

# Opis 3Smart tehničkog rješenja na poslovnoj zgradi EPHZHB i distribucijskoj mreži

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Javno predstavljanje 3Smart pilot projekta u Bosni i Hercegovini

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# Poslovna zgrada EPHZHB



## Postojeće stanje

- Zgrada proizvodnje, Vučiji brig b.b., 88240 Tomislavgrad
- 1000 m<sup>2</sup>
- Prizemlje i 1. kat
- Uredski prostori, sala za sastanke, prostorija nadzorno - upravljačkog centra, IT prostori, pomoćni prostori
- Objekt u funkciji od 2013. godine

# Poslovna zgrada EPHZHB

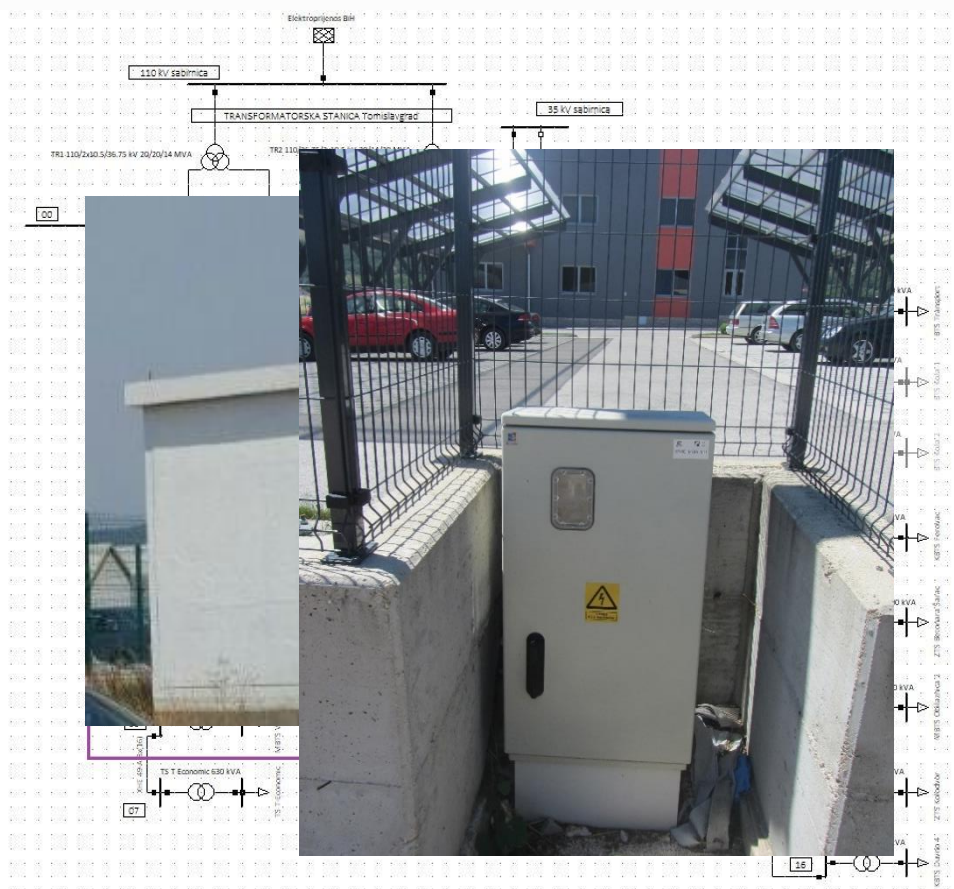


## Postojeće stanje

- Kod priprema medija za grijanje i hlađenje prostora u objektu se koriste 2 izvora
- Primarni izvor energije za grijanje i za hlađenje je dizalica topline YORK YLHA 80T
- Sekundarni izvor energije za grijanje je električni termo-blok Termo Extra 88 kW
- Distribucija toplinske energije u objektu se izvršava korištenjem parapetnih ventilokonvektora YORK YFCN te stropnih ventilokonvektora YORK YHK
- Za salu za sastanke u prizemlju i prostoriju nadzorno-upravljačkog centra na katu je omogućen dovod svježeg zraka preko dvije klima-komore tipa PKU-1



# Distribucijska mreža



## Postojeće stanje

- JP Elektroprivreda Hrvatske zajednice Herceg Bosne d.d. Mostar – Poslovnica Elektro Tomislavgrad
- TS Tomislavgrad 110/35/10(20) kV
- KO Latice - SN 10 kV izvod koji primarno napaja MBTS Vučiji Brig 10(20)/0,4 kV – trafostanica lokacije pilota; moguće napajanje i preko KO Plastika
- Iz MBTS Vučiji Brig se rasprostire 0,4 kV NN kabel do SPMO – priključno mjesto zgrade proizvodnje
- Prikazani SPMO će realizacijom projekta 3Smart postati susretno mjesto priključka (eng. Point of Common Coupling) – mjesto razmjene energije s jedne strane skupa trošila (poslovna zgrada EPHZHB), distribuirane proizvodnje (FNE Vučiji Brig), spremnika energije (baterijski sustav) te distribucijske mreže s druge strane



# 3Smart EMS koncept

## Razina zone

### Upravljanje toplinskom energijom grijanja/hlađenja u pojedinim prostorijama

- Cilj: Čim manja cijena korištenja toplinske/rashladne energije
- Uvjeti: održavanje temperatura prostorija u intervalu udobnosti dok god je moguće
- Koordinacija s centralnom HVAC razinom:
  - Preuzeto: Optimirane cijene korištenja toplinske energije po trenutcima, 12-36 sati unaprijed, kvant 15 minuta
  - Dano: Predviđanja potrošnje toplinske energije i temperature zraka svih zona, 12-36 sati unaprijed

# 3Smart EMS koncept

## Centralna HVAC razina

### Upravljanje polaznom temperaturom pripremljenog medija prema zgradi

- Cilj: Čim manja ukupna cijena korištenja električne energije
- Uvjeti: Omogućiti svim zonama kondicioniran medij za ostvarenje optimalnih toplinskih zahtjeva
- Koordinacija s razinom zona (navedeno)
- Koordinacija s razinom mikromreže:
  - Preuzeto: Optimirane cijene korištenja električne energije
  - Dano: Predviđanje potrošnje električne energije

# 3Smart EMS koncept

## Razina mikromreže

### Upravljanje energijom razmjene između baterijskog sustava i ostatka zgrade

- Cilj: Čim manji ukupan združeni trošak električne energije zgrade i trošak degradacije baterije
- Uvjeti: Ugovor o pružanju usluga odgovora potražnje; stanja napunjenosti baterije unutar granica

### Optimalni angažman upravljivog ostatka sustava, u skladu s preuzetim cijenama i uvjetima razmjene energije s mrežom

- Uzete u obzir neupravljiva potrošnja električne energije zgrade te proizvodnja fotonaponskih panela



# 3Smart EMS koncept

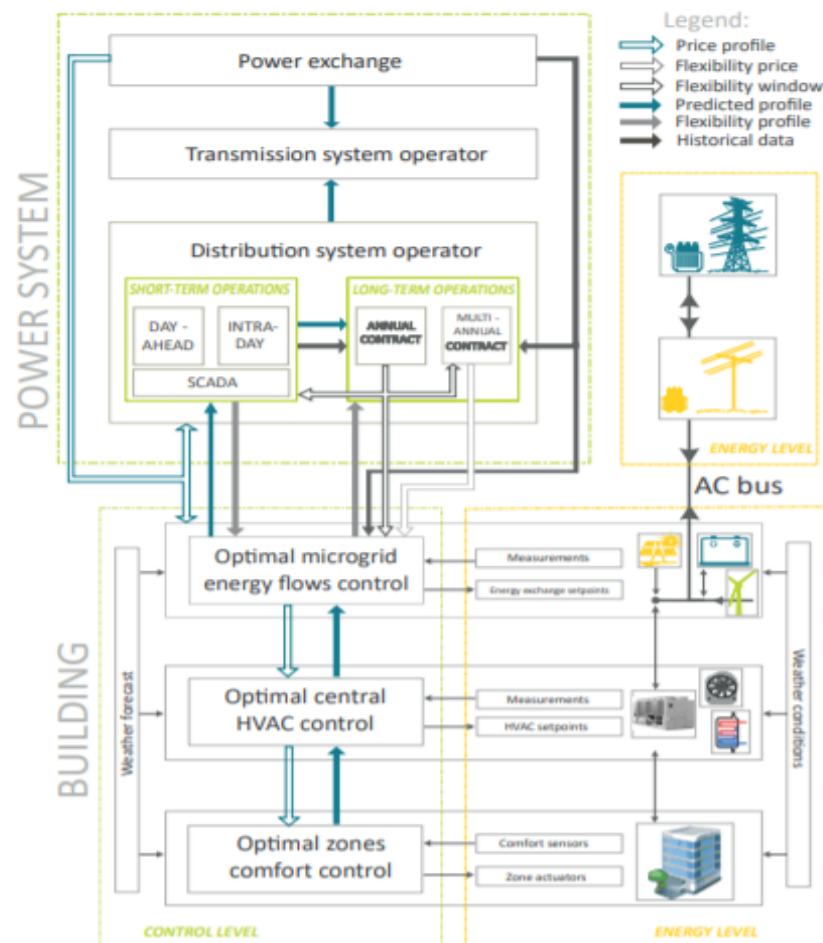
## Distribucijska mreža – Operator distribucijskog sustava

Izazovi u radu operatora distribucijskog sustava su:

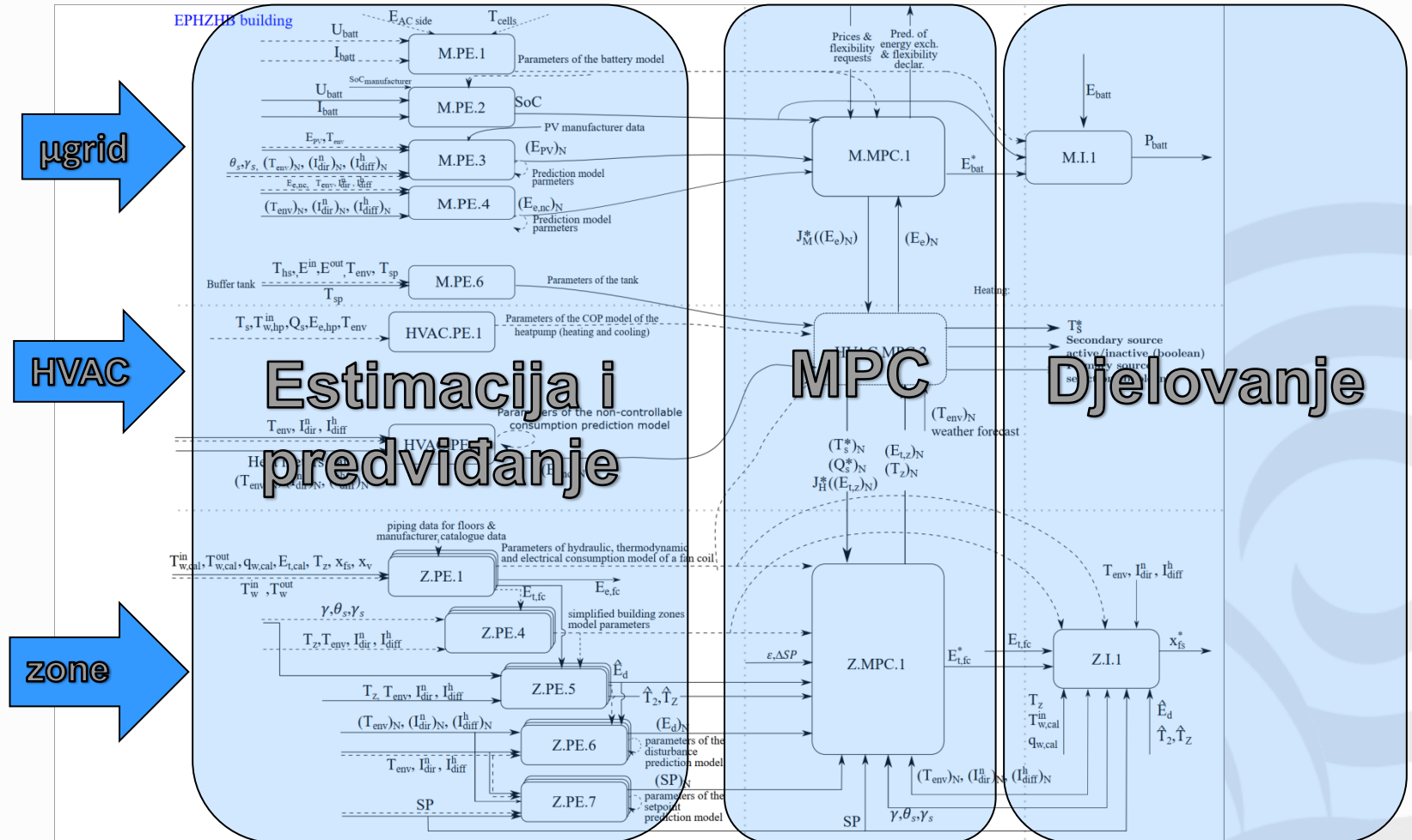
- sigurna, pouzdana i kvalitetna isporuka električne energije krajnjim kupcima
- smanjenje gubitaka
- rad distribucijske mreže sa integriranim distribuiranim izvorima

Operator distribucijskog sustava želi koristiti usluge distribuiranih izvora i aktivnih subjekata u mreži kad je to ekonomičnije u odnosu na investicije u pojačanje mreže

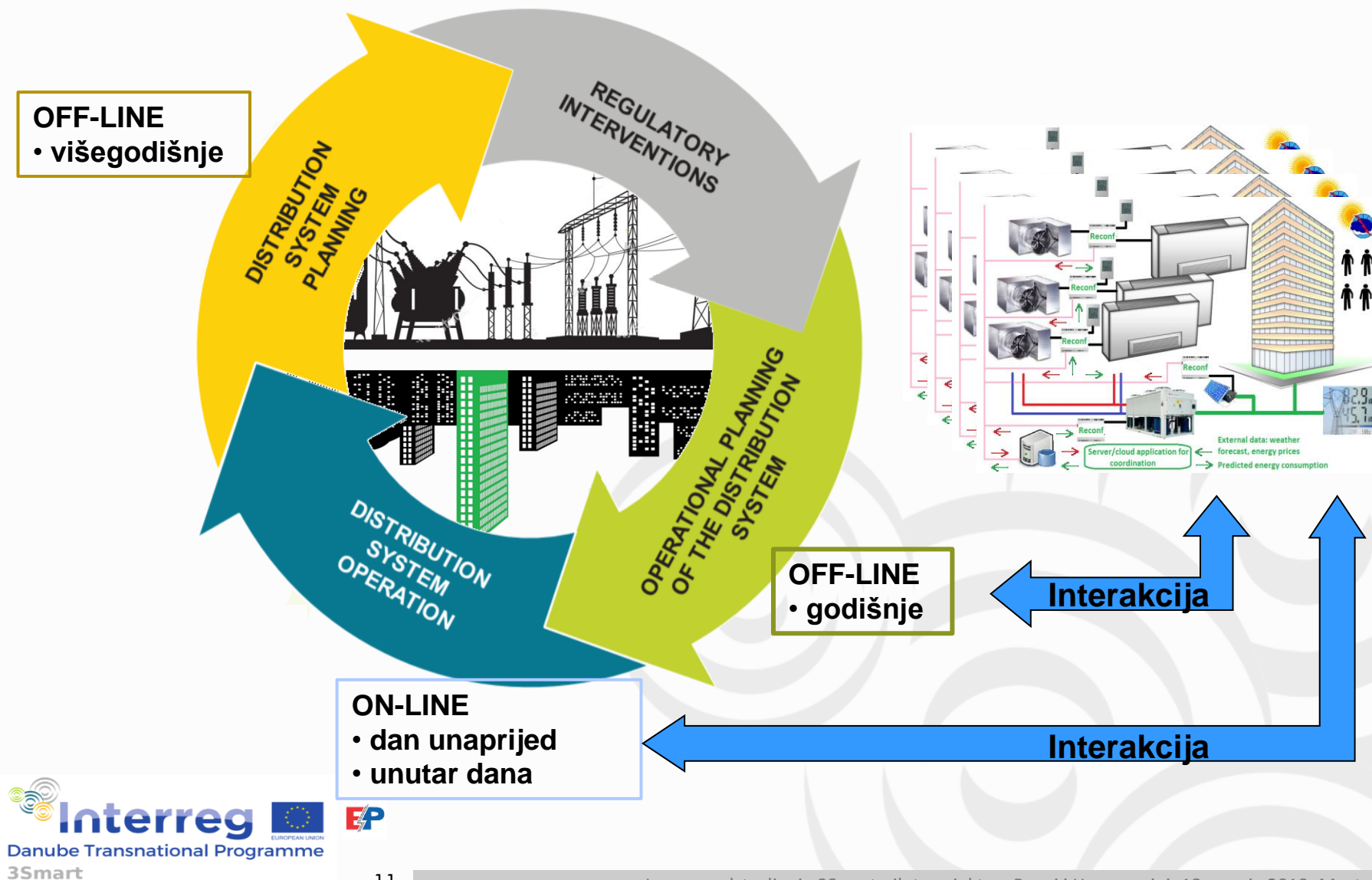
# 3Smart EMS koncept



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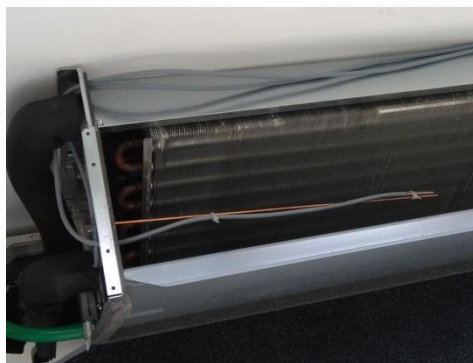
# 3Smart EMS koncept



# Zahtjevi za intervencijama na poslovnoj zgradi EPHZHB i distribucijskoj mreži

- Programski odabir dijelova zgrade koje se koordinira
  - odabir do razine pojedinačnih soba ili grupa soba
- Jednostavan i automatiziran povratak na klasično upravljanje ako je potrebno
  - upravljačke akcije s vremenskim tragom
- Uzorkovanje podataka iz zgrade s vremenskom rezolucijom  $\sim 1$  min u 3Smart bazu podataka
- Upravljačke naredbe iz 3Smart baze podataka propagiraju do krajnjih uređaja u sustavu automatizacije u zgradi
  - neremećenje lokalnih upravljačkih petlji HVAC/ $\mu$ grid

# Intervencije na poslovnoj zgradi EPHZHB



## RAZINA ZONA

- Osjetnici temperature za mjerenje povratne temperature medija i za mjerenje temperature odlaznog zraka ventilokonvektora, QAP1030.200
- Kontroleri za upravljanje radom ventilokonvektora DXR2.E09
- Kontroleri za upravljanje radom klima komora DXR2.E18
- Sobne jedinice QMX3.P34 i QMX3.P74



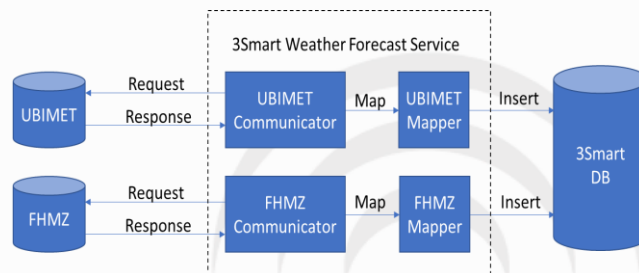
# Intervencije na poslovnoj zgradi EPHZHB



## CENTRALNA HVAC RAZINA

- Kalorimetri UH50 za dizalicu topline, električni termo-blok te na polazu iz inercijskog spremnika prema potrošačima u zgradi
- Kalorimetri UH50 za klima komore, za potrošače u prizemlju i potrošače na katu

# Intervencije na poslovnoj zgradi EPHZHB



## RAZINA MIKROMREŽE

- FNE Vučiji Brig 49,8 kWp:  
166 FN panela MEPV Turbo Superior 300;  
inverteri Symo 2x20 kW i 1x10 kW
- Multifunkcijska kompaktna brojila električne energije SENTRON PAC 3200 i 2200
- Piranometri SMP6-V za mjerenje razine Sunčeva zračenja
- Vremenska prognoza 72h unaprijed - FHMZ i UBIMET

# Intervencije na poslovnoj zgradi EPHZHB

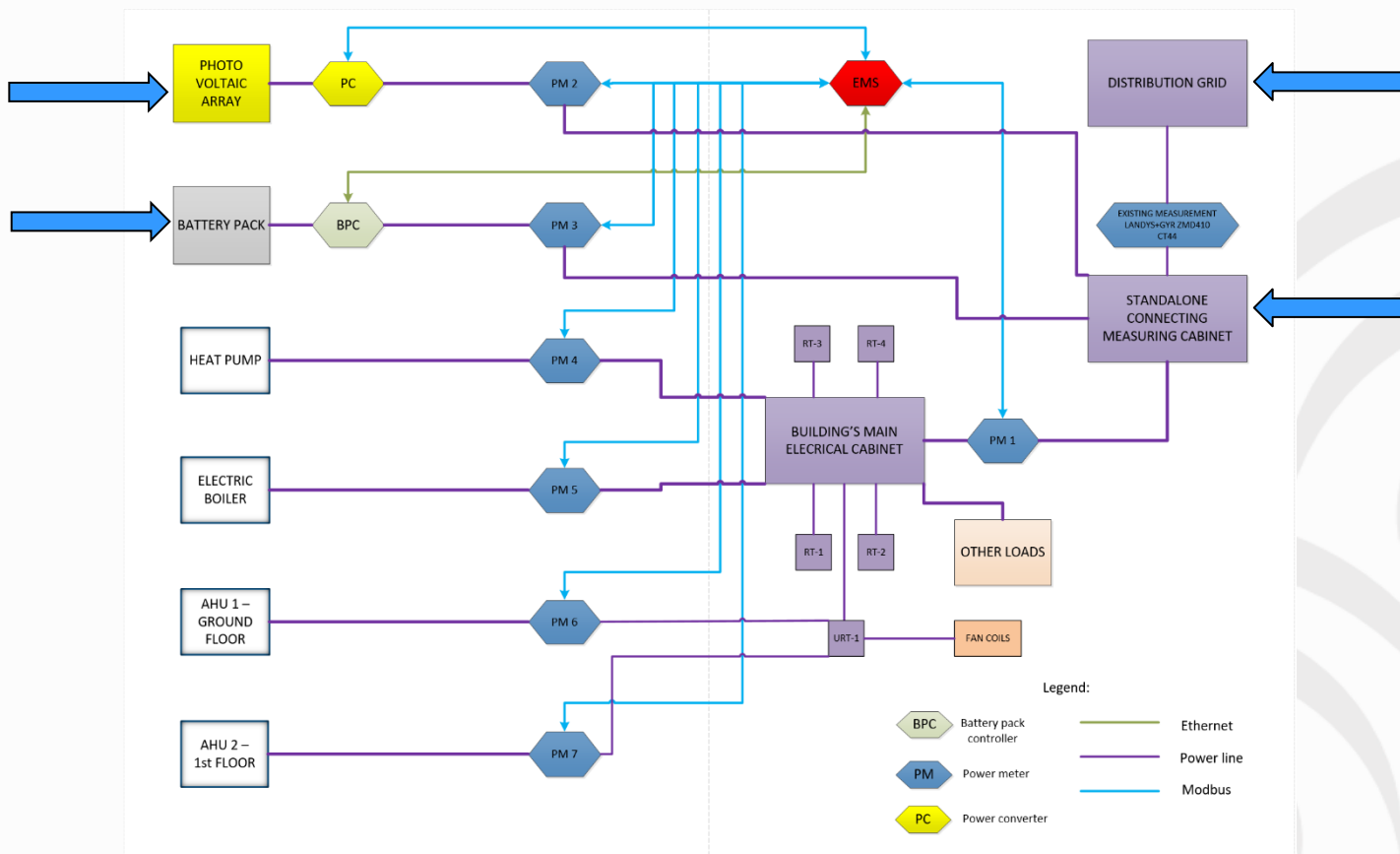


## RAZINA MIKROMREŽE

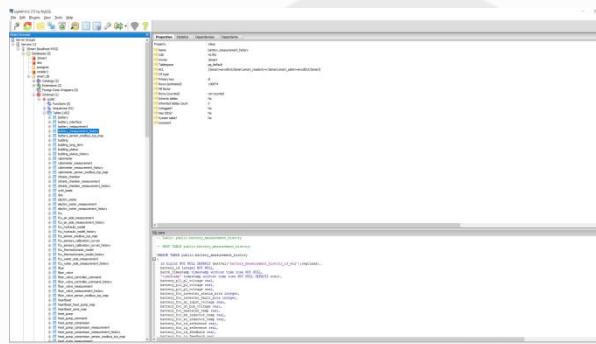
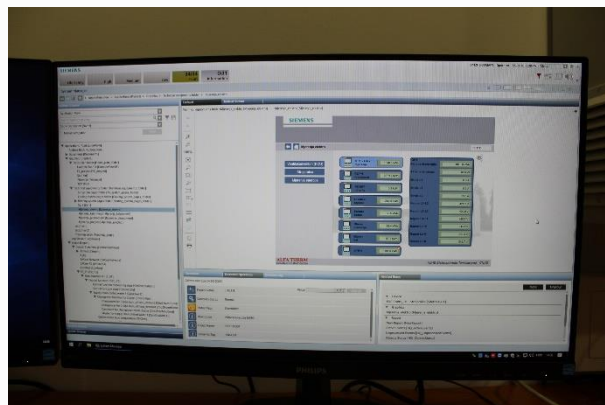
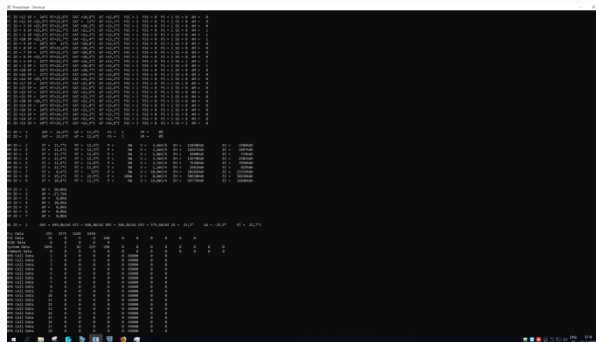
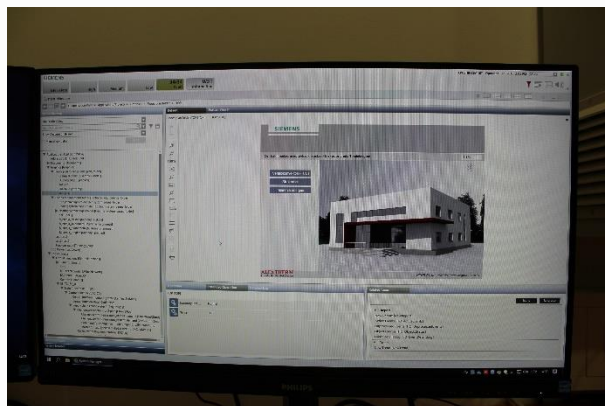
- Baterijski sustav 32 kWh, 10 kW: 100 litij-ionskih ćelija  $\text{LiFePO}_4$  sa jediničnim kapacitetom 0,32 kWh – ukupni kapacitet 32 kWh; 1xDC/AC inverter Open4Lab snage 10 kW

# Intervencije na poslovnoj zgradi EPHZHB

## MIKROMREŽA NA LOKACIJI POSLOVNE ZGRADE EPHZHB U TOMISLAVGRADU



# Intervencije na poslovnoj zgradi EPHZHB



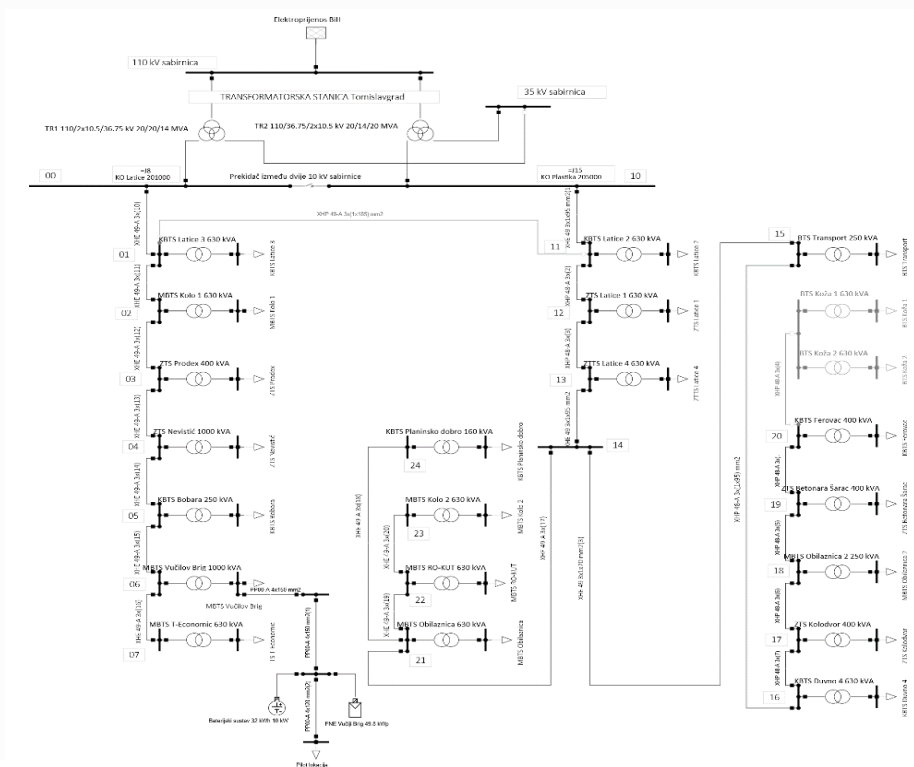
## IT

- SCADA računalo
- SCADA Desigo CC
- 3Smart računalo EMS
- Aplikacija za prijenos podataka BMS – 3Smart baza podataka
- PostgreSQL baza podataka




# Intervencije u distribucijskoj mreži

- Model distribucijske mreže kod lokacije pilota izrađen u programskom alatu DlgSILENT Power Factory
- Rezultate proračuna koriste moduli sa strane mreže








Programme co-funded by European Union funds (ERDF, IPA, ENI)

# Newsletter No.4



**PILOT IN BOSNIA AND HERZEGOVINA: JP EPHZHB d.d. Mostar, Vuciji Brig b.b., 80240 Tomislavgrad**

**Basic facts and initial state:**

- 26 controllable heating/cooling zones over 2 floors, covering area of about 1.000 m<sup>2</sup>
- Heating and cooling system with 29 fan coils; digital room climate control
- Heating energy supplied from the heat pump with 75 kW nominal heat power (27 kW nominal electric power) and electrical boiler with 88 kW nominal heat and electrical power; cooling energy supplied from the heat pump with 73 kW nominal cooling power (27 kW nominal electric power)

**Total cost of the investment:**  
226.500 EUR, of which 192.500 EUR funded from the Interreg Danube Transnational Programme

**3Smart investment:**


- PV plant 49,8 kWp, battery storage system 32 kWh/10 kW lithium-ion with controllable charging/discharging power
- Heat meters for measuring heating/cooling energy, temperatures, flow for several key points, electrical energy meters for measuring parameters of electrical energy for several key points
- Compact room automation stations for fan coil control, room operator units for fan coils, compact room automation stations for air handling units control, room operator units for air handling units control
- Pyranometers for extraction of direct and diffuse component of solar irradiance from 2 measurements of global solar irradiance, weather forecast service for prediction of direct and diffuse component of solar irradiance
- DDC equipment
- Building management system – SCADA
- 3Smart database as a data source/sink for the 3Smart Energy Management System (EMS) with integrated all relevant data including data exchange with the grid to implement demand response
- Simple, robust and modular changeover (soft switch) between the mode in which climate control is performed on a classical decentralized way as up to now, and the mode in which the newly introduced 3Smart EMS can through its open two-way database issue commands towards the key actuating variables in the building

**Application of the 3Smart tool on-site:**

- Coordinated
  - (building zone level) predictive control of energies used for cooling/heating individual rooms
  - (central HVAC system level) predictive control of starting temperatures for the heating and cooling medium for the building and shaping optimal energy-exchange profile with the district heating grid
  - (microgrid level) predictive control of the battery system charging / discharging energy that implements control of energy exchange profile with the electricity grid including demand response
- which maintain comfort as required by the end-users and minimize the building energy costs
- Auxiliary prediction and estimation procedures which as a side-effect facilitate and enhance building maintenance
- Interfacing procedures to implement computed commands on existing actuating equipment

**Expected effect:**


Decrease of electrical power peak of the building; decrease of electrical energy consumption of the building; decrease of electrical energy usage from the grid by using electrical energy from PV plant and battery storage system when technically and economically justified



**Please follow further news regarding the event on 3Smart webpage**


Public presentation will be held on: 18 July 2019

**SAVE THE DATE**



Programme co-funded by European Union funds (ERDF, IPA, ENI)

# Newsletter No.4



**PILOT IN BOSNIA AND HERZEGOVINA: Electricity distribution grid of JP EPHZHB d.d. Mostar, around pilot building**

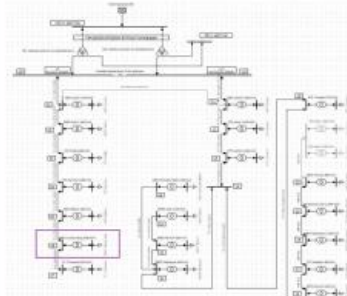
**Basic facts and initial state:**

- Pilot location is connected to low voltage network which is supplied from substation 10(20)/0,4 kV. Substation is part of 10 kV MV feeder
- EPHZHB building has its own metering point towards the distribution system operator (DSO)
- The power exchange market in Bosnia and Herzegovina is not yet established
- EPHZHB has professional tool for grid modelling which is used for grid-side modules
- The DSO does not have the tools (and does not do it in real-life) for optimizing grid planning by taking end-users flexibility into account. There is no methodology for encouraging end-users to exhibit flexibility to help the grid (and the DSO)

**Total cost of the investment:** 3.000 EUR, of which 2.550 EUR funded from the Interreg Danube Transnational Programme

**3Smart investment:**

- Creation of grid model for implementing long-term and short-term 3Smart grid management modules



**Application of the 3Smart tool on-site:**

- Short-term modules:
  - Day-ahead module for optimal management of building flexibility, driven by long-term contract with the DSO
- Long-term modules:
  - Annual: Contracting flexibility provided by end-users, defining reservation and utilization costs and "negotiating" these with the end-users
  - Multiannual: Defining the need for flexibility in the distribution network based on investment triggers

**Expected effect:** More efficient planning and operation of the distribution network, concept for the methodology to encourage the end-users to assist the system, reduction of end-users' electricity bills due to flexibility services for the DSO

Public pilot presentation date: 18 July 2019

