Country example from Croatia:

Role of deemed savings calculations and measurements in monitoring savings and identifying new savings potential

streamSAVE and DEESME joint final event “From potentials to achievements: unlocking the power of energy savings ”

Brussells , 6th June 2023

Agenda

- Intro on monitoring of energy savings (and energy consumption) in Croatia
- Examples of deemed vs. measured savings
  - Public buildings
  - Public lighting
  - Deemed savings for information measures
- Lessons learned

Monitoring of energy savings in Croatia

Monitoring of EE measures implementation and energy consumption in public sector

EIHP

Legal framework for monitoring of energy savings (and energy consumption) in Croatia

Law on EE (amended April 21)	• Art 7. targets are defined in Law, NEEAP and NECP • 50-50 AM-EEOS for 2014-2020; 30-70 AM-EEOS for 2021-2030 • Public sector – obligatory energy management • Annual reporting
Regulation on M&V (Revised version adopted Sept 2021; March 2022)	• Obligatory use of **MVP (SMIV)** for subsidy providers, obligated parties, public sector and ESCOs • BU methods for calculation of energy savings for **33 measures**
Regulation on energy management system in the public sector (2015/16)	• Energy advisors and energy associates in the public sector – education • Use of **EMIS**

EIHP

MRV of savings provisions

- Monitoring
  - Process of data and information collection about implemented EE measures: type of measure; input data for energy saving calculation; cost of implementation, received subsidies
- Measurement
  - Calculation of new annual energy savings achieved by EE measures using prescribed methods -> always using project specific data rather then reference data prescribed in methodology
  - For measures for which methods are not prescribed, energy savings should be calculated by the authorized design engineers or energy auditors
- Reporting
  - Annually by 15th March
  - Savings from EEOS and AM
  - All other data and information required by Regulation (EU) 2018/1999
  - Reported savings to be based on data from SMiV
  - Report to be published on national web site for EE
- Verification
  - Process of confirming energy savings by the authorized body – National EE Coordination Authority within Ministry of Economy and Sustainable Development

EIHP

System for M&V (SMiV)

- **SMIV** developed through regional cooperation project implemented by GIZ – ORF EE
- Used since 2015
  - transfer of savings
  - stimulation of energy poverty related measures –10 to 30% higher savings are accounted
  - primary energy savings
- Obligatory tool for subsidy providers, public sector, obligated parties and ESCOs
  - Dominant user is EE Fund – subsidy provider (cca 90% of all entries)
- Data base of implemented EE measures in Croatia
  - > 26,000 EE projects
- Tool for calculation of energy savings and CO2 emission reductions
  - Calculates new and cumulative annual savings from a measure
- Public sector
  - In Croatia, obligation to input data on energy consumption in IT system for energy management (**EMIS**)
  - Enables monitoring of actual energy savings achieved in renovated public buildings

EIHP

EMS in public sector

- Obligation to nominate person responsible for EMS
- Obligatory education for persons responsible for EMS
- Obligatory use of EMIS and annual reporting
- Energy bills + direct metered data from energy supplier/DSO

Examples of deemed vs. metered savings

Public buildings and public lighting

+

Deemed savings for informational/behavioural measures

Case example – renovated public building (hospital)

- EE measures included: Building envelope, Heating substations and systems, Reactive power compensation, External and internal lighting, BACS, Water supply system

ENERGY [kWh]	BASELINE energy consumption before*	DESIGNED energy consumption after**	METERED energy consumption after***	DEEMED energy savings****
Heat	9.730.096,00	3.041.367,00	4.632.624,00	
Electric	4.272.870,00	2.475.256,00	2.993.532,00	
TOTAL	14.002.906,00	5.516.623,00	7.626.156,00	
ENERGY SAVINGS		8.486.283,00	6.376.750,00	9.489.402,78

** Based on energy audit and detailed investment study (data from energy bills)*
*** Based on calculations of energy service provider (as contracted)*
**** Based on data from EMIS, normalised by heating degree days*
***** Based on data from SMIV*

$$UFES = \frac{SHD_{init}}{\eta_{init}} - \frac{SHD_{new}}{\eta_{new}}$$

$$FES = \sum_{i=1}^{n} UFESi \times Ai$$

Case example – public building to be renovated (office)

1. **Hourly dynamic simulations for different combinations of EE measures (DesingBuilder & EnergyPlus)**

OPTIMAL TEHNICAL SOLUTION:

Heating/cooling: *heat pump water/water*
Lighting: *LED*
External wall insulation: *16 cm*
Roof insulation: *20 cm*
U-value of windows : *1,40 W/(m²K)*

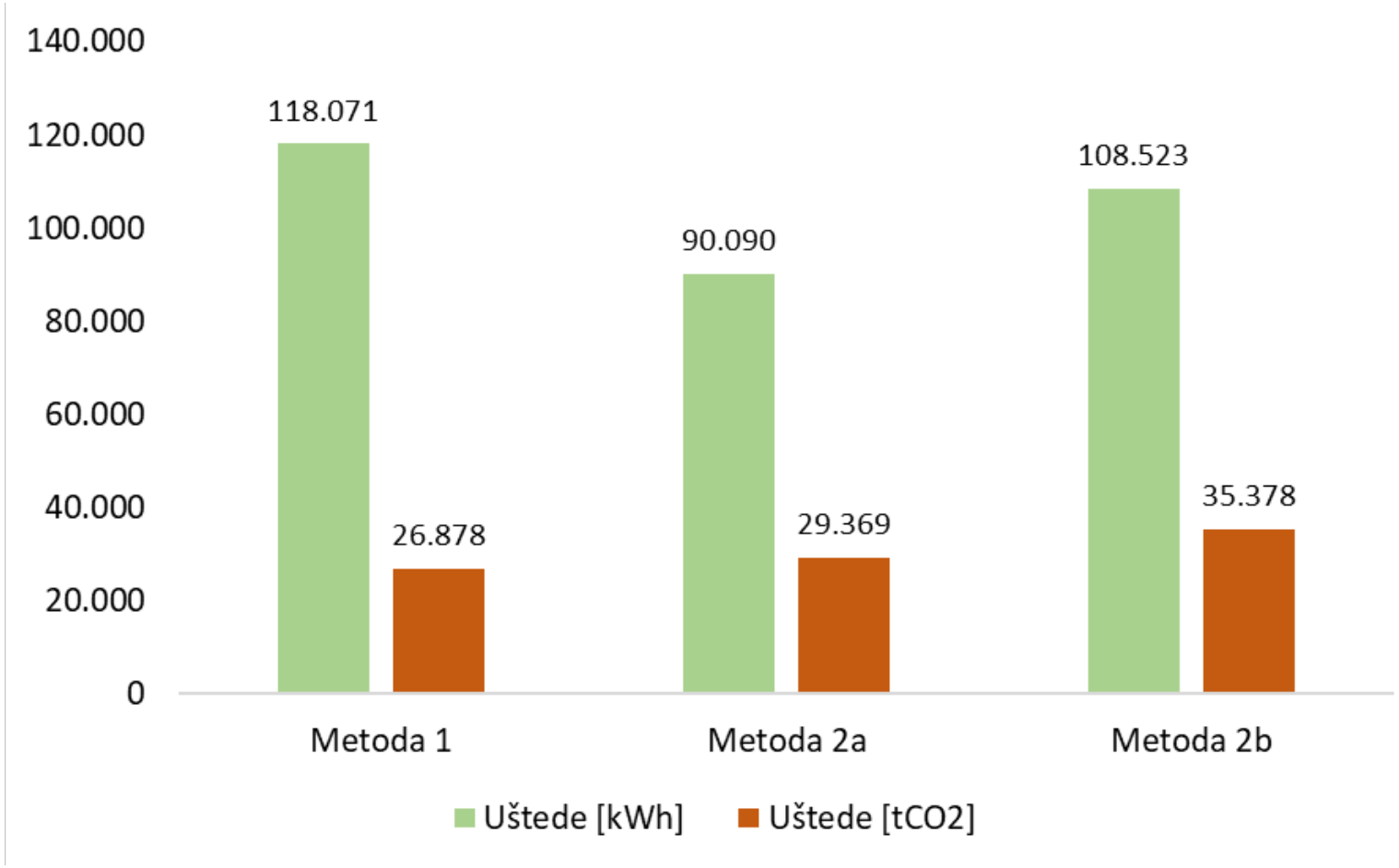
2. **Regulation on monitoring, measurement and verification of energy savings**
2a – project values
2b – reference values

Method – Integral renovation of a building

$$UFES = \frac{SHD_{init}}{\eta_{init}} - \frac{SHD_{new}}{\eta_{new}}$$

$$FES = \sum_{i=1}^{n} UFES\,i \times Ai$$

Case example – public building to be renovated (office)



Case example – public lighting

- Metred data on electricity consumption available in EMIS
  - Enables comparison of savings calculated using BU methods (SMIV) and metered savings
- Data for 37 public lighting projects available in SMIV
- Analysis methodology
  - Annual energy savings from SMIV distributed per year after renovation
  - These savings compared with savings determined from EMIS (metered data before and after renovation, per year)

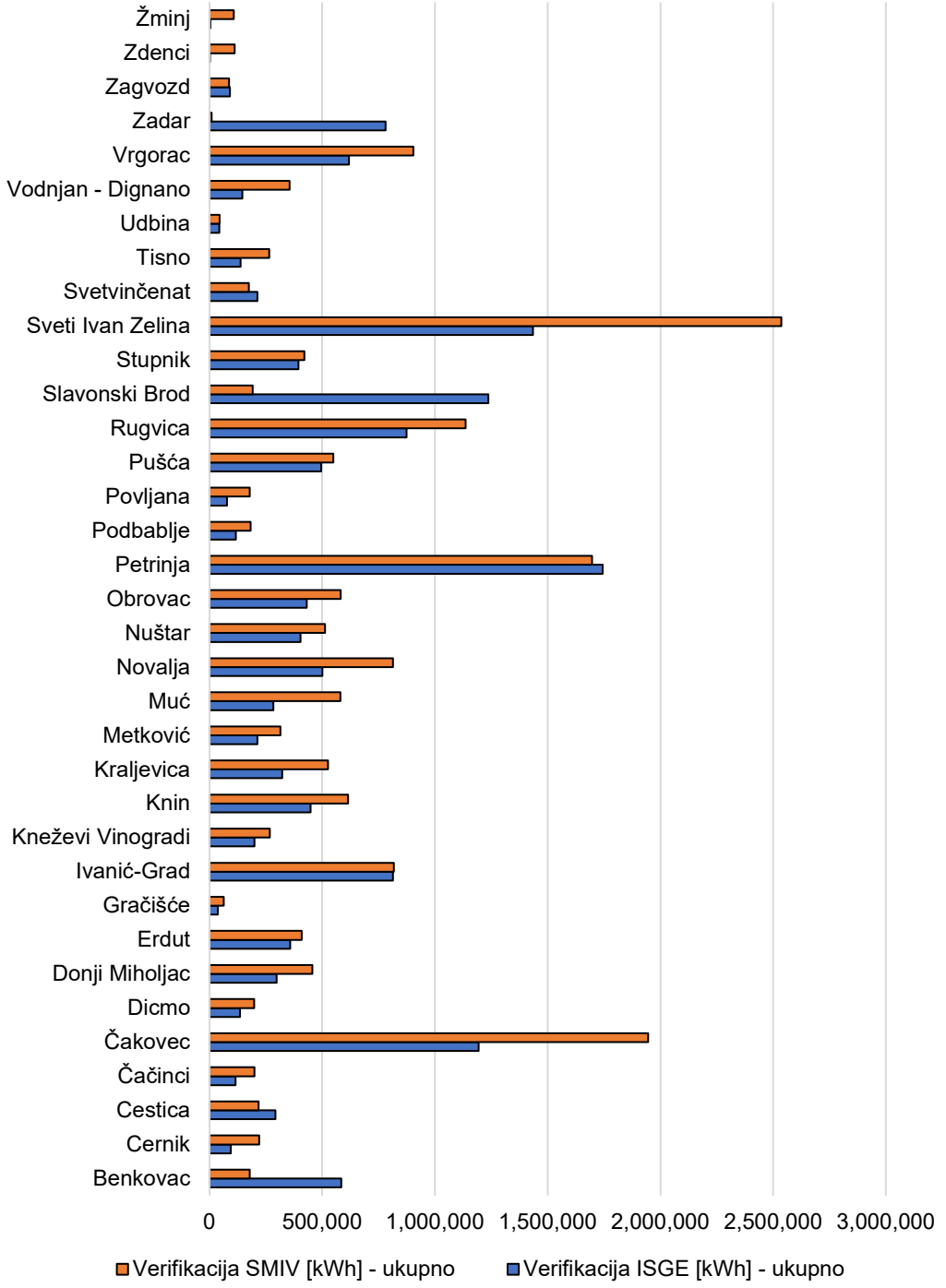
$$UFES = \frac{P_{init} \times n_{hinit} - P_{new} \times n_{hnew}}{1000}$$

$$UFES = \frac{P_{init} - P_{new} \times r}{1000} \times n_h$$

$$FES = UFES \times N$$

Case example – public lighting

- Results
  - EMIS savings 15.14 GWh
  - SMIV savings 17.87 GWh
- Deemed savings 18% higher than metred



Case example – information measures

- Measures mostly used by obligated parties in EEOS
  - Sending leaflets to their customers
  - Preparation of leaflets or brochures and their distribution by inserting in daily newspapers

$$UFES = FEC_{HHs} \, x \, S$$

$$FES = N \, x \, UFES$$

- Energy saving factor – lowest level of advising 0.25% (MultEE)
- Energy savings from 30.000 leaflets ≈ replacement of 10 electric motors from 18,5 to 110 kW
  - Value of saving, duration of savings

EIHP

Lessons learned

- Metered data available in some cases – public sector (EMIS)
- Energy savings are not simple '*before* – *after*' even when metered data are available
- Possibility to improve deemed savings by using metered data
  - Must be available before and after
  - Influencing factors must be taken into account (quite complex for buildings) - > more data needed
- Additional research in the domain of behavioural measures needed

EIHP

Thank you for your attention!

Vesna Bukarica, Ph.D.

Department for Energy Efficiency

+385 99 532 6134

vbukarica@eihp.hr