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CONCERTED ACTION
ENERGY EFFICIENCY
DIRECTIVE

Energy Management Information System in Croatia

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Croatian Government Real Estate Agency

5th Plenary Meeting Concerted Action on the Energy Efficiency Directive

Working Group 5.3 Establishing baselines and systems to track the various public body targets

Systematic energy management in Croatia

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Energy Efficiency Act

Measure EnU-7 from Croatian Integrated National Energy and Climate Plan

The public sector in Croatia is obliged by Energy Efficiency Act to systematically manage energy
The basis of the measure is the Energy Management Information System,

Web application: www.isge.hr

In use since 2008.

Energy Management Information System EMIS

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- Main Croatian national tool for monitoring and analysis of energy and water consumption data in public sector buildings
  - Additional: public lighting
    vehicle fleet
    multi apartment buildings
    Indoor air quality: temperature, CO2, VOC, relative humidity, PM2.5, PM10…
- Every public institution in Croatia must have appointed Energy manager for systematic energy management
- Based on Energy consumption centre ECC (building, complex, object…) with defined metering points

Energy Management Information System EMIS

CONCERTED ACTION ENERGY EFFICIENCY DIRECTIVE

https://isge.hr/core/firstpage.xhtml

HOME | USERS | OBJECTS | REPORTS AND CHARTS | GEO ADMINISTRATION | ENERGY ADMINISTRATION | ESCO | REMOTE READINGS SENDING | SYSTEM | (10623) | IVA.FAKIN

STATISTICS | STATISTICS OF MY OBJECTS | PERSONAL CHARTS | MAP

EMIS database statistics (14.10.2024.)

ECC type	Number of objects	Number of metering points	Automatic Meters Count	Energy bill count	Number of readings	Number of automatic readings	Sensors count	Number of sensor readings
Complex	1.086	3.123 (29)	455 (3)	632.729	23.583.074	23.200.732	0	0
Building in complex	4.566	5.238 (21)	1.644 (5)	796.868	25.341.869	24.743.507	54	2.056.606
Free-standing building	11.728	27.636 (434)	1.322 (8)	5.771.786	36.377.538	34.253.720	843	27.320.538
Part	4.294	7.513 (22)	419	1.384.599	14.144.595	13.880.716	2.585	119.195.124
Sum - Building stock	**21.674 (16.294)**	**43.510 (506)**	**3.840 (16)**	**8.585.982**	**99.447.076**	**96.078.675**	**3.482**	**148.572.268**
Public lighting	24.279	23.370	2	6.379.672	1.165	0	0	0
Sum	**45.953**	**66.880 (506)**	**3.842 (16)**	**14.965.654**	**99.448.241**	**96.078.675**	**3.482**	**148.572.268**

Criteria for the inclusion of objects in the statistics: must have an EMIS code, must be existing (date of end of existence of the object must be empty), must not belong to the DEMO or TEST projects, object type must have the checkbox "Physical object" checked.

Active EMIS users

Role	Number
Korisnik	803
Energetski menadžer	24
Energetski administrator	143
Administrator sustava	12
KorisnikV3_test	1
Stanar	5
Ukupno	**988**

EMIS Modules – objects, reports

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ENERGY EFFICIENCY
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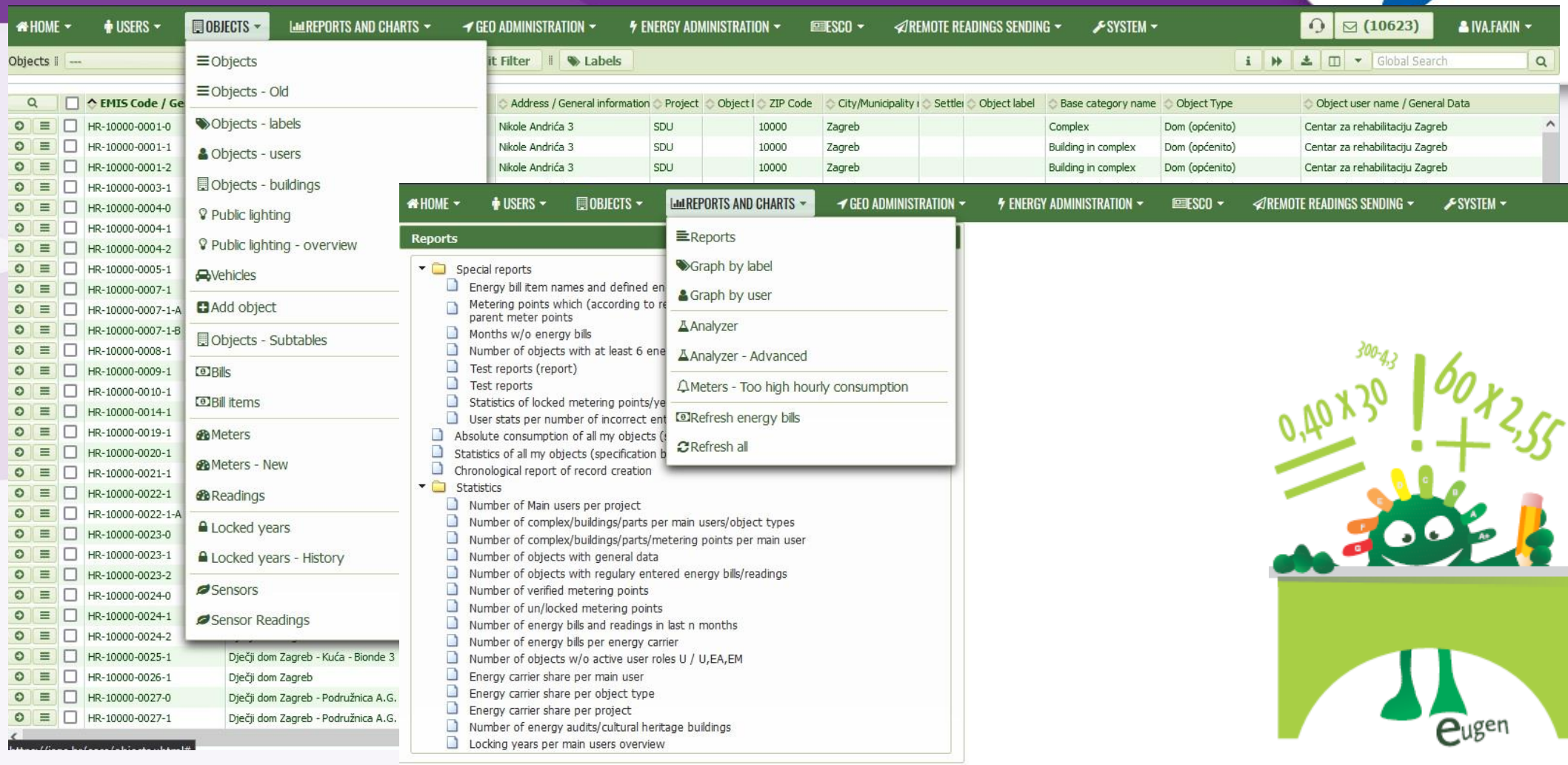

EMIS Dashboard

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HOME | USERS | OBJECTS | REPORTS AND CHARTS | GEO ADMINISTRATION | ENERGY ADMINISTRATION | ESCO | REMOTE READINGS SENDING | SYSTEM | (10623) | IVA.FAKIN

Objects | Učenički dom Varaždin [HR-42000-0036-1]

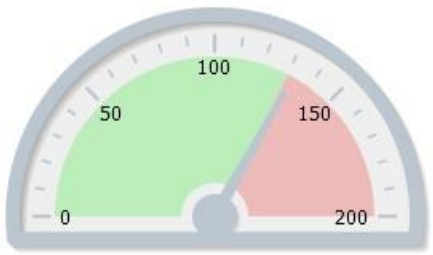
OVERVIEW | APPLICATION USERS | MAP | METERS | BILLS | BILLS WITH ITEMS | BILL CHARTS | READINGS | METER CHARTS | SENSORS | COMBINED CHARTS | INDICATORS | REPORTS

OVERVIEW | GENERAL DATA | ENERGY SYSTEMS DATA | CONSTRUCTION DATA | DOCUMENTS | ENERGY DOCUMENTS | ENERGY RECONSTRUCTION | OBJECT USERS | YEARLY BUDGET

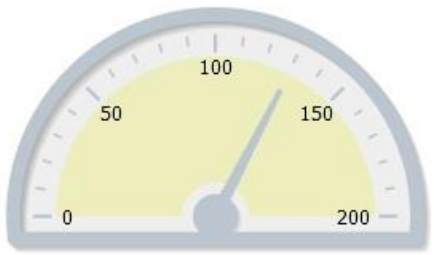
Energy carrier	Meters		
	Serial number	Last energy bill	Last reading
Električna energija	**0300002484** Učenički dom Varaždin	08.2024	23.12.2022. 16:00:00
Prirodni plin	**12645** 033409 kuhinja	08.2024	23.12.2022. 16:00:00
	17949 033410	08.2024	
	21326 033410 033408 grijanje	08.2024	23.12.2022. 16:00:00
Voda	**95667**	08.2024	

General Data	
Object name	Učenički dom Varaždin
EMIS Code	HR-42000-0036-1
Address	Hallerova Aleja 2
City	42000 Varaždin
County	Varaždinska županija
Object user	
User	Učenički dom Varaždin
Main User Name	Varaždinska županija
Contact person (EMIS)	
Contact person	Ines Zeljko
Telephone	042 331 575
Mobile phone	
E-mail	info@ucenickidom-vz.hr

Energy input [kWh/m²a] in 2023



Average energy input in 2023 for object type Đački i studentski dom



EMIS Modules - charts

CONCERTED ACTION ENERGY EFFICIENCY DIRECTIVE

HOME | USERS | OBJECTS | REPORTS AND CHARTS | GEO ADMINISTRATION | ENERGY ADMINISTRATION | ESCO | REMOTE READINGS SENDING | SYSTEM | (10623) | IVA.FAKIN

Object users

- Državni ured
- Grad
- Ministarstvo
  - Ministarstvo financija
  - Ministarstvo gospodarstva
  - Ministarstvo hrvatskih branitelja
  - Ministarstvo kulture i medija
  - Ministarstvo mora, prometa i infrastruktur
  - Ministarstvo obrane
  - Ministarstvo poljoprivrede, šumarstva i ribi
  - Ministarstvo pravosuđa, uprave i digitalne
  - Ministarstvo prostornoga uređenja, gradit
  - Ministarstvo rada, mirovinskog sustava, ob
  - Ministarstvo regionalnog razvoja i fondova
  - Ministarstvo turizma i sporta
  - Ministarstvo unutarnjih poslova
  - Ministarstvo vanjskih i europskih poslova
  - Ministarstvo zdravstva
  - Ministarstvo znanosti, obrazovanja i mladih
- Općina
- Ostalo
- Privatno
- Tijela javne vlasti
- Županija

CHARTS | CHARTS - NEW | LOCKING OVERVIEW | COMBINED CHARTS | REPORTS

Year range

Range: All One Year:

2007 2007 - 2024 2024

Filtar energenata

All energy carriers: All energy carriers

Energy carriers groups: Električna energija | Grijanje | Voda

Energy carriers: Električna energija | Prirodni plin | Toplina | Para | Loživo ulje ekstra lako | Loživo ulje lako | Voda

Meters

Odabir vrste grafova

ABSOLUTE VALUE | INDICATORS | ET | CUSUM

Absolute value

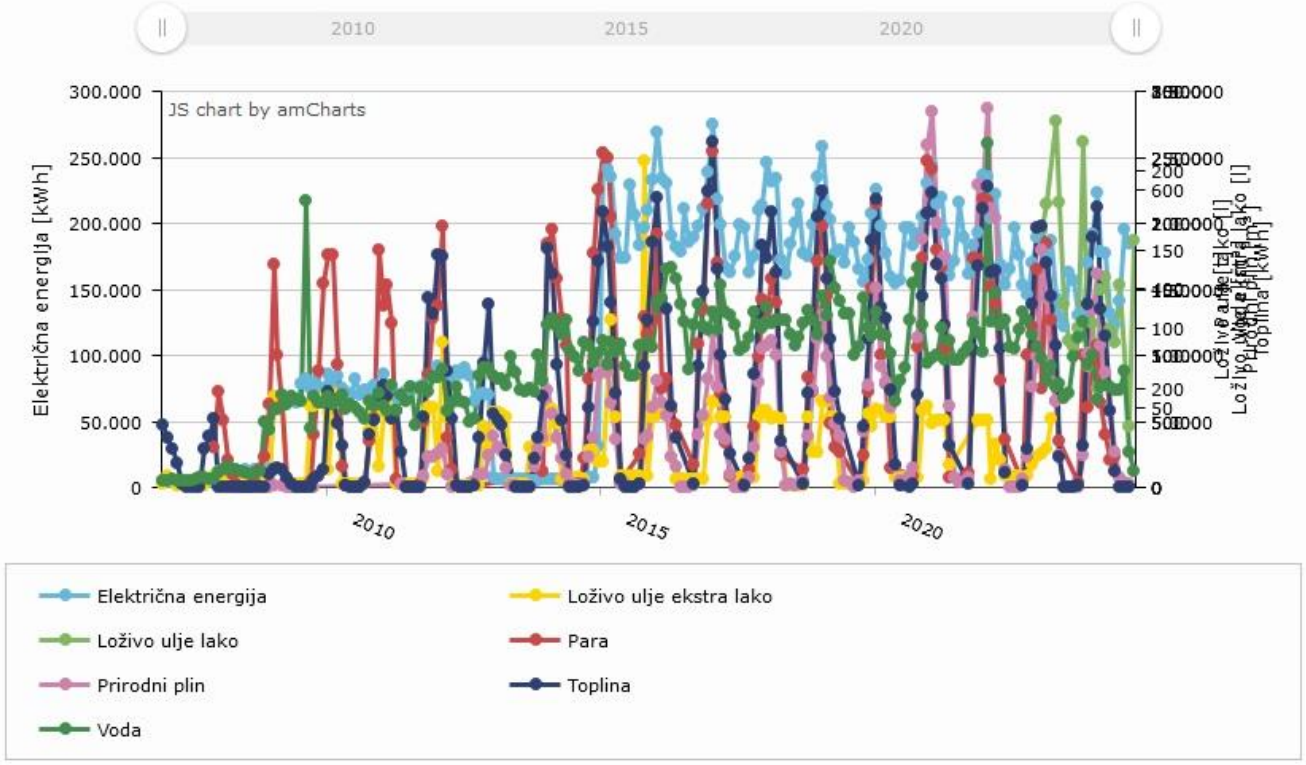
Show

Charts | Source Data: Simple View | Charts + Tables | Source Data: Table

Charts

Absolute value

Consumption



EMIS Data gathering

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ENERGY EFFICIENCY
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Dynamic data:

Energy and water monthly consumption

- remote bills by vendors - EMIS is connected to different vendor billing data bases
- manually entered bills by EMIS users

Energy and water hourly/minute consumption from meter readings

- remote/smart readings – EMIS is connected to automatic reading systems installed on metering points
- manual readings by EMIS users

- Indoor Air Quality readings: temperature, CO2 level, relative humidity, VOC level…
- Weather station readings: insulation, wind speed and direction, outdoor temperature…
- Croatian Meteorological and Hydrological Service sends climate data to EMIS

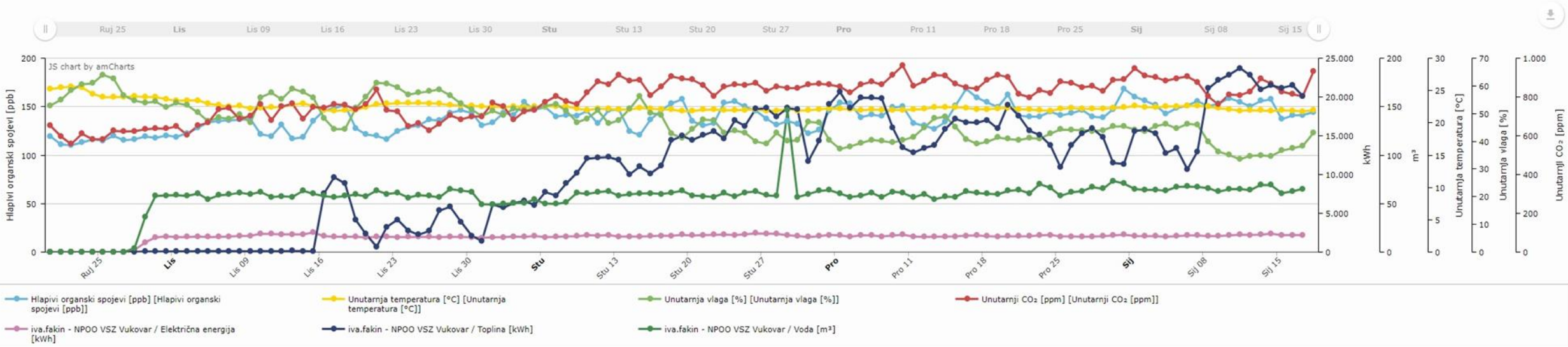
EMIS Data gathering

CONCERTED ACTION ENERGY EFFICIENCY DIRECTIVE

Kriteriji za prikaz stavki na grafu.
Sve promjene na tablici su odmah spremljene, ne treba posebno klikati na snimanje.

Prikaži	Obriši (?)	Kategorija	Filtar	Y (?)	Grupiranje
☑	Obriši	Senzor	Vrsta senzora: Hlapivi organski spojevi		Objekt
☑	Obriši	Očitanja	Grupa energenata: Grijanje [kWh]	Količina	Objekt Energent Mjerno mjesto
☑	Obriši	Očitanja	Grupa energenata: Voda [m³]	Količina	Objekt Energent Mjerno mjesto
☑	Obriši	Očitanja	Grupa energenata: Električna energija [kWh]	Količina	Objekt Energent Mjerno mjesto
☑	Obriši	Senzor	Vrsta senzora: Unutarnja vlaga		Objekt
☑	Obriši	Senzor	Vrsta senzora: Unutarnja temperatura		Objekt
☑	Obriši	Senzor	Vrsta senzora: Unutarnji CO_2		Objekt

Dodaj na graf ...



Serija	Y os	20.09.2023.	21.09.2023.	22.09.2023.	23.09.2023.	24.09.2023.	25.09.2023.	26.09.2023.	27.09.2023.	28.09.2023.	29.09.2023.	30.09.2023.	01.10.2023.	02.10.2023.	03.10.2023.	04.10.2023.	05.10.2023.	06.10.2023.	07.10.2023.	08.10.2023.	09.10..
Hlapivi organski spojevi [ppb] [Hlapivi organski spojevi [ppb]]	Hlapivi organski spojevi [ppb]	119,578	110,937	110,243	112,983	116,234	115,077	119,743	115,363	116,323	119,282	117,703	120,307	118,787	122,614	128,235	133,816	135,258	135,905	136,395	137,:
Unutarnja temperatura [°C] [Unutarnja temperatura [°C]]	Unutarnja temperatura [°C]	25,228	25,444	25,599	25,462	24,488	23,952	23,97	24,007	24,083	23,986	23,971	23,675	23,394	23,471	23,487	22,95	22,73	22,481	22,6	22,2
Unutarnja vlaga [%] [Unutarnja vlaga [%]]	Unutarnja vlaga [%]	52,867	54,997	58,35	60,577	60,905	64,024	62,607	56,541	54,643	53,91	54,291	52,255	53,818	53,002	50,33	47,265	48,607	48,047	49,604	46,7
Unutarnji CO_2 [ppm] [Unutarnji CO_2 [ppm]]	Unutarnji CO_2 [ppm]	652,222	596,469	556,63	609,632	581,672	582,323	625,445	621,801	623,581	633,085	637,463	636,283	648,534	604,67	652,236	667,329	736,72	742,96	685,297	703,
iva.fakin - NPOO VSZ Vukovar / Električna energija [kWh]	kWh	0	0	0	0	0	0	0	0	269,357	1.259,029	1.891,475	2.018,031	1.923,727	1.937,832	2.007,538	1.939,153	1.965,591	1.993,228	2.078,235	2.108
iva.fakin - NPOO VSZ Vukovar / Toplina [kWh]	kWh	0	0	0	0	0	0	0	0	19	69	66	73	88	106	109	134	126	139	113	90,:
iva.fakin - NPOO VSZ Vukovar / Voda [m³]	m³	0	0	0	0	0	0	0	0	4,121	36,581	57,739	58,461	58,667	57,944	60,376	54,469	58,542	59,347	61,229	59,7

FOR A SUSTAINABLE FUTURE

EMIS Data gathering

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ENERGY EFFICIENCY
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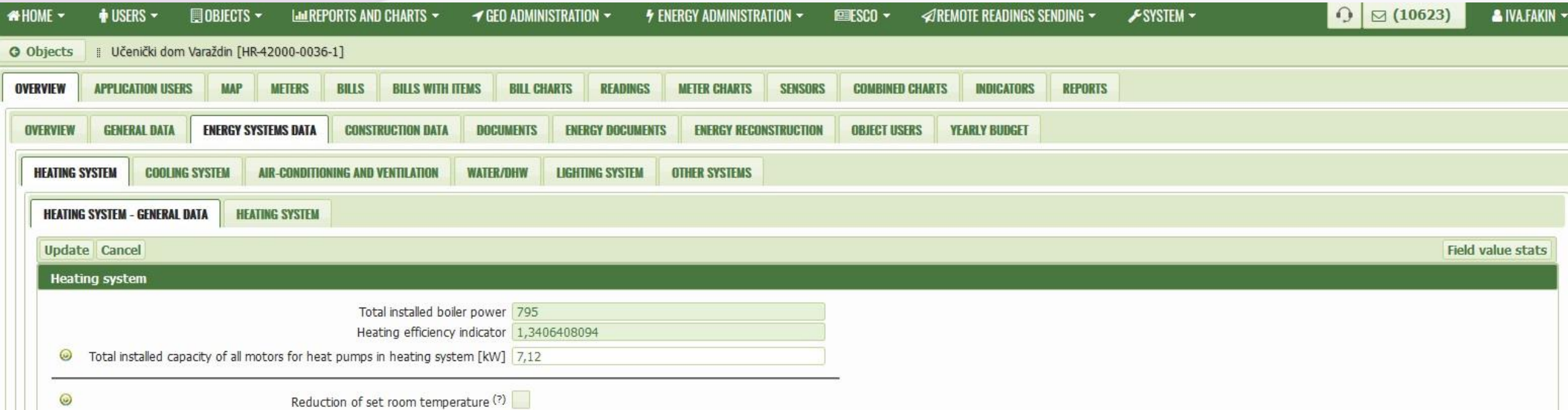
„Static" data

General data on object: location, year of construction, basic building dimensions (floor area…), etc.

- Energy systems: heating, cooling, air-conditioning and ventilation systems, water supply system
- Construction: orientation and structure of external walls, type of glazing, etc.
- Energy certificates and audits module, applied energy efficiency measures



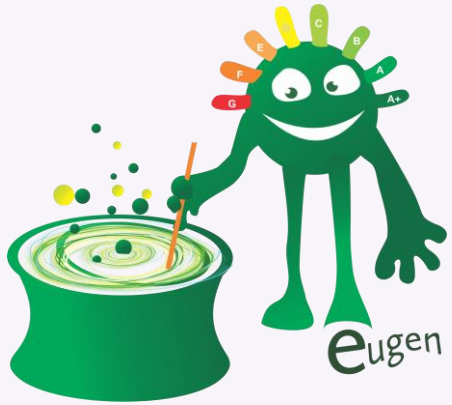
EMIS Data gathering

CONCERTED ACTION
ENERGY EFFICIENCY
DIRECTIVE

„Static" data

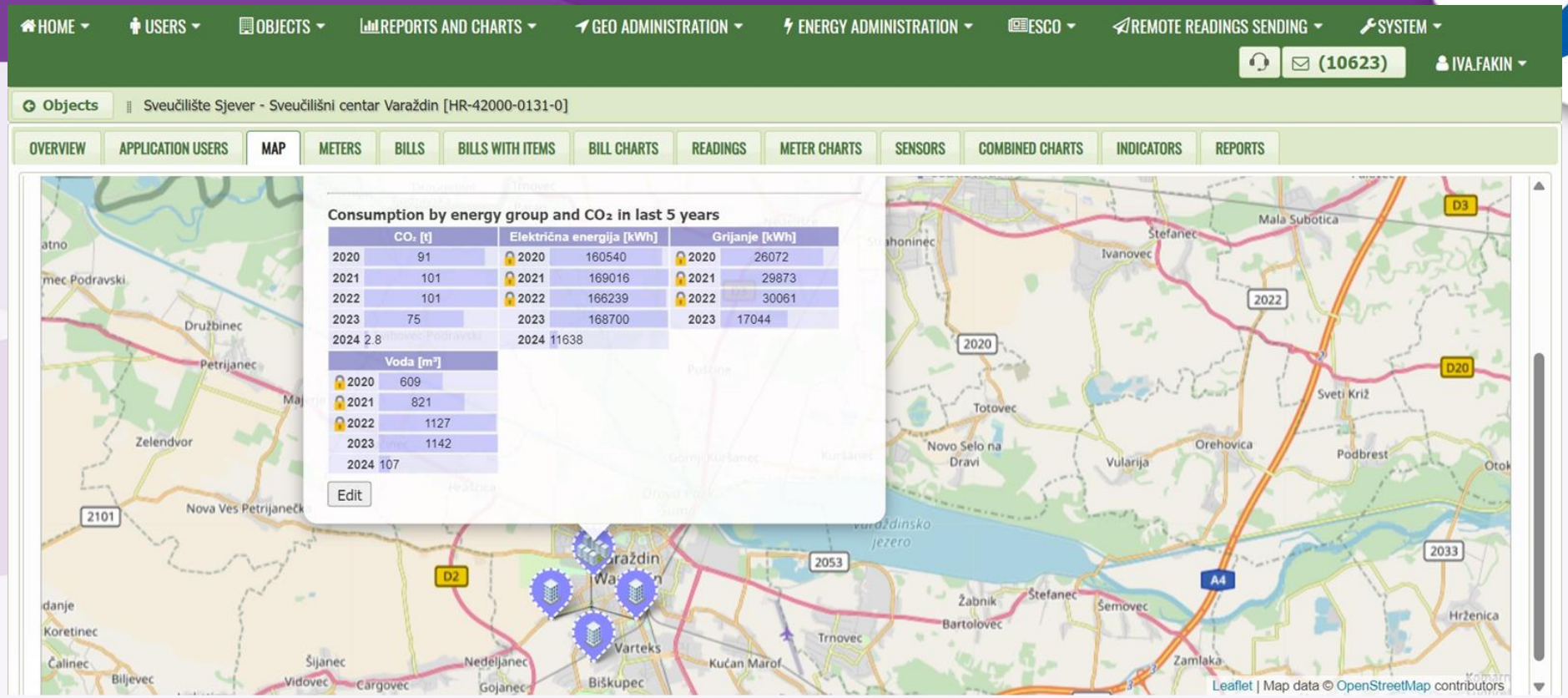
Data on building user:

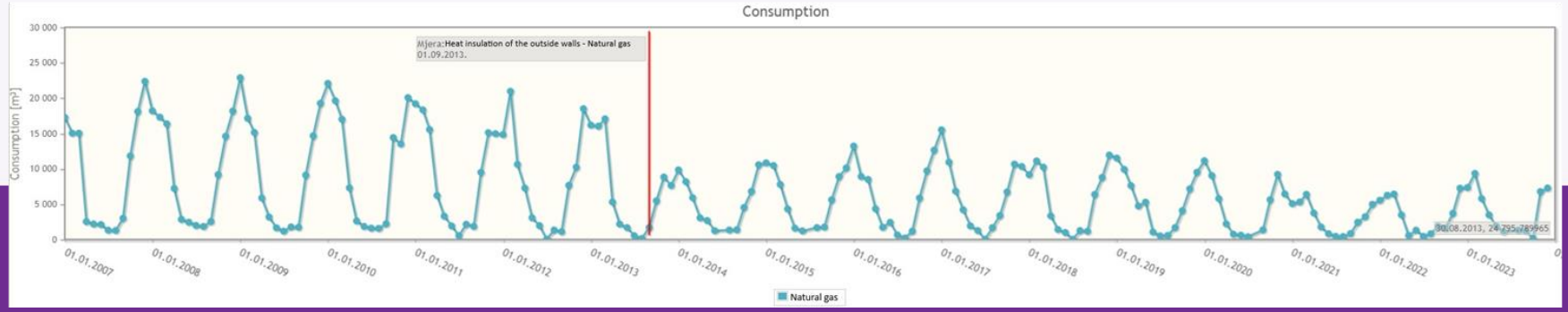
- Institution ownership
- Building type: office, elementary school, hospital, etc.
- Geographic data
- Construction and restauration
- Building usage, working hours



- This additional information about ECC makes it easier to generate targeted reports – introduces flexibility and scalability into reporting
- EMIS allows data export in other formats (.xlsx, .pdf, .csv)
- Huge amount and variety of data collected in EMIS makes it great tool for analysing and planning future energy efficiency measures, for creating Action plans and strategies on local, regional and national level as well as reporting

EMIS Data gathering





How will we use EMIS to form a baseline

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Our wish is to track all necessary through one application – EMIS

We will adapt it for other sectors: public transport & industry

Verification of measured savings module

- valuable tool in EMIS to analyse and calculate different data
- we can process all collected data in a simple way and in the desired form as long as we have all the data collected

- Needs to be upgraded with different visualisations for tracking progress

EMIS needs to be upgraded for all additional data collecting and connected with other systems such as System for monitoring and verification of energy savings (project savings) and Informational system for energy certificates

Verification of measured savings module

CONCERTED ACTION ENERGY EFFICIENCY DIRECTIVE

HOME | USERS | OBJECTS | REPORTS AND CHARTS | GEO ADMINISTRATION | ENERGY ADMINISTRATION | ESCO | REMOTE READINGS SENDING | SYSTEM | (10623) | IVA.FAKIN

New Entry (?)
Session name:

Analysis Type Refresh

Object	Consumption/Sensors
Table	Simple View [1] Table [2] Existing data
Map	Map
Savings verification Savings verification PL (?)	Charts - Advanced

1 is better for smaller amounts of data, 2 is better for larger amounts of data. Values are the same.

Object selection Refresh

All | Object | Label - Object | Object user | Label - Object user

Show more detailed object filters Clear

Number of selected objects: 46072

Savings verification Refresh

2003	Baseline	Calculation
2004	Baseline	Calculation
2005	Baseline	Calculation
2006	Baseline	Calculation
2007	Baseline	Calculation
2008	Baseline	Calculation
2009	Baseline	Calculation
2010	Baseline	Calculation
2011	Baseline	Calculation
2012	Baseline	Calculation
2013	Baseline	Calculation
2014	Baseline	Calculation
2015	Baseline	Calculation
2016	Baseline	Calculation
2017	Baseline	Calculation
2018	Baseline	Calculation
2019	Baseline	Calculation
2020	Baseline	Calculation
2021	Baseline	Calculation
2022	Baseline	Calculation
2023	Baseline	Calculation
2024	Baseline	Calculation

Show only locked

Bills - OBJ | Bills - OBJ_D

Statistics of selected objects

Objects with consumption in at least one year (candidates for analysis)	12.595
Objects with consumption in at least one year, which have an entered heated area Ak (under analysis)	9.057

Export

Consumption indicators (?)

Year	2021						2023					
Analysis Type	Energy		CO₂ emission		Primary energy		Energy		CO₂ emission		Primary energy	
Building type / The results	Indicator of energy consumption for heating [Wh/(m² HDD)]	Electricity consumption indicator [kWh/m²]	Indicator of CO₂ emission for heating [kgCO₂/(m² HDD)]	Electricity CO₂ emission indicator [tCO₂/m²]	Indicator primary energy consumption heating [Wh/(m² HDD)]	Primary energy electricity consumption indicator [kWh/m²]	Indicator of energy consumption for heating [Wh/(m² HDD)]	Electricity consumption indicator [kWh/m²]	Indicator of CO₂ emission for heating [kgCO₂/(m² HDD)]	Electricity CO₂ emission indicator [tCO₂/m²]	Indicator primary energy consumption heating [Wh/(m² HDD)]	Primary energy electricity consumption indicator [kWh/m²]
Bolnica	81,60	98,06	0,02	0,02	86,29	158,27	120,05	115,24	0,03	0,03	122,38	185,99
Hotel i restoran	38,15	60,75	0,01	0,01	45,41	98,04	40,70	49,03	0,01	0,01	51,77	79,14
Obiteljska	58,08	48,38	0,02	0,01	68,21	78,08	69,08	46,22	0,02	0,01	83,17	74,60
Obrazovna	40,29	25,94	0,01	0,006	46,28	41,87	51,30	28,20	0,01	0,007	60,41	45,52
Ostale nestambene	54,24	108,74	0,01	0,03	60,21	175,51	70,45	121,14	0,02	0,03	75,83	195,52
Sportska dvorana	56,74	70,36	0,01	0,02	65,40	113,56	80,10	85,46	0,02	0,02	94,71	137,94
Trgovina	38,04	143,56	0,01	0,03	44,63	231,70	56,58	157,85	0,02	0,04	67,02	254,77
Uredska	57,31	67,99	0,01	0,02	65,19	109,73	67,53	67,70	0,02	0,02	78,59	109,26

Export

Consumption (?)

Year	2021						2023					
Analysis Type	Energy		CO₂ emission		Primary energy		Energy		CO₂ emission		Primary energy	
Building type / Consumption	Energy consumption for heating [kWh]	Electricity consumption [kWh]	CO₂ emission of heating [tCO₂]	Electricity CO₂ emission [tCO₂]	Primary energy consumption for heating [kWh]	Primary energy of electricity consumption [kWh]	Energy consumption for heating [kWh]	Electricity consumption [kWh]	CO₂ emission of heating [tCO₂]	Electricity CO₂ emission [tCO₂]	Primary energy consumption for heating [kWh]	Primary energy of electricity consumption [kWh]
Bolnica	405.751.774	175.190.995	103.970	41.137	431.847.432	282.758.266	311.886.898	180.341.234	83.585	42.346	320.348.355	291.070.751
Hotel i restoran	3.937.557	3.109.819	1.153	730	4.739.198	5.019.248	1.445.624	2.007.085	441	471	1.880.544	3.239.436
Obiteljska	145.451.266	52.856.156	38.815	12.411	172.906.670	85.309.836	98.010.582	43.669.533	27.073	10.254	120.276.131	70.482.627
Obrazovna	499.795.234	138.501.503	130.912	32.522	582.445.425	223.541.425	319.736.406	120.926.187	85.318	28.395	379.913.811	195.174.865
Ostale nestambene	194.333.648	160.541.405	50.226	37.697	214.465.710	259.113.827	144.921.271	149.405.510	36.738	35.082	155.753.132	241.140.492
Sportska dvorana	55.536.362	35.255.297	14.530	8.278	63.690.514	56.902.050	43.261.362	34.125.246	11.689	8.013	50.380.840	55.078.147
Trgovina	4.241.868	11.522.910	1.113	2.706	5.086.707	18.597.976	2.450.914	8.214.463	691	1.929	3.070.922	13.258.143
Uredska	209.857.042	111.294.575	55.431	26.133	241.574.758	179.629.443	137.467.379	94.338.209	38.262	22.152	160.490.186	152.261.870

Export

Reference (base indicators) (?)

Analysis Type	Energy		CO₂ emission		Primary energy	
Building type / The results	Indicator of energy consumption for heating [Wh/(m² HDD)]	Electricity consumption indicator [kWh/m²]	Indicator of CO₂ emission for heating [kgCO₂/(m² HDD)]	Electricity CO₂ emission indicator [tCO₂/m²]	Indicator primary energy consumption heating [Wh/(m² HDD)]	Primary energy electricity consumption indicator [kWh/m²]
Bolnica	81,60	98,06	0,02	0,02	86,29	158,27
Hotel i restoran	38,15	60,75	0,01	0,01	45,41	98,04
Obiteljska	58,08	48,38	0,02	0,01	68,21	78,08
Obrazovna	40,29	25,94	0,01	0,006	46,28	41,87
Ostale nestambene	54,24	108,74	0,01	0,03	60,21	175,51

Recommendations for introducing monitoring of energy and water consumption

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ENERGY EFFICIENCY
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System development is a demanding and long-term process, but we believe that the Croatian example shows that the same is possible.

We definitely suggest:

- collecting data on end consumption at least on a monthly basis
- to automate the process in order to reduce the administrative burden on end users as much as possible and to ensure the credibility and accuracy of the data.
- To connect with all other national database to reduce double input

Yearly up to 5% reduction in energy in water consumption is achieved by only using EMIS (monitoring)

Final thought

CONCERTED ACTION
ENERGY EFFICIENCY
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EMIS, as it is, has been transferred and is actively being used in Bosnia and Herzegovina, Serbia, Malaysia, Hungary, Armenia and Ukraine.

States collaborate on using and developing in terms of sharing knowledge and developed upgrades.

Ask us – we love to talk about EMIS and share it!

Don’t get me wrong, it’s not without it’s challenges, but now, we can say:

We know who, how, why, when and where consumes what energy in public sector buildings in Croatia.

…Or at least we have a good idea… ☺

Thank you for your attention

CONCERTED ACTION
ENERGY EFFICIENCY
DIRECTIVE

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