ACTION FOR ENERGY EFFICIENCY IN BALTIC CITIES
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EU STRATEGY FOR THE BALTIC SEA REGION

Gdynia LEEG
Achievements of Local Energy Efficiency Group

Adam Cenian, IMP PAN Gdańsk

Online Conference
„Green economy – the heating market changes – *Act Now!*“

Bremerhaven, 2020- 11-19

IMP PAN GDAŃSK

1. Motivation/Aim

In EU 50% of final energy is used for heating and cooling (80% in buildings)

New EU **Directive 2018/844/UE** (to be implemented in EU countries by 20.03.2020)

- **long term thermomodernization plans are required**
- **self-regulating systems (regulating temperature in all rooms) are postulated**
- support for electromobility (parking with electro-charging systems)
- compatibility with smart grids are postulated
- **heating/clima system should be reviewed**

Gdynia/IMP PAN LEEG focussed on these issues by

- preparing thermomodernization audits of chosen schools
- monitoring systems for temperature and air quality in class-rooms and heat supply to the buildings

2. Local Energy Efficiency Groups (LEEGs)

The local energy efficiency Groups (LEEGs) has been created in Gdynia in order to facilitate the SEAP/SECAP implementation.

LEEG initiative group (ActNow)

Gdynia Municipality
Szewalski Institute
PKT

OMGGS

Association of 57 Municipalities around Gdansk-Gdynia-Sopot Metropolitan Area

ActNow LEEG

- OMGGS
- ACT NOW PARTNERS
- Local electricity provider
- Local heat providers
- Marshall Office of Pomeranian Region

Additional experts (heat and power production and distribution, financing bodies, local administration, building associations, private owners association, etc.) and stakeholders are invited when needed

3. Main results

- 3.1 Audits/Investment planning
- 3.2 Monitoring of thermal and air conditions in class-rooms
- 3.3 New monitoring system

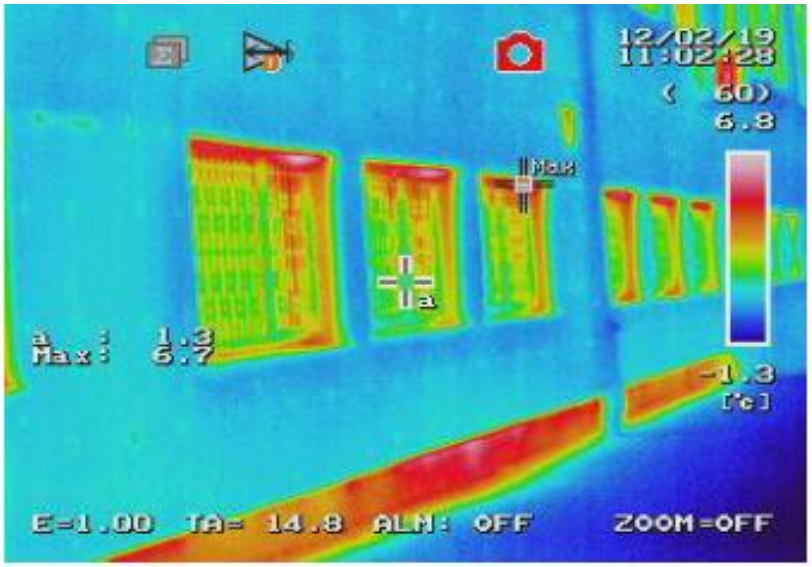
3.1 Audits/Investment planning

Investment and financing plans (in agreement with SEAP/SECAP) are under development for school buildings.

The plans are being developed on the bases of SEAP/SECAP, knowledge of modern technologies (including EMS and BMS systems) and auditing activities (6 audits and 9 energy performance certificates are being issued) - in some cases lack of design copies forces IMP to carry out an inventory.
The final recommendations for city administration are being formulated by expert partner/IMP PAN.

3.1 Audits/Investment planning

The auditing activities were supported by thermovision techniques



Week thermal-isolation of foundation ceiling is evident in this school building

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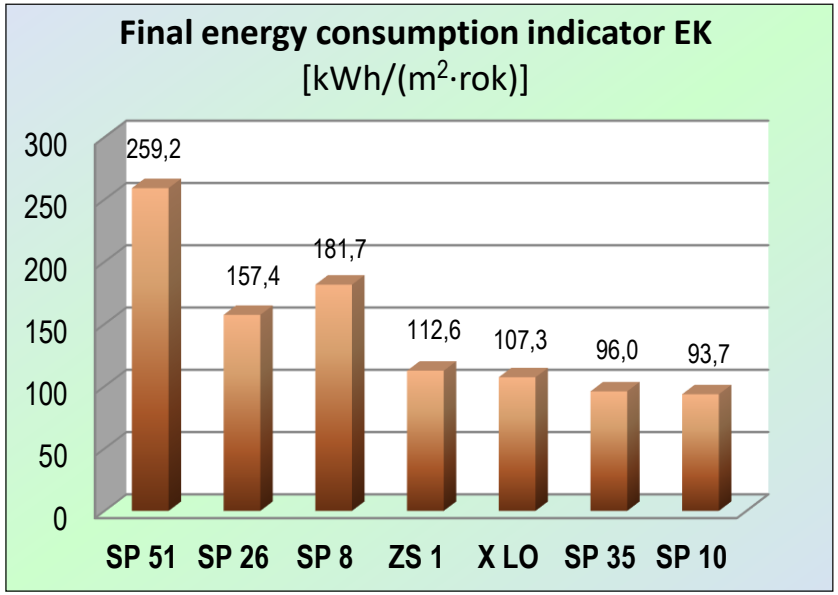
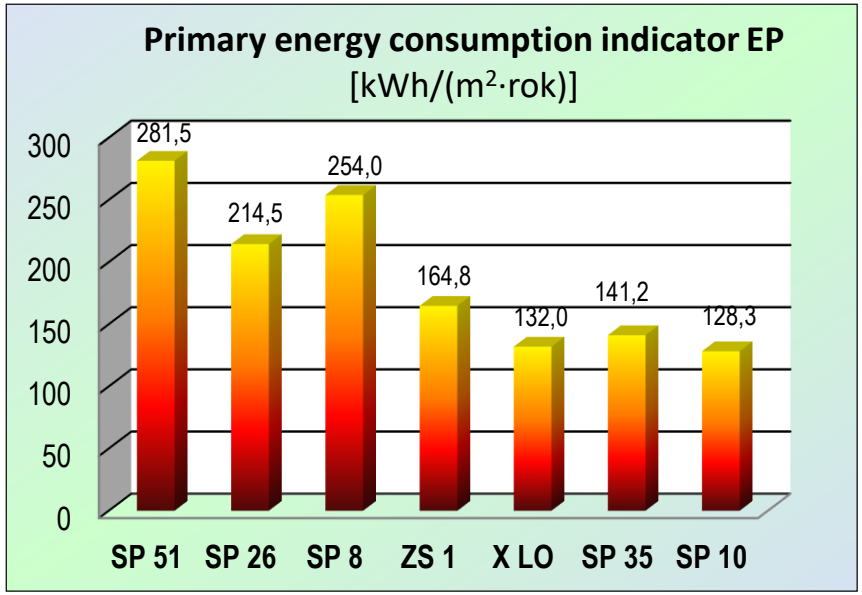
3.1 Audits/Investment planning

The Final and primary energy consumption in audited school buildings





The performer thermomodernization led to significant reduction of energy consumption. However, further reductions of energy consumtion is possible

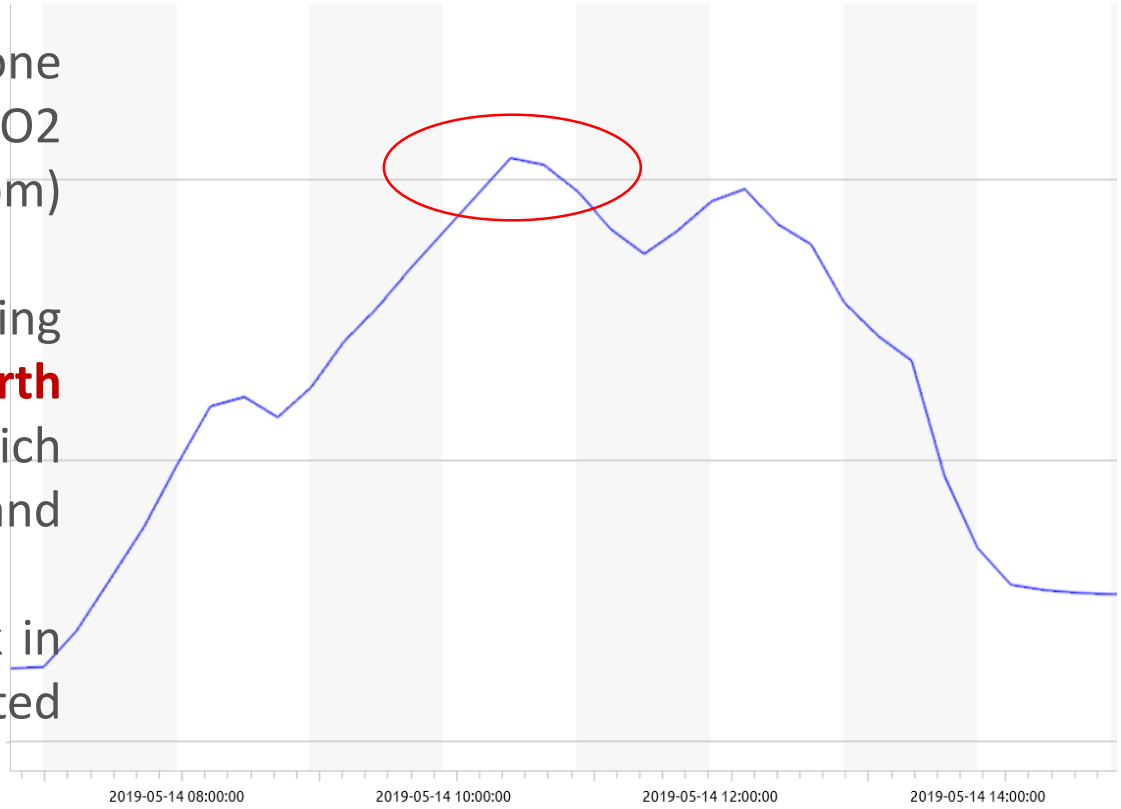
3.1 Audits/Investment planning

General conclusions

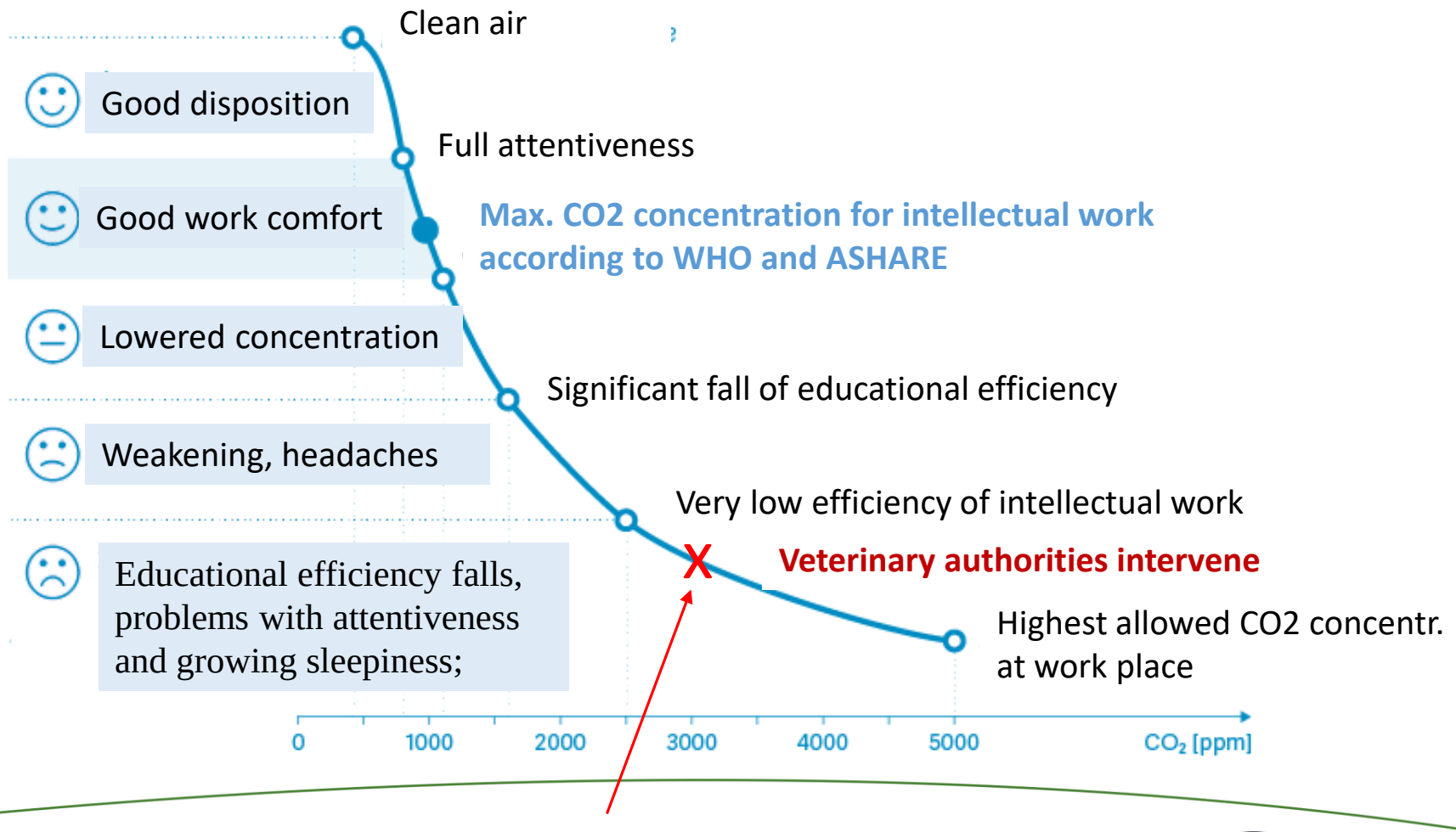
- Some thermomodernized building (in past) were not been isolated adequately but their repeated thermomodernisation is not economically justified
- The renewable energy sources were not installed in the school building even in the cases where it would be economically based
- Windows should be exchange even in thermomodernised building wherever their thermal characteristics are not updated
- There is a need for assessment of substation in school buildings whether they are properly adjusted to changed heat demand of the modernised buildings
- The energy performance of the buildings modernized so far is increasingly dominated by the level of electricity consumption – no thorough improvements were done to reduce the energy used for lighting,

3.2 Monitoring of thermal and air conditions in class-rooms

- Durind auditing activities in one of the school very high CO2 concentration (above 4000 ppm) was registered;
- The school was participating in competition **„Each Watt worth its weight in gold”** which resulted in closed windows and to low ventilation;
- The need for air quality check in class-rooms was communicated to city aythorities.



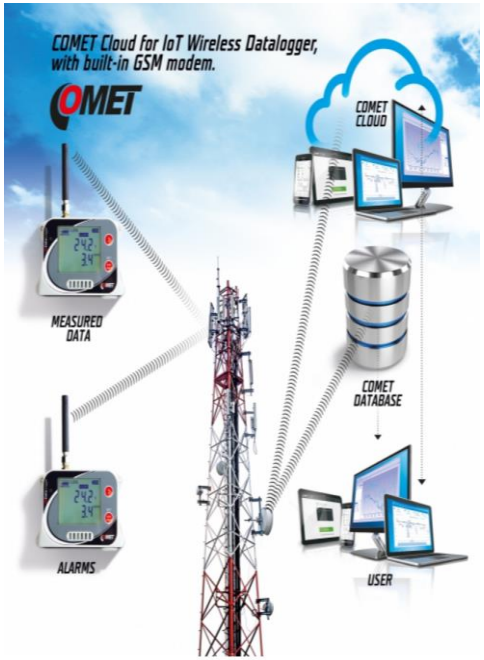
3.2 Monitoring of thermal and air conditions in class-rooms

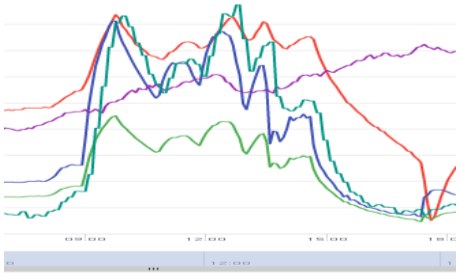


There is no authority which intervene in the case of children !!!!

3.2 Monitoring of thermal and air conditions in class-rooms

In order to assess the thermal and air quality in class-rooms (constantly) Gdynia municipality purchased 4 air condition dataloggers (CO2, humidity, pressure and temperature) which enable online transmission of data to municipality “WEB cloud”





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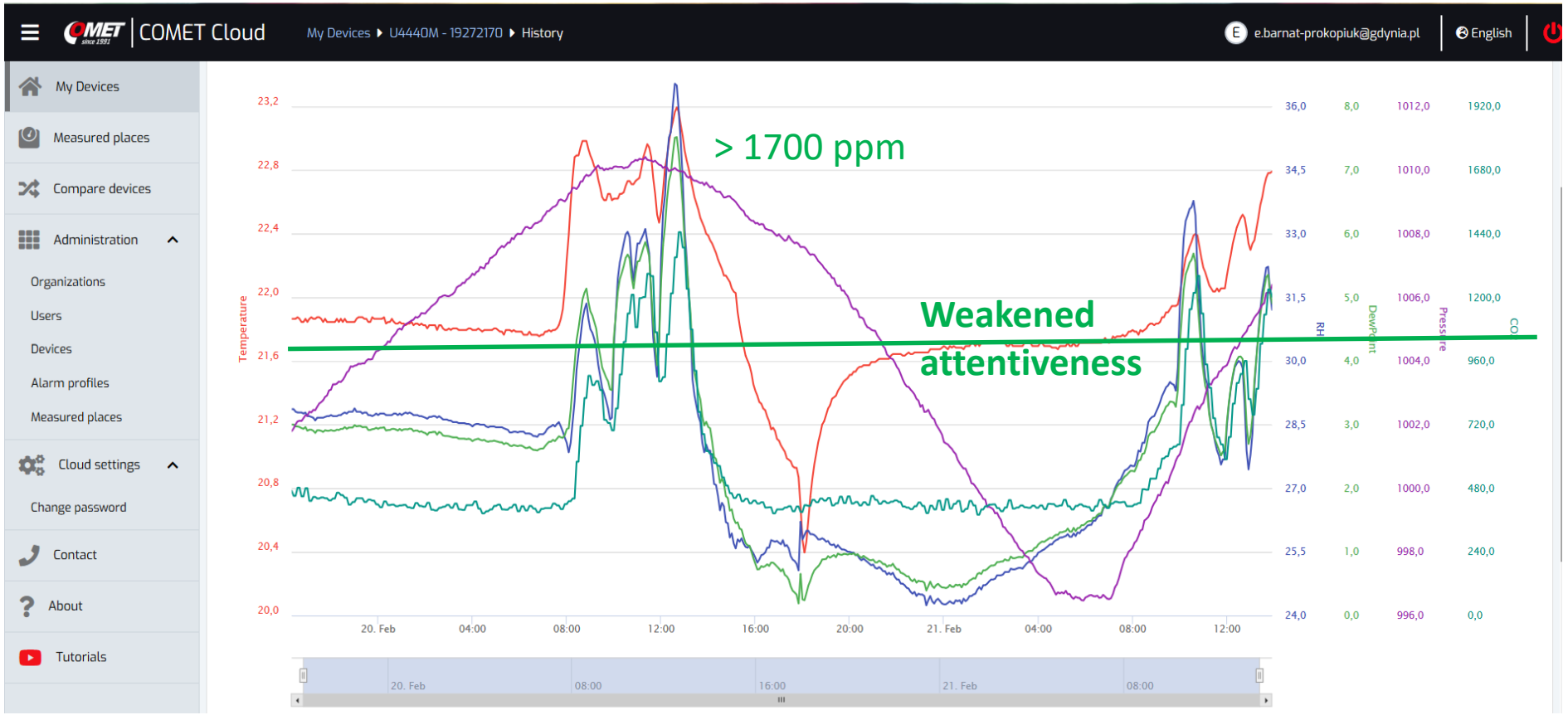

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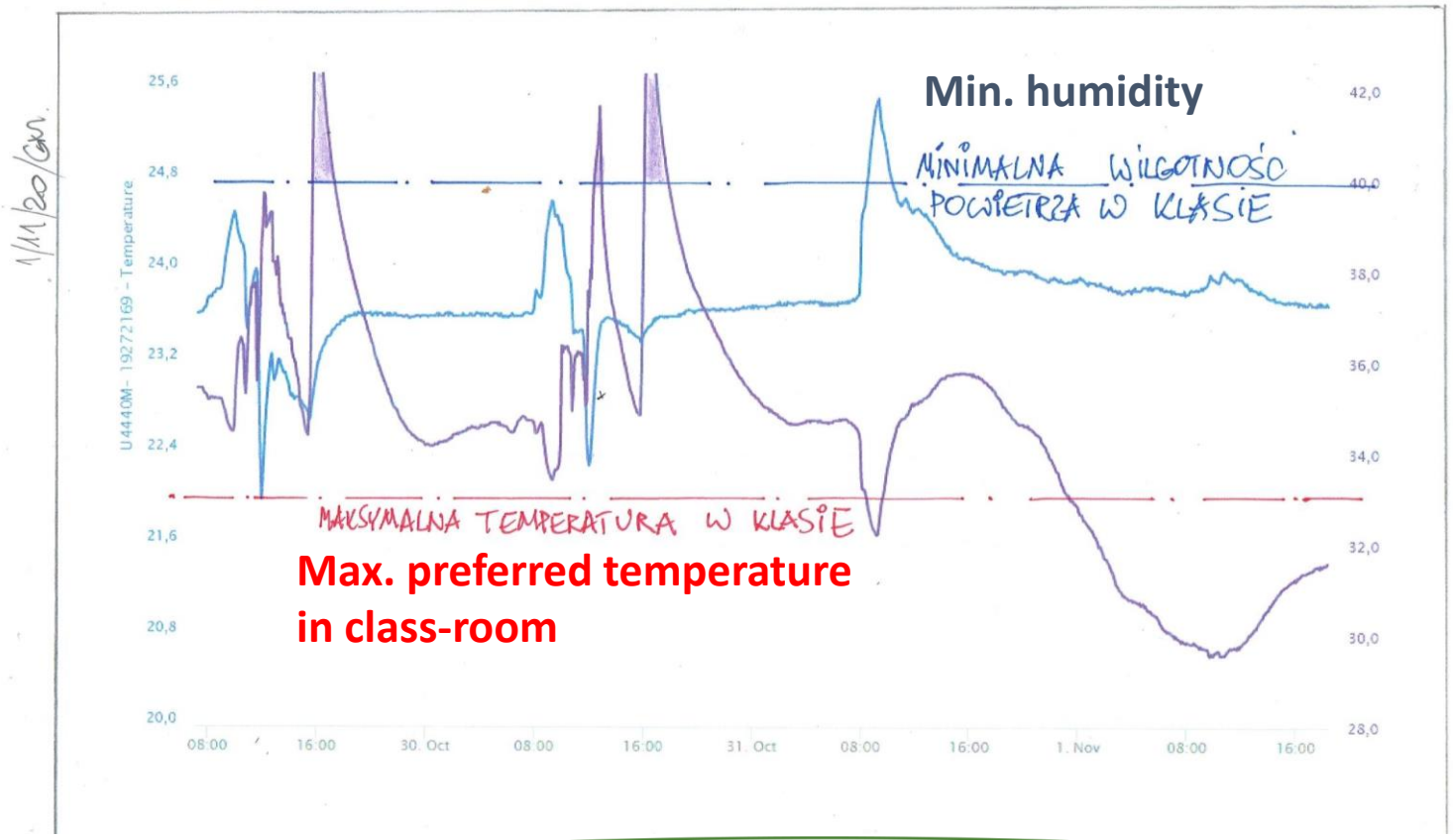
3.2 Monitoring of thermal and air conditions in class-rooms



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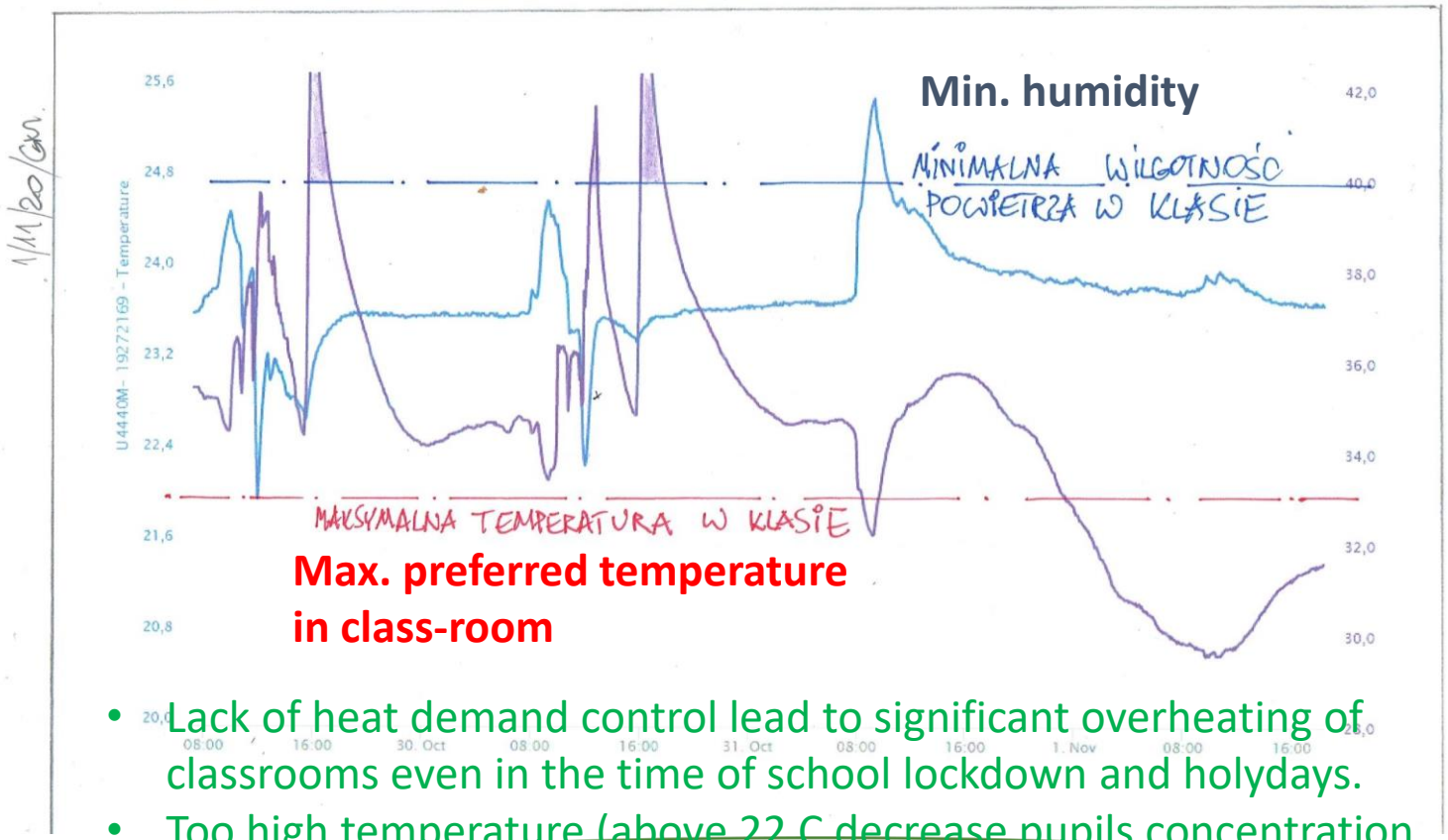

- Lack of heat demand control lead to significant overheating of classrooms even in the time of school lockdown and holydays.
- Too high temperature (above 22 C decrease pupils concentration
- During weekends temperature should be reduced significantly through cutting/limiting heat supply
- The role of online control is evident
- Too low humidity (below 40%) is not healthy

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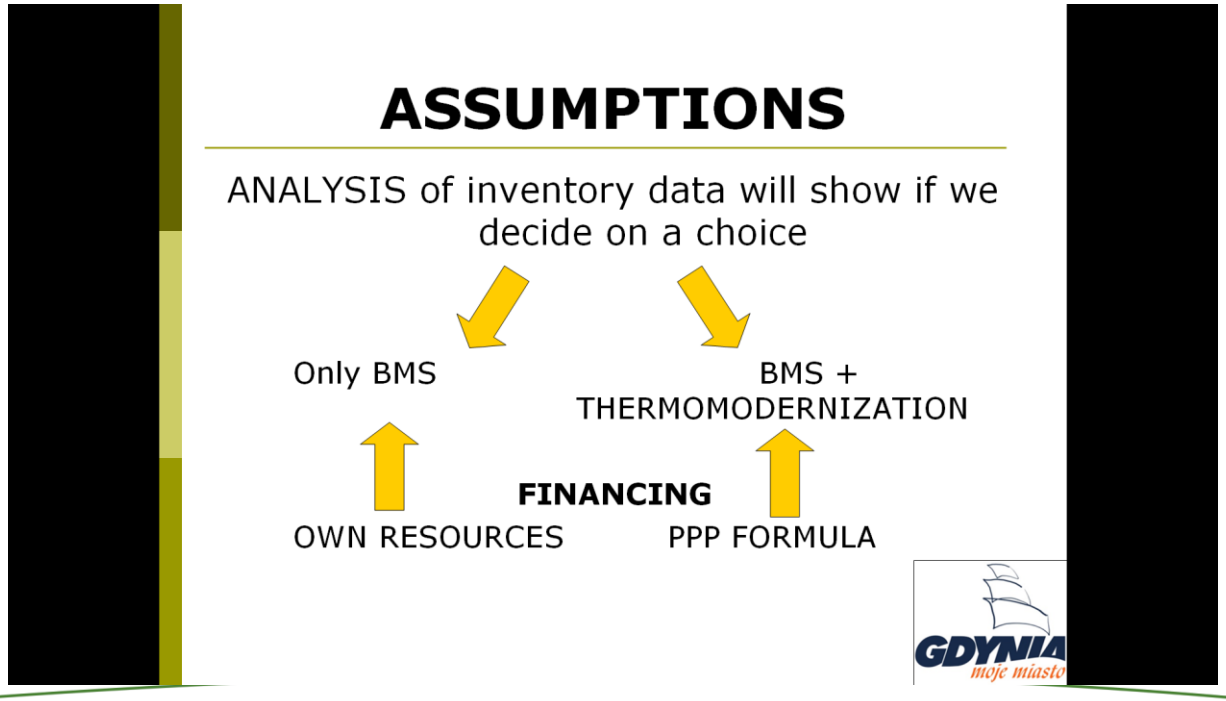
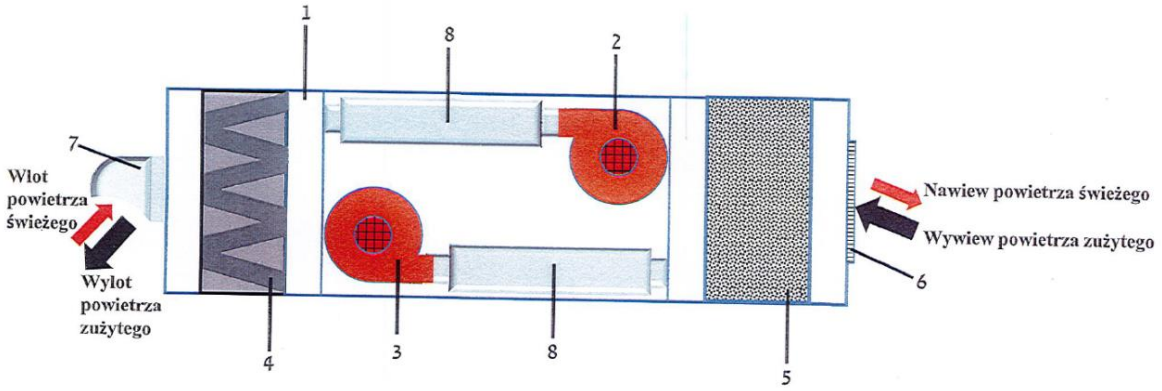
3.2 Monitoring of thermal and air conditions in class-rooms

Gdynia administration already decided to implement pilot BMS systems in 9 educational buildings – the tender procedures are under preparation. Administration took part in Workshop on PPP



3.2 Monitoring of thermal and air conditions in class-rooms

New distributed clima system was developed, enabling efficient air control and ventilation was developed and send to patent office, which takes into account **pandemic conditions**



1. Obudowa
2. Wentylator wywiewny
3. Wentylator nawiewny z tłumikiem
4. Filtr wysokoskuteczny przeciwpyłowy
5. Filtr węglowy / akumulator ciepła
6. Kratka nawiewna / wywiewna
7. Czerpnia / wyrzutnia
8. Tłumik hałasu

KLIMAWENT

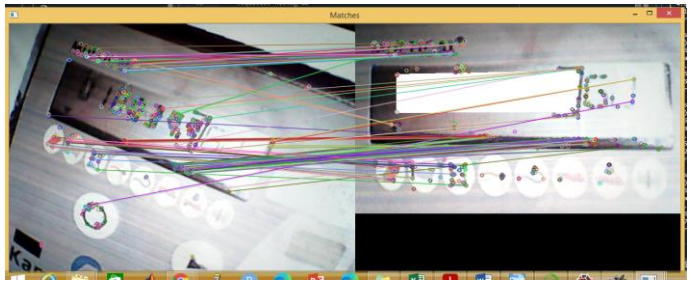
3.3 New monitoring system

Motivation for new system development: lack of understanding of local energy/heat providers for energy efficiency measures

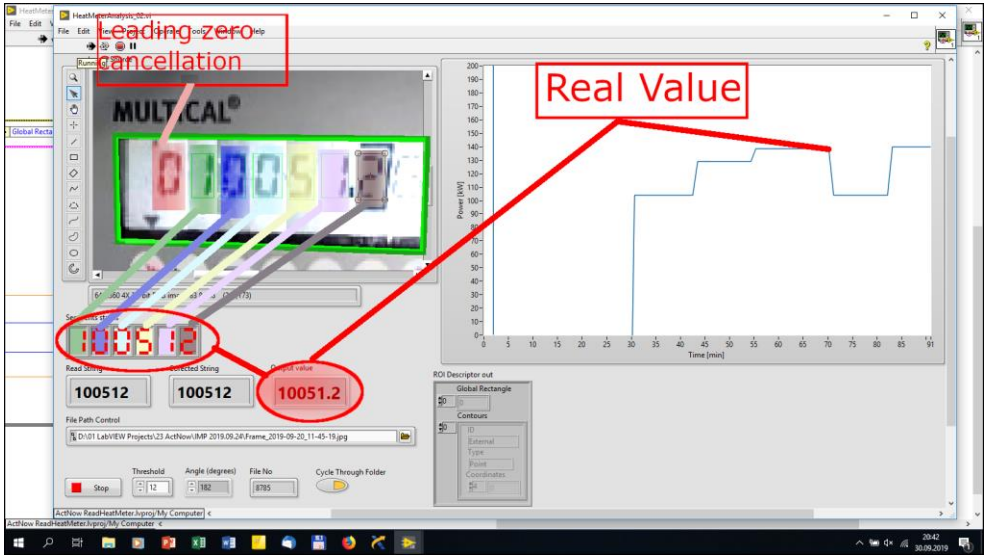
- local energy/heat providers already installed the online monitoring systems but they are not eager to share the knowledge with their clients;
- although the data belongs to clients, cities have not yet exercise their right to get online information from energy/heat providers;
- there is a possibility to get the data online from the installed metering equipment – what is proved by example below
- IMP PAN implemented as ‘proof of concept’ system at its premises to enable easy

3.3 New monitoring system – ’proof of concept’ test stand

- WiFi camera system with lighting diode is placed in front of metering device.
- The picture is send by Ethernet infrastructure to the EMS server and is interpreted/translated to numbers.
- Besides the info on the weather conditions (temperature, and humidity) is assessed
- Data are stored at IMP PAN Cloud and could be used by authorized staff members.



- OCR analysis of the video stream for recovering the energy meter displayed values



Heat supply, GJ
date and time

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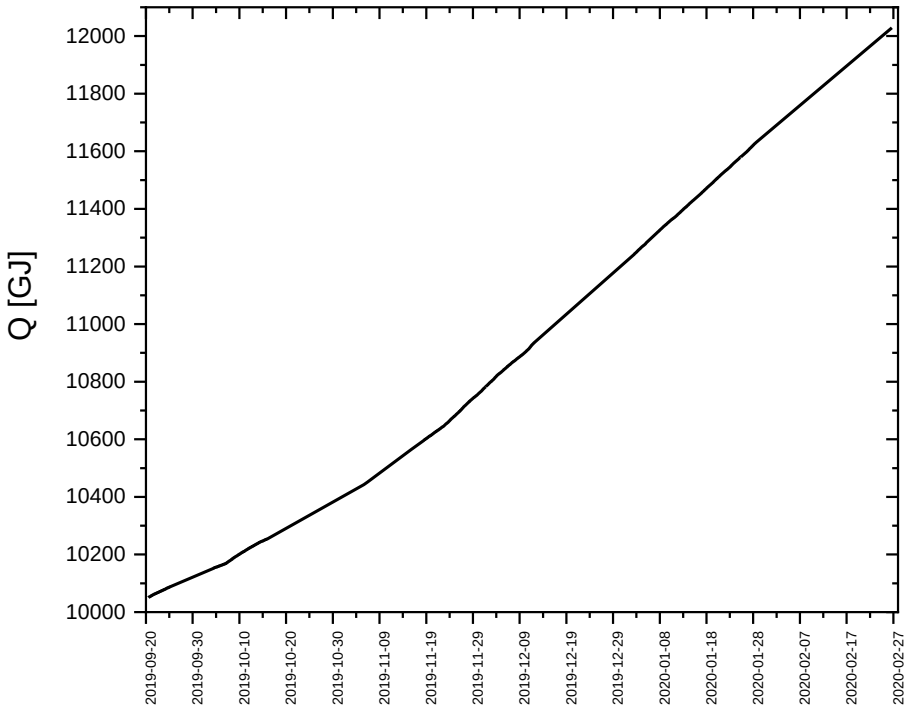
- IMP PAN – First results

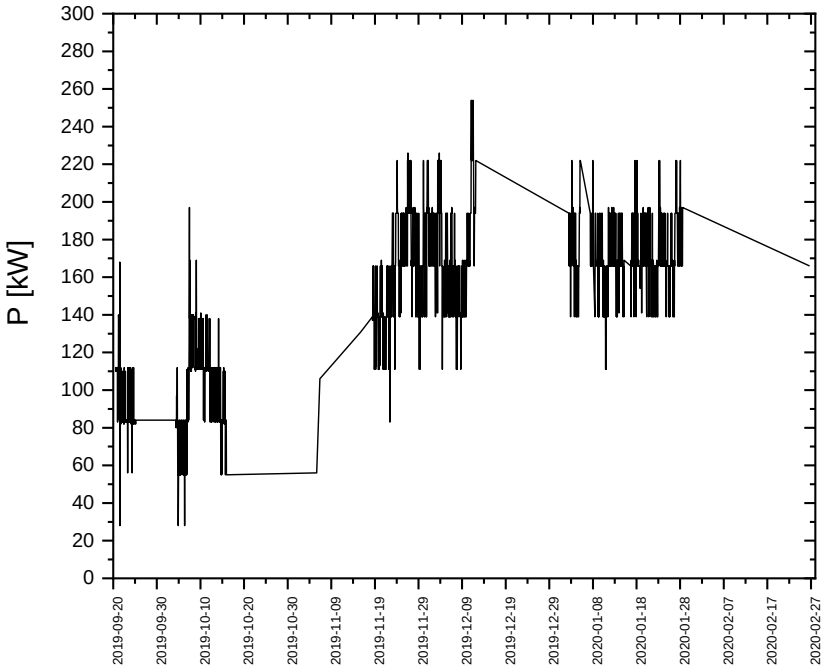
(20.09.2019 – 28.09.2020)

Heat meter :

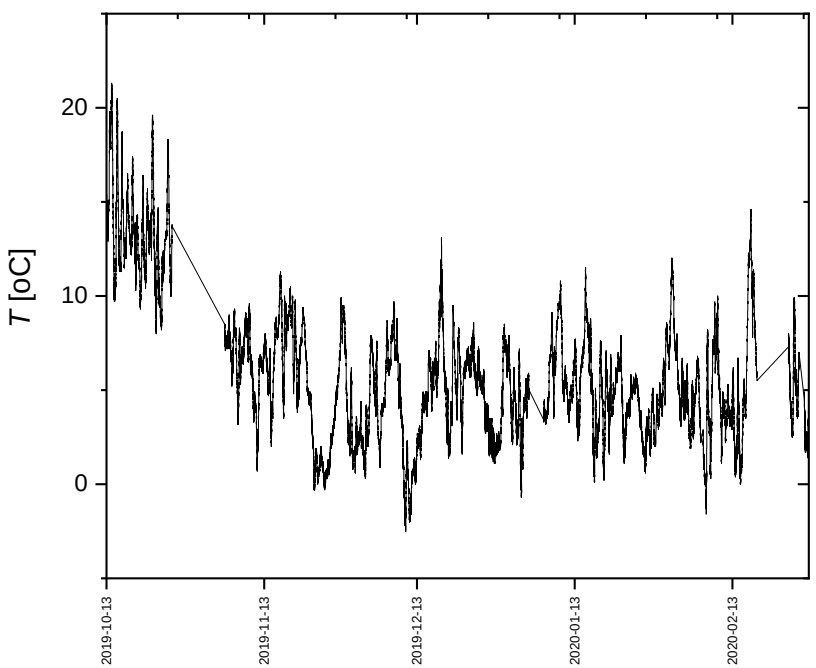


IMP PAN Bulding – 10 390 m2
Energy (132 days) - 2020 GJ
Energy (132 d) – 561,6 MWh
Mean power – 177.2 kW

IMP PAN – calculated power and ambient temperature



(one hour resolution)



(data from the weather station at IMP PAN building)

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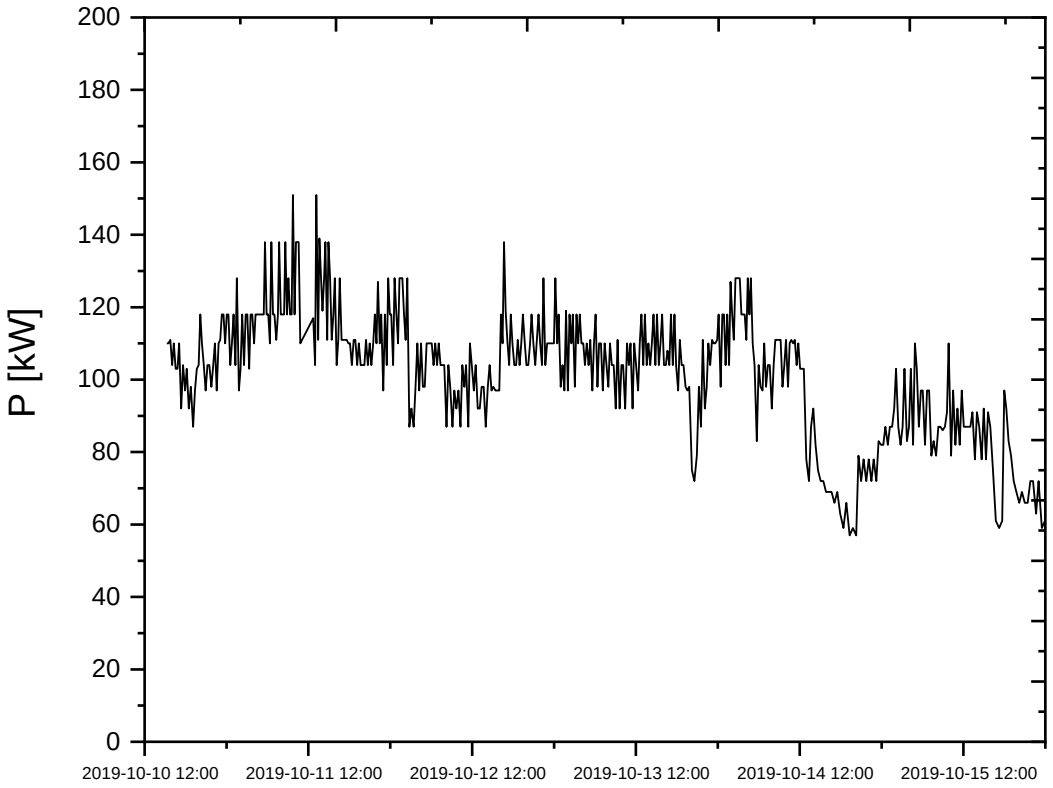
IMP PAN – calculated power (high resolution)



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Conclusions

- Administration place a **key role** in energy transformation and other innovative technologies, but it needs support from local stakeholders to make long term plans and to advance their implementation;
- Local Energy Efficiency Group can support the positive changes
- Modern technologies are ready but their implementation needs promotion, courage and consequence in advancement;
- Thermal renovation is required but it is a long process, nevertheless even in old houses energy efficiency could be improved.

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