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### Smart Urban Energy Management,

#### from Opportunity to Impact

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# Romania map and EM coverage









# What are local communities?



#### It can be like this:







#### or like this ....







#### With colored urban rules....















#### Very high concentration ....







#### Or spread on a large area ....







#### or recently visited community ....























# Public infrastructure

- Public buildings direct influence;
- Residential buildings indirect influence;
- Public local transportation direct influence;
- District heating direct influence;
- Public street lighting direct influence.





# Public (energy) utilities

- Electricity;
- Natural gas;
- Drinkable water;
- Public local transportation;
- Waste collection;
- Public street lighting.





# What about the budget of a public local authority?

#### Between ~ 40-60% goes on operational costs;

#### ~ 60-40% investments in the infrastructure.





# Going deeper within the public budget

### 2 – 14% energy bill (buildings, street lighting).







#### A city with more than 400.000 people

| No. | Energy users                       | Electricity [MWh/yr] | %             |
|-----|------------------------------------|----------------------|---------------|
| 1   | Industry                           | 66.000               | 9,7%          |
| 2   | Private commercial buildings       | 50.612               | 7,4%          |
| 3   | Water company                      | 39.770               | 5 <i>,</i> 8% |
| 4   | Public universities                | 18.356               | 2,7%          |
| 5   | Public buildings                   | 88.844               | 13%           |
| 6   | Public street lighting             | 10.783               | 1,6%          |
| 7   | District Heating company           | 12.269               | 1,8%          |
| 8   | Local public transportation        | 13.048               | 1,9%          |
| 9   | Residential energy users & others. | 453.744              | 54,6%         |
|     | Total                              | 682.017              | 100%          |





# **Energy transition**





# The 3rd energy transition

Fossil fuels: heat, mobility, electricity (started more than 200 years ago and to be ended);







### 4th energy transition

Low carbon emission energy sources (we intend to finish it in less than 30 years)...







# **Energy security**





# **Energy security** Reliable, affordable access to all fuels and energy sources

Source: International Energy Agency - Energy Security definition





# Energy security main objectives

- 1) Diversification of energy sources;
- 2) Reserve capacities;
- 3) Power / gas grid interconnections;
- 4) Stability in the energy markets.

Source: <u>https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security</u>



#### **Energy security**



| Secure gas supplies  | Diversification of gas supply sources and routes                        | Security of electricity supply  |
|--|---|---|
| EU legislation helps to prevent and respond to potential gas supply disruptions                                    | Diversified supply routes increase security of energy                   | EU legislation to prepare for and manage electricity crisis situations                  |
| EU oil stocks  | Offshore oil and gas safety   | Oil and gas licensing   |
| EU countries are required to maintain emergency stocks of oil which can be used in case of a disruption to supply. | EU rules to prevent and respond to accidents on offshore installations. | EU rules governing the granting of licenses for oil and gas exploration and production. |
| Critical infractructure and  | Energy cumply and pendemice   |   |

# Critical infrastructure and cybersecurity

Source: Europe Energy Security

#### **Energy supply and pandemics**





# Energy sufficiency





#### Progress within boundaries

"Energy sufficiency goes beyond energy efficiency: it's about having enough but not using too

much. It's about doing things differently; about living well, within the limits."







# Urban energy management,

### from opportunity to impact

# challenges and opportunities





#### What do we have:

# Sustainable Energy and Climate Action Plans – SECAP European Energy Award evaluation – EEA Annual Energy Efficiency programs – EEP Energy Strategies – ES nZEB multiannual programs – nZEB Smart Energy City











# Decarbonization

What is the price? Shall we do it with the same ambition everywhere?





# Distributed energy generation

What is the impact in the local energy grids?





# Prosumers on large scale

Is it an opportunity for local energy markets? Is it an opportunity for energy communities?





# nZEB on daily basis

Are we ready? Have the local public authorities started?





# Energy planning included in the urban planning?





# Energy poverty

Is it generalized in the present day?





# District heating with low emission

Do we still believe in the future of district heating?





# Energy storage

#### 0,4 kWh/kg VS 11,6 kWh/kg

electricity

diesel fuel

How much time do we need to have an equal balance?





# Electrified mobility

What will be the impact on the power grid?





# Professionals

Do we have the human resources?





# Research and innovation

Is it visible in Romania?





# Local technology production

How much money will go in China?





# Energy security and carbon neutrality

Act on the root not on the effect...







# **Energy Transition Research Center**

23 May 2022







EnTReC mission is to significantly contribute through evidenced based research to the energy transition in the energy sector, industry, buildings and local communities, in a sustainable approach focused on development, testing and replication of innovative instruments, energy and digital technologies.



# HORIZON 2020 projects









#### **Best European Energy Service Project**

granted to Technical University of Cluj-Napoca & Cluj-Napoca City Municipality by EU EESA in Brussels – February 2019







#### **Institutional Energy Management Award**

granted to Technical University of Cluj-Napoca & Cluj-Napoca City Municipality by Association of Energy Engineers (AEE) on World Energy Engineering Congress

