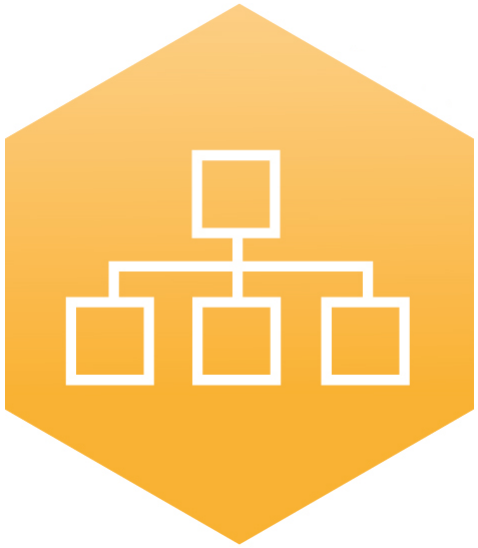
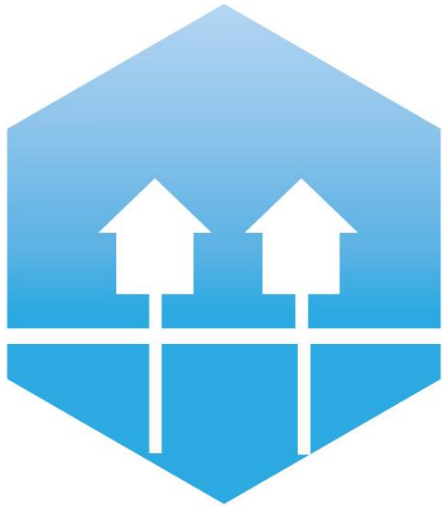
2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016





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Technologies and Systems

VEOLIA

SMART 4th GENERATION ENERGY MANAGEMENT:

ONLINE INTERACTIVE BUILDING ACTUAL ENERGY CONSUMPTION CLASS MAP

Dr. Romanas Savickas
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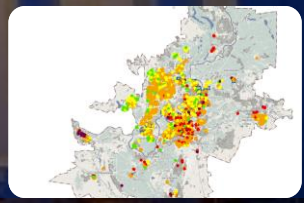

2016


PM SCREEN
INNOVATIVE
MULTIMEDIA
AGENCY

Contents

1. Innovative energy management solutions: ONLINE INTERACTIVE BUILDING ACTUAL ENERGY CONSUMPTION CLASS (AECC) MAP

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   1.2 AECC as the optimal solution;

   1.3. Examples of Interactive Actual Energy Consumption Class (AECC) map

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Introduction

William Edwards Deming (October 14, 1900 – December 20, 1993) was an American statistician, professor, author, lecturer, and consultant

YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE

Energy evaluation issue

ENERGY CONSUMPTION IN BUILDINGS CAN BE EVALUATED BY THE HELP OF:

- Energy performance **certificate**;
- Energy **audit**;
- According to **bills** for heating;
- Other scientific methodologies;

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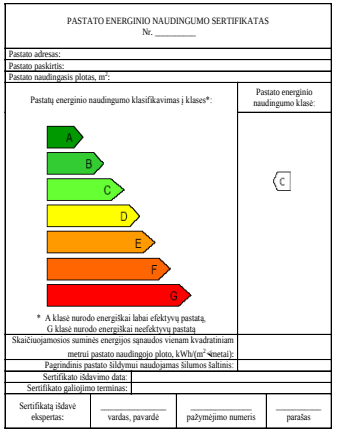
Energy evaluation issue

ENERGY PERFORMANCE CERTIFICATES

Regulation:

- Directive 2010/31/EU of the European Parliament and of the Council on the **Energy performance of buildings**;
- Local legal state deeds: Buildings Technical Regulation "**Energy performance of buildings. Energy performance certification",** Environmental Ministry of LR, 20-12-2005, etc.;
- **Objectives** – that every person without special education would be able to understand about energy consumption performance of his building. This certificate presents **energy performance class**.
- All buildings are divided into **7 classes** from **A** to **G**
- (A – best, G – worst).


PASTATO ENERGINIO NAUDINGUMO SERTIFIKATAS
Nr. _____
Pastato adresas:
Pastato paskirtis:
Pastato naudingasis plotas, m²:
Pastatų energinio naudingumo klasifikavimas į klases*:
Pastato energinio naudingumo klasė:
A
B
C
D
E
F
G
C
* A klasė nurodo energiškai labai efektyvų pastatą, G klasė nurodo energiškai neefektyvų pastatą
Skaičiuojamosios suminės energijos sąnaudos vietiam kvadratiniam metrui pastato naudingojo ploto, kWh/(m²·metai):
Pagrindinis pastato šildymui naudojamas šilumos šaltinis:
Sertifikato išdavimo data:
Sertifikato galiojimo terminas:
Sertifikatą išdavė ekspertas:
vardas, pavardė
pažymėjimo numeris
parašas

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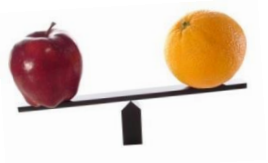
Energy evaluation issue

ADVANTAGES:

- Better than a nothing (first step forward);

DISADVANTAGES:

- Calculated energy amount is only **theoretical**, for calculations are taken theoretical values and coefficients;
- Time costs – requires to **visit an object**, requires technical **documentation** (for old buildings that makes the problem);
- Despite certificate is performed, the building **actually can consume** absolutely **different amount of energy;**



- There are cases than a building according to reconstruction Investment plan, which requires energy performance certificate, **consumes 30 % less energy almost now**. **What shows such Investment plan**?

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Energy evaluation issue

ENERGY AUDIT

Regulation:

- Order to perform audits – order of Economy Minister of LR, 29-04-2008, "**Methodology to perform energy** and cold water **audits** in public buildings";

- **Objectives** – to evaluate state of building constructions and engineering systems, to define measures for energy/water consumption decrement. Etc.;

- **Audit performance takes stages:**
  - Data collection;
  - Metering of energetic parameters;
  - Technical analysis of energy, cold water consumption;
  - Formation of energy and water balances;
  - Recalculation of actual energy costs for a standard climatic year conditions;
  - Energy and water saving measures;
  - Economical evaluation, preparation of report, etc.

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Energy evaluation issue

Advantages:

- **Detailed information** about a building and its engineering systems, actual **energy**/water consumption, potential **investments**;
- Proper for reconstruction Investment project;

Disadvantages:

- Huge **time costs**;
- **Price** – huge time costs leads to high price;
- Can be **performed only during heating season** (must be performed metering of temperature, humidity, etc. for not less than two weeks);
- Preparing a report is collected and presented a lot of detailed information about a building, which is required only for an energy audit;
- **Impossible** to perform **in a wide scale** – for all city or
- for all country (or it will take few years);

Energy evaluation issue

BILLS FOR HEATING

Advantages :

- Energy is divided proportionally for every flat;

Disadvantages :

- Energy for heating is defined subtracting normative amount for circulation and hot water preparation according to in flats declared amount of hot water;

- **Normative heat amount for circulation** is applied for all buildings,
- but in separate building can differ;

- **Amount of declared hot water** differ from total consumed hot
- water amount in a building, so subtracted heat amount is not precise;

- In accordance with the above-presented the energy amount of kWh/m^2 presented in a bill is **not precise**. This amount of energy **can't be compared with other buildings**, it is influenced by **different** heating seasons **temperatures** and **durations**.

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Solution

Solution?

AECC as the optimal solution

To compare different buildings, various influencing factors must be eliminated:

- Areas;
- Hot water consumption;
- Number of days;
- Outside temperature;
- Wind speed ???
- Outside air humidity ???
- Other ???

AECC as the optimal solution

EVALUATION OF ENERGY FOR HEATING

- After influencing **factors** were **eliminated**, finally we got a heat amount to increase **1 m²** of premises temperature by **1° C** per **1 day**;
- According to such criterion can be compared different type of buildings with different heating seasons;

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AECC as the optimal solution

Must be defined the separate evaluation criterion, showing actual consumption in a building and which would be comparable;

Solution – Actual Energy Consumption Class (AECC);

Evaluation principles:

- Defined **actual** energy amount for **hot water circulation** and **hot water heating** (not according to declared hot water, not according to normative amount of circulation);
- From total energy amount is subtracted actual energy for hot water heating and circulation. **The actual energy amount for heating is get**;
- **Eliminated influence of** different heating seasons **durations** and **temperatures**;
- The result can be **compared** between **different buildings** between **different climatic** conditions and heating seasons;
- Buildings are divided into **15 classes**. **1** – most effective, **15** – worst.

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AECC as the optimal solution

ACTUAL ENERGY CONSUMPTION CLASS

No.	Building	AECC
1		1
2		2
3		3
4		4
5		5
6		6
7		7
8	Gedimino av. 100, Vilnius	8
9		9
10		10
11		11
12		12
13		13
14		14
15		15

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AECC as the optimal solution

ADVANTAGES OF ACTUAL ENERGY CONSUMPTION CLASS

- All **different buildings can be compared** – from smallest to largest;
- Can be compared buildings of the same type. Different types of buildings consumes different amount of energy. Can be analyzed, does a new building consumes too much of energy due to a bad maintenance or does an old building consumes too small amount of energy it should to use, does the **consumption** of building **corresponds to** consumption of **such type of buildings**.

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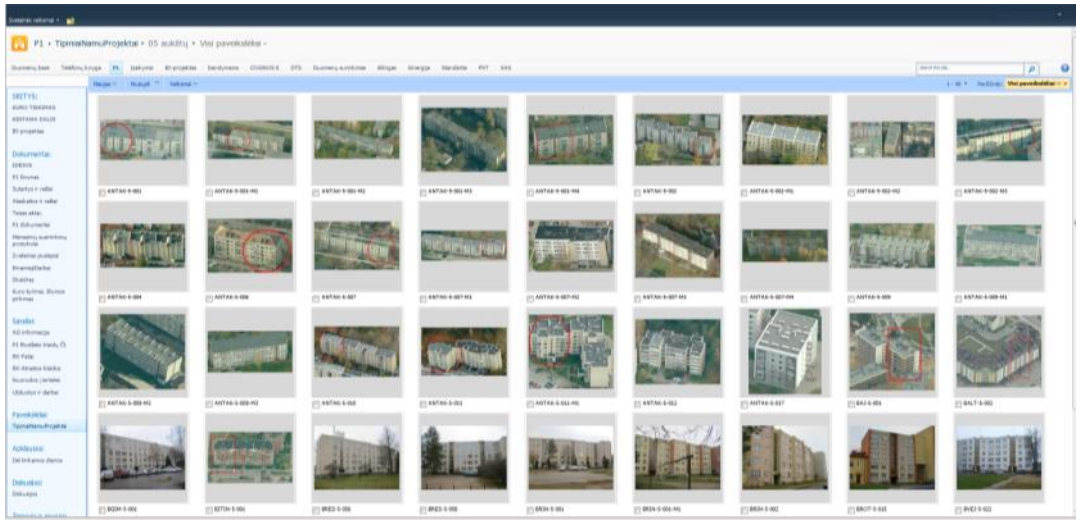
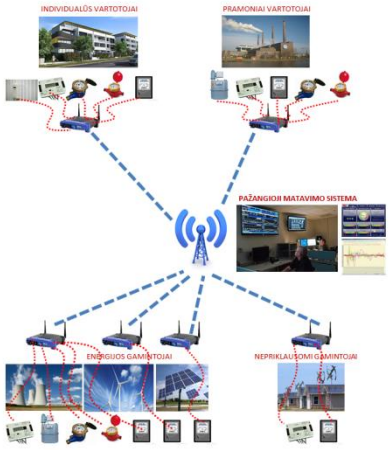
AECC as the optimal solution

Development of AECC was possible due to: **Wireless distant Smart data collection & monitoring system Rubisafe**, **CRM**, **COGNOS** and other developed intellectual systems

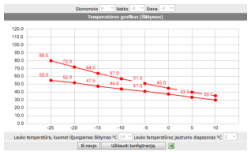
- **Buildings** under analysis are divided into **groups** according to the **same project types**: more than **330** projects and **740** modifications.





Compare a different types during different heating seasons

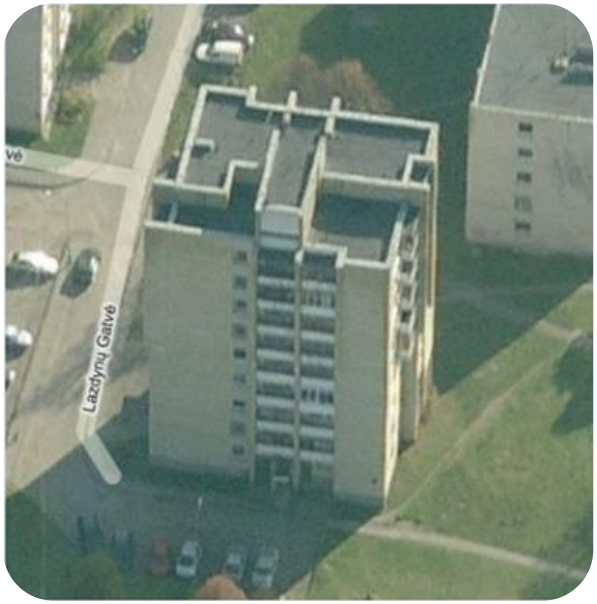
- By the help of smart intellectual systems **we know** about our buildings **everything** – from construction type to heating system regime and energy consumption



AECC as the optimal solution

- Vilnius according to typical projects:

Total: **330** typical projects and **740** additional modifications of these types



LAISV-9-001-M1

LAISV-9-001-M2

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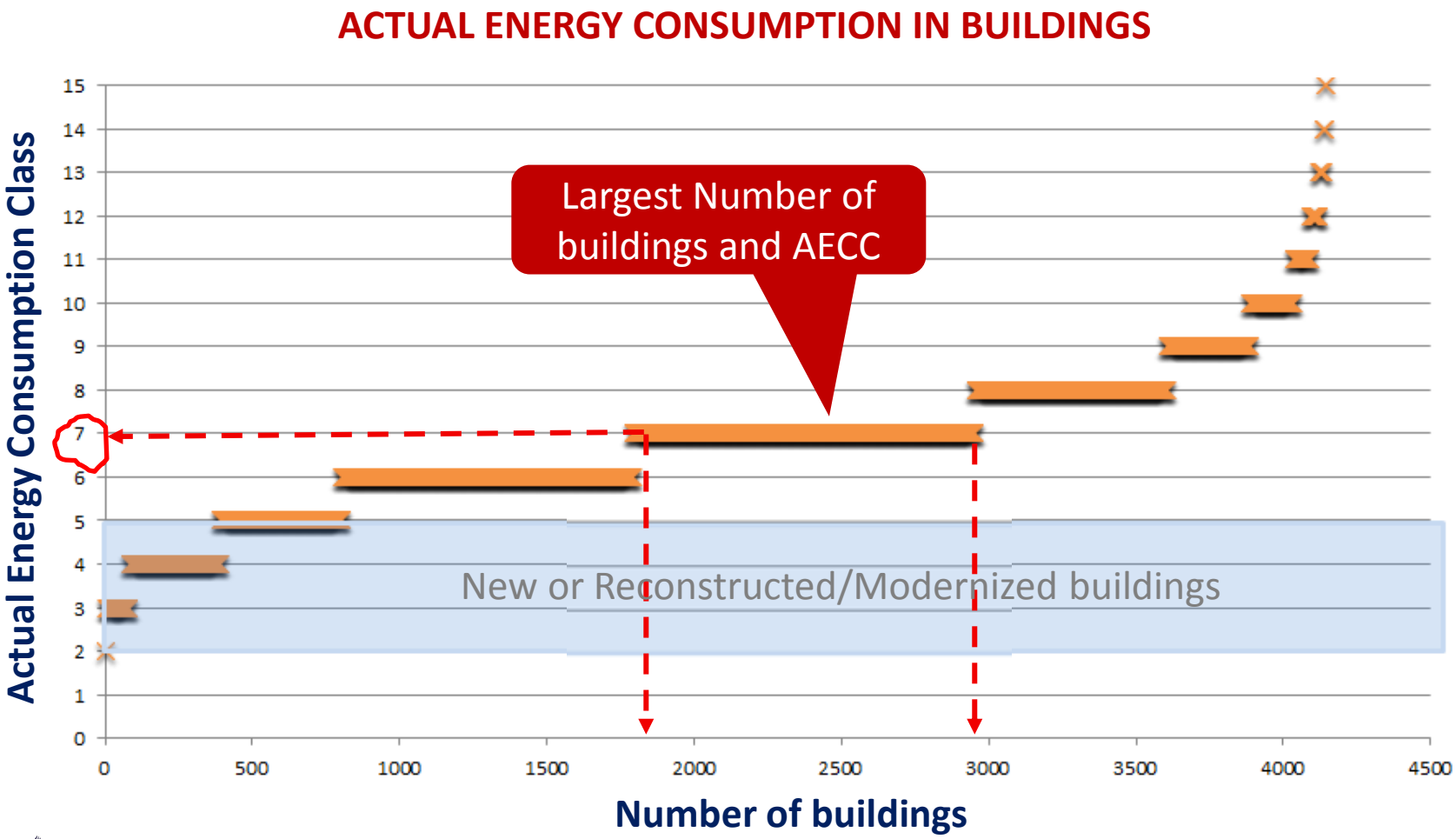
AECC as the optimal solution



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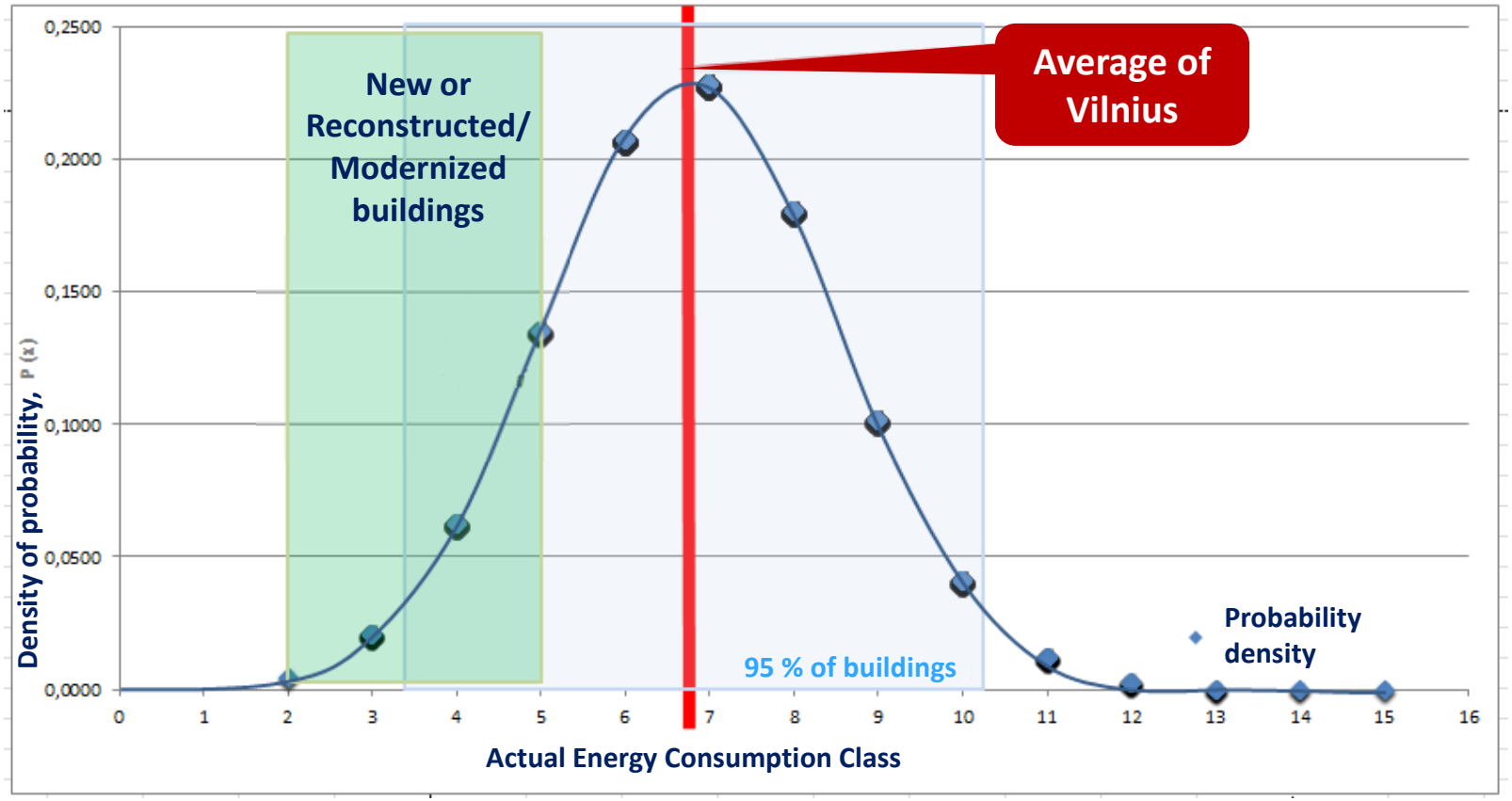
AECC as the optimal solution



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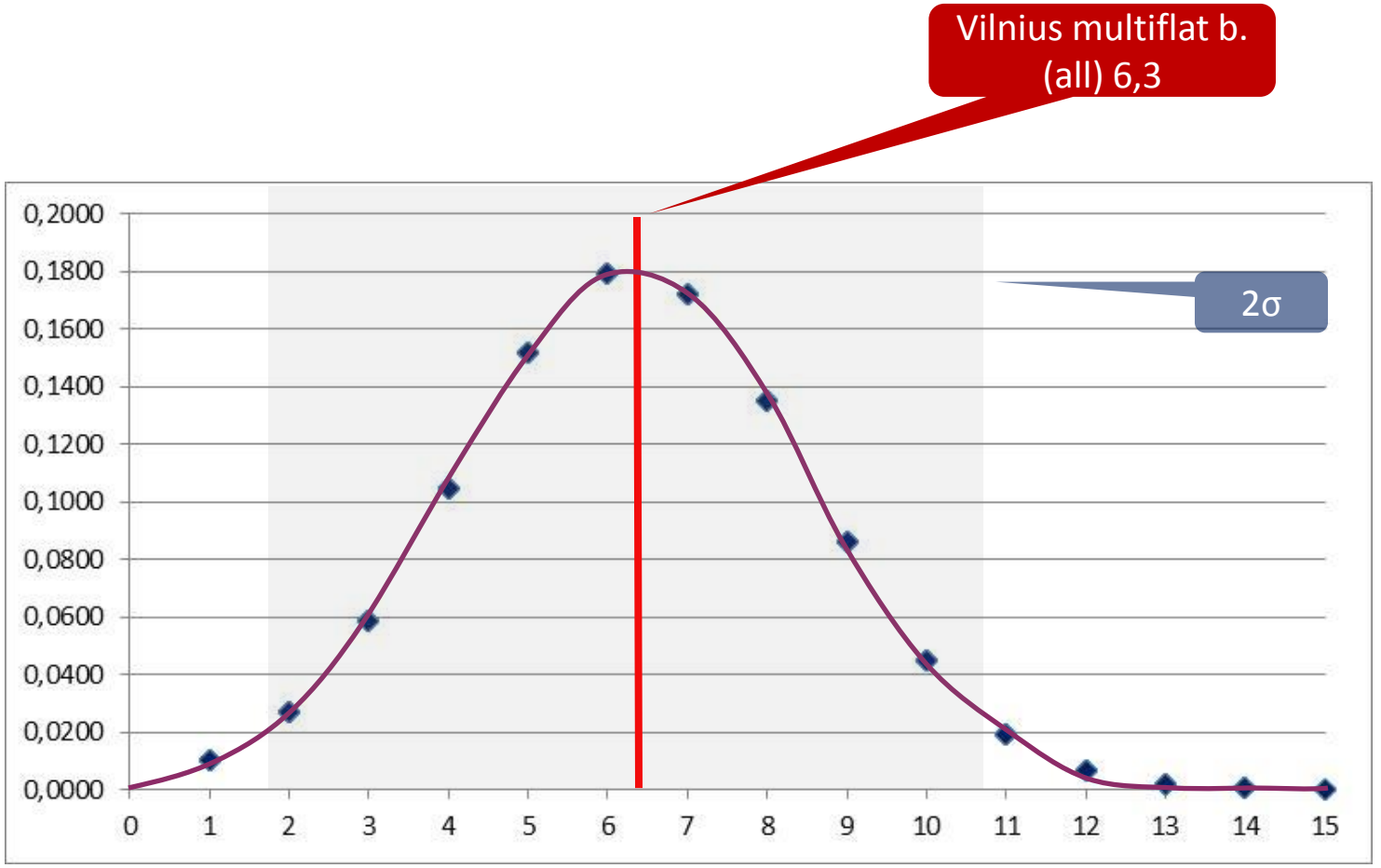
AECC as the optimal solution

- **Multiflat dwelling** buildings (all), 2012/2013:



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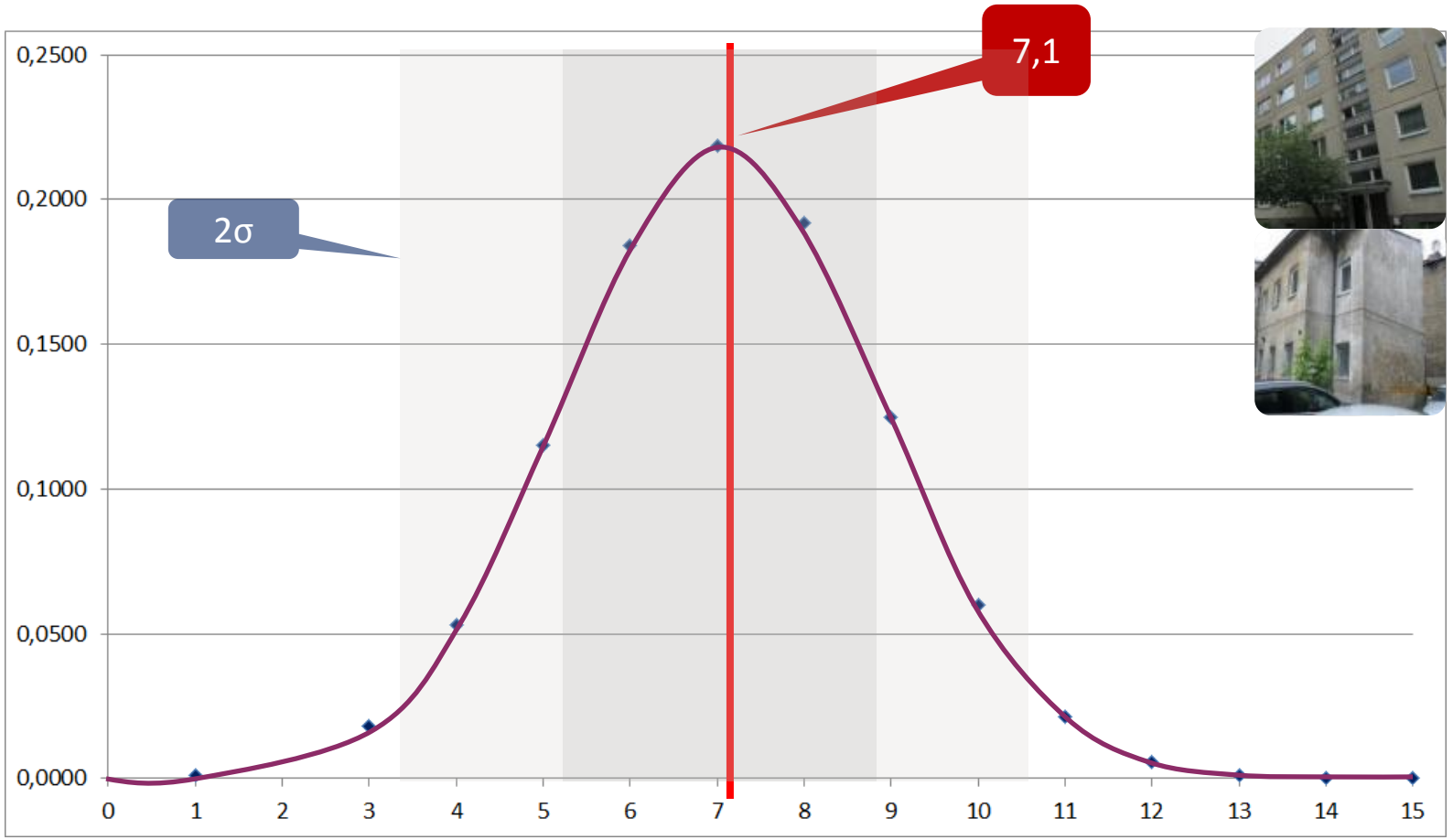
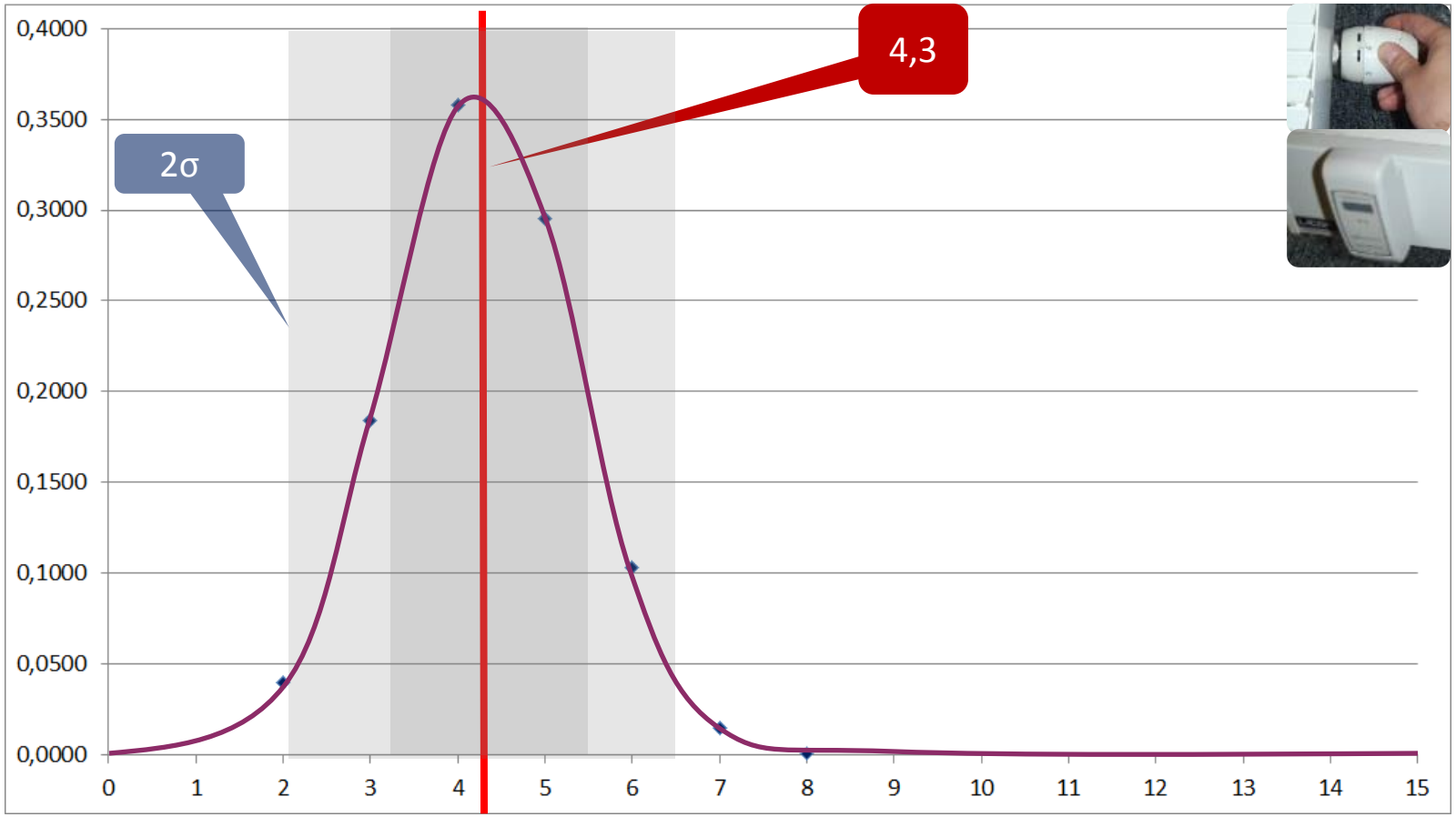
AECC as the optimal solution

- Multiflat buildings **until 1992 year, without heat cost allocators, not modernized:**



AECC as the optimal solution

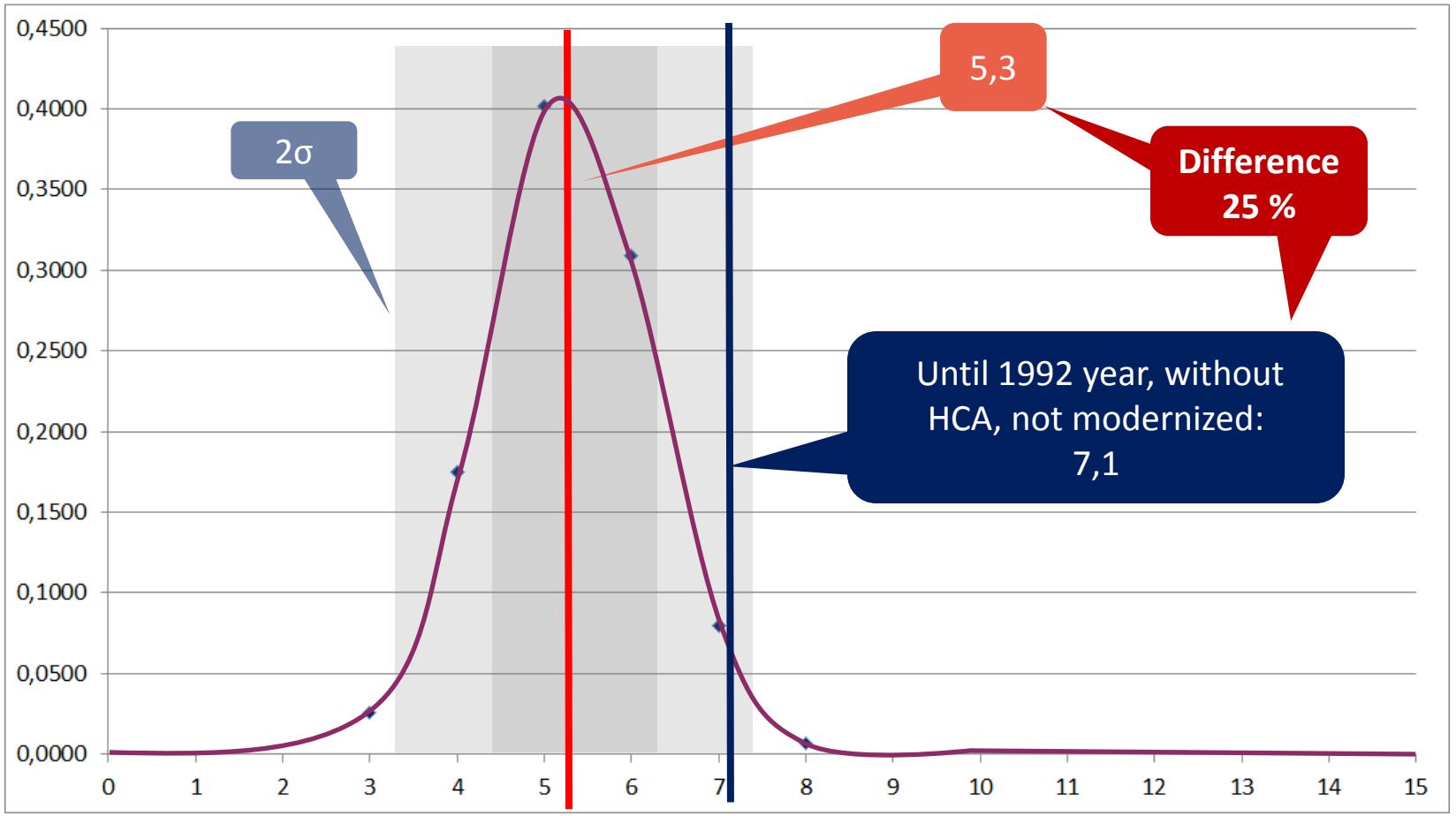
- All multiflat buildings – **with heat cost allocators, old, modernized, new:**



Actual Energy Consumption Class

AECC as the optimal solution

- Multiflat buildings **until 1992 year, with heat cost allocators (HCA), not modernized:**



Actual Energy Consumption Class

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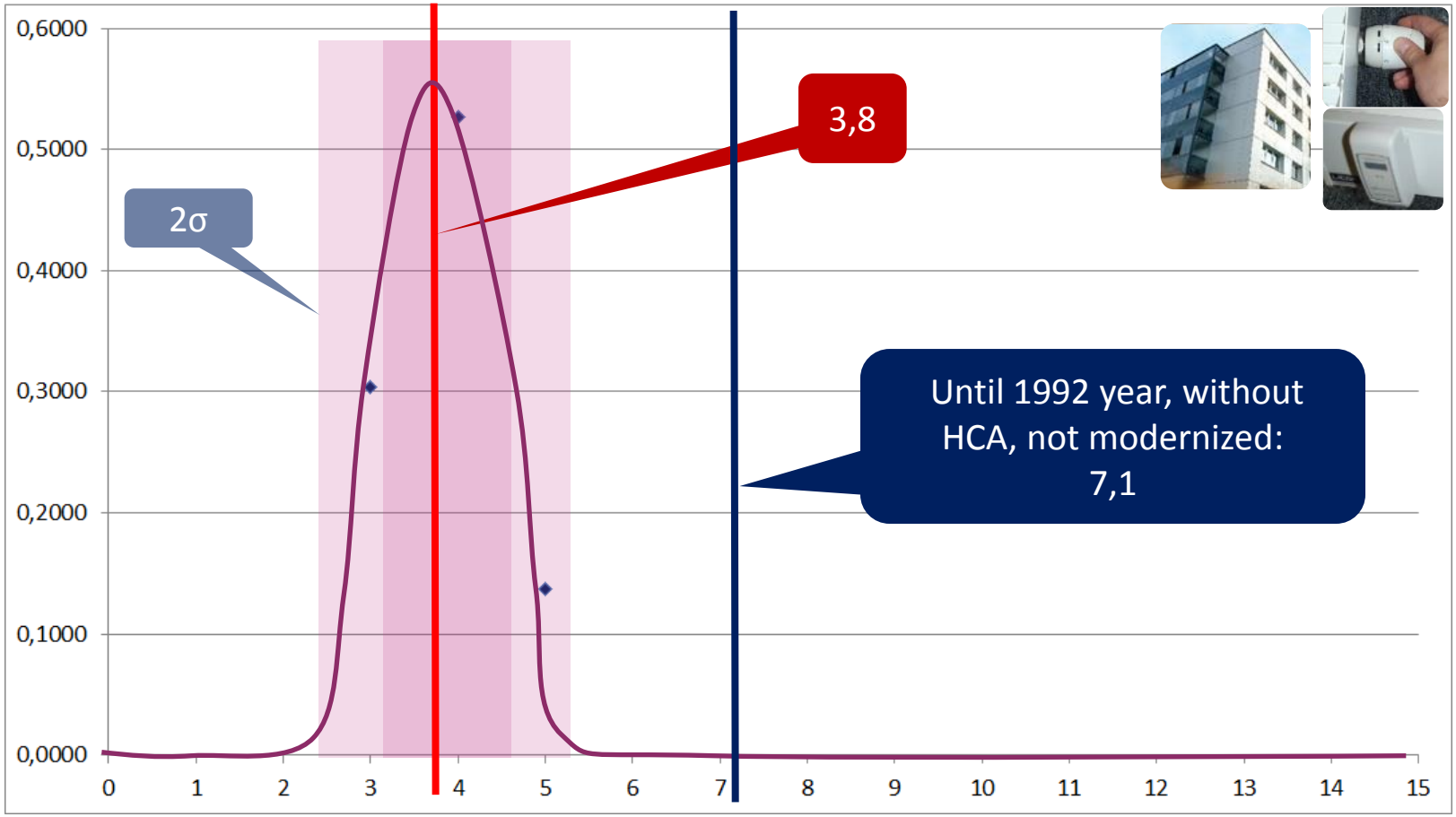
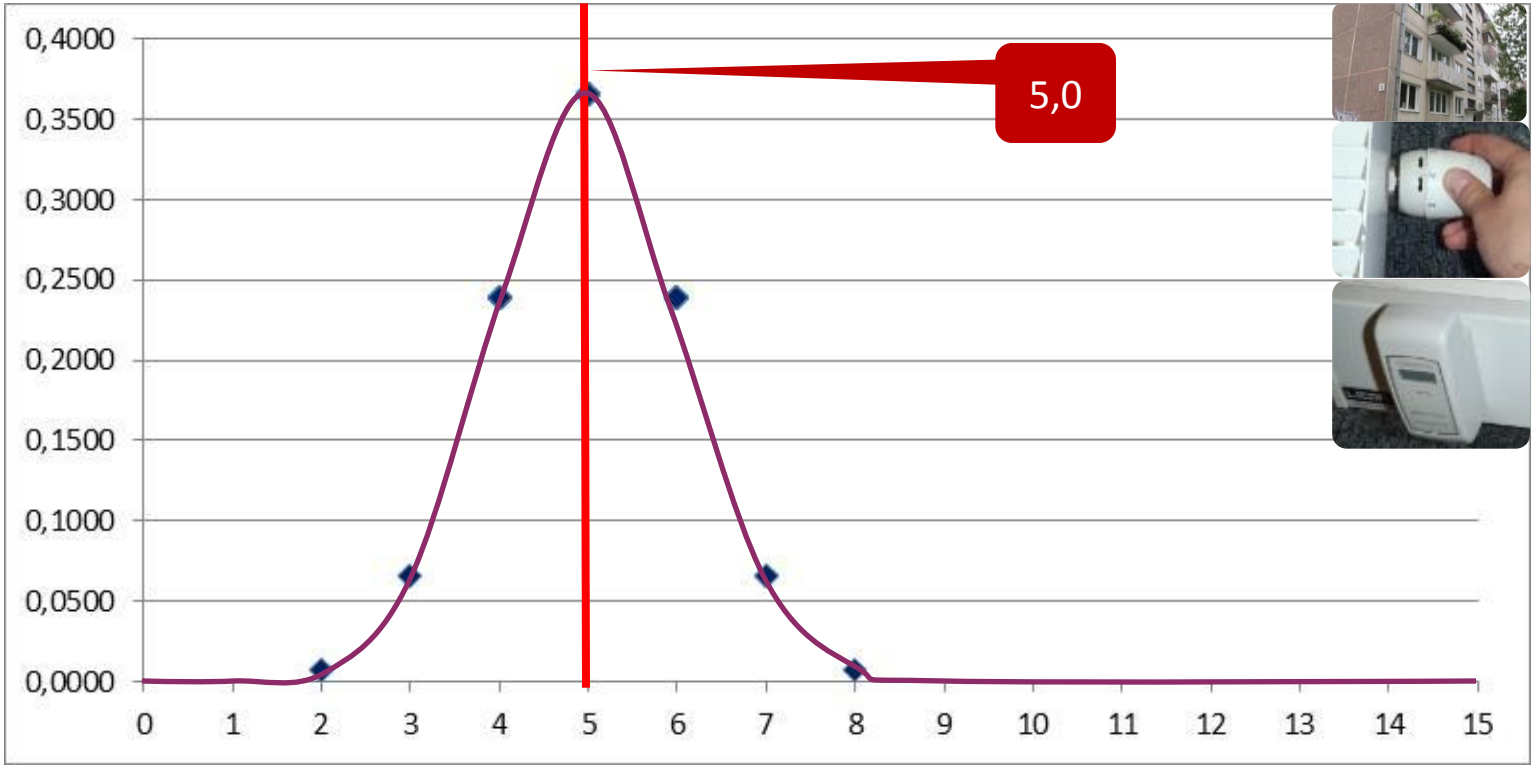
AECC as the optimal solution

- **New** multiflat buildings **with Heat cost allocators:**



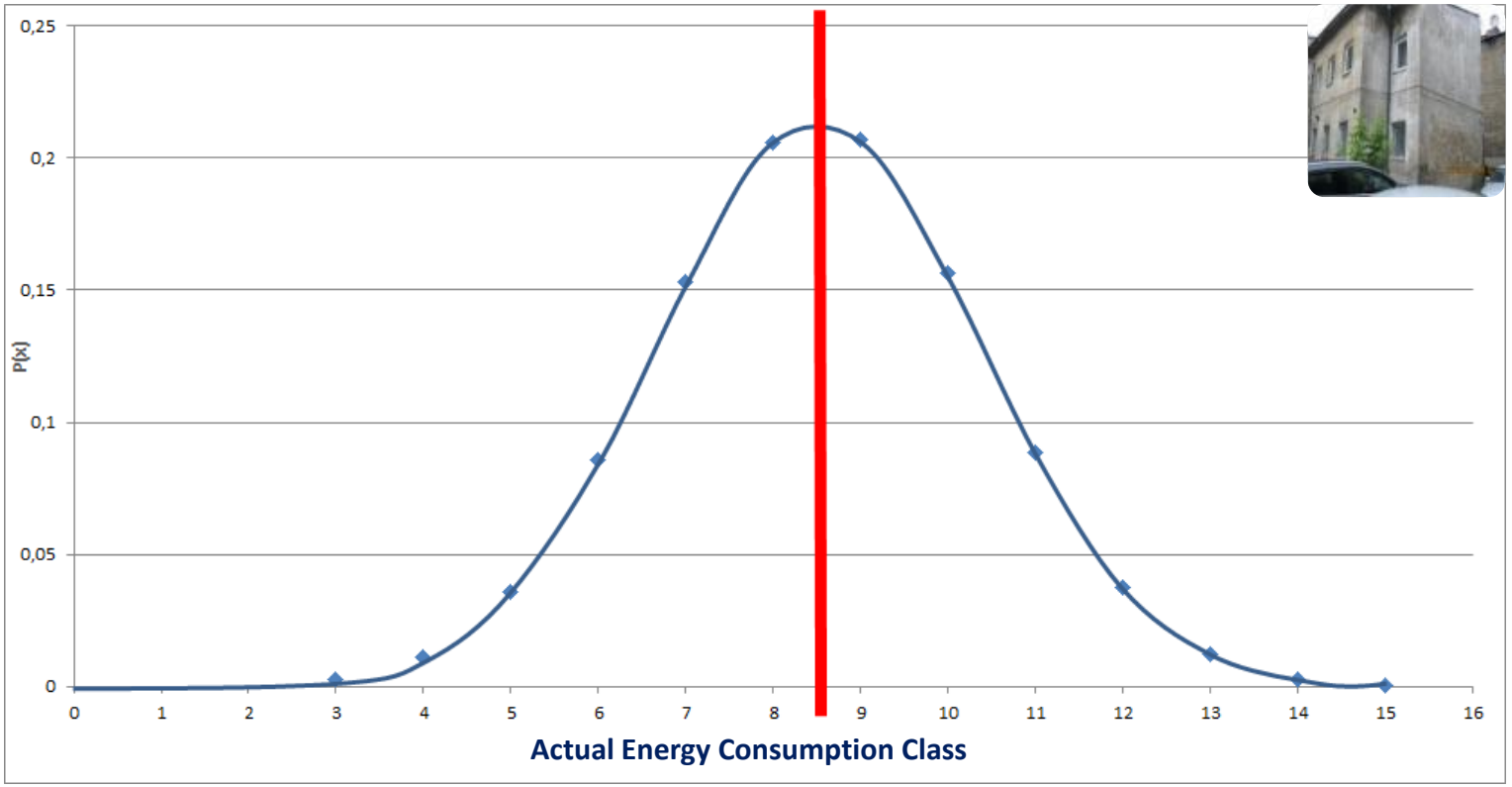
AECC as the optimal solution

- Multiflat buildings of 1960-1992 year **with Heat cost allocators consumes ~20-30 % less of heat energy:**



AECC as the optimal solution

- Until 1960 year:



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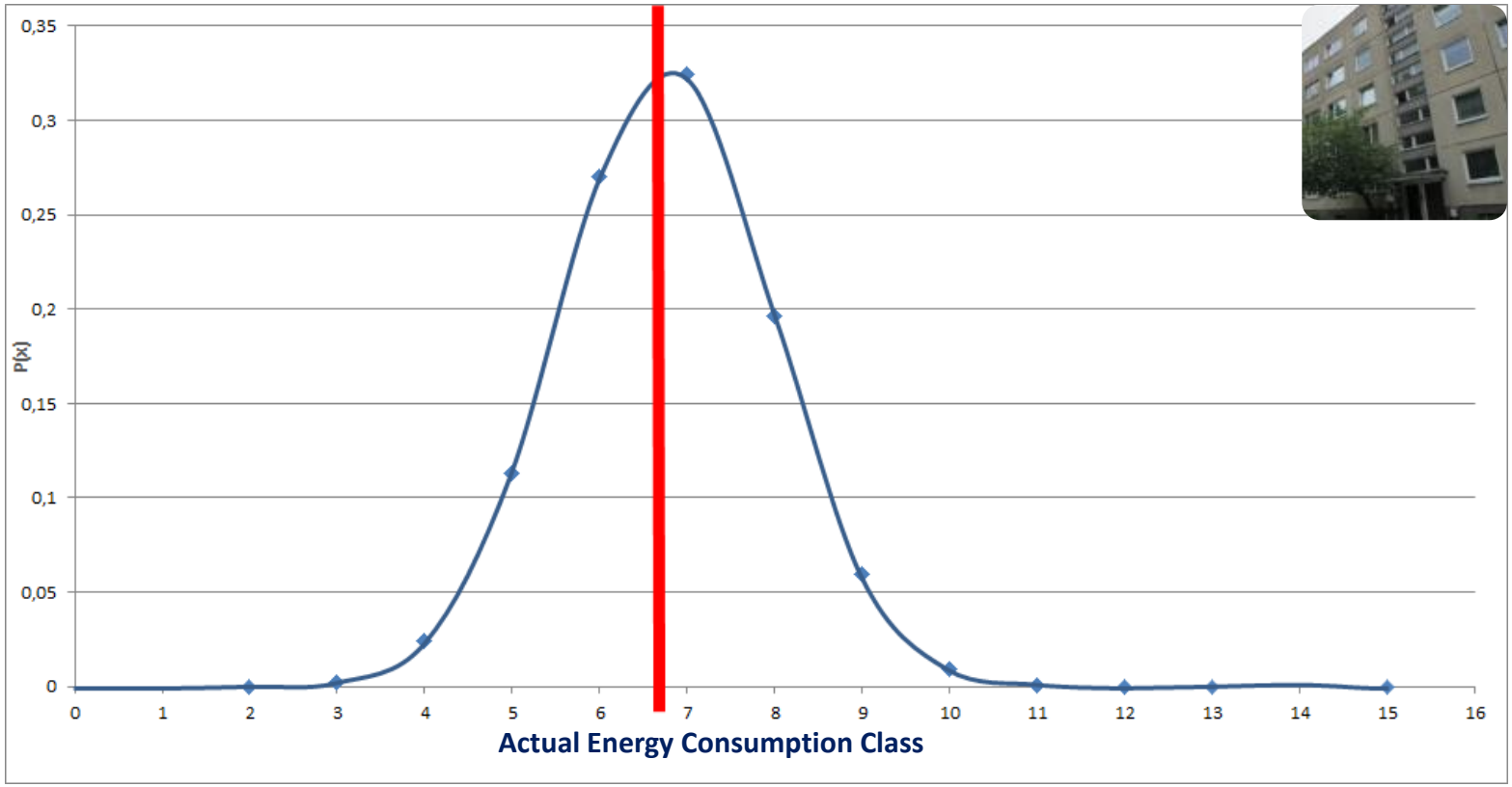
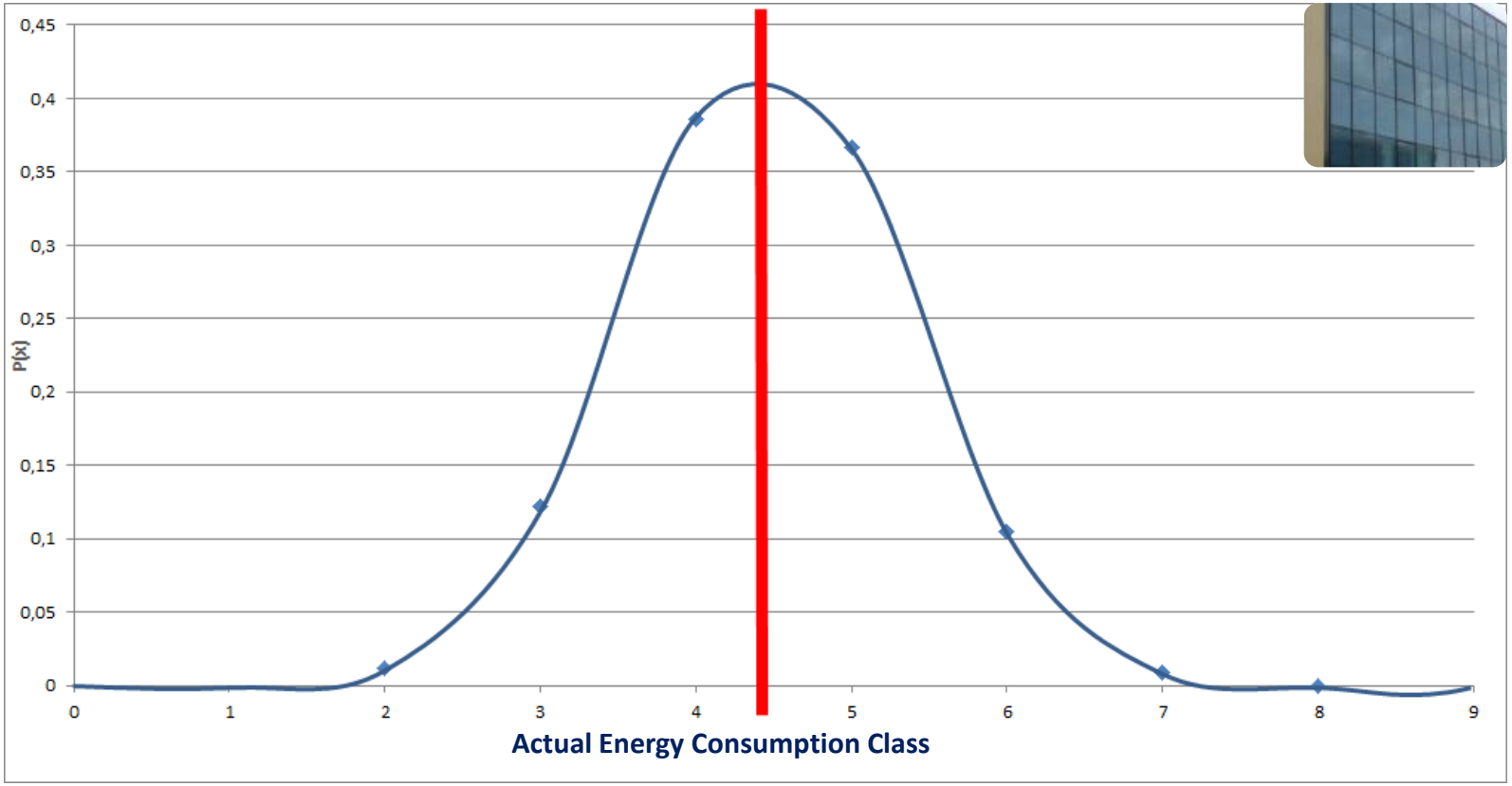
AECC as the optimal solution

- 1960-1998 year:



AECC as the optimal solution

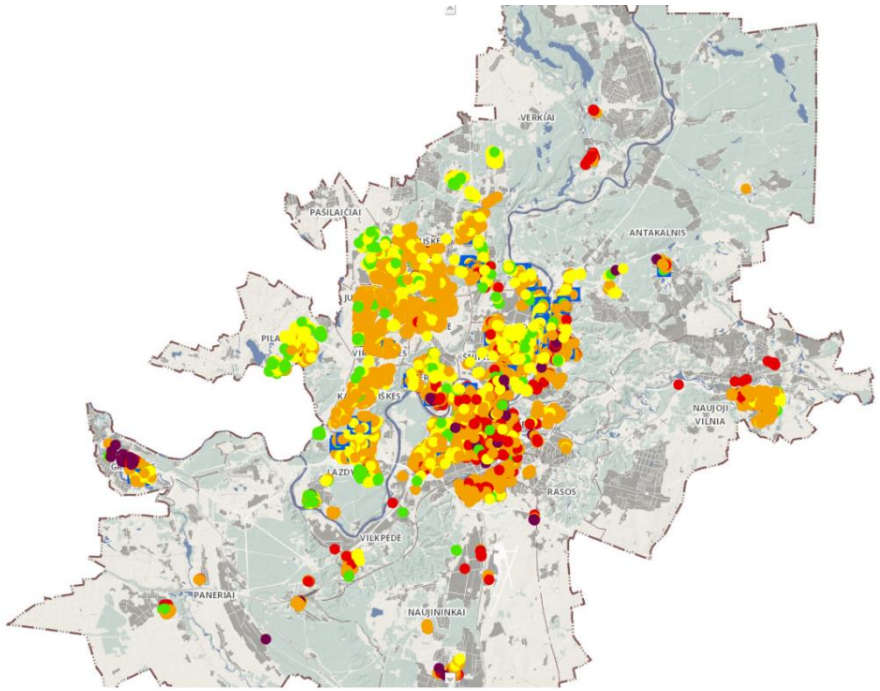
- After 1998 year:



Online Interactive Building Actual Energy Consumption Class (AECC) Map

INTERACTIVE ACTUAL ENERGY CONSUMPTION CLASS MAP

http://www.vilnius.lt/vmap/t1.php?layershow=siluma



Interactive Actual Energy Consumption Class (AECC) map

Interactive Actual Energy Consumption Class Map on Vilnius city municipality page:

http://www.vilnius.lt/vmap/t1.php?layershow=siluma

Or:

- 1. www.vilnius.lt
- 2. Go to: „**Efektyvus vartojimas**“ and to “**Pastatų energinio efektyvumo žemėlapis**“

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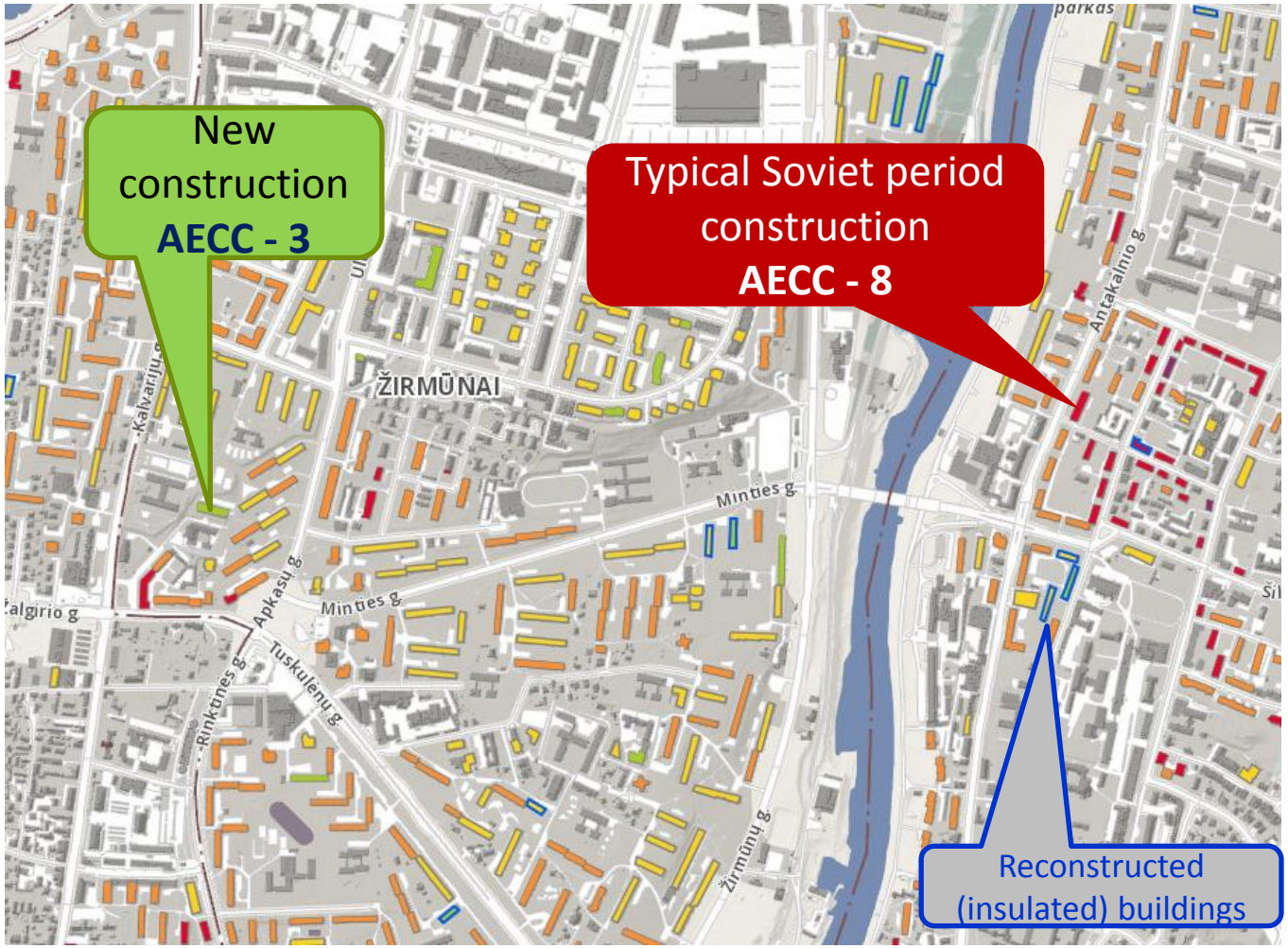
Online Interactive Building Actual Energy Consumption Class (AECC) Map

- City plan – district of multiflat buildings:



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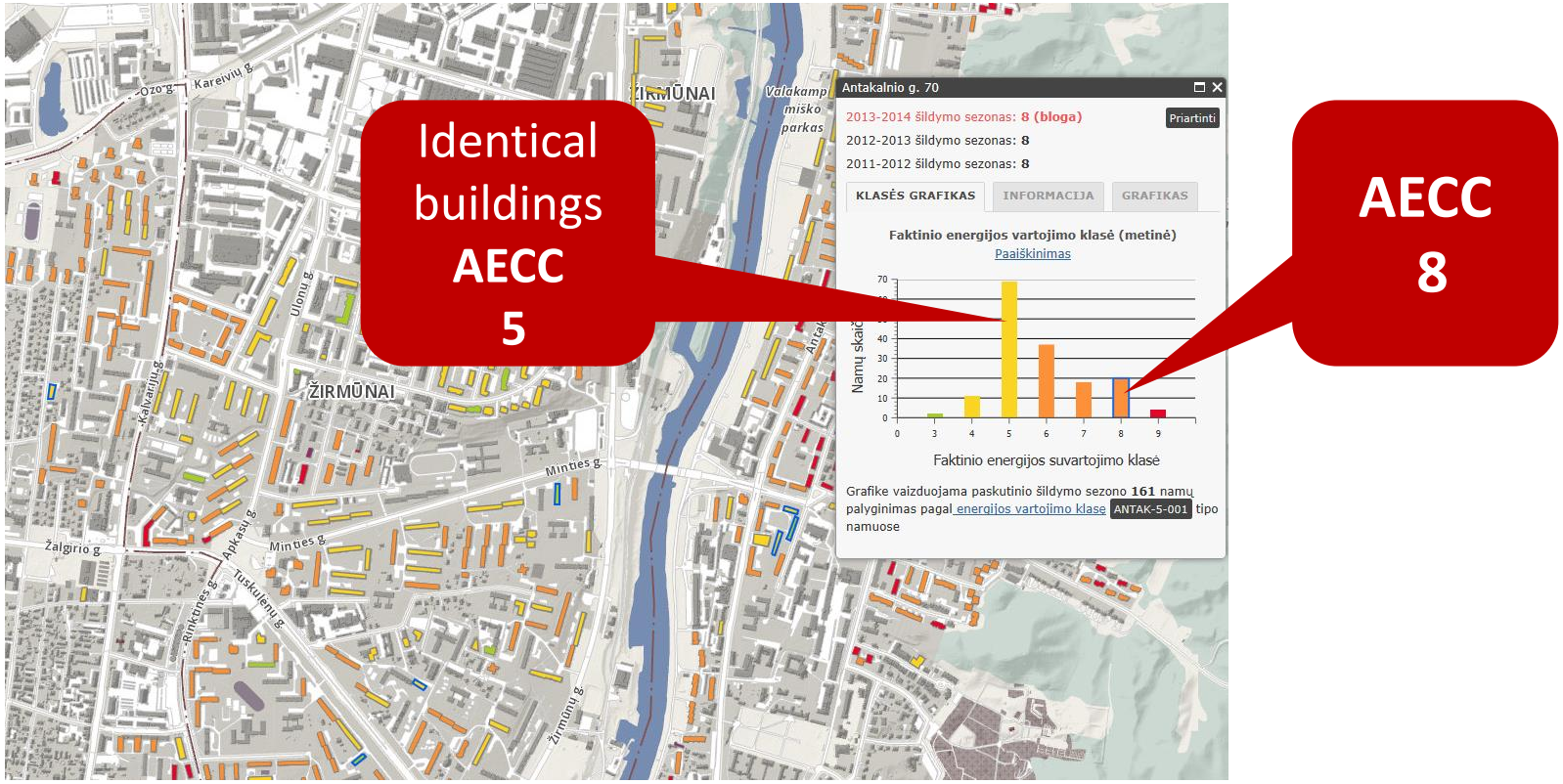
Online Interactive Building Actual Energy Consumption Class (AECC) Map

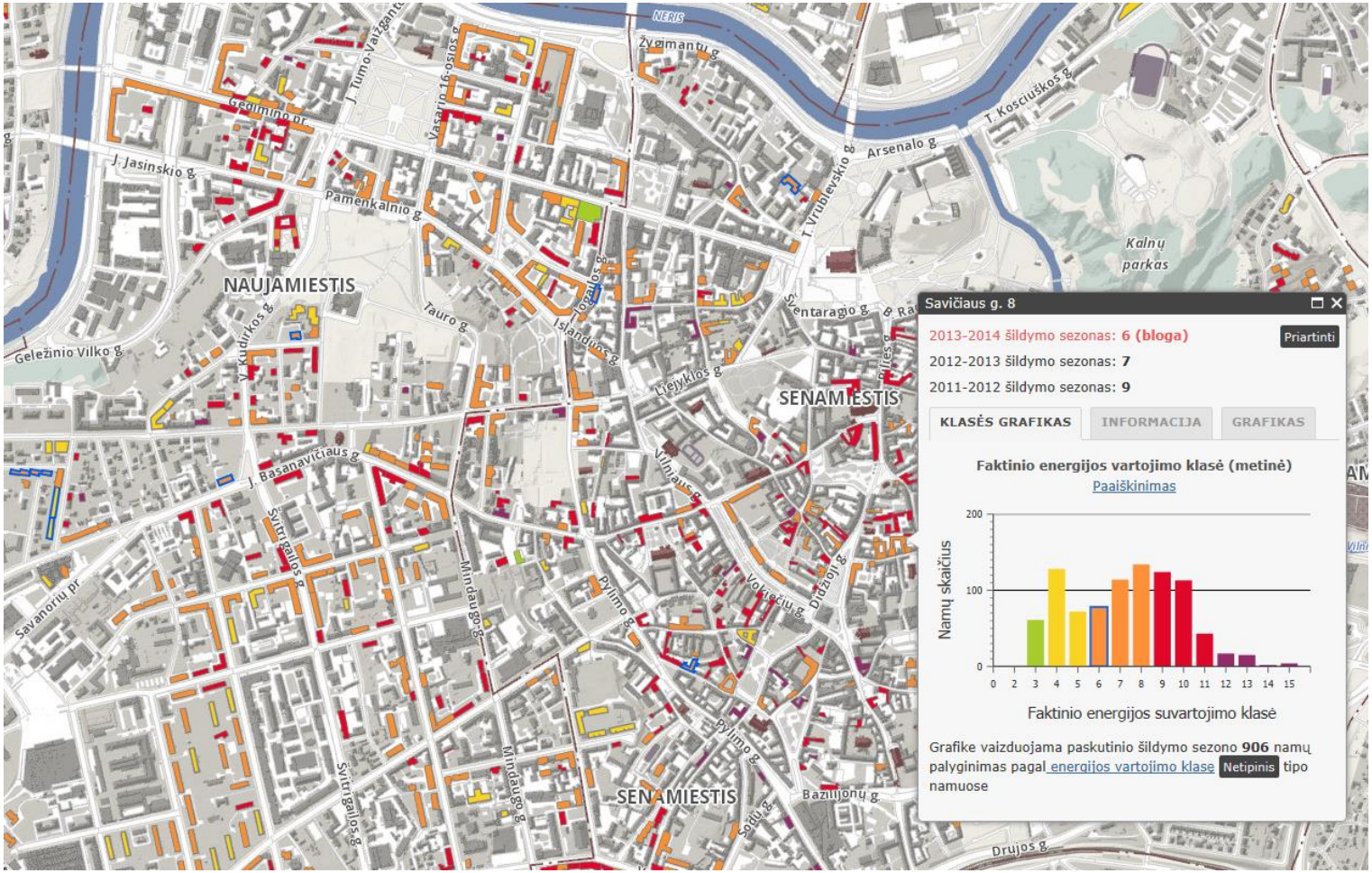
- **Delegate** (return) **responsibility** for a huge **energy bills from heat supply company to a heating systems maintenance company** (or building administrator)



- Selected buildings of **identical project type**
- Selected building has **AECC–8,** then the largest part of **such project type** buildings has **AECC–5**

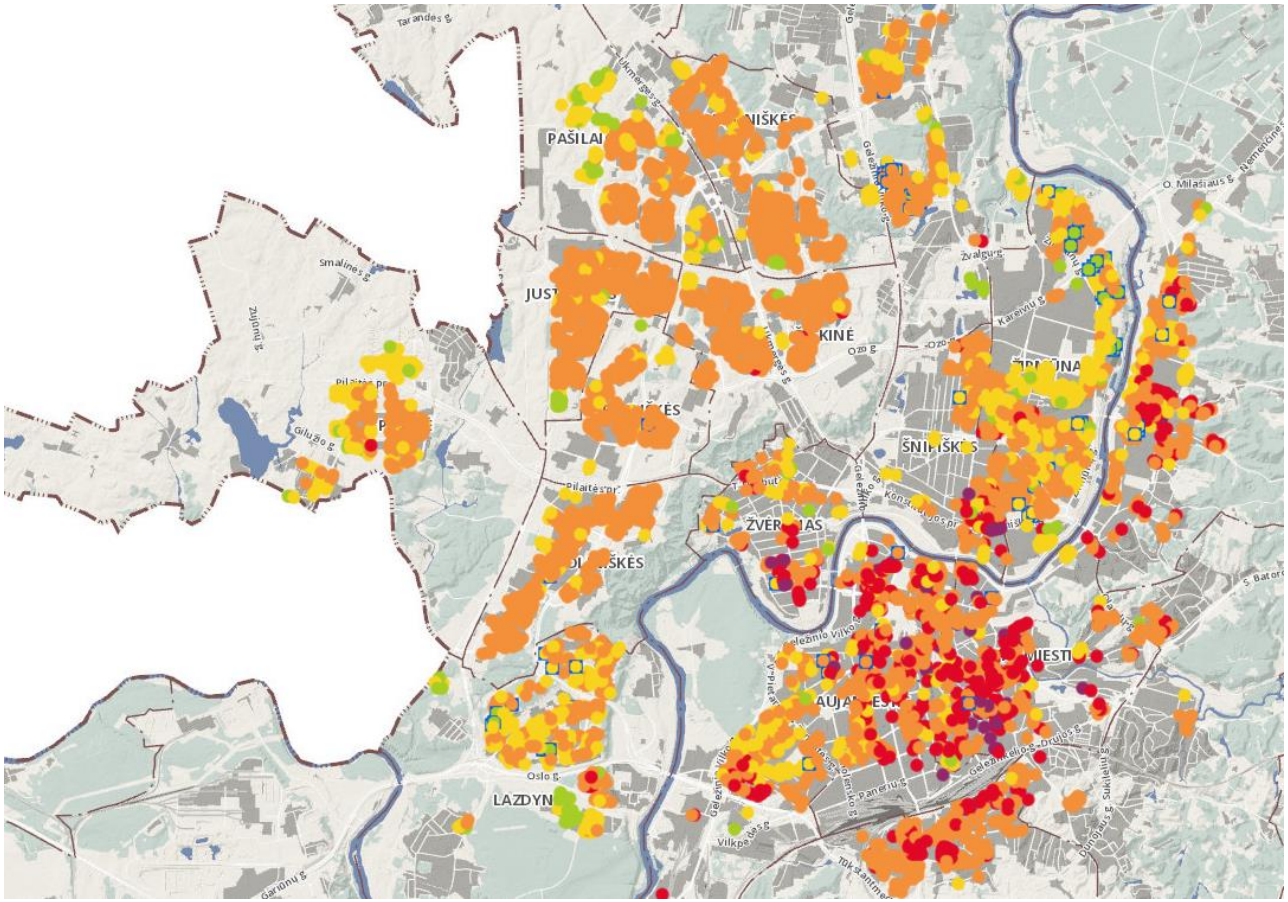
Online Interactive Building Actual Energy Consumption Class (AECC) Map

- Old town view:



Online Interactive Building Actual Energy Consumption Class (AECC) Map

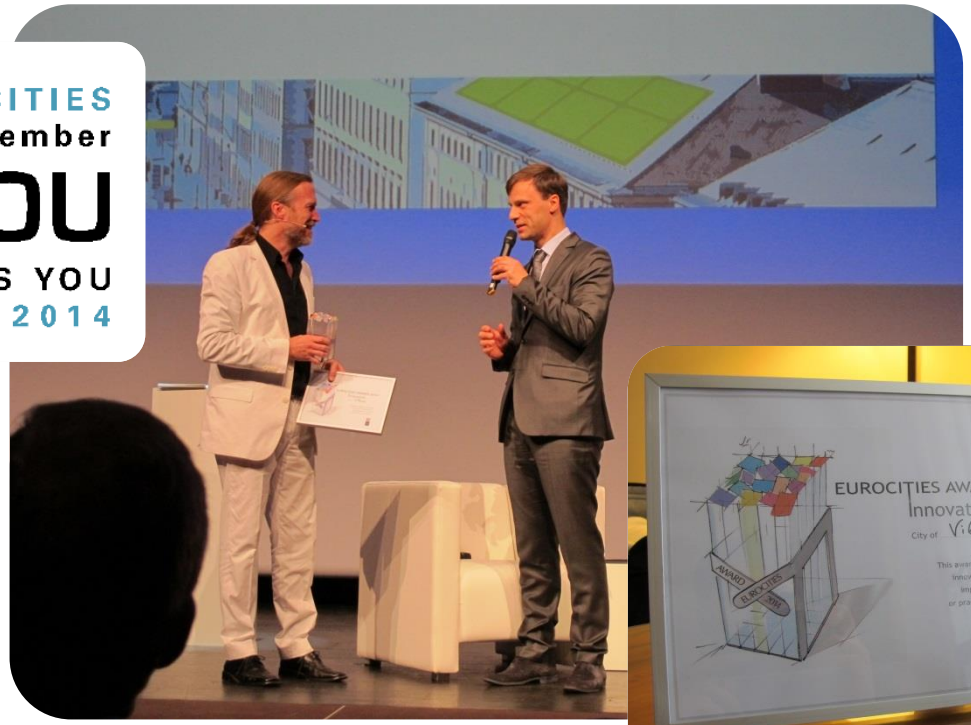
- Strategic Energy Efficiency plan for a whole City (reconstruction (insulation), District heating development, etc.):



Online Interactive Building Actual Energy Consumption Class (AECC) Map

- **AECC – Winner** of "**EUROCITIES 2014**" for Innovation in Energy:

ENERGISING CITIES
Munich 5-8 November
MYOU
MUNICH LOVES YOU
EUROCITIES 2014



- Short film in YouTube :
- https://www.youtube.com/watch?v=KiVII7hqsl0
- Or find on Google: "Interactive Actual Energy Consumption Map"

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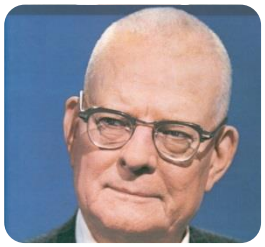
Online Interactive Building Actual Energy Consumption Class (AECC) Map



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YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE

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Online Interactive Building Actual Energy Consumption Class (AECC) Map

4DH
4th Generation District Heating Technologies and Systems

THANK YOU

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