



Built environment facing climate change



REHVA 13th HVAC World Congress

26 - 29 May, Bucharest, Romania

The Power of the Cloud

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- **Power of the Cloud: A Vision or Reality?**
- Actuator Commissioning: Wireless and Powerless with NFC
- Already a Reality: The Energy Valve Performance Device
- Cloud Analytics: Monitoring and Optimization
- IoT: An Augmented Reality
- Outlook



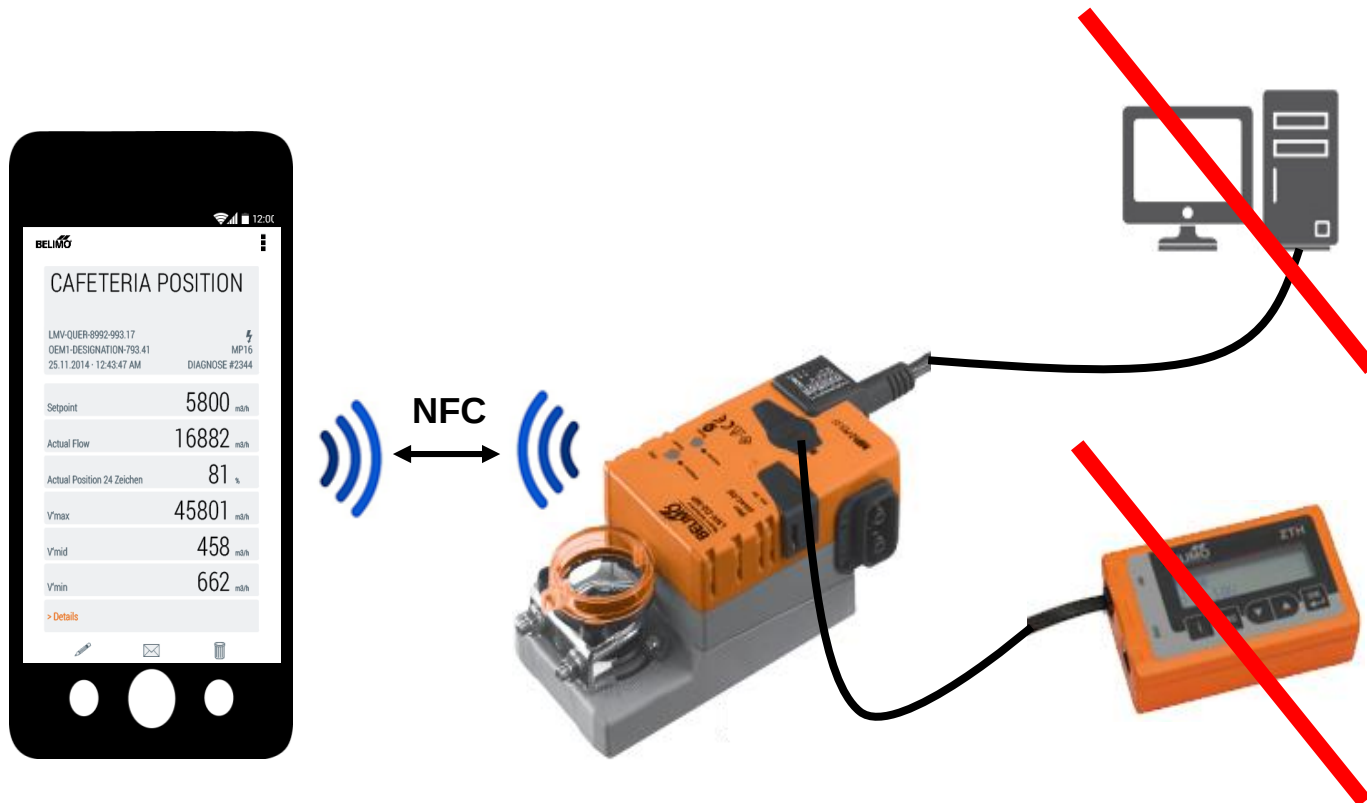
Power of the Cloud: A Vision or Reality?

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**Actuator
Commissioning:
Wireless and
Powerless with
NFC**

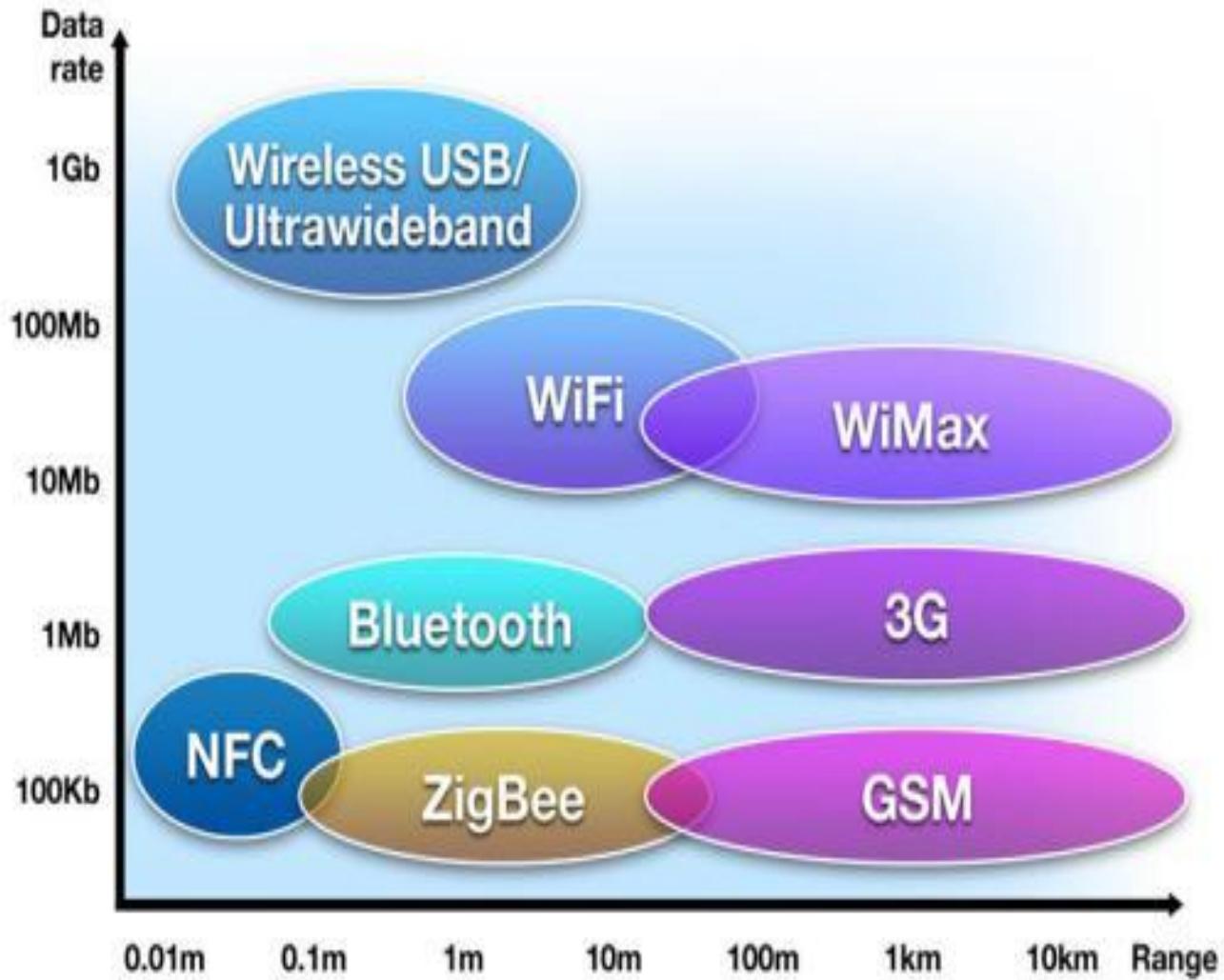






THE ALLURE OF NFC IS ITS SIMPLICITY

POWERLESS **LOW COSTS** **SMARTPHONE**
NFC **INTEGRATION**
EASY TO
USE



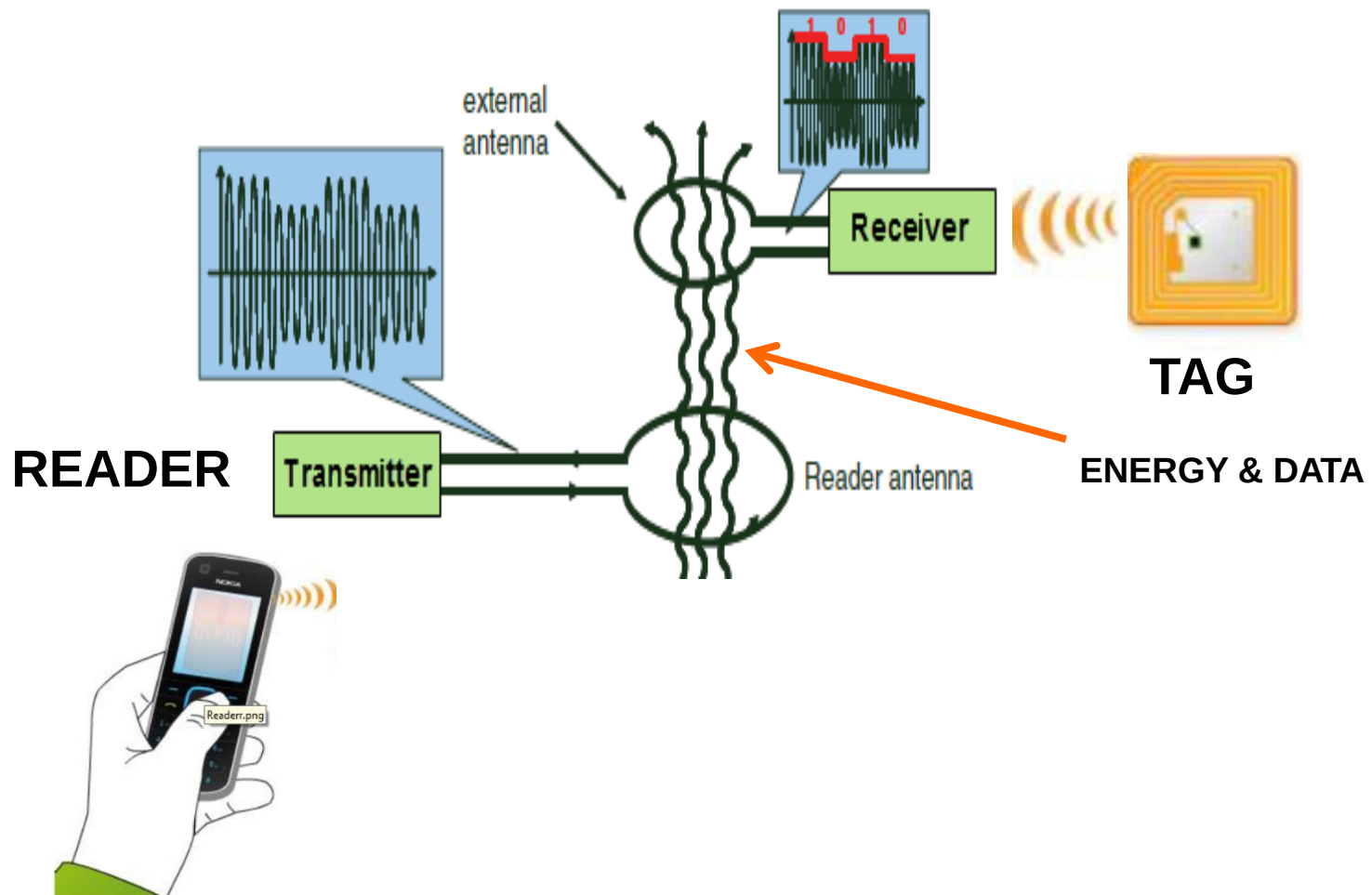
<4cm

Typ 1.5cm

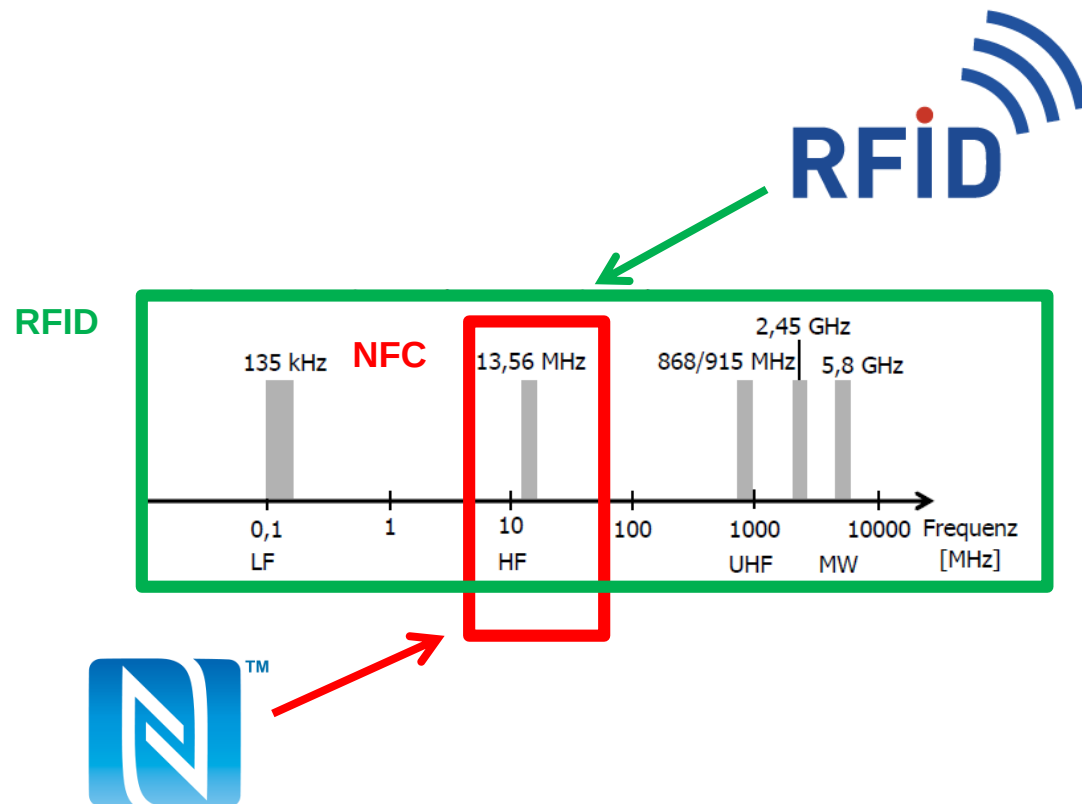
106kBit/s

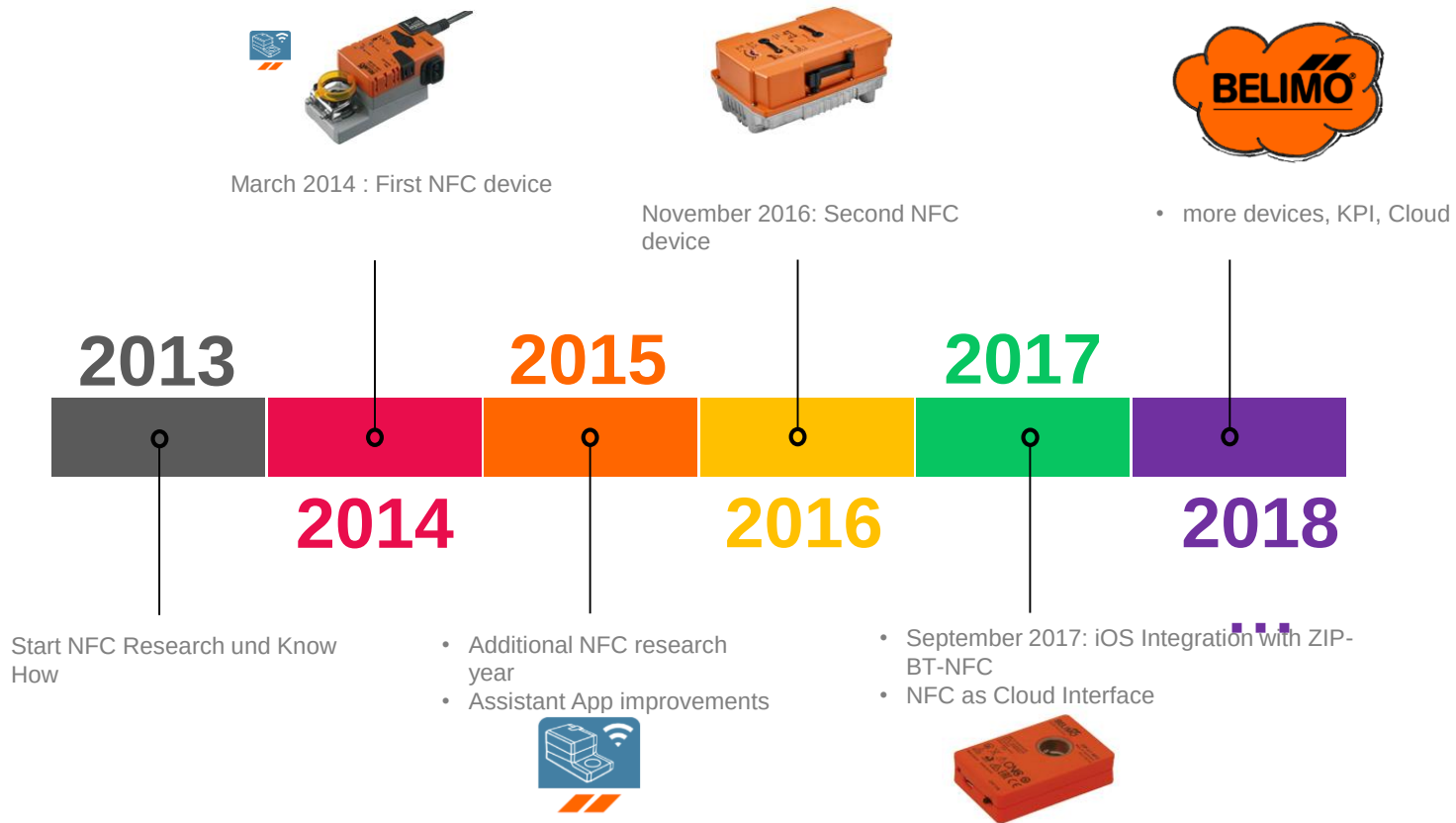
payload is smaller because of overhead

GSM 9.6kBit/s, EDGE (2G) 260 kBit/s, UMTS(3G) 384 kBit/s

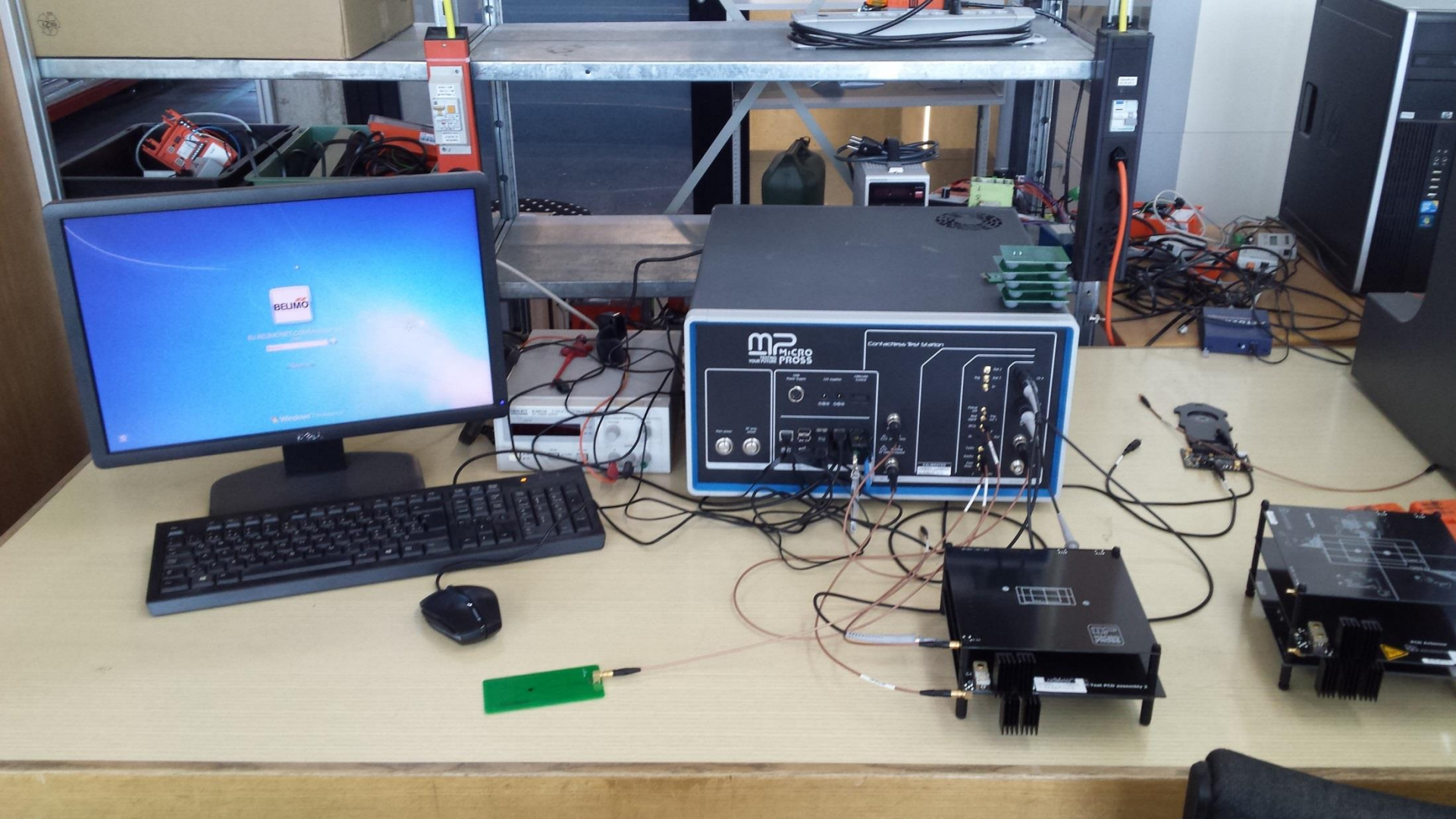


NFC IS NOT RFID, BUT A PART OF IT!

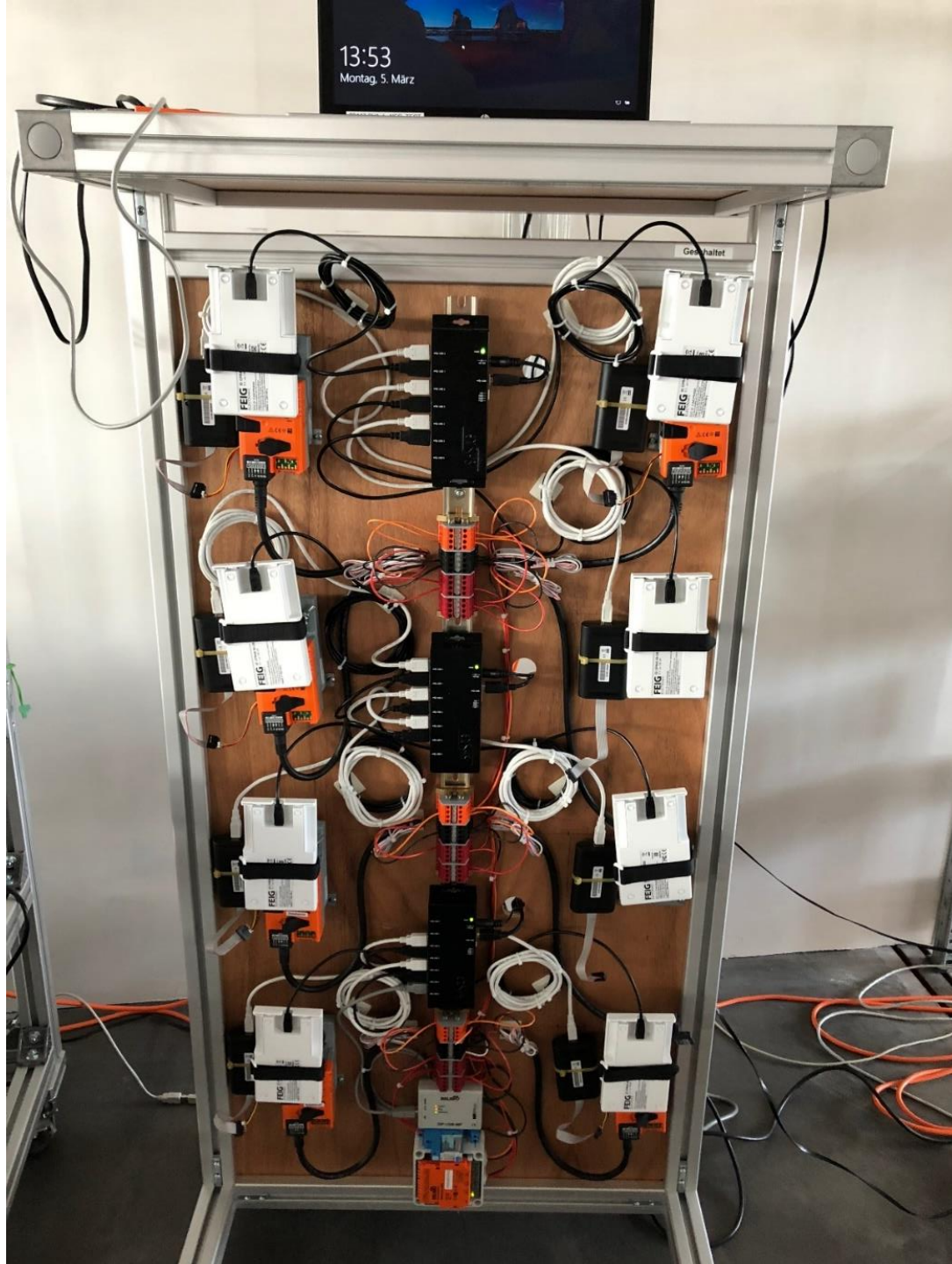








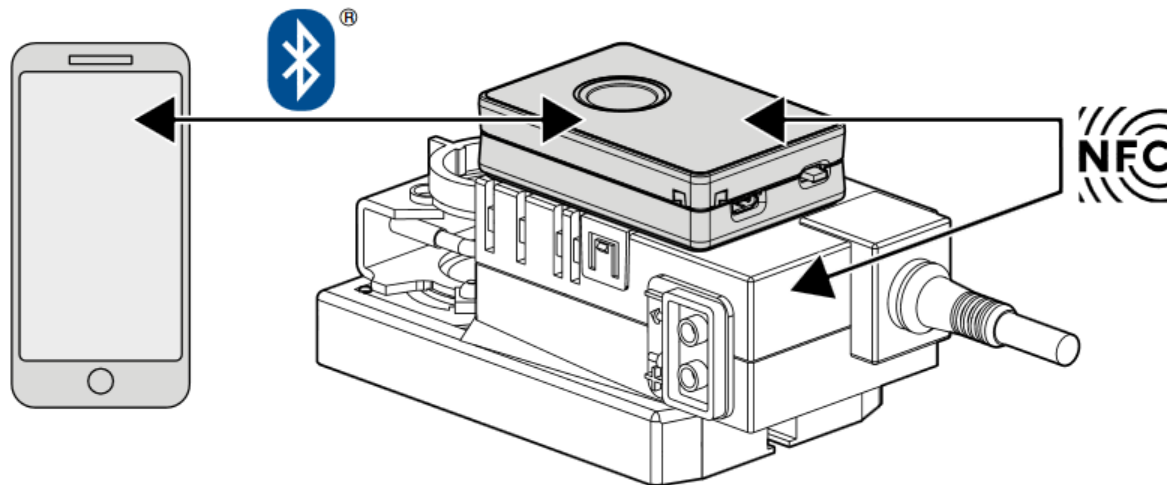








DESIGNED TO SUPPORT iOS AND ALL OTHER BLE DEVICES



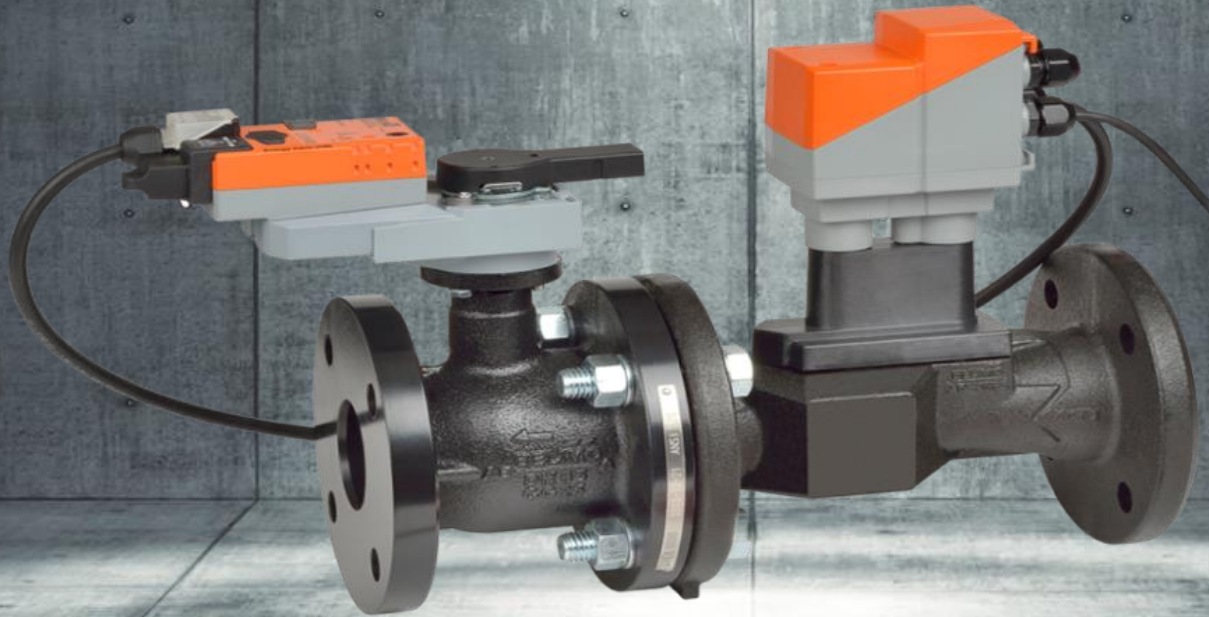
Workshop

Questions?

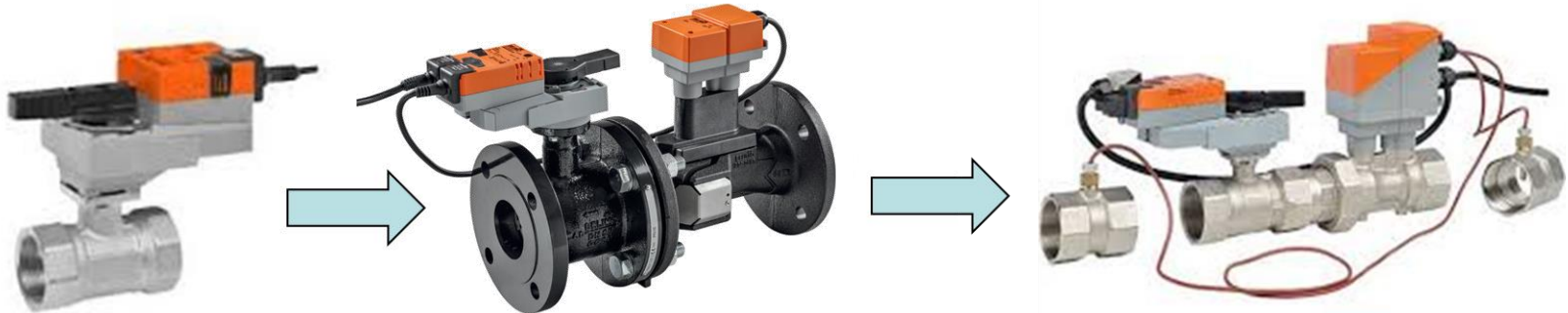


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**Already a
Reality: The
Energy Valve
Performance
Device**



Hydraulic Control Valves



Position Control

- Water Independent

Flow Control

- Pressure Independent

Energy Control

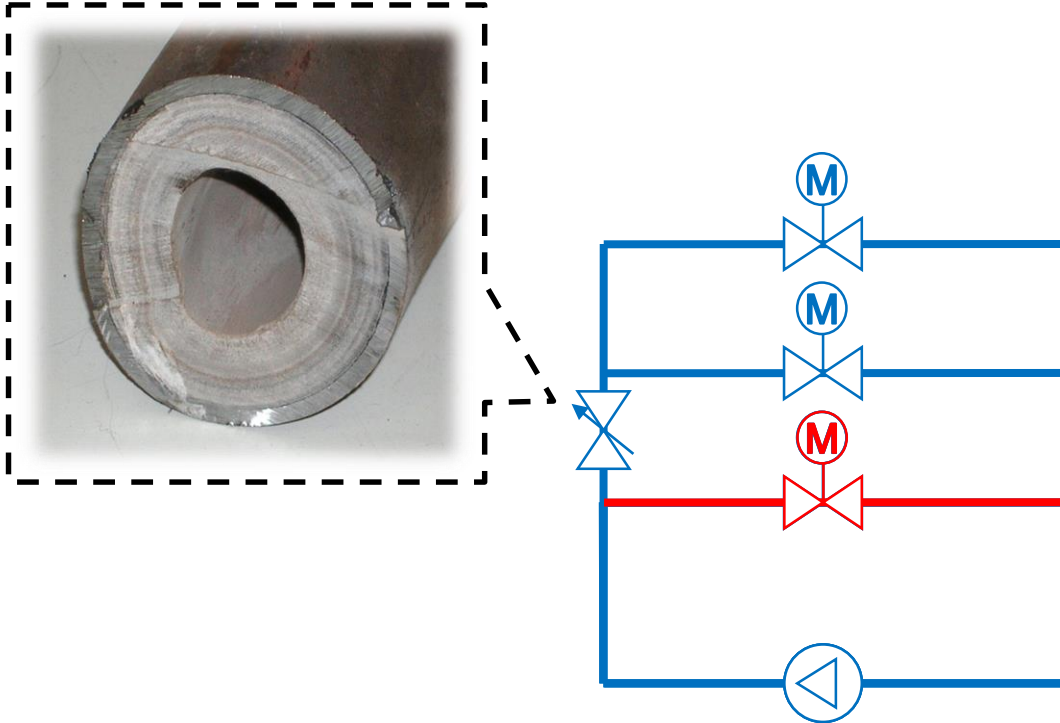
- Pressure Independent
- Temperature Independent

Hydraulic Balancing



Hydraulic Balancing

Parallel Interaction

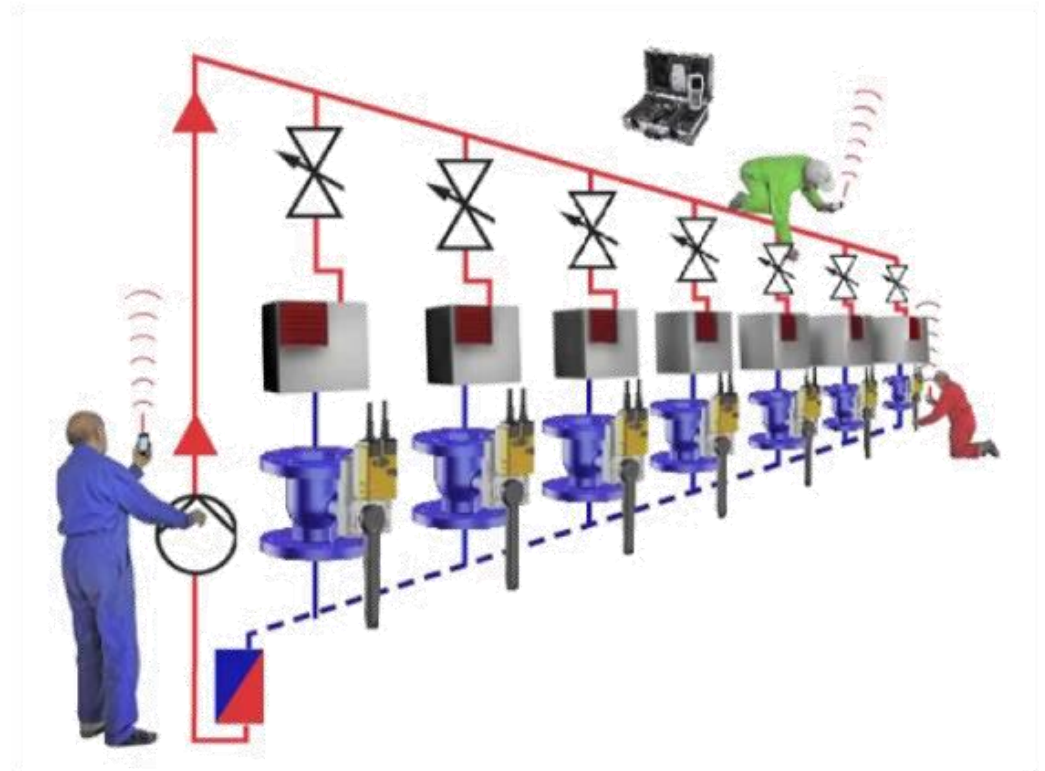


- Constant Pressure

Hydraulic Balancing

Manual

- Equitable distribution of flow under design conditions
  - Maximize comfort to all zones
  - Especially under peak load



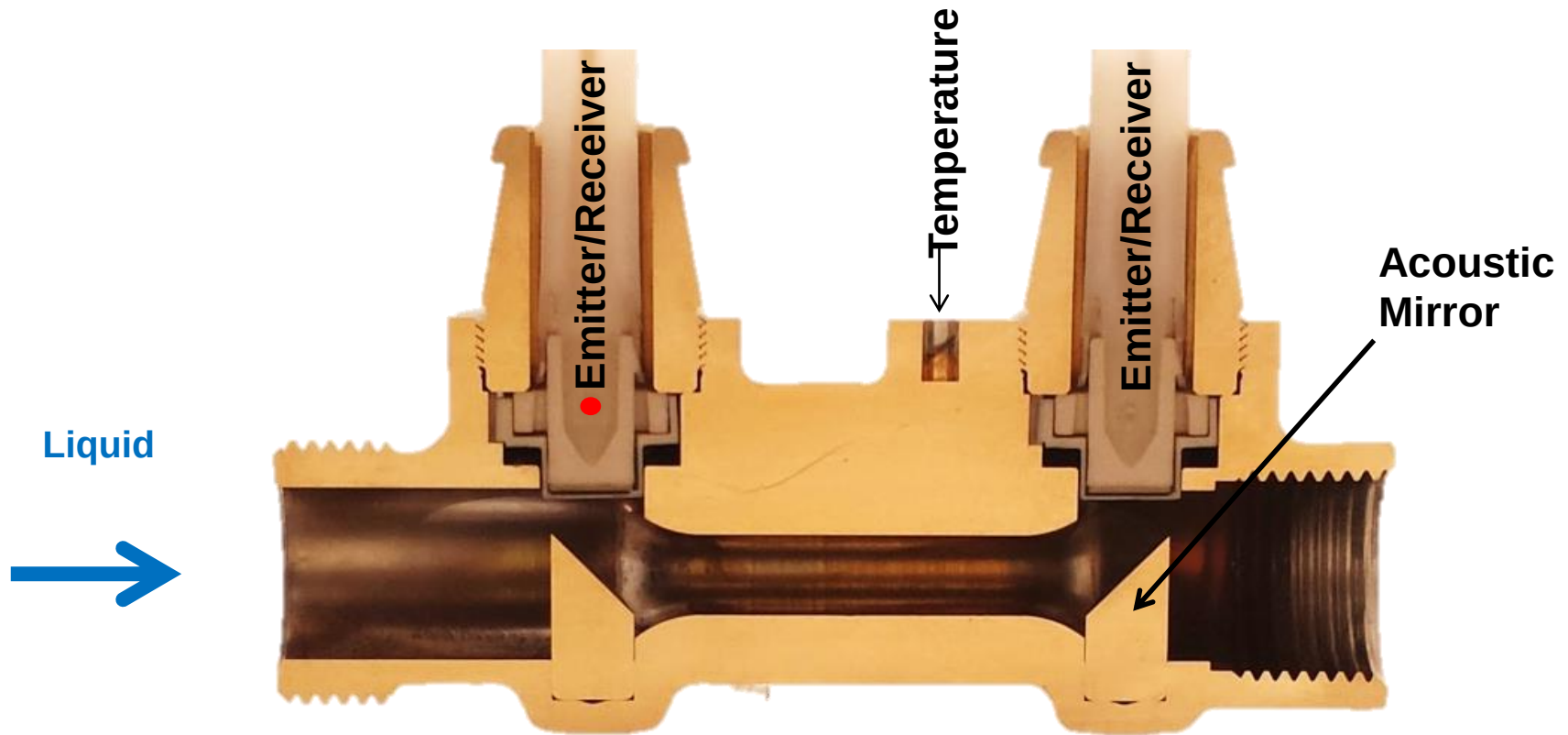
Hydraulic Balancing

Electronic



Hydraulic Balancing

Electronic – ultrasonic flow sensor



$$\text{Speed(Pulse)} = \text{Speed(Fluid)} + \text{Speed(Sound)}$$

Electronic Pressure-Independent Valve (EPIV)



DN15 ... DN50



DN65 ... DN150



0-10V

Clima 2019

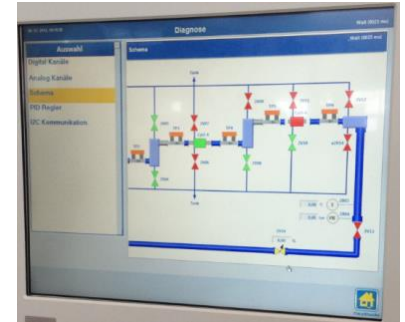
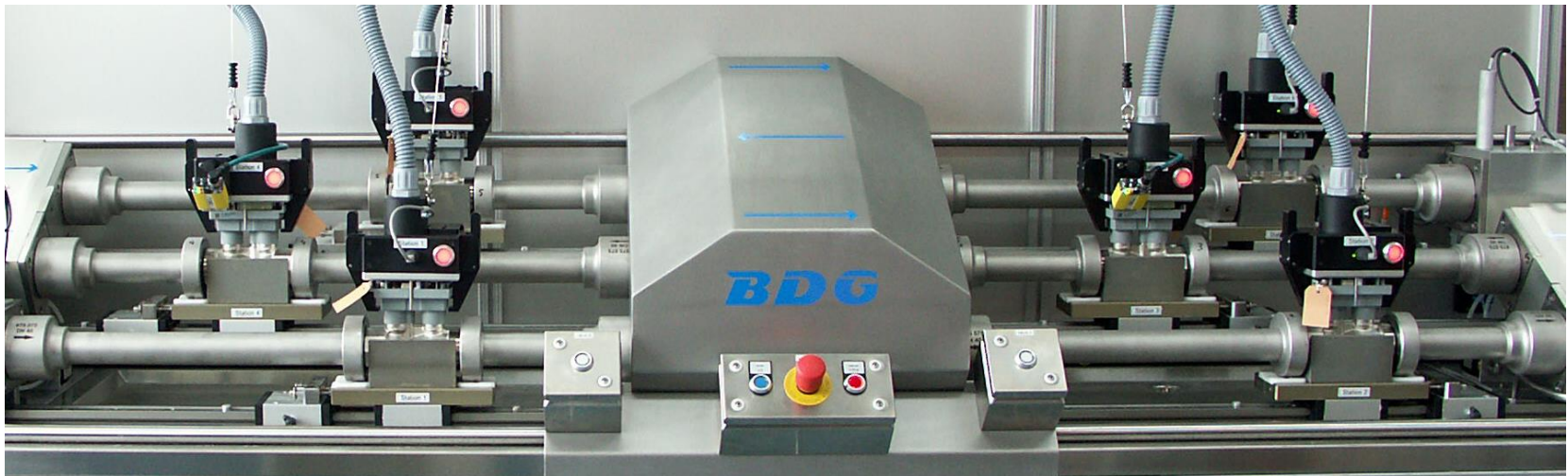


Electronic Pressure-Independent Valve



Made in Switzerland

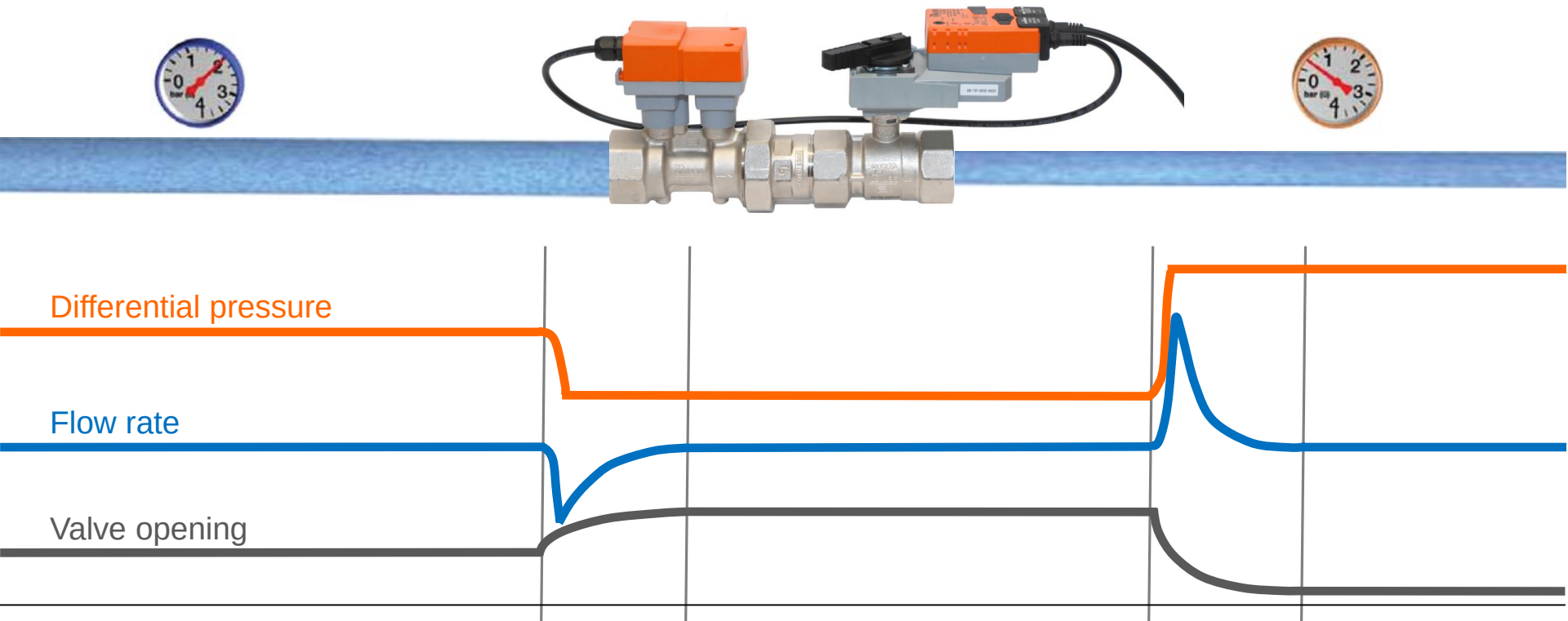
- **Design and production: Hinwil Switzerland**
- **Each sensor is wet calibrated**



Electronic Pressure-Independent Valve

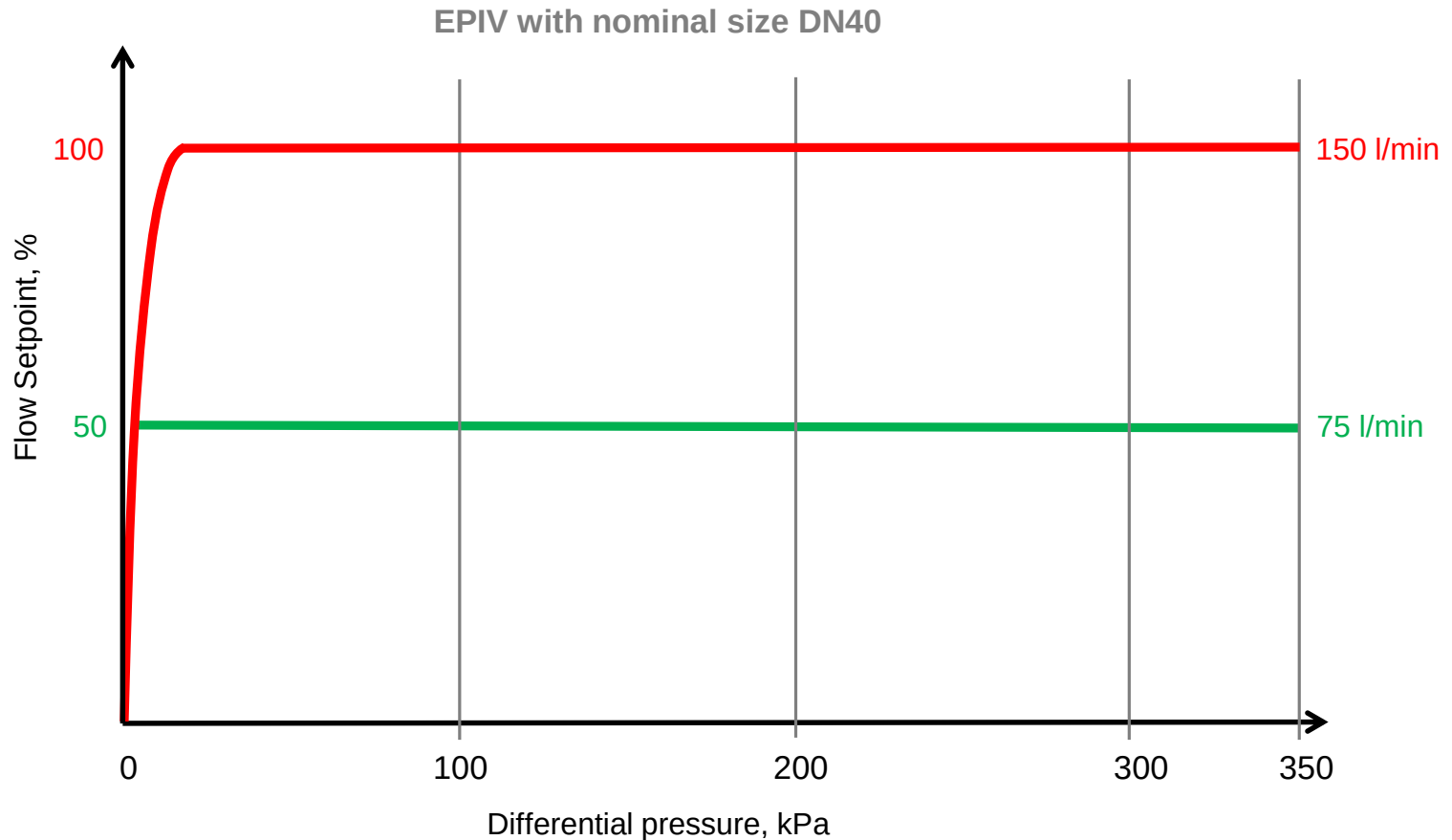
Perfect flow control

- Automatically controls to the desired set-point flow, regardless of pressure variations in the system



Electronic Pressure-Independent Valve

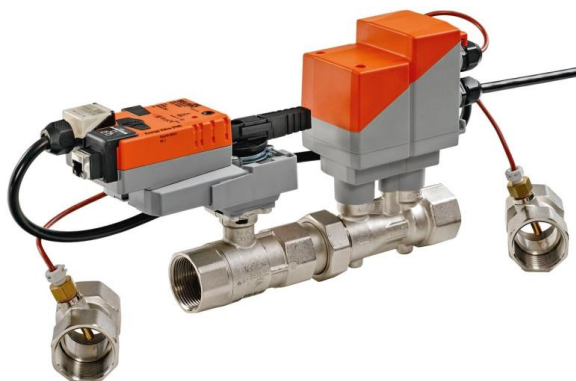
Pressure-independence



Belimo Energy Valve™ (EV)



DN15 ... DN50



DN65 ... DN150



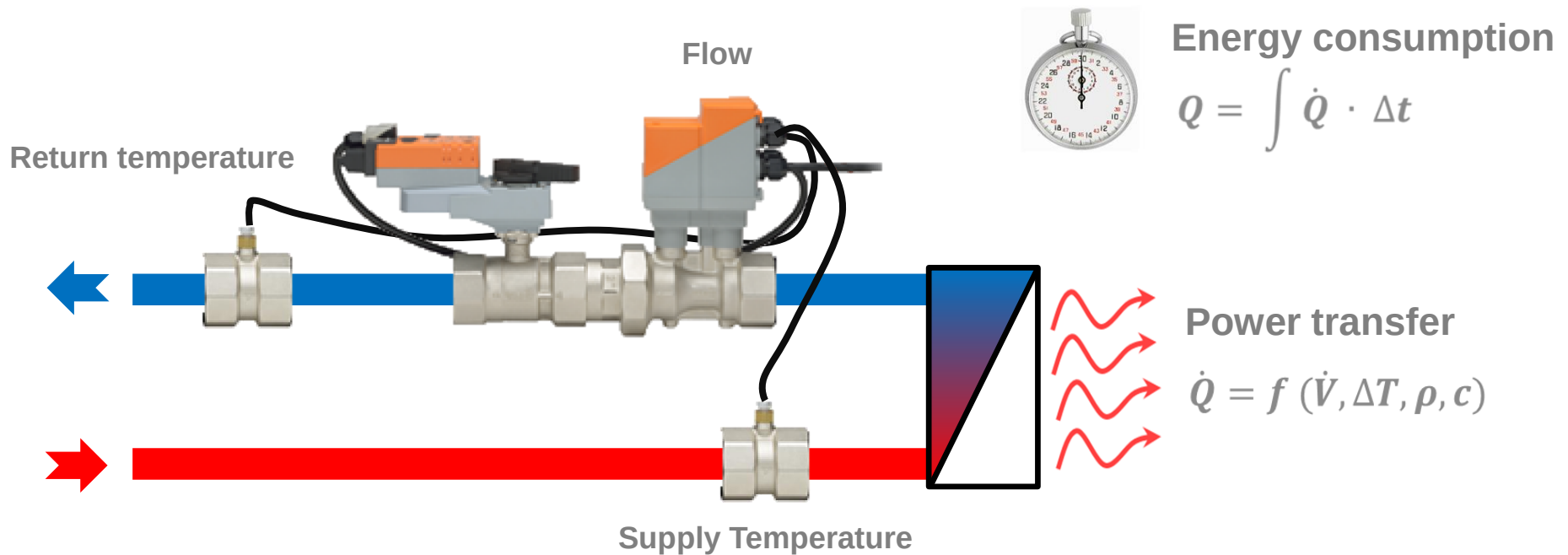
0-10V

Clima 2019



Energy Valve

Power and Energy



Energy Valve

Delta-T Manager

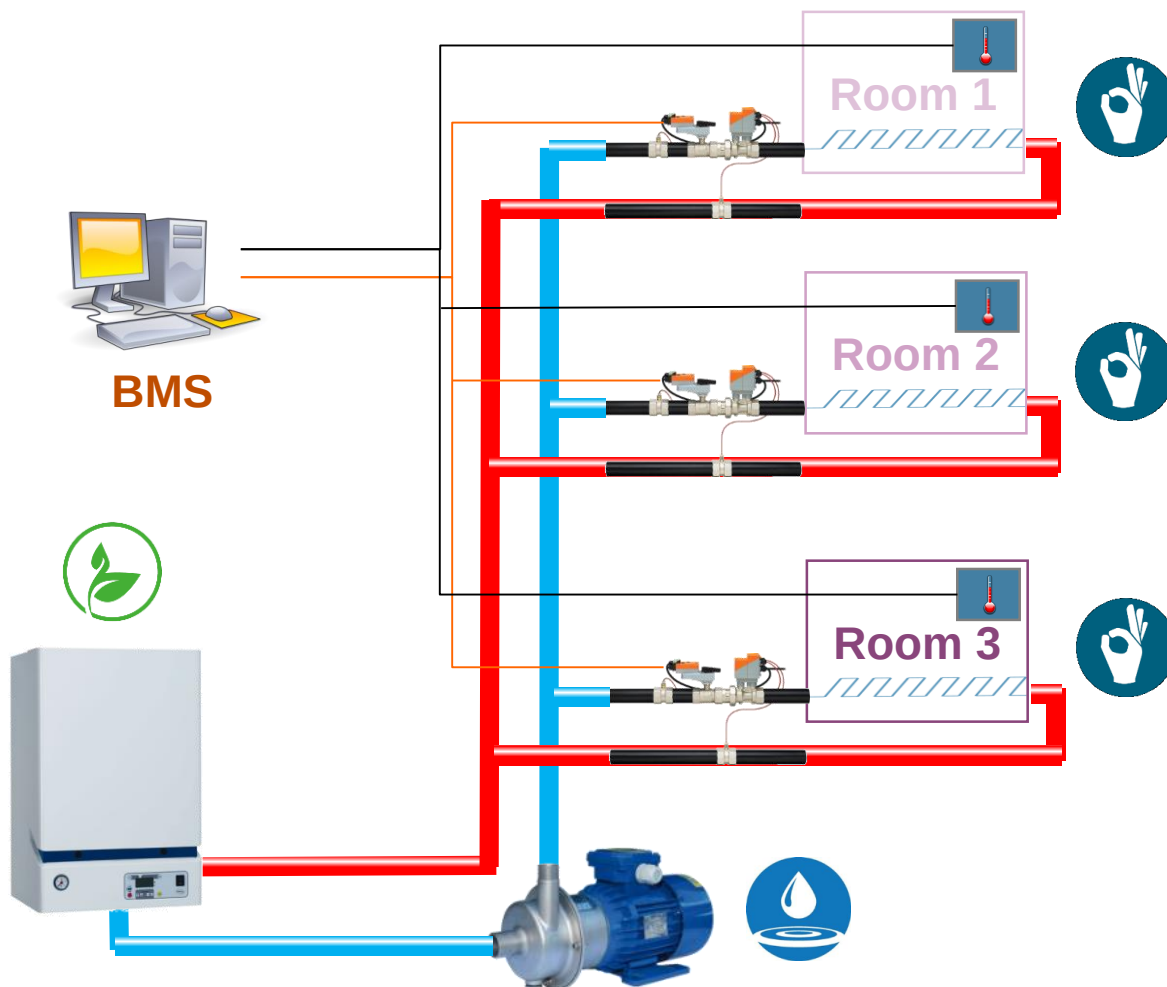


The plant will operate in the saturation zone with a higher flow, but no added kW



Energy Valve

Delta-T Manager

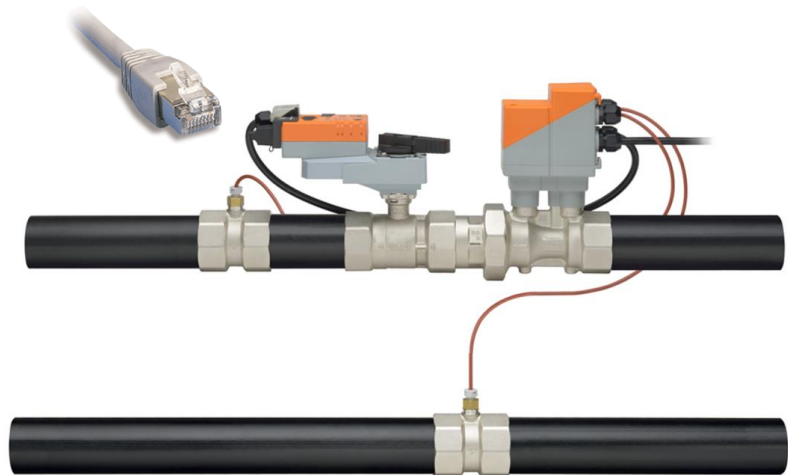


Energy Valve

Integrated Web Server



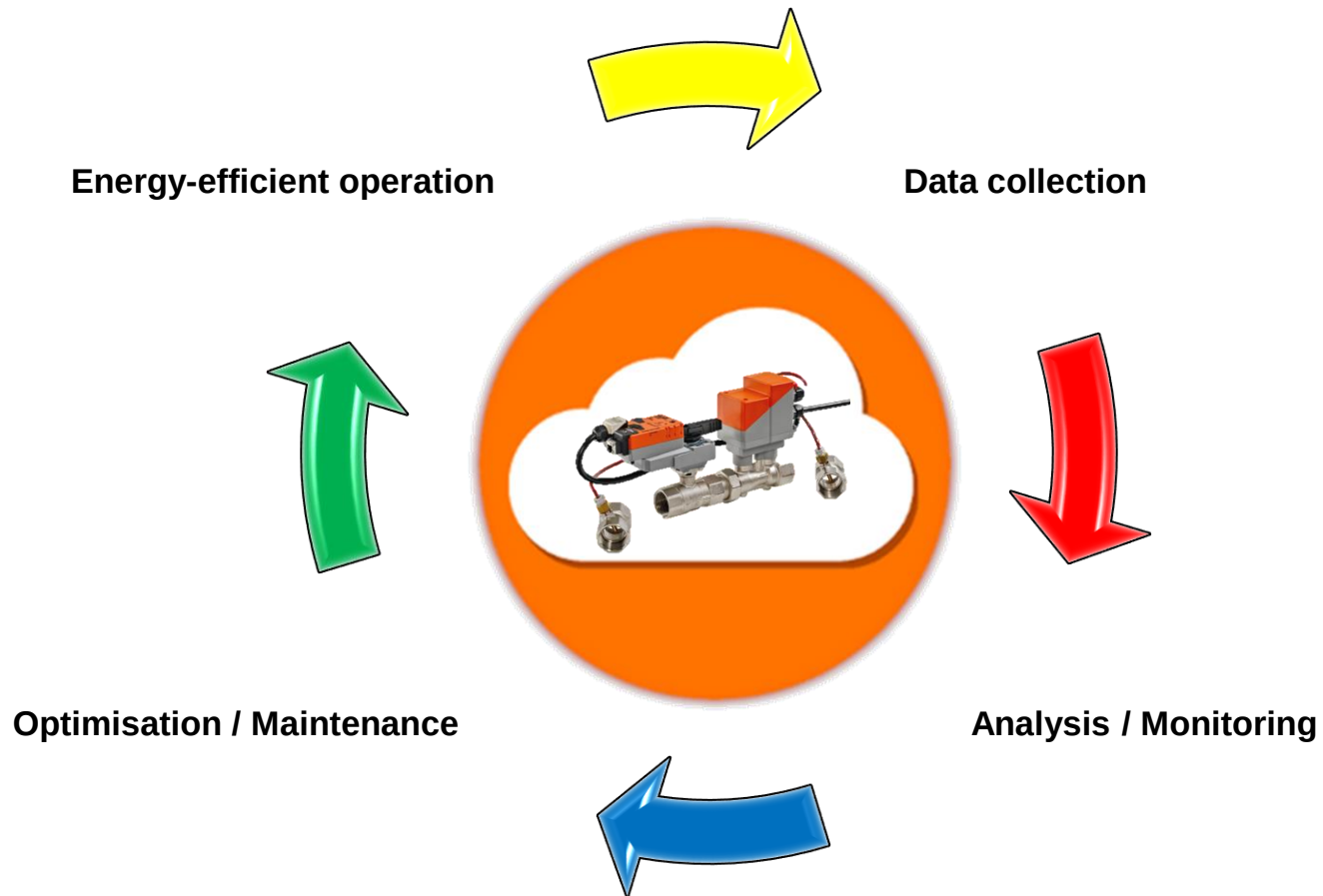
Web browser



Web server

Energy Valve

Energy monitoring



Pressure Independent Valves

Functions

1. Dynamic hydronic balancing



2. Air bubble-tight shut off

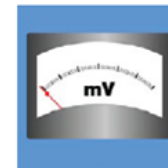


3. Pressure-independent flow control



4. Continuous measurements

- Flow rate
- Supply/return media temperatures



5. Monitoring function

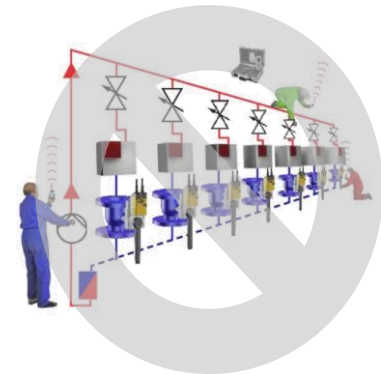
- Power output heating/cooling coil
- Expenditure of energy for heating/cooling



Legend

EPIV

EV



Workshop

Questions?



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Advanced Monitoring and Optimization



Cloud

Energy Valve 3.0



Multiple benefits providing advanced optimization



OPTIMIZATION OF
DELTA T AND
FLOW SETTINGS



PERFORMANCE
REPORT



ONLINE
SUPPORT



SOFTWARE
UPDATES



INCREASE
WARRANTY TO
7 YEARS



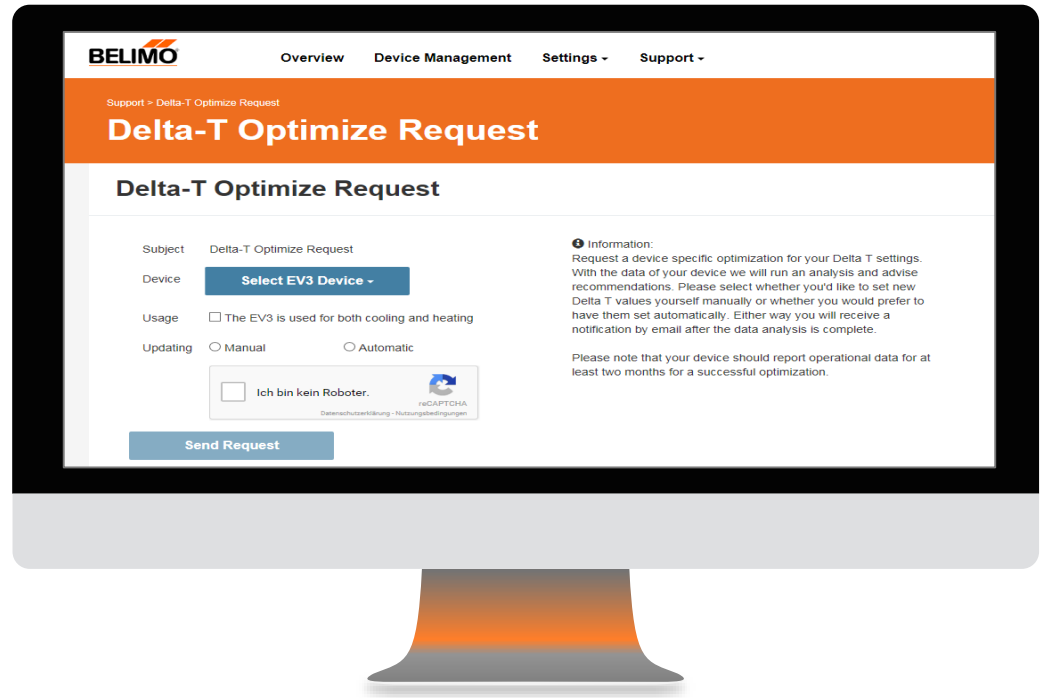
LIFETIME
DATA
ACCESS

Cloud

Energy Valve 3.0

Optimization of delta-T and flow settings

- Better performance and system stability
- Ensures effective use of the Delta T Manager
- Cost savings through efficient operation



The screenshot shows a web browser interface for the BELIMO Delta-T Optimize Request form. The page has a navigation bar with links: Overview, Device Management, Settings, and Support. The main heading is "Delta-T Optimize Request". Below this, there is a form with the following fields:

- Subject:** Delta-T Optimize Request
- Device:** Select EV3 Device (dropdown menu)
- Usage:** ☐ The EV3 is used for both cooling and heating
- Updating:** ☐ Manual ☐ Automatic

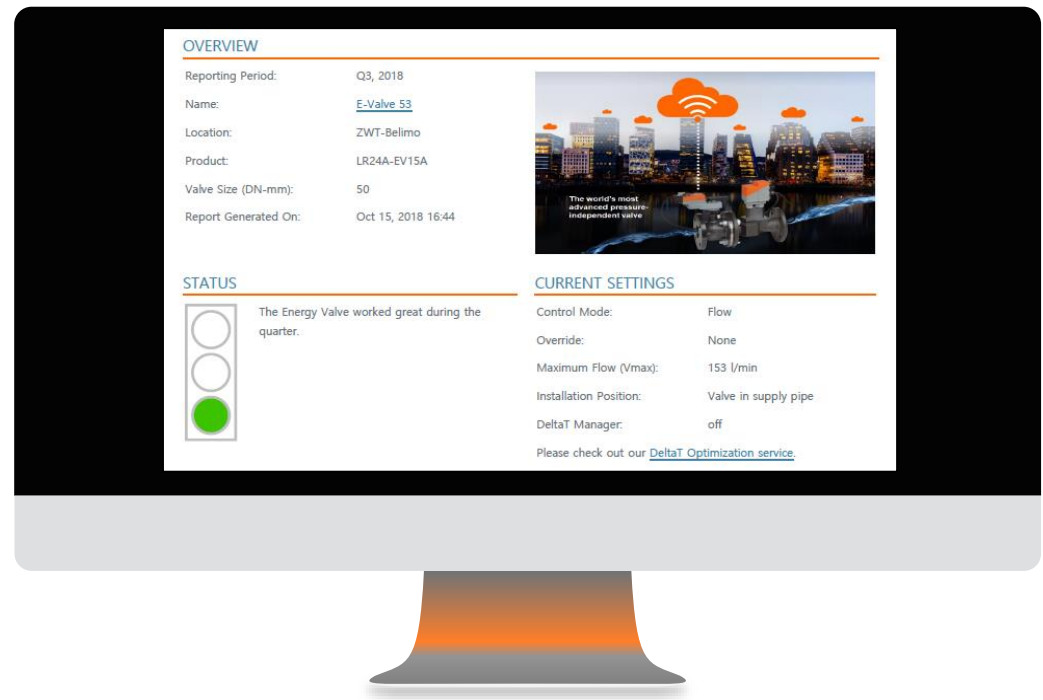
Below the form fields is a reCAPTCHA widget with the text "Ich bin kein Roboter." and a "Send Request" button.

Information:
Request a device specific optimization for your Delta T settings. With the data of your device we will run an analysis and advise recommendations. Please select whether you'd like to set new Delta T values yourself manually or whether you would prefer to have them set automatically. Either way you will receive a notification by email after the data analysis is complete.

Please note that your device should report operational data for at least two months for a successful optimization.

Performance Reporting

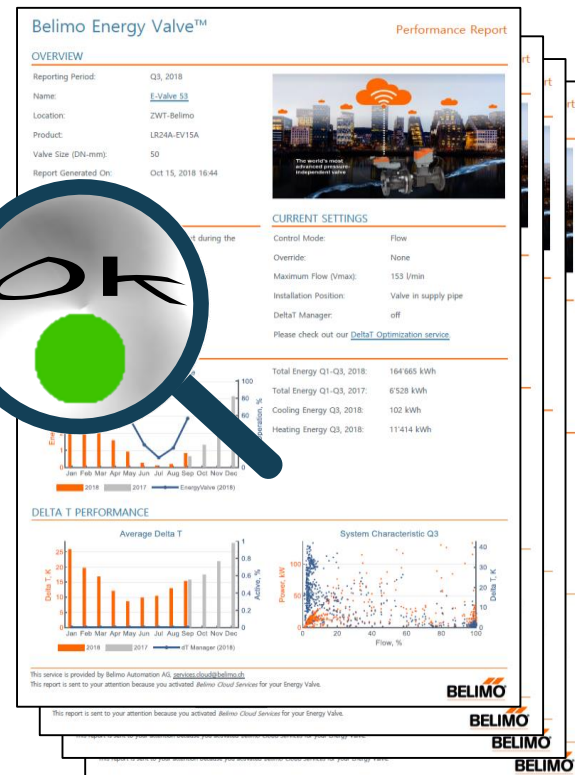
- Automatically generated performance and commissioning report with key insights
- Important KPI data for system transparency



Quarterly Performance Report

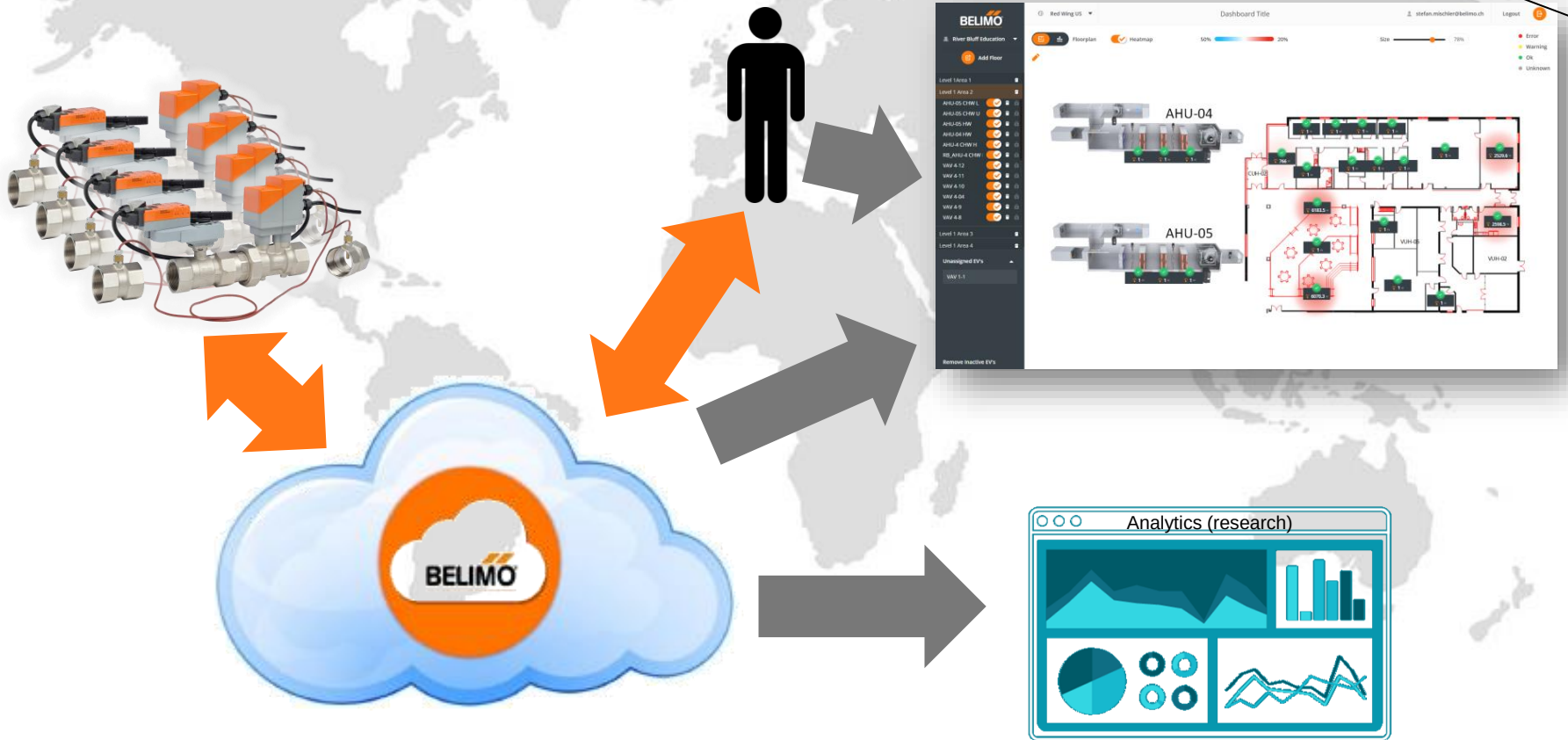


Name	Status	Total Energy Q3, 2018	Serial Number
TABS EG Nord Comfort@HQBelimo		4'548 kWh	21815-20176-022-135
TABS EG Süd Comfort@HQBelimo		5'169 kWh	21815-20169-022-135
TABS 1.OG Nord Comfort@HQBelimo		3'602 kWh	21821-30003-022-136
TABS 1.OG Süd Comfort@HQBelimo		5'737 kWh	21815-20167-022-135
TABS 2.OG Nord Comfort@HQBelimo		4'915 kWh	21821-30008-022-136
TABS 2.OG Süd Comfort@HQBelimo		6'827 kWh	21815-20161-022-135
TABS 3.OG Nord Comfort@HQBelimo		4'153 kWh	21815-20160-022-135
TABS 3.OG Süd Comfort@HQBelimo		5'523 kWh	21821-30003-022-160
TABS 4.OG Nord Comfort@HQBelimo		2'427 kWh	21815-20177-022-135
TABS 4.OG Süd Comfort@HQBelimo		3'335 kWh	21819-00275-022-135
E-Valve S1		8'190 kWh	21708-40017-001-160
E-Valve S2		134'168 kWh	21708-00103-001-126
E-Valve S3		164'665 kWh	21706-40005-001-126
E-Valve S4		79'276 kWh	21708-40020-001-160



Energy Flow Map

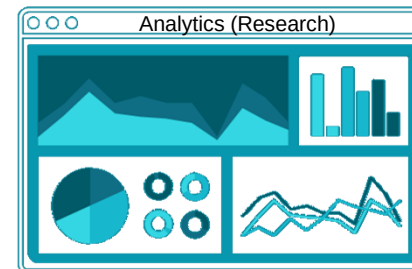
coming soon



Cloud Data Analytics



1. Business opportunity
2. Fit for use
3. Device flag patterns

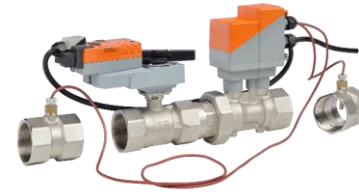
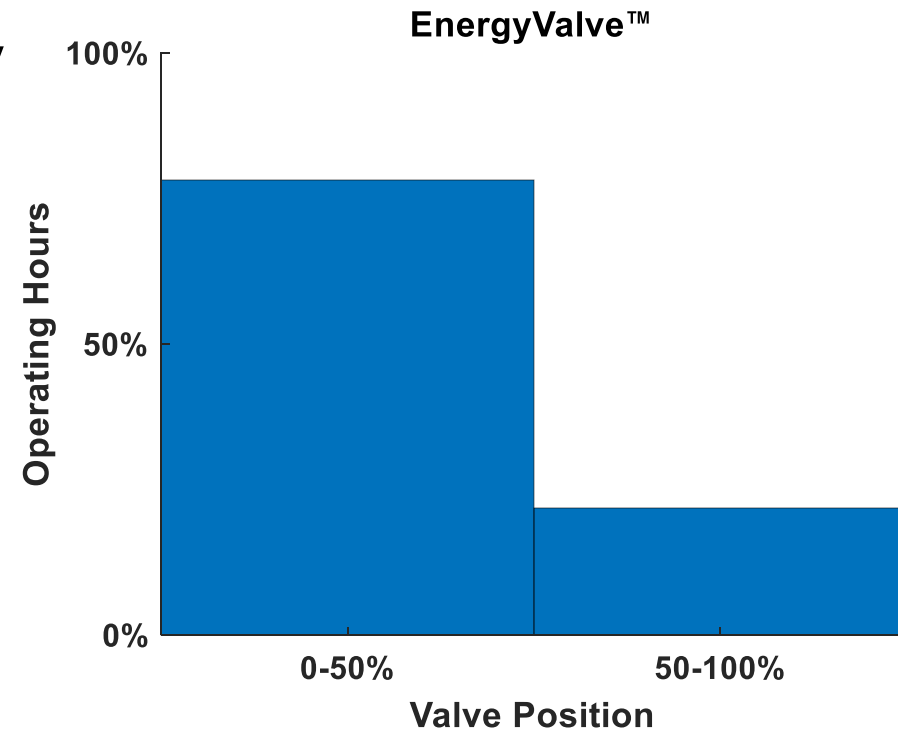


Cloud Data Analytics

Business opportunity

- Valves **consume** energy through pressure loss.
- Open valves operate more **efficiently** than closed valves.
- A **pump optimizer** adjusts its speed to keep valves as open as possible.
- **78%** of EnergyValve™ operation is below **50%** position.

Large potential for pump optimizer!

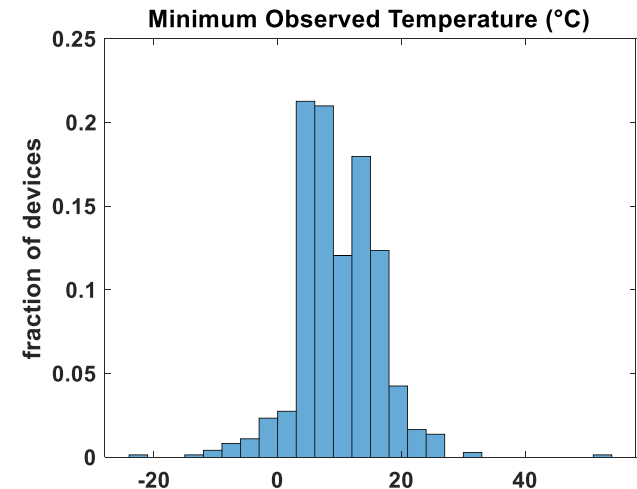
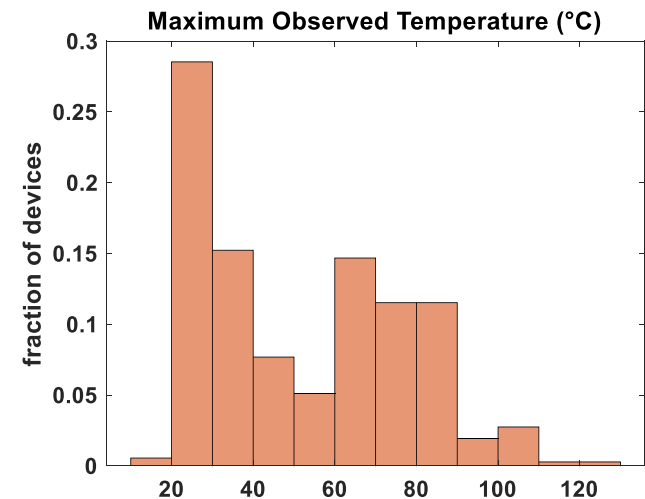


Cloud Data Analytics

Fit-for-use

- Product development requires specification
- This leads to questions like “Which **temperature range** should we cover with an EV?”
  - Today: -10°C to 120°C.
- Would the customer benefit from an option with extended temperature range?

Out of range **less than** 0.0015% of operating hours.



Cloud Data Analytics

Device flag patterns

What we would like to do...

1. Find interesting behavior
2. Understand behavior
3. Identify general rule
4. Verify it on other systems
5. Automatically detect this in the future

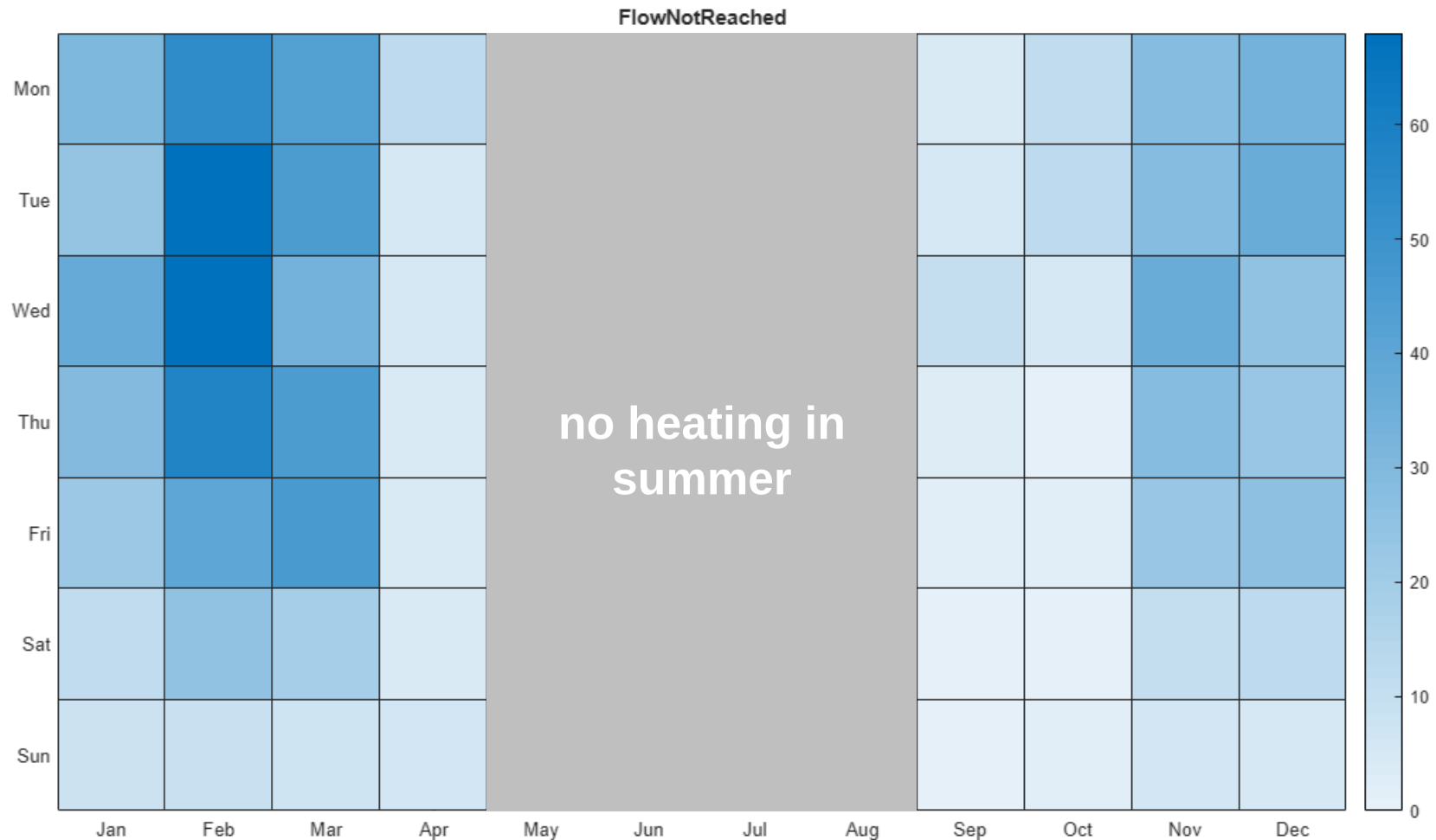
Let's analyze...

- Devices EV50 to EV54 in Hinwil, Switzerland
- Over 1 year of warning and error flags



Cloud Data Analytics

Device flag patterns

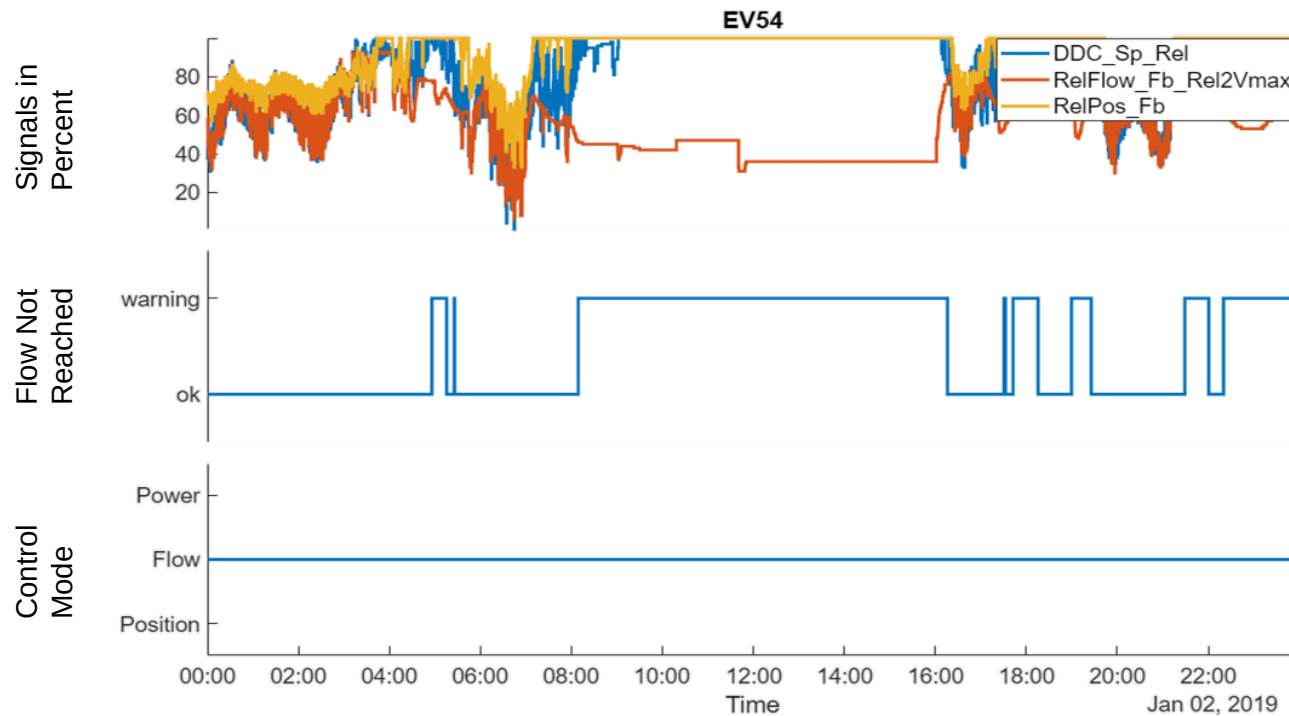


Cloud Data Analytics

Device flag patterns

Setpoint flow cannot be reached

- and the valve is fully open (out of control)

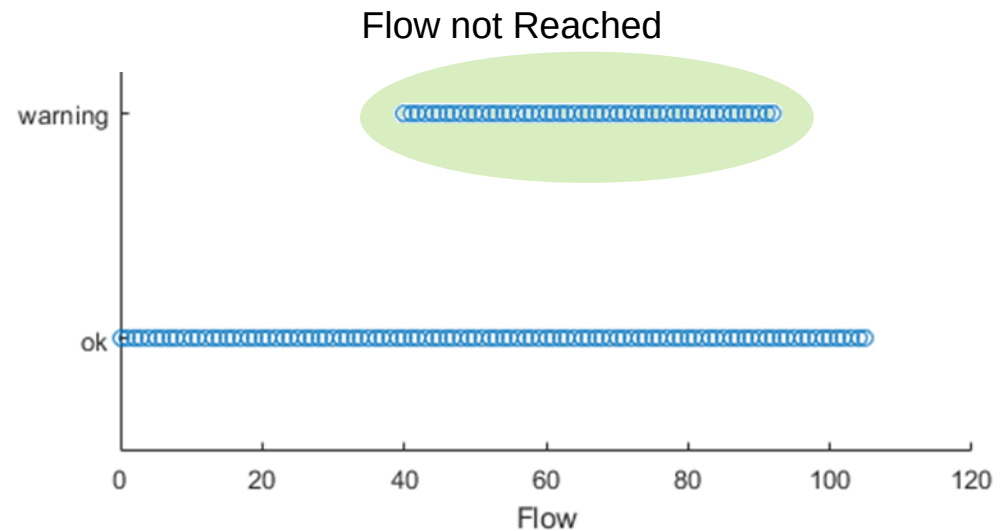


Cloud Data Analytics

Device flag patterns

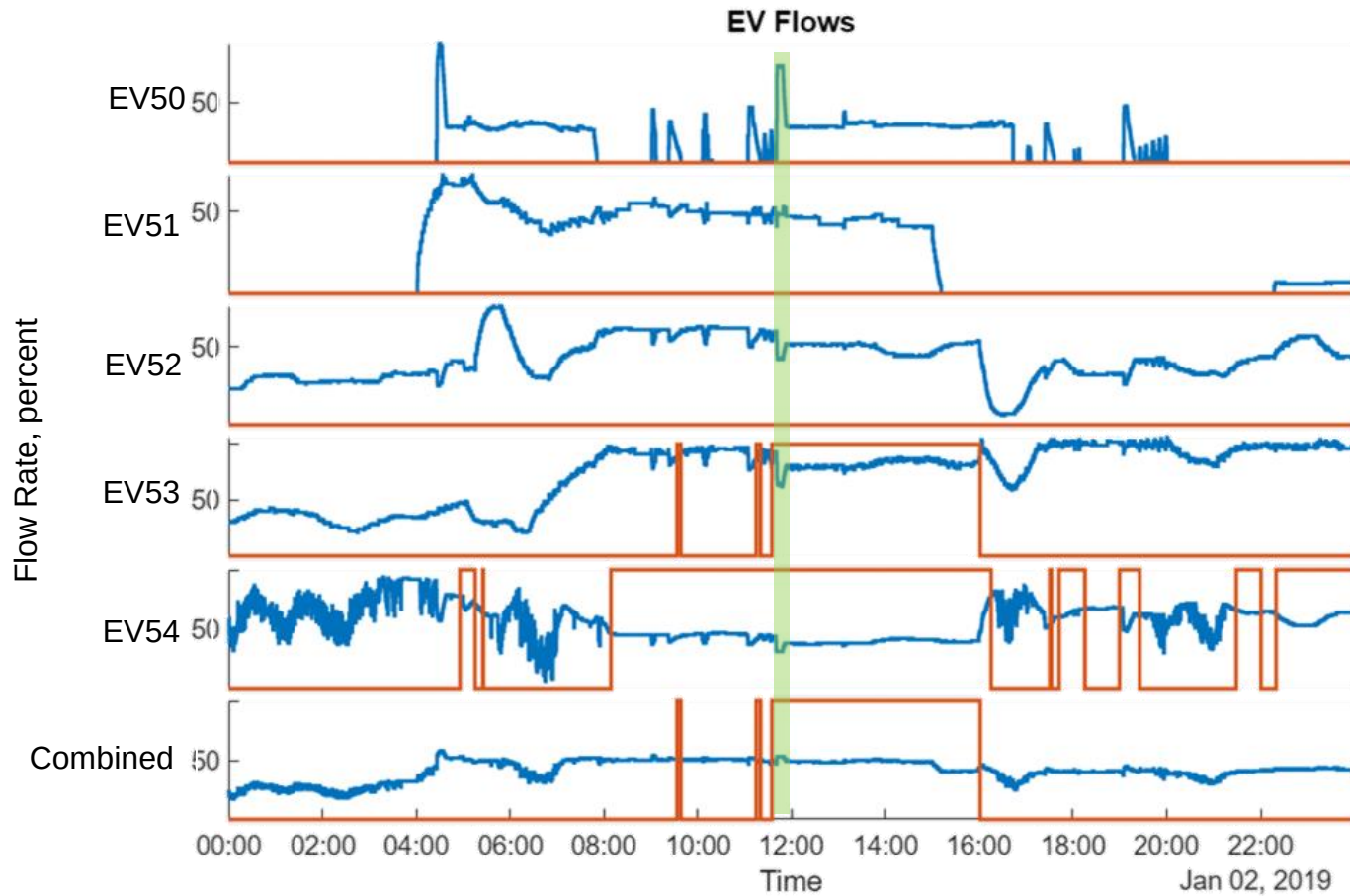
Why does it occur?

- ~~Flag is wrong~~
- ~~Vmax is set too high~~
- ~~Pump not operating~~
- Parallel loads consume the water
  - system capacity is too low



Cloud Data Analytics

Device flag patterns



Legend

Flow Rate

Flow not Reached

Cloud Data Analytics

Device flag patterns

Why does it occur?

- ~~Flag is wrong~~
- ~~Vmax is set too high~~
- ~~Pump not operating~~
- Parallel loads consume the water
  - system capacity is too low



Short Term

better understanding of root causes
provides meaningful insight for end users

Mid Term

Combining flags reduces
the number of alarms in a
meaningful way

**patent
pending**

Long Term

Use AI to improve system behavior

Cloud Data Analytics

Summary

- Analytics...
  - provided an indicator that building operators can improve their systems
  - can improve product development
  - is an important tool to develop intelligent, meaningful feedback for the end user



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IoT: An Augmented Reality

Virtual Reality (VR)
recreate a digital
environment around
the user



Augmented Reality (AR)
overlays digital
objects in the real
world





MPH
65

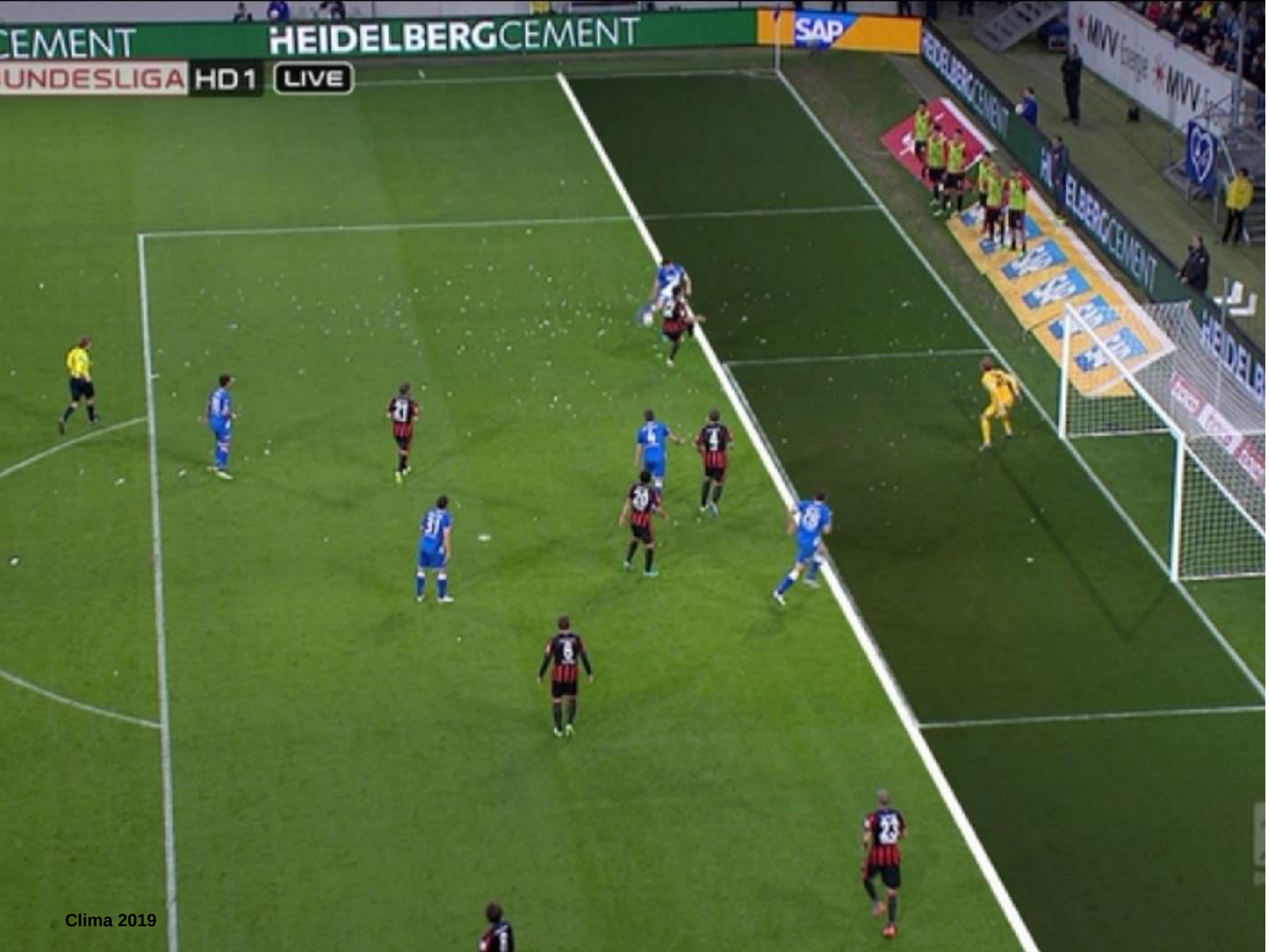
126ft

NE
354
MILES TO
DESTINATION



73°
OUTSIDE
68°
INSIDE





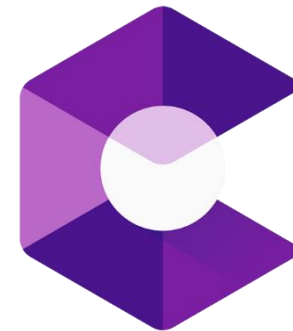
CEMENT HEIDELBERGCEMENT SAP
UNDESLIGA HD1 LIVE



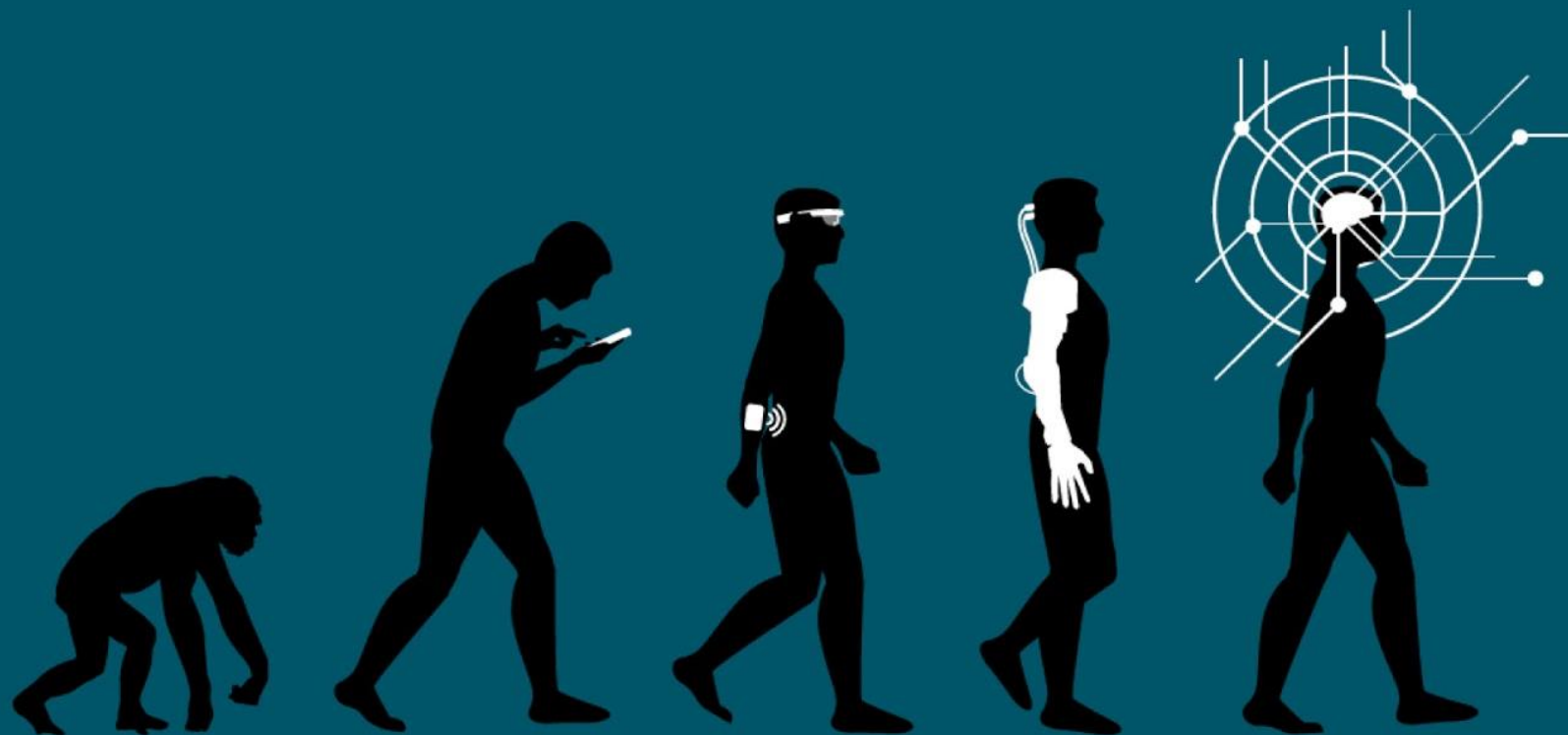
IF YOU HAVE A
MODERN
SMARTPHONE
YOU ARE **AR**
READY!

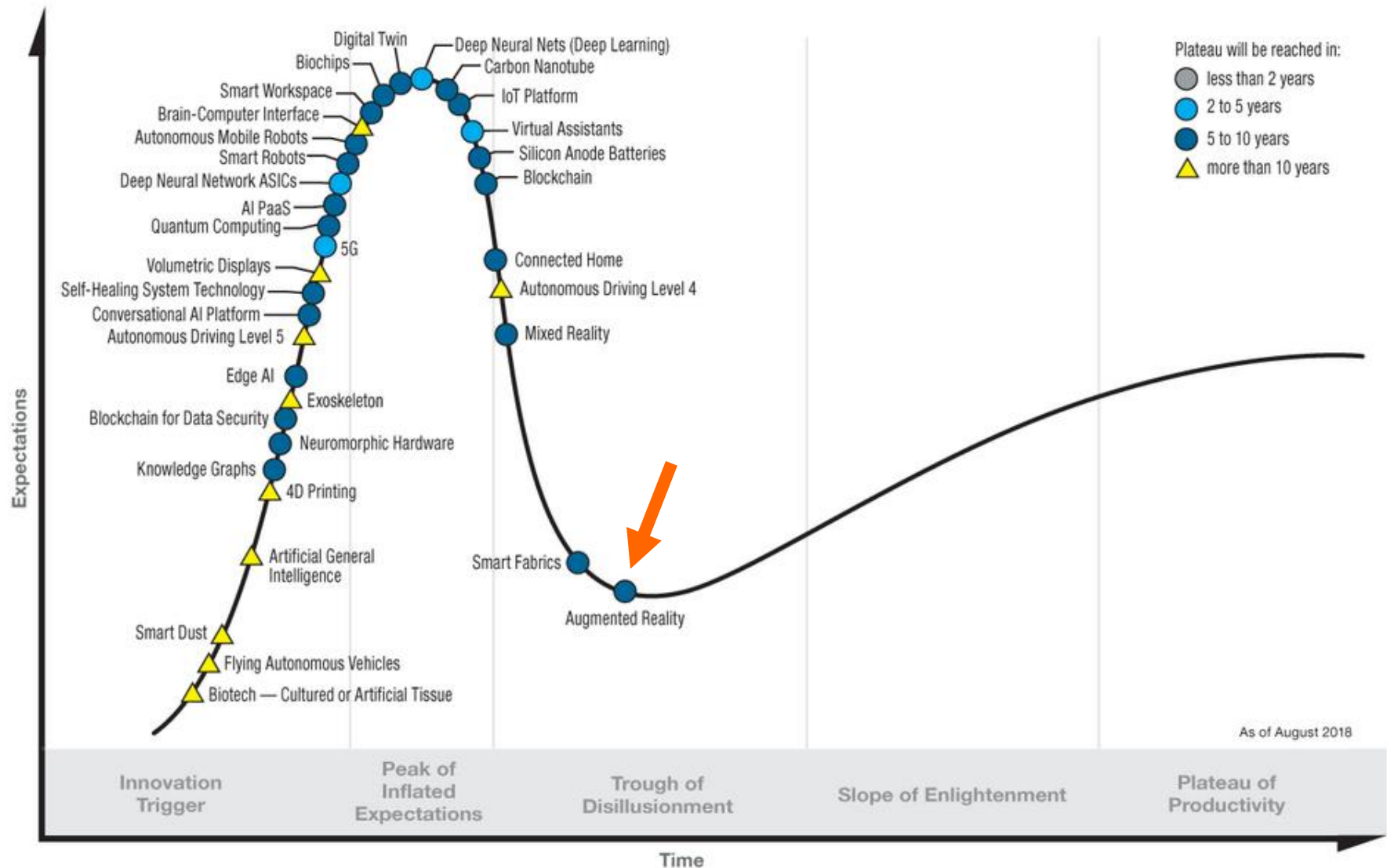


 AR Kit



 AR Core





THE VR FUND H1 2018 AR INDUSTRY LANDSCAPE



APPLICATIONS
TOOLS/PLATFORM
INFRASTRUCTURE



THE VENTURE REALITY FUND

BY TIPATAT@THEVRFUND.COM

OUR FIRST AR PoC



SECOND PoC: COMMISSIONING FOR PRCA

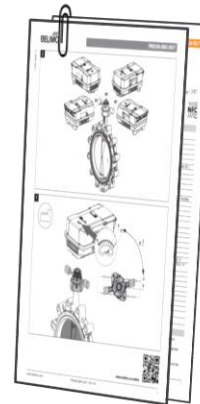


EYE TRACKING STUDY FOR PRCA COMMISSIONING

- **QUESTION:** Are there any advantages of the AR-APP against paper manual?



vs.

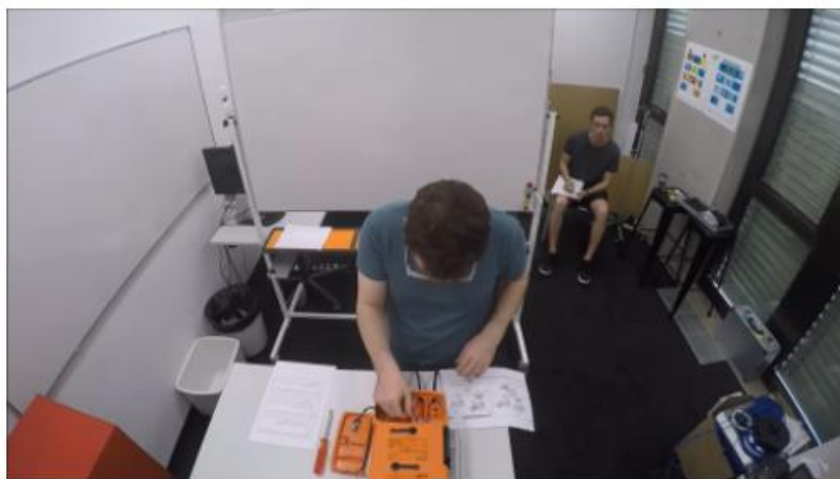


49

47 students
2 real Belimo customers



3rd Person View 1st Person View



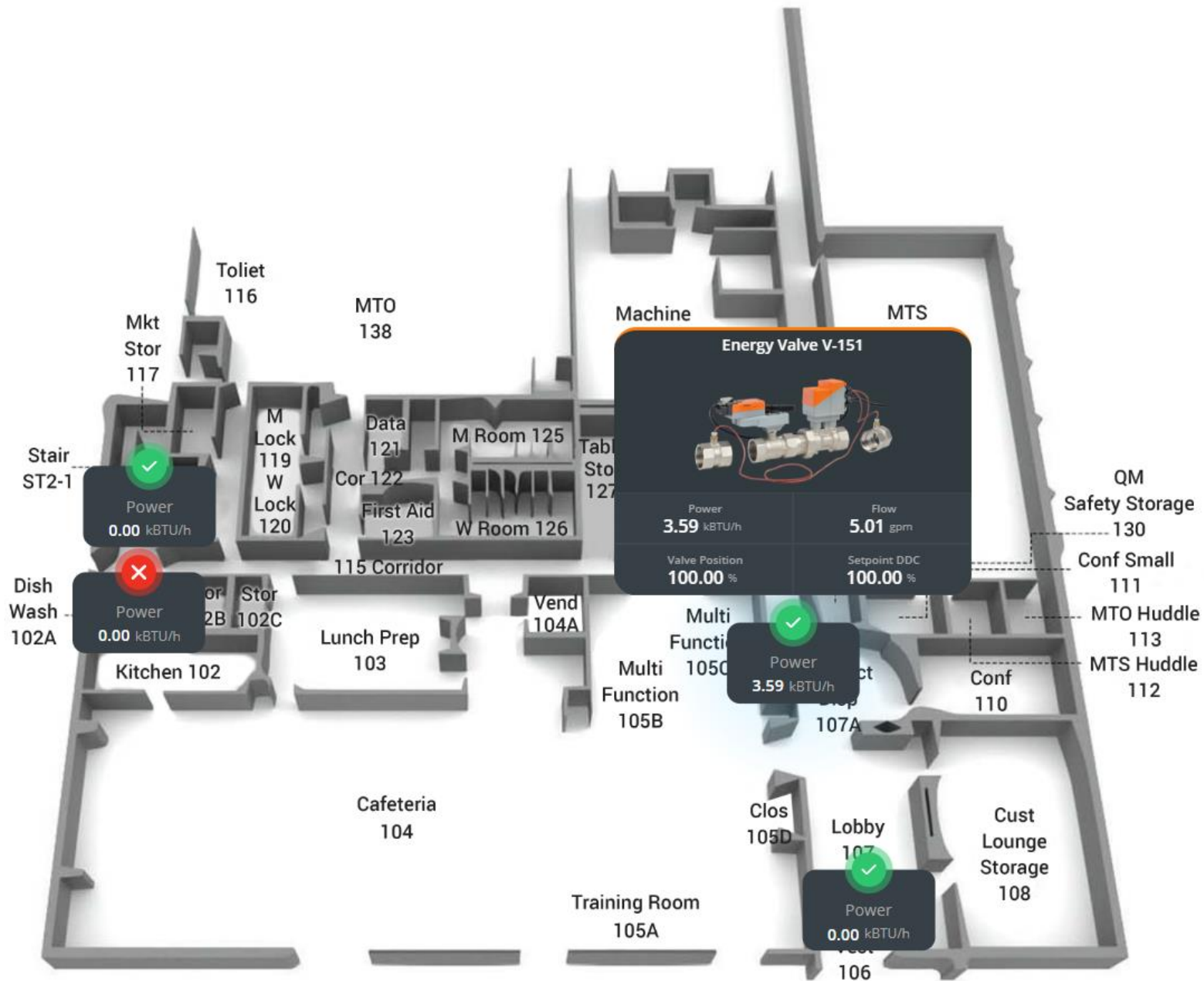
60%

time savings
with AR APP (-
12min)



With App:
...lower error rate
...better
understanding

CREATE A **UNIQUE** AR
LANGUAGE!



THIRD PoC: **LIVE DATA FROM CLOUD**



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Outlook

Q&A
Lunch and Demo



BELIMO®
