



DEEP RENOVATION OF MULTI-FAMILY RESIDENTIAL BUILDINGS

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PROJECT DREEAM

DREEAM is a consortium of European organizations that bring the key expertise to help European housing companies and cities scale up their renovations:

- *Research*

Chalmers University of Technology, RISE, Wuppertal Institute

- *Engineering*

Exeleria

- *Consultancy & solution providers*

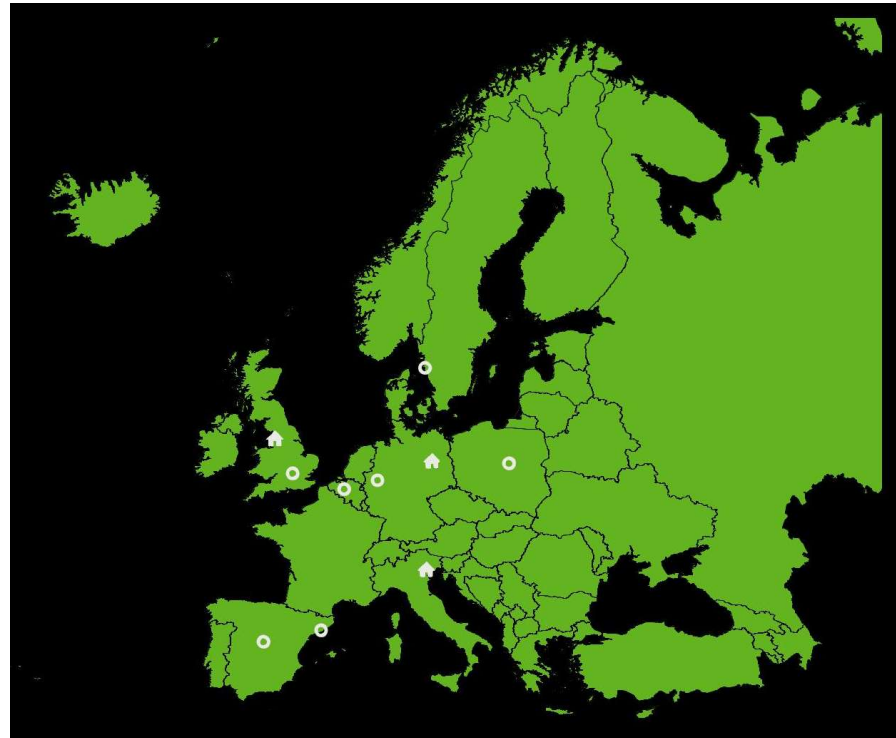
Bax & Company, 3C-Precon, Energy Pro, SinCeo2, **NAPE**, OpenDomo

- *Real estate and housing companies*

Savills, Places for People, Ater Treviso

- *Housing network*

EURHONET



DREEAM – THINK BIG, SAVE BIG!

DREEAM DEMONSTRATES THAT AMBITIOUS LARGE SCALE RENOVATIONS YIELD BETTER ENERGY EFFICIENCY GAINS AND ARE MORE COST-EFFECTIVE.

Challenge

- In Europe residential and commercial buildings are responsible for 40% of energy consumption and 36% of CO₂ emissions. Most of the residential buildings are more than 30 years old and need renovation, in order to improve their energy efficiency and comfort.
- However, standard renovations result in only 10-40% of energy efficiency improvement and the payback time is too long for more renovations to be justifiable.

Thus, housing companies and cities look for solutions to:

- Enhance the energy efficiency gains from renovations.
- Maximize the returns on their investments (ROI).
- Increase the renovation rate of their building stock

Approach

DREEAM's solution to the challenge faced by housing companies is to scale up renovations. This means to:

- **Increase the scale of renovation from the typical one building to multiple buildings at a time.**
- **Raise the renovation ambition to a nZEB (nearly Zero Energy Building) standard.**

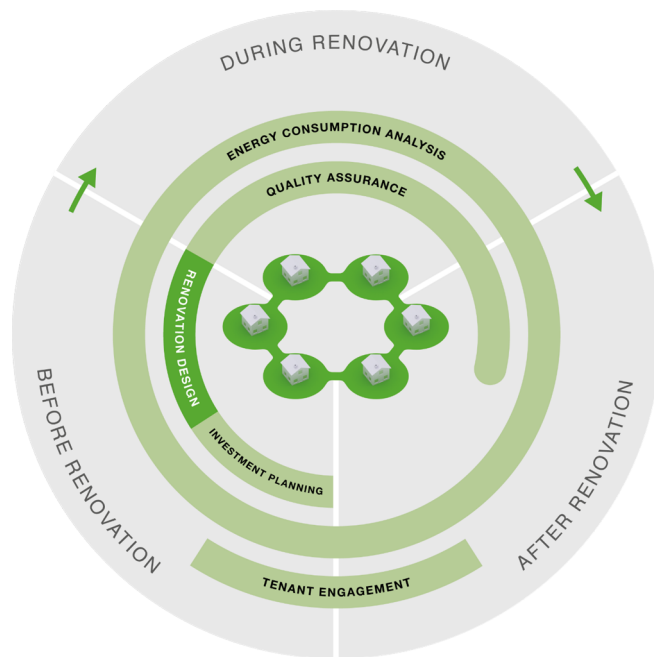
The project aims to demonstrate that ambitious large renovations:

- Allow for a better integration of renewables
- Result in higher energy efficiency gains
- Are more cost-effective

DREEAM helps to plan, design and implement ambitious multi-building renovations in accordance with individual targets and objectives of housing companies and cities.

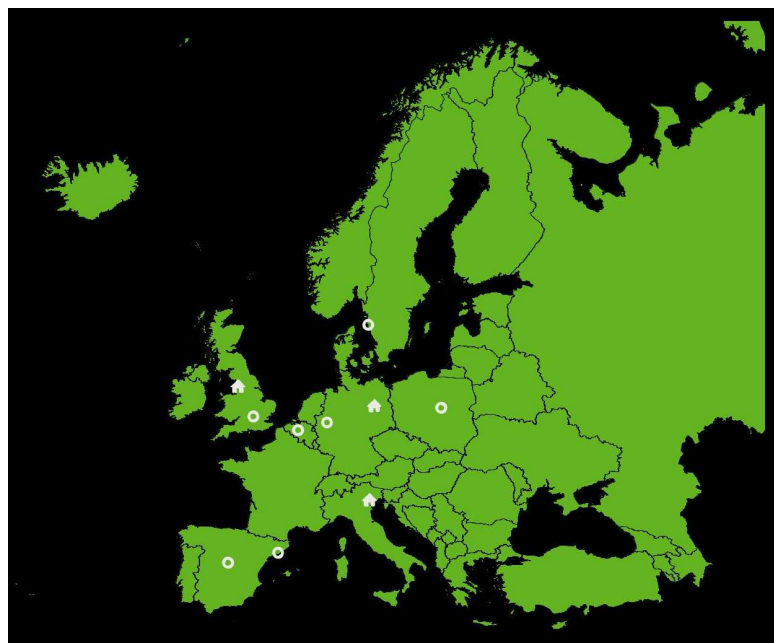
DREEAM – DEEP RENOVATION

DREEAM supports housing companies and cities in scaling up their renovation ambitions through an integrated approach allowing informed decisions before, during and after renovation.



€				
Investment planning	Renovation design	Quality assurance	Energy consumption analysis	Tenant engagement
Strategic decision support for investment planning on building portfolio level – integration of sustainability goals into long-term financial strategies.	Key DREEAM innovation is a renovation design tool: <ul style="list-style-type: none"> • online access designs for multi-building projects • optimized nZEB renovation, incl. renewables. 	Technical quality supervision during renovation works: tailor made quality assurance plan 3 supervision visits during renovation.	Detailed energy consumption monitoring throughout the renovation process: <ul style="list-style-type: none"> • historical energy data analysis • real time consumption tracking on tailor-made monitoring platform. 	Tenant engagement before and after renovation: <ul style="list-style-type: none"> • user validation of planned renovation • innovative social mapping & indicators • trust building • tenant coaching on energy saving.

ABOUT DREEAM



DREEAM is a 4-year project (2015-2019). As part of DREEAM over 150 dwelling across three pilot sites will be renovated to a nZEB standard.

DREEAM approach will be demonstrated and tested in three pilot sites in Europe:

- Padiham, UK
- Treviso, Italy
- Berlin, Germany

An ambitious 75% of energy demand reduction is targeted in all pilot buildings.

It will be promoted in CEEC (Poland, Ukraine)

PROJECT DREEAM PILOT SITE : PADIHAM, UK

- A mix of 109 properties built in mid-1970s in general need of upgrade.
- Heat is supplied to 23 properties by a natural gas fired high efficiency combi-boiler, and to 86 properties using legacy electrical storage heating.



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PILOT SITE: PADIHAM, UK

PREFERRED CONCEPT A (aplicable to 100% EE)

- PV system in roof: 3kWp
- Heating/DHW:
 - ✓ High Efficiency Electric Storage heaters (lounge-hall)
 - ✓ Panel heaters (bedrooms)
 - ✓ Storage tank for DHW
- Ventilation system:
 - ✓ Single room heat recovery
- Envelope:
 - ✓ EWI up to 0,28 W/m²K
 - ✓ Roof (loft) +300 mm

PREFERRED CONCEPT B (aplicable to 100% EE)

- PV system in roof: 3kWp + **battery storage**
- Heating/DHW:
 - ✓ High Efficiency Electric Storage heaters (lounge-hall)
 - ✓ Panel heaters (bedrooms)
 - ✓ Storage tank for DHW
- Ventilation system:
 - ✓ Single room heat recovery
- Envelope:
 - ✓ EWI up to 0,28 W/m²K
 - ✓ Roof (loft) +300 mm

PROJECT DREEAM

PILOT SITE: ATER TREVISO, ITALY

- The current construction has **no insulation**, **double glazed windows** with **ageing zinc coated steel frames** and **PVC shutters**.
- Living space heating and DHW are produced by **single natural gas boilers** (25 Kw).
- Many tenants use **single cooling system** in the hot season and in half-season against **the high humidity and mould** (wall and air).
- All tenants currently have an **independent** electrical and natural gas **grid connection** and third party supplier contract.
- Tenants complain that heating and cooling expenses **are very high** and they feel uncomfortable.



PROJECT DREAM

PILOT SITE: ATER TREVISO, ITALY

ACTION		
	Description	Total (€)
External walls	16 cm EPS	182.210
	1 cm aerogel	18.048
	/	
Roof	20 cm RW	6.131
	8 cm XPS	
Floor	20 cm XPS	20.031
Windows	New windows 1,1 W/m2K	328.750
Energy source	Condensing boiler	65.700
Ventilation	Forced ventilation with heat recovery	68.310
Solar thermal	67,86 m2	36.869
PV system	/	
Total		726.049

RENOVATION (Primary energy (kWh/year))		
Before	After	Energy savings
159.486	24.362	85 %

Payback time 70 years

	Electricity (day)		Gas		Total	Saved	Investment
	kWh	€*	kWh	€*	€	€	€
Before	29.176	6.127	151.891	12.151	18.278	10.238	726.049
After	31.282	6.569	18.388	1.471	8.040		

PROJECT DREEAM

PILOT SITE: BERLIN, GERMANY

- Berlin Pilot site joined the project at the end of 2017.
- The data collection and formulating the concept are still ongoing.



ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE – KRIVYJ ROG

1st step –
selection of
typical
buildings

*Інформація
на протокол доручень, наданих на
нараді щодо реалізації програми DREEM у м.Кривому Розі
під головування першого заступника міського голови Удода Є.Г.
16.03.2017 року*

п.1 під.4 управління благоустрою та житлової політики виконкому
Криворізької міської ради надає загальну площу кожного типу із 3-х груп
будинків міста, а саме:

Управитель	житловий будинок цегляний 3-5-ти поверховий		житловий будинок залізобетонний панельний 4-5-ти поверховий		житловий будинок залізобетонний панельний 6 та вище поверхів	
	к-сть	загальна площа тис.м²	к-сть	загальна площа тис.м²	к-сть	загальна площа тис.м²
Всього	889	1924	835	2800	597	3465
ТОВ «Уют-2011»	110	258	176	598	177	953
ТОВ «КК «Дом. Ком»	173	354	73	229	7	32
ТОВ «Житлокомцентр»	75	160	56	183	52	279
ПП «Домініум»	0	0	0	0	16	70
ТОВ «Житлосервіс-КР»	8	11	249	900	235	1481
ТОВ «Комбінат благоустрою»	24	31	68	239	47	244
КП «Послуга»	45	118	13	52	6	39
ТОВ «Сітісервіс-КР»	387	884	198	590	50	322
ТОВ «Дивобуд»	67	108	2	9	7	45

Заступник начальника управління
Серезженко С.М.
Авраменко Л.Д., 74-42-10

І.Тереженко



ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE – KRIVYJ ROG

2nd step –
setting-up
methodology
of energy
audit

No	Assumptions
I	thermomodernization by the assumption that internal temperature is like actual °C before and after thermomodernization
II	thermomodernization by the assumption that internal temperature is like actual before and 20 °C and after thermomodernization
III	thermomodernization and the assumption that internal temperature is 20 °C before and after thermomodernization

Presented II with variation concerning PV

ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE – KRIVYJ ROG

3rd step –
elaboration
of energy
audits

Adresses		Cost of thermomoder- nization	Heated area	Total area	A/V	Cost of thermomodernization		Indoor temperature
		UAH	m2	m2	m2/m3	UAH/ [m2 heated]	UAH/ [total m2]	st.C
Gagarina, 1	thermomoder- nization (only heat)	3 753 024	1071	1914	0,37	3504	1961	17
	thermomoder- nization + PV (heat and electricity)	4 626 624				4320	2417	
Myru, 46	thermomoder- nization (only heat)	9 037 879	4222	5715	0,33	2141	1581	17
	thermomoder- nization + PV (heat and electricity)	10 348 279				2451	1811	
Myru, 31	thermomoder- nization (only heat)	21 118 701	10592	17289	0,30	1994	1222	17
	thermomoder- nization + PV (heat and electricity)	22 429 101				2118	1297	

ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE – KRIVYJ ROG

4th step – evaluation
of energy audit
results



**Theoretical savings are almost equal
to paid heat cost !!!**

Gagarina 1

Modernization structure	Thermomodernization (only heat)		Thermomodernization + PV (heat + electricity)	
	UAH	%	UAH	%
External walls	1834890	48,9	1834890	39,7
External walls of cellar	173074	4,6	173074	3,7
Roof	595741	15,9	595741	12,9
Staircase window replacement	86930	2,3	86930	1,9
Staircase door replacement	61908	1,6	61908	1,3
Modernization of the heating installation	870480	23,2	870480	18,8
PV	0	0,0	873600	18,9
Documentation	130000	3,5	130000	2,8
Sum	3753024	100	4626624	100

UAH/m2 total area	1961		2417
UAH/m2 heated area	3504		4320
energy demand savings	64,2	%	65,3
energy cost		UAH	
theoretical savings/y	+ 110088		+ 235582
paid 2016	106977		114356

ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE-KRIVYJ ROG

5th step –
segmentation
of the project
for tender

Presentation project number		Buildings		Cost of modernization																
		Total number of buildings	Total area	External walls		External Walls of cellar		Roof/flat roof		Staircase window replacement		Staircase door replacement		Modernization of the heating installation		PV		Documentation		Total cost of modernization on
		pcs	thousands m2	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH	%	mln UAH
Residential brick house, 3-5 floors	T	889	1924	1844	48,9	174	4,6	599	15,9	87	2,3	62,2	1,6	875	23,2	0	0,0	131	3,5	3773
	T+ PV			1844	39,7	174	3,7	599	12,9	87	1,9	62,2	1,3	875	18,8	878	18,9	131	2,8	4651
Residential building of reinforced concrete panels, 4-5 floors	T	835	2800	2473	55,9	0	0,0	657	14,8	119	2,7	145,4	3,3	969	21,9	0	0,0	64	1,4	4428
	T+ PV			2473	48,8	0	0,0	657	13,0	119	2,4	145,4	2,9	969	19,1	642	12,7	64	1,3	5070
Residential building of reinforced concrete panels, 6 and higher floors	T	597	3465	2540	60,0	0	0,0	427	10,1	147	3,5	71,8	1,7	1020	24,1	0	0,0	26	0,6	4233
	T+ PV			2540	56,5	0	0,0	427	9,5	147	3,3	71,8	1,6	1020	22,7	263	5,8	26	0,6	4495
All buildings	T	2321	8189	6858	55,2	174	1,4	1683	13,5	354	2,8	279	2,2	2864	23,0	0	0,0	220	1,8	12433
	PV			0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	1783	100,0	0	0,0	1783
	T+ PV			6858	48,2	174	1,2	1683	11,8	354	2,5	279	2,0	2864	20,1	1783	12,5	220	1,6	14216

Average modernisation cost = 53€/m2



ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE-KRIVYJ ROG

6th step –
preparation of
investment
memorandum
for FI

Type of building	Variant	Cost of modernization
		mIn UAH
Residential brick house, 3-5 floors	T	3 773
	T+PV	4 651
Residential building of reinforced concrete panels, 4-5 floors	T	4 428
	T+PV	5 070
Residential building of reinforced concrete panels, 6 and higher floors	T	4 233
	T+PV	4 495
All buildings	T	12 433
	T+PV	14 216

= 440 million €

ASSUMPTIONS FOR LARGE SCALE RENOVATION PROGRAM UKRAINE-KRIVYJ ROG

Use of domestic sources ,
applying to EU ELENA,
EBI, EBRD

Що роблять держава і донори для підтримки тих, хто вирішив інвестувати в енергоефективність?							
	Джерела фінансування	Тип підтримки	Компенсація тіла кредиту:		Компенсація відсотків	Банки партнери	
			для фізичних осіб	для ОСББ			
	«Теплі кредити» Держенерго-ефективності	2016 р. 894 млн грн 2017 р. 400 млн грн	1. Компенсація тіла кредиту (з Держбюджету) 2. Компенсація відсотків (з місцевих бюджетів)	1. На придбання твердопаливних котлів: 20% (але не більше 12 тис. грн) 2. На утеплення (купівля енергоефективних матеріалів та обладнання): 35% (але не більше 14 тис. грн)	Від 40% (для «звичайних» мешканців), але не більше 14 тис. грн в розрахунок на одну квартиру До 70% (для отримувачів субсидій), пропорційна до кількості субсидіантів в ОСББ.	Від 15% до 20% (в залежності від регіону) – реальна ставка може становити біля 5%–10% в залежності від місцевої компенсації * Наразі підписано 196 місцевих програм по компенсації відсотків	Ощадбанк, Укргазбанк, Укресімбанк, Приват Банк
	IQ Energy від ЄБРР	Кредитні кошти: 75 млн євро Гранти: 15 млн євро Всього: 90 млн євро (~2,5 млрд грн)	1. Компенсація тіла кредиту 2. Технічна допомога	15% – 20% в залежності від кількості реалізованих заходів – Обмеження розміру кредиту – до 15 тис євро – Обмеження суми компенсації за одним кредитом – до 3 000 євро	Планується: 25% – 35%* в залежності від кількості реалізованих заходів * Від меншої з величин – суми кредиту або вартості заходів (включаючи монтажні роботи)	Відсутня (сплачується ринкова ставка – 25% – 35%)	Мегабанк, ОТП Банк, УкрСиббанк
	Фонд Енергоефективності (з квітня 2017 року)	2017 р.: – 400 млн грн (внесок України) – До 3 млрд грн (внесок міжнародних донорів)	1. Компенсація тіла кредиту 2. Пільгові кредити зі зниженими відсотковими ставками 3. Технічна допомога	– Знаходиться на етапі розробки	– Знаходиться на етапі розробки. – Відомо, що максимальний розмір компенсації може складати до 50% при досягненні класу енергоефективності «А» (найвищий).	– Знаходиться на етапі розробки. – Відомо, що це будуть пільгові позики, із відсотками, що нижчі за ринкові.	Поки що не визначено (будь-який банк, що відповідає мінімальним вимогам Фонду)

LVIV CASE

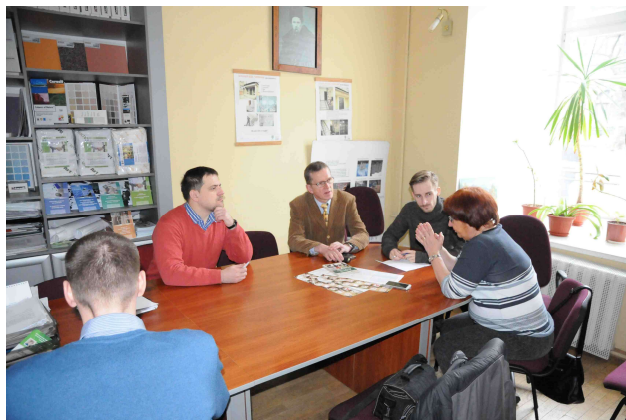
Buildings	Internal temperature	Year of construction	Total area	E (heat + electricity) - before	E (heat + electricity) - after	Energy saving	Cost of modernization	Scope of modernization
			m2	kWh	kWh	%	€/m2	
6 typical buildings	The same internal temperature before and after thermomodernization	From 1900 to 1983	33959	3154651	525409	83,3	49,1	Modernization of the heating installation Insulation of the roof Insulation of external walls Replacement of windows Replacement of external doors PV installation
	Change internal temperature to 20 °C after thermomodernization		33959	3154687	759800	75,9	49,3	

Project's scope:

- 3440 buildings
- 18,55 milliard UAH= 660 million €
- SPBT=15 years (without subsidy)

LVIV CASE

7th step –
involvement
of people



LVIV CASE

Final meeting with HOAs in Lviv on 7th June 2018

One of them has started the renovation, already!!!



PROJECT DREEAM

MAIN FINDINGS

- The residential housing stock has been rather neglected in national and municipal policies of support to energy efficiency measures
- The potential of energy demand reduction in these buildings is high – achieving 50%-75% is feasible even without very advanced technologies, however the cost savings are not proportional because of subsidizing the heat prices and under heating of dwellings
- The cost of measures is high (50€/m² in Ukraine) however the SPBT is reasonable (15 years); due to financing instruments with national and EU, municipal support may be accepted by residents
- The municipalities need to play the role of initiator of projects, then the residents supported by energy auditors and facility managers undertake the process themselves



THANK YOU FOR ATTENTION

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