics, storage)
- **Fully virtualized** (compute, storage & network)
- **Containerized microservices** (may use traditional VMs during early development)
- **Security all-around**

- Currently using **Microsoft Azure**
- Considering **Service Fabric, Event Hubs / IoT Hubs, CosmosDB / Tables & Blob Storage**

- **Open source dashboard**, thus fully customizable
- **Both UDP & TCP** based transport

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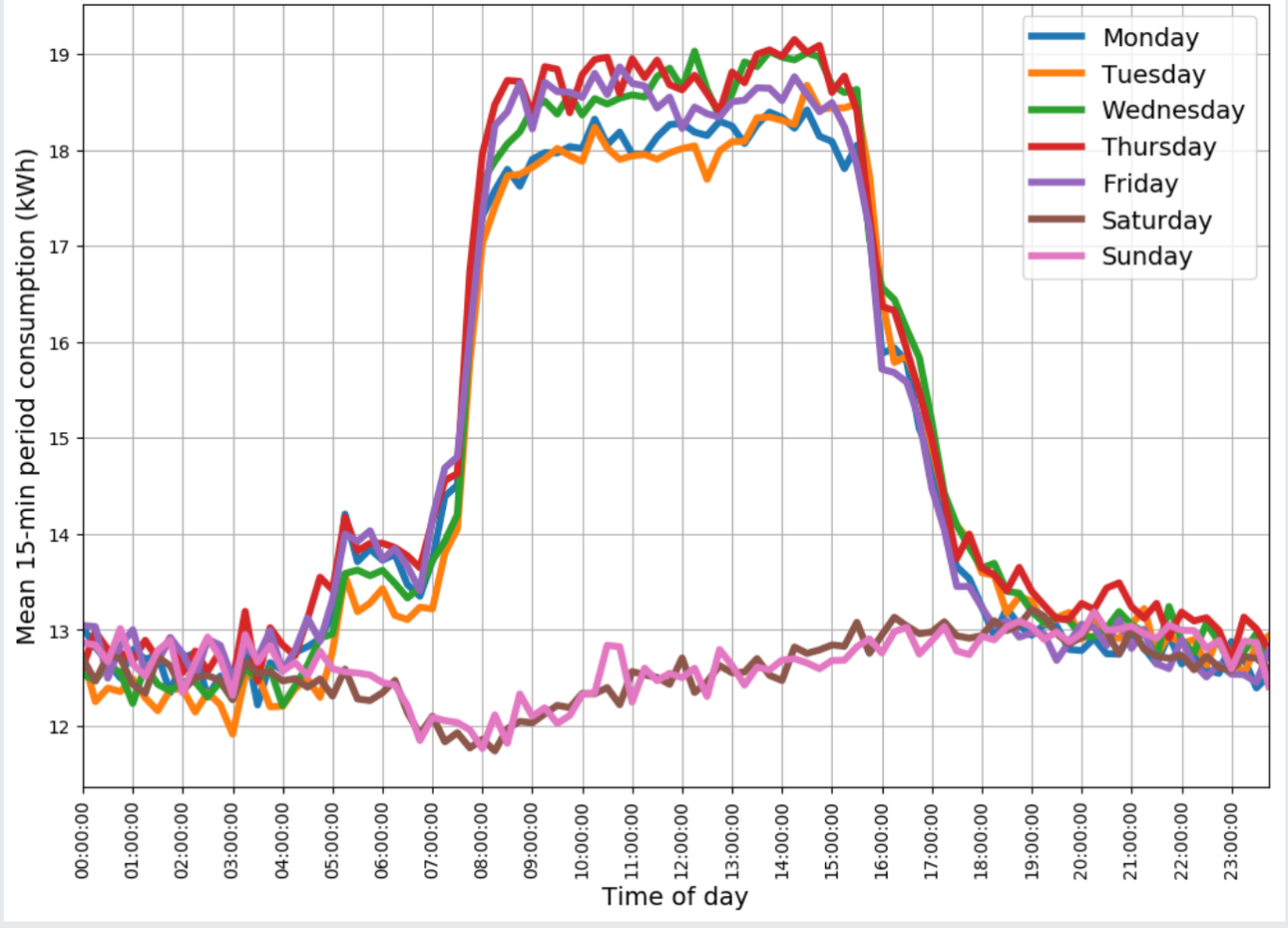
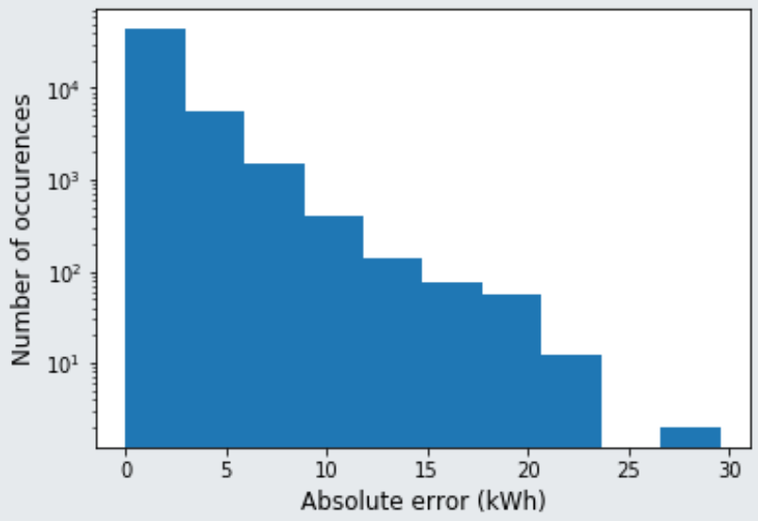
Analytics-based services

- **Consumption prediction** (power demand forecast)
  - Participation in EU-backed H2020 project
- **Predictive maintenance**
- **Power disaggregation**
  - Using both active & reactive power measurements
  - Hardware disaggregation using plugs
  - Software disaggregation using machine learning, possibly at the edge

TABLE I
PERFORMANCE RESULTS

Metric	AR-1	RF-30
MAE (kWh)	1.98	1.71
MAE (% of mean)	12.96	11.23
MAPE (%)	17.98	16.16





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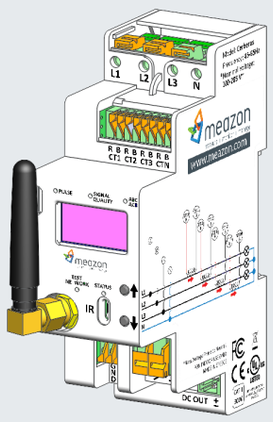
Is this disruptive?

➢ **List Price:** $7.999.99 USD



➢ **List Price:** $399+ $10 per month

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www.meazon.com