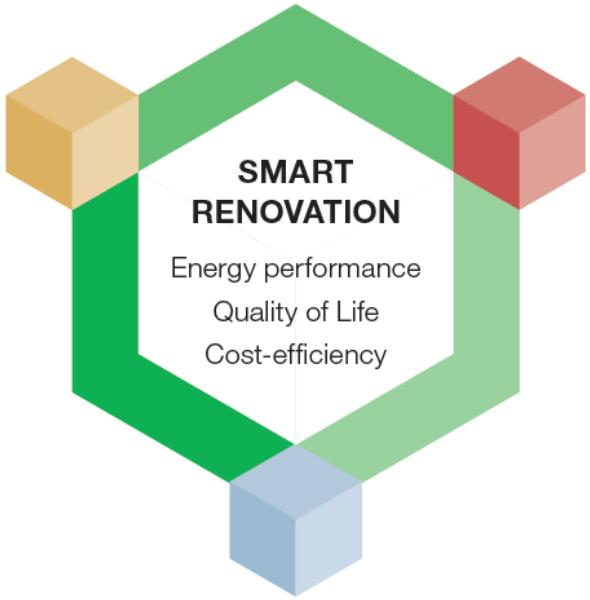
PAVLA HOROVA 17, 19

PILOT PROJECT OF DEEP RENOVATION OF RESIDENTIAL BUILDING IN BRATISLAVA

Zuzana Sternová, BUILDING TESTING AND RESEARCH INSTITUTE (TSUS) sternova@tsus.sk
Roman Grünner, ALCHEMIA-NOVA (ALCN) roman.grunner@alchemia-nova.net

The EU-GUGLE project

European cities serving as Green Urban Gate towards Leadership in sustainable Energy



- **6 Pilot cities: AACHEN, BRATISLAVA, MILAN, SESTAO, TAMPERE, VIENNA**
- **3 associated cities: GOTHENBURG, GAZIANTEP, PLOVDIV**
- **21 partners (9 different countries)**
- **186,000 m² of living space renovated**
- **Target: up to 82% primary energy savings**
- **5 + 1 years (2013 – 2019)**

EU-GUGLE project: OBJECTIVE

- Achieve better energy performance than defined by national regulation
- Reach parameters in BEST Sheets (Building Energy Specification Table)
- Subsidy 50% of additional costs, maximum 50€/m^2
- Costs at least or higher than 100€/m^2
- Demonstration (refurbishment), research and replication

SITUATION IN SLOVAKIA, APARTMENT HOUSES

146 682 flats (in Slovakia 890.000 build until 1992)

2 987 (in Slovakia 21.000) houses various construction type

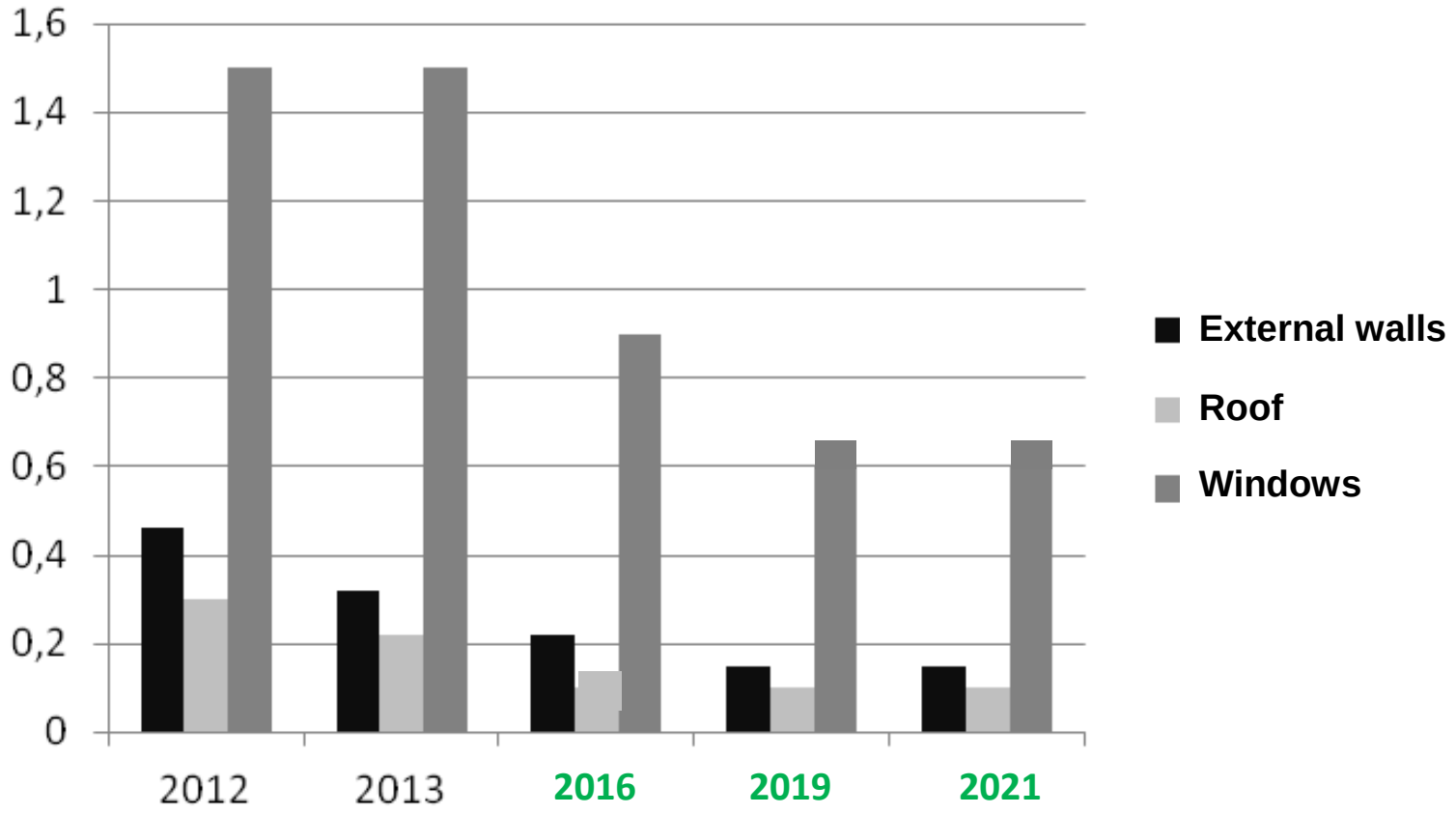
Private property of apartment owners

Renovated buildings: approximately 55%

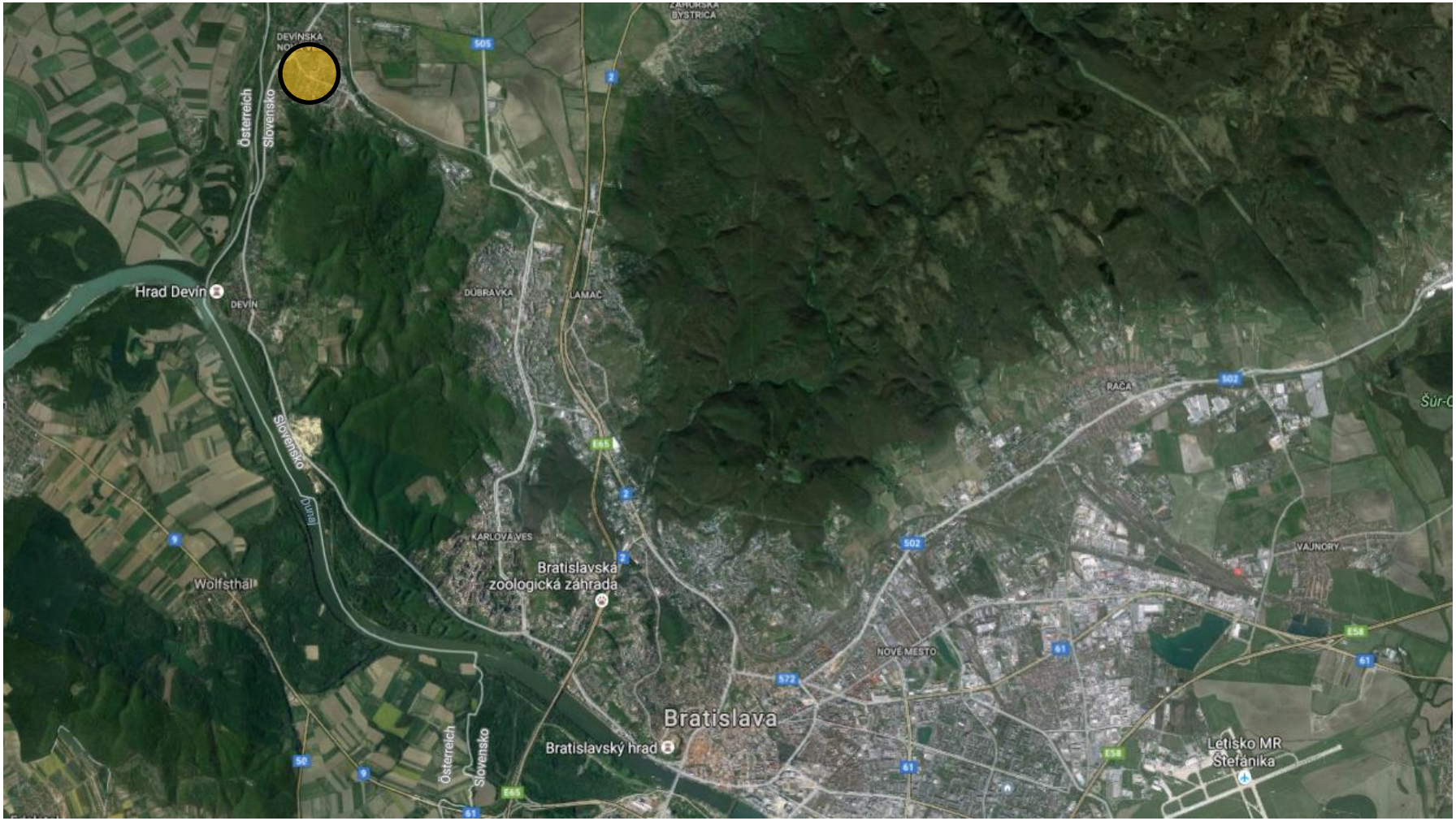
Individual renovation solutions

TIGHTEN OF REQUIREMENTS ON THERMAL PROTECTION

require higher thickness of the thermal insulation layer (ETICS)



PROJECT DEVELOPMENT



BUILT-UP AREA TYPICAL FLOOR:

540,9 m²

TOTAL FLOOR AREA OF THE RESIDENTIAL AREA:

3 786,3 m²

ENCLOSED VOLUME:

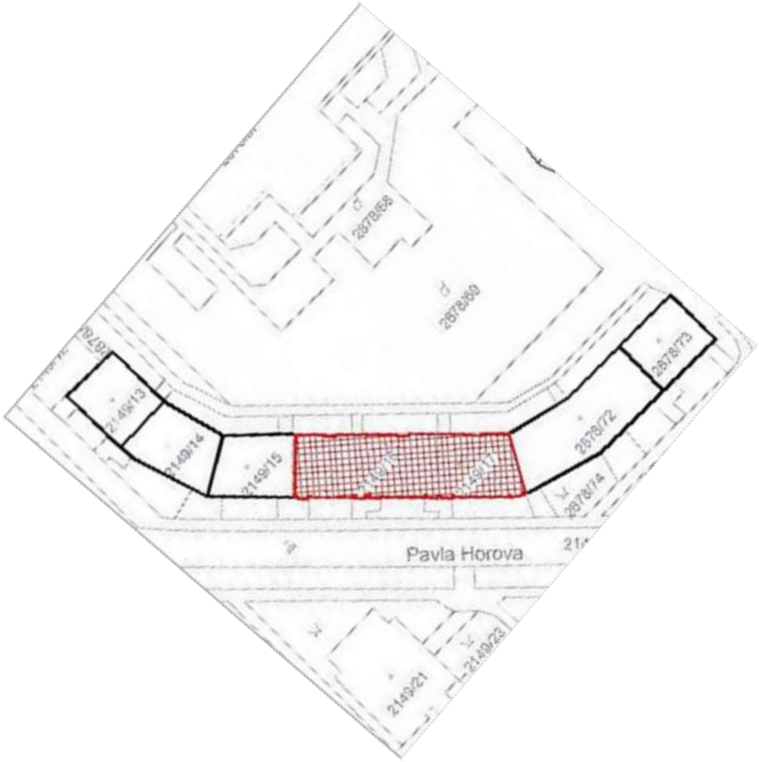
10 774,7 m³

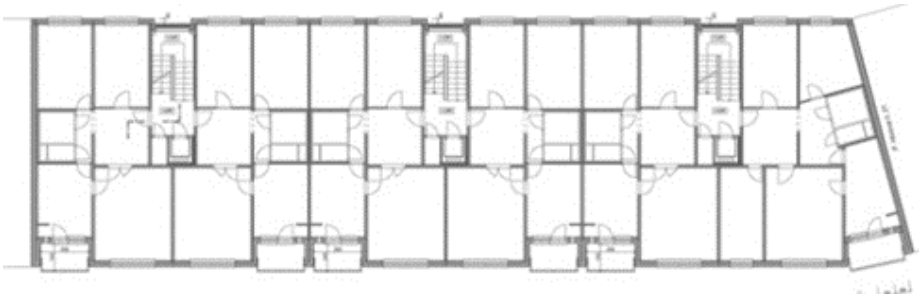
NUMBER OF FLOORS:

7

NUMBER OF HOUSING UNITS:

42






TUTO
STAVBU
REALIZUJE
eran
BASF

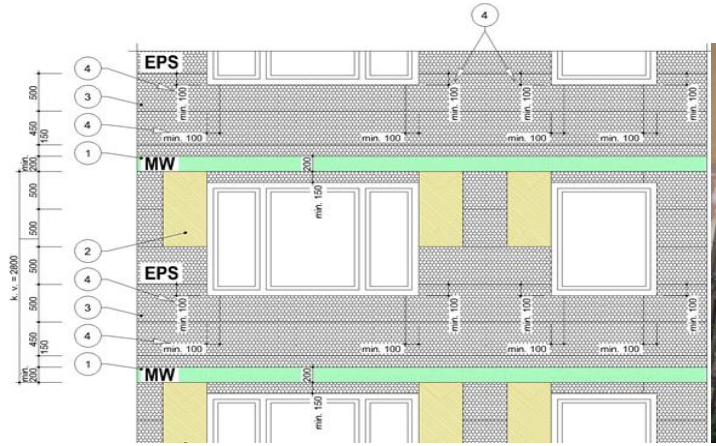
GOALS AND CHALLENGES OF THE PROJECT

BUILDING STRUCTURES AND BUILDING PARTS

» replacement of opening structures (replacement of all opening constructions in the house even those in replaced in the recent years)

» installation of a central system of controlled ventilation with heat recovery in each apartment.

» thermal insulation of external walls

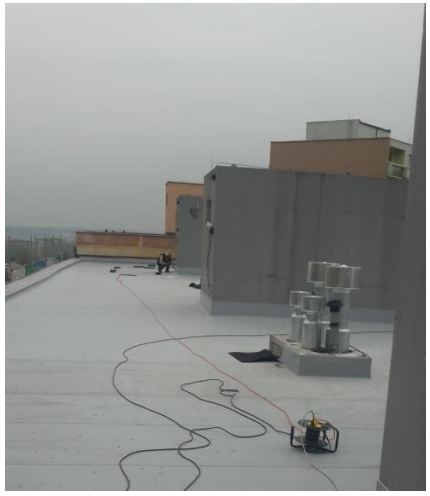


BUILDING STRUCTURES AND BUILDING PARTS

» renovation and insulation of roof with an increase of the attic and modification of the installation shafts with new ventilation

» replacement of exterior doors, at the doorway and glass walls

» renovation of balconies and their glazing



TECHNICAL BUILDING SYSTEMS

- modernization of vertical distribution systems, cold and hot water and circulation including their thermal protection
- modernization of sewerage, horizontal and vertical gas installations and exhaust air ducts replacement of exhaust fans in toilets and bathrooms
- removal of the original piping required special measures to be taken to dispose of harmful asbestos-based waste - the ventilation system piping in the installation core



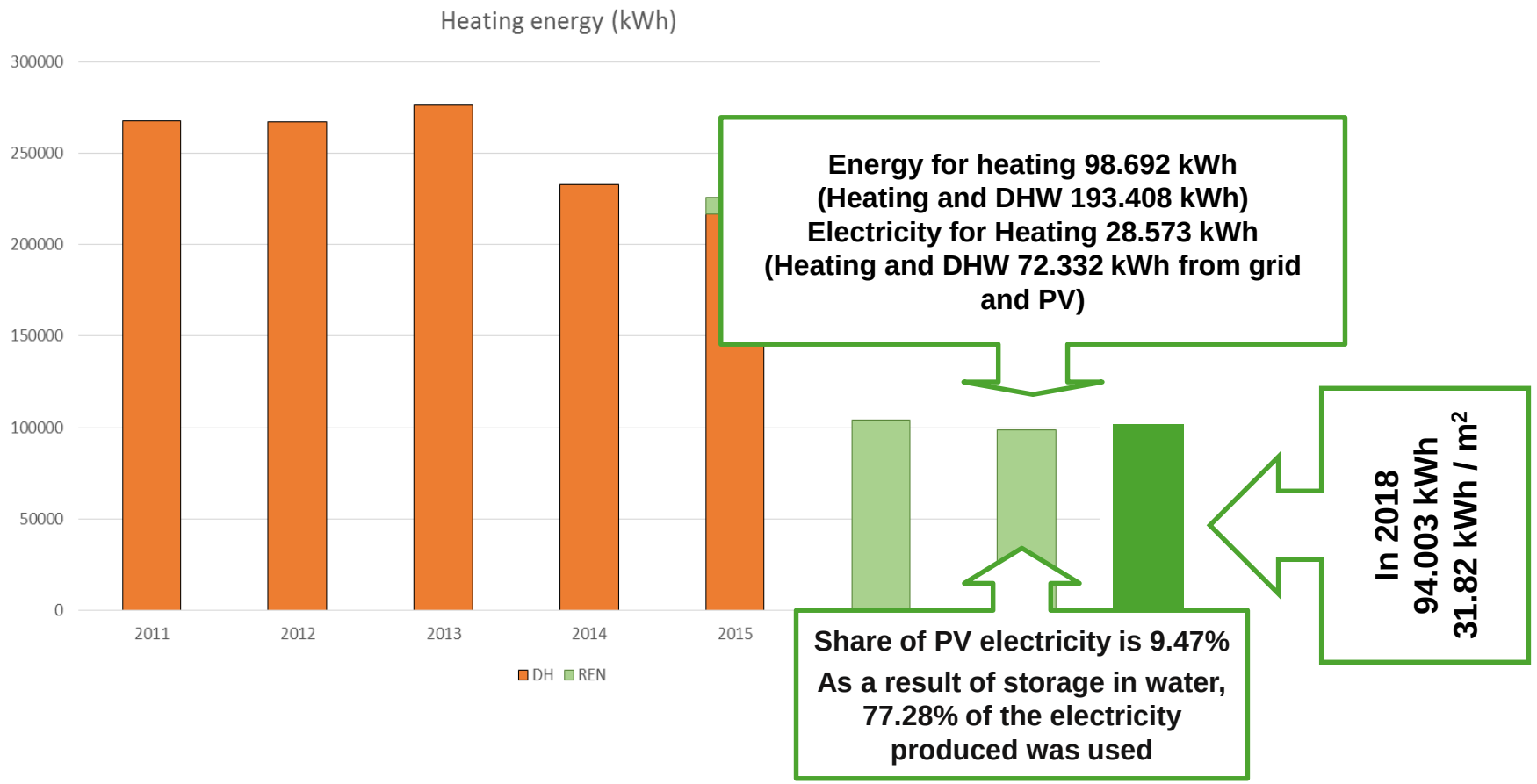

RENEWABLE RESSOURCES

» 10 kWp photovoltaic on roof

» Cascade of 4 electric heat pumps air / water with additional electric heating pads

» The total installed thermal power for heating and hot water: 98,92 kW

REDUCTION OF ENERGY CONSUMPTION FOR HEATING

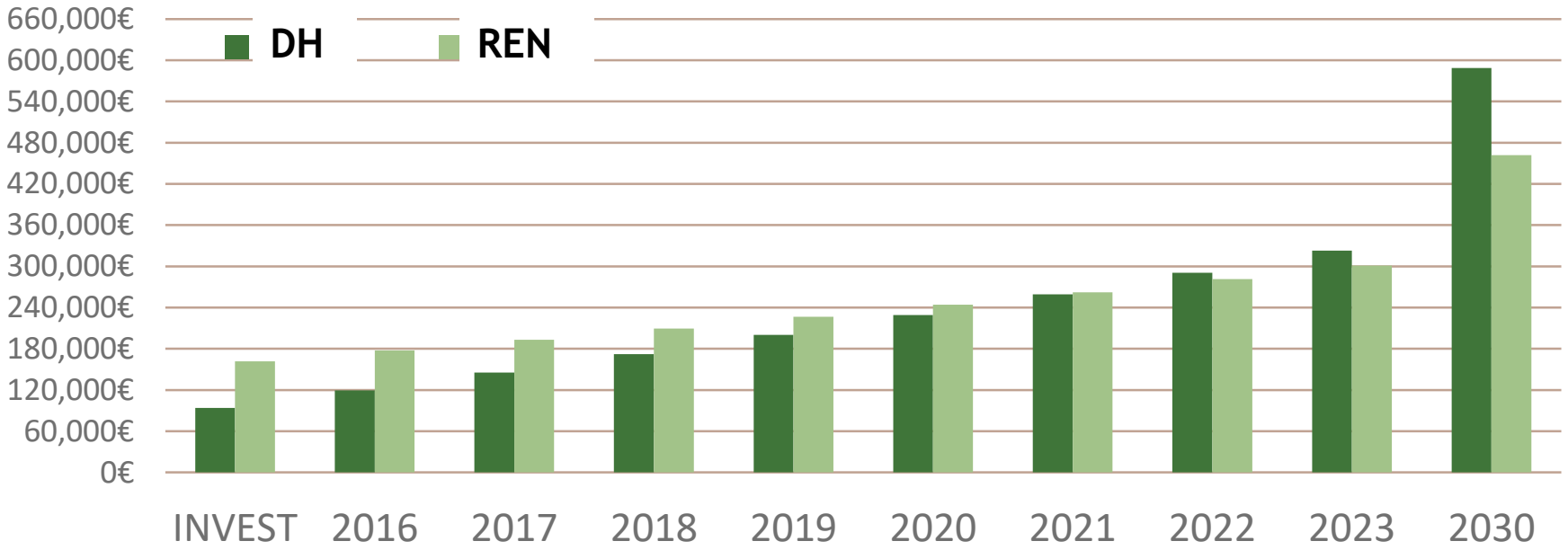


INVESTMENT COSTS OF THE PROJECT

Energy efficiency in the building	
Retrofitted area	3.786,30 m^2
Total costs	920.520 €
Costs per m^2	243,12 €
Payback period	7,8 years
Energy demand (baseline)	93,32 kWh/(m^2.yr)
Energy demand (after)	8,91 kWh/(m^2.yr)
CO_2 reduction	117 tCO_2/yr
Energy supply	Solar PV, heat pumps

RETURN ON INVESTMENT

	Investment cost	2016 Costs after 1 y	2017 Costs after 2 y	2018 Costs after 3 y	2019 Costs after 4 y	2020 Costs after 5 y	2021 Costs after 6 y	2022 Costs after 7 y	2023 Costs after 9 y	2030 Costs after 15 y
DH	93 821 €	119 289 €	145 209 €	172 117 €	200 052 €	229 056 €	259 172 €	290 446 €	322 925 €	588 471 €
REN	161 537 €	177 460 €	193 193 €	209 522 €	226 469 €	244 060 €	262 321 €	281 280 €	300 965 €	461 744 €
Savings										**126 727 €**



ENERGY AND ECONOMIC EFFICIENCY

Comparison of selected monthly prepayment for using a 70.16 m² flat with actual monthly costs in 2016

	till 29.02. 2016	from 01.03.2016		costs 2016
Occupancy of 4 people	1,00 EUR / m2	1,75 EUR m2		
Fund for operations, maintenance and repair	70,16 €	122,78 €	Fund for operations, maintenance and repair	114,67 €
Heat - Costs for CH	58,26 €	10,11 €	Heat - Costs for CH	6,00 €
Heat – HW heating	22,22 €	6,56 €	Heat – HW heating	7,55 €
Heat - HW heating basic constituent	3,27 €	0,73 €	Heat - HW heating basic constituent	1,64 €
HW - water sewerage	9,10 €	9,10 €	HW - water sewerage	8,71 €
CV - water sewerage	15,53 €	15,53 €	CV - water sewerage	10,91 €
Electricity – common rooms	4,88 €	2,60 €	Electricity – common rooms	2,31 €
Monthly deposit total	223,53 €	210,05 €	Monthly deposit total	189,71 €

The essence of energy efficiency projects based on future energy cost savings is the fact that less money is spent from wallets or domestic budgets. Thus, the ultimate effect is also an improved economic result.

ENVIRONMENTAL COMPARISON OF HEAT SOURCES

Calculation of ecological impact (equivalent CO_2 leakage in kg) of compared heat sources for one year

	MJ	DH	REN
Total heat consumption	kWh	201 752	201 752
COP			2,72
Electricity	CO_2 / kg	-	0,178
DH heating	CO_2 / kg	0,2365	-
Annual CO_2 emissions	**kg**	**47 714**	**13 203**
Savings	**%**	**0**	**-72,33**

calculated in terms of the real values of emissions, in the conditions of Slovakia it is possible to calculate with the value of 0.1780 kg CO_2 / kWh (data of Slovak Power Plants) *
for district heating with natural gas, calculated with experimentally detected values of 0.2365 kg CO2 / kWh *

* Havelský, V.: Ekonomické a ekologické hodnotenie zdrojov tepla v bytových domoch. In: TZB Haustechnik 01/2016

Benutzer: Miroslav Bauco | Abmelden

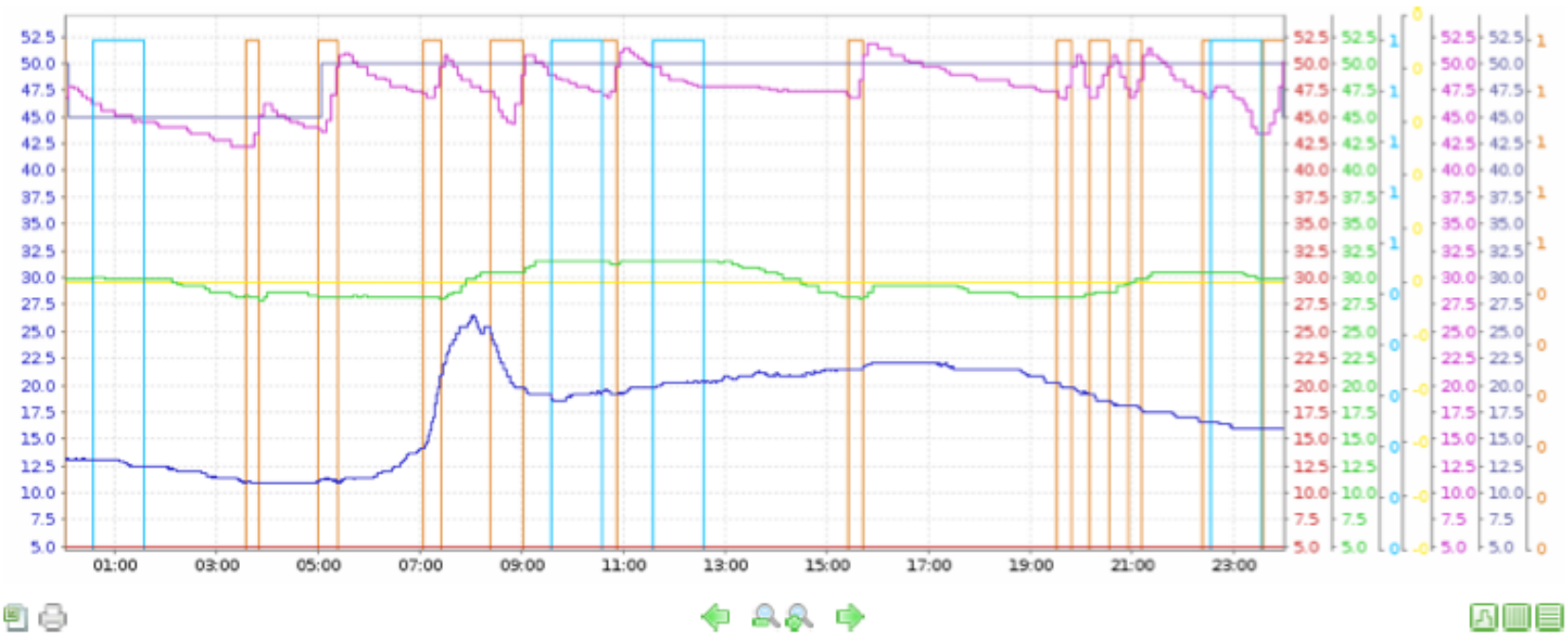
STIEBEL ELTRON
Technik zum Wohlfühlen

Start | Anlagen | Diagramm

» Diagramm

Persönliche Profile

BD – Horova 17–19, BA



Auswahl Zeitraum

MAIN LESSONS LEARNT

Technical

- Building companies profit orientated, adjusting quality of components (e.g. inferior thermal insulation, but changed to required after inspection of construction works)
- Low skilled workers for technical systems/new technologies
- New technologies – HVAC, fire barriers, leveling the façade (thermal insulation) with loggias, disconnection from district heating (technical and technological), new boiler room with cascading heat pumps connected to PV, intelligent monitoring system
- Problems with bird protection, asbestos, acoustics of the heating room

Management / organizational issues

- Problems with disconnection from district heating
- Change of the law on disconnection from district heating
- Permits for deep renovation time demanding

MAIN LESSONS LEARNT

Economic / financial

- Return of interest surpassed calculations, better than standard refurbishment even 3-times expensive
- Reciprocity: electricity is given for free into the network, there is no concession when taking it back
- Legislation – heat producers not forced into renewables, problems with primary energy factor, “protected” by legislation against disconnection
- Combination of loans – Own, Bank, State Housing Development Fund

Societal

- **The knowledge acquired by the renovation of was applied in the second phase of the process of deriving the cost-optimal levels of the energy performance requirements for Nearly Zero Energy Buildings (Directive, required by the European Commission till end of March 2018)**
- **as well as the basis for the processing of the amendment of the national standard STN 73 0540-2 Functional Requirements. Thermal protection of buildings.**

THANK YOU FOR ATTENTION

TECHNICKÝ A SKÚŠOBNÝ ÚSTAV STAVEBNÝ
BUILDING TESTING AND RESEARCH INSTITUTE

ZUZANA STERNOVÁ
BUILDING TESTING AND RESEARCH INSTITUTE - TSUS
Studená 3, 821 04 Bratislava, Slovakia
Tel: +421(2) 49228 111
Fax:+421(2) 44453 617
E-mail: info@tsus.sk
Web: www.tsus.sk

alchemia nova
institute for innovative phytochemistry & closed loop processes

ROMAN GRÜNNER
alchemia-nova GmbH
Institute for innovative phytochemistry & closed loop processes
Baumgartenstrasse 93, 1140 Vienna, Austria
Tel +43(1) 810 1000
Fax +43(1)8101000-10
E-mail office@alchemia-nova.net
Web: www.alchemia-nova.net