

## PROOF OF HOW BUILDINGS RENOVATION CAN HELP MEET THE EUROPEAN GREEN DEAL

Launched as “the EU’s Man on the Moon moment”, the European Green Deal is massively ambitious in scope and scale. While we appreciate the breadth of its eight “deeply transformative policies” and are pleased to see these backed up with a Roadmap of 50 related measures, Renovate Europe finds that the vital and underpinning roles of energy efficiency and building renovations are not fully considered.

The policy ambition to support “building and renovating in an energy- and resource-efficient way” is positive, but it falls short of seizing two related opportunities. Strategic renovation could transform a large portion of the existing EU building stock into “energy” sources capable of “supplying clean, affordable and secure energy”. Additionally, buildings have a central role in the overarching aim of “increasing the EU’s climate ambitions for 2030 and 2050.”

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*“Considering that 90% of existing buildings will still be in use in 2050 and that 97% of them require deep energy renovation to be considered energy efficient, they could “make or break” the overarching ambition.”*

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Strategic energy renovation must be made a top priority for multiple reasons. EU citizens spend **90%** of their time inside buildings, the quality of which have direct and indirect impacts on their health and well-being, which in turn links to public healthcare costs. Clearly, wide-scale deep energy renovations can quickly move the EU closer to European Green Deal core aims.

With solid data on what is achievable in the buildings sector – and practical knowledge on how to achieve it, at what cost-benefit ratios – Renovate Europe calls on the European **Commission to specifically prioritise deep energy renovations** as part of the European Green Deal.

Additionally, 97% of the EU building stock is known to be inefficient: buildings account for 40% of EU energy demand and 36% of EU greenhouse gas emissions.

To that end, we offer a sampling of projects already undertaken to show that it is technically possible and financially feasible to dramatically reduce the energy demand of EU buildings – by up to **80%** on average. Rapid action to do so by 2050 would reduce the EU’s total consumption of energy by **>30%**, the combined annual energy use of Germany and Italy. Aside from slashing carbon dioxide (CO<sub>2</sub>) emissions, this would deliver multiple health and well-being benefits to individuals alongside social and economic benefits to societies.

### BUILDING AND RENOVATING IN AN ENERGY- AND RESOURCE-EFFICIENT WAY

At present, the rate of new builds in the EU is relatively low compared with the number of existing buildings that are resource and energy inefficient. Renovation needs to be given much higher priority to capture the efficiency potential available across all building types: individual homes, large apartment complexes, schools, hospitals, public facilities and heritage buildings

### Across building types, renovations prove energy- and resource-efficient • Ljubljana, Slovenia

With its turn to be the European Green Capital on the horizon, the City of Ljubljana needed to take action on upgrading old buildings. To leverage technical expertise and secure financing, the City created a public-private partnership (PPP) with *Petrol*, the largest Slovenian energy company, and *Resalta*, an energy services company (ESCO).

Since 2017, the partners have renovated **48** public buildings, including schools, libraries, cultural institutions, sports centres, etc. Twenty-five of the projects were done to standards qualifying for deep energy renovation while actions possible on some buildings were constrained by their heritage status. Even so, the initiative achieved an average energy reduction of **70% to 85%**. The City's energy bills have been slashed by €1m annually while building occupants benefit from greater comfort. This innovative approach won the PPP an award from the EU-funded project known as *GuarantEE*.



*Sports hall renovated as part of the partnership  
(Photo provided by the City of Ljubljana)*

Measures implemented	Results	
<ul style="list-style-type: none"> <li>• Diverse energy efficiency upgrades and installation of renewable energy systems across 48 buildings of different types, uses and ages.</li> <li>• Insulate roofs and walls; replace windows and doors; install new heating systems.</li> <li>• Install renewable energy sources covering 25% of total demand.</li> <li>• Connect buildings to a central energy management system (EMS), enabling remote monitoring, operation and data collection.</li> </ul>	Average energy savings*	<b>8,245MW</b>
	Average energy savings*	<b>70%-85%</b>
	Average CO2 emissions reduction*	<b>2.96MtCO<sub>2</sub>-eq</b>
	Total investment	<b>€14.8m</b>
	* per year	
<b>Partners</b>	City of Ljubljana, Resalta and Petrol	

### 30-year-old postal sorting plant revived and expanded to become multi-function complex • Tours, France

Project Le Nef set out to radically transform a building constructed in the 1980s to serve as a Postal Sorting Outlet into an energy-positive, multi-purpose facility comprising a medical centre, offices, apartments and individual houses.

With an overarching aim to demonstrate the feasibility of making old buildings part of a green city, the building (made of reinforced concrete) was extended upwards using prefabricated timber structures. This

allowed integration of bio-climatic design principles within a high-performing building envelope, in turn linked to advanced and regularly commissioned heating, cooling and energy-generating systems.



*Completed exterior of the Le Nef renovation project  
(Photo provided by Benoit Lavant)*

Measures implemented		Results	
<ul style="list-style-type: none"> <li>• Install highly insulated timber-framed walling elements and roof structures.</li> <li>• Add 100% renewable energy sources including photovoltaics, solar thermal and ground-sourced heat pumps.</li> <li>• Integrate heat recovery ventilation system and energy balancing using underground tanks.</li> </ul>	Energy performance	<b>&gt;100%*</b>	
	Total investment	<b>€17m (€1,300 per m<sup>2</sup>)</b>	
		* building now produces more energy than it consumes.	
<b>Partners</b>	Boille et Associates, Tours (Architects) • Egis Batiments Centre-Ouest		

### *Large-scale, deep retrofit pilot programme targets residential dwellings • Dublin, Ireland*

In 2017, Ireland launched a pilot scheme to evaluate policy mechanisms designed to incentivise deep retrofits, either by homeowners or by market players.

With the aim of bringing houses rated at C (or below) up to A, the programme sought to assess the effectiveness of:

- grant support to make extensive home upgrades achievable and attractive to homeowners; and
- incentives to spark market engagement in delivering integrated, whole house solutions at a reasonable scale.

Homes that met the criteria for what could be defined as a 'deep retrofit' were eligible to apply for a grant that paid 50% of the costs of the renovation. The programme was designed to investigate the technical, financial and behavioural challenges and opportunities associated with deep retrofits, with the ultimate goal of informing policy options for future programmes.

Between 2017 and July 2019, the programme was carried out on **261 homes**. The Irish government estimates that criteria by which homes could qualify for grants under the pilot applies to around **1 million homes** in the country. As such, the potential energy savings and emissions reduction is enormous.



*A completed renovation of a home in Ireland, renovated with the support of the pilot scheme (Photo provided by the Sustainable Energy Authority of Ireland (SEAI))*

### Defining 'deep retrofit' in Irish Scheme

- Home must achieve an A rating (< 75 kWh/m<sup>2</sup>/yr) from a starting point of C3 (> 200 kWh/m<sup>2</sup>/yr) or worse.
- Efficiency first, i.e. improving insulation and airtightness means much less energy is required for heating.
- Airtightness must be no greater than 5 m<sup>3</sup>/hr/m<sup>2</sup> with a financial incentive for achieving ≤ 3 m<sup>3</sup>/hr/m<sup>2</sup>.
- New heating technologies must be from a renewable source (fossil fuel heating not funded).
- Mechanical ventilation must ensure good indoor air quality.

Measures implemented		Results	
<ul style="list-style-type: none"> <li>• Upgrade wall, floor and roof insulation.</li> <li>• Replace windows and doors.</li> <li>• Implement airtightness measures.</li> <li>• Transition to heating systems using renewable energy sources.</li> <li>• Install mechanical ventilation systems with demand control.</li> </ul>	Average energy savings*	36,600kWh	
	Average energy savings*	87%	
	Average CO2 emissions reduction*	10,160kg CO <sub>2</sub> -eq	
	Average cost per home (split 50/50)	€49,600	
	* per year, per home		
<b>Partners</b>	Achieving the A rating across diverse dwelling types required a range of expertise, including energy consultants, architects, engineers, etc.		

## BUILDINGS CAN GO BEYOND “HELPING” TO MITIGATE CLIMATE CHANGE

The European Green Deal needs to recognise that buildings can do much more than just contribute less to climate change. When properly considered within local contexts, they can deliver clear and long-lasting gains.

### *School renovation offers better indoor environment and protection from external risks • Bergamo Province, Italy*

Students at the Masana di Carvagio School in Italy’s Lombardy Region are subject to three particular risks linked to its geographic location. Situated in a humid, continental climate zone, the area has high precipitation and large swings in air temperature throughout the year, factors that lead to high energy consumption. Additionally, close proximity to busy road and rail transportation routes means students are exposed to high levels of emissions and noise pollution. Finally, the school (which was constructed in the 1950s) was closed in 2014 after seismic activity raised concerns regarding its stability and safety.

Motivated by the need to address all of these issues, local government took a holistic approach to building upgrades that put high priority on students, paying special attention to their thermal, visual, indoor-air and acoustic comfort. Improving the building envelope reduced heat loss and provided a more effective sound barrier, while optimising daylight reduces the need for artificial light. Installation of purifying products, together with an ionisation unit in the ventilation system, have significantly improved indoor air quality. In short, the school has been completely transformed to achieve an exceptional indoor environment for learning combined with an exceptional level of energy performance and safety.



*Students studying in their newly renovated school (Photo provided by Saint Gobain)*

Measures implemented	Results	
<ul style="list-style-type: none"> <li>• Seismically strengthen loadbearing reinforced concrete frame with masonry infill panels; over clad with an ETICS system with mineral wool insulation.</li> <li>• Install high-performing windows and replace old doors to ensure airtightness.</li> <li>• Install air-source heat pump with new heat recovery ventilation along with a building energy management system (BEMS).</li> <li>• Renew all electrical installations.</li> </ul>	Energy savings*	<b>87%</b>
	Floor area	<b>240m<sup>2</sup></b>
	Total investment	<b>€440,000 (€1,850 per m<sup>2</sup>)</b>
	* against average of schools in region	
<b>Partners</b>	Building Department of Caravaggio Municipality • Saint-Gobain Italy	

**Energy renovation of low-income households also supports aims to reduce emissions and enhance skills • Romania**

Designed with the specific objective of reducing greenhouse gas (GHG) emissions in the buildings sector in Romania, the Improving Energy Efficiency in Low Income Housing and Communities (IEELIHC) programme recognised substantial opportunities in reducing energy consumption in dwellings across the country that are occupied by this vulnerable segment of society.

A joint undertaking of the Romanian Ministry of Regional Development and the United Nations Development Programme (UNDP), the project was launched with a grant worth **~€2.75m**, from which it was able to leverage investments of **~€447m**. Acknowledging the limited ability of such households to undertake renovations, it was set up so that beneficiaries were required to co-finance only **~3.5%** of actual costs.

Two additional objectives set the stage for more widespread renovation in the future. One was to boost the understanding and knowledge of building professionals on the need to consider the energy performance of the building stock and to increase their skill sets. Evaluation reports show that more than 800 professionals reported greater knowledge and improved skills. In parallel, the project aimed to develop standardised project documentation for the renovation of 50 different apartment types, thereby making it much easier to prepare tenders for diverse projects across administrations in various regions of Romania.



*One of the completed renovation projects supported by the programme (Photo provided by Mihai Moia, ROENEF)*

Measures implemented	Results	
<ul style="list-style-type: none"> <li>Renovation of 114 buildings, including multi-family blocks, public buildings and individual households.</li> <li>Insulate roofs and walls; replace windows and doors; install renewable energy sources and replace heating systems.</li> </ul>	Total energy savings*	<b>7,351MW</b>
	Average energy savings across total project*	<b>47% - 52%</b>
	CO2 emissions reduction*	<b>4.4 MtCO<sub>2</sub>-eq</b>
	Total investment	<b>€447mln</b>
	* per year	
<b>Partners</b>	Government of Romania • UNDP	

## EFFICIENT BUILDINGS BOOST OCCUPANT HEALTH, REDUCE NATIONAL HEALTH-CARE COSTS

Acknowledging that healthy citizens and a healthy environment are both critical to a healthy economy, the European Green Deal has the stated aim of a “zero pollution ambition for a toxic-free environment”. Renovating the existing building stock is vital to improving both indoor and outdoor air quality.

### *Social housing renovation delivers big energy savings and better occupant health • Portsmouth, UK*

Energy efficiency was not a high priority for UK social housing in the 1960s, including for **Wilmcote House** a complex of three connected apartment blocks comprising **107 homes**. Portsmouth is the most densely populated city in the UK outside of London and the *Somerstown* area (in which Wilmcote House is situated) is one of the country’s most deprived zones. For decades, residents experienced high heating bills (most being in severe energy poverty) and had to cope with mould, damp and condensation that adversely affected their health.



*Completed exterior of Wilmcote House (Photo provided by ROCKWOOL Group)*

Today, these buildings meet passive housing standards (EnerPHiT), with the result that energy consumption has plummeted by 90%. Residents now report dramatically improved living conditions and quality of life, with energy bills being a fraction of what they were in the past and noting positive impacts on health and well-being. Remarkably, advanced planning made it possible for them to stay in place while the deep energy renovation was undertaken.

Measures implemented		Results	
<ul style="list-style-type: none"> <li>Apply cladding – with continuous airtight ETICS** to eliminate thermal bridges – over original prefabricated, reinforced concrete sandwich panel system.</li> <li>Install triple-glazed windows to benefit from good energy balance.</li> <li>Replace old, inefficient and expensive heating with a mechanical ventilation and heat recovery system, as renovation eliminated the need for an active heating system.</li> </ul>	Energy savings*	<b>90%</b>	
	Floor area (after works)	<b>14,500m<sup>2</sup></b>	
	Total investment	<b>€15.3m (€1,058 per m<sup>2</sup>)</b>	
<b>Partners</b>	ECD Architects Ltd. (Architect) • Portsmouth City Council, Wilde Carter Clack, NLG and Keegans (Technical Consultants)		
**ETICS = external thermal insulation composite systems for facade insulation.			

### Hospital renovation helps patients heal faster, boosts staff well-being • Karlovac Hospital, Croatia

As part of a large-scale initiative led by the Croatian government to boost energy performance contracting, the Karlovac Hospital, which serves a population of **~130,000 people**, has been fully energy renovated to a very high standard using energy performance contracting. Built in the 1960s, when energy performance standards were non-existent, the structure consists of a reinforced concrete frame with inefficient and poorly fitted infill panels. With no insulation and single-glaze windows, it leaked a great deal of the warmth supplied by the district heating network, which ran on heating oil.

Although energy savings (**54%**) are lower than in some projects highlighted, the works delivered other economic benefits in terms of reducing the average length of stay for patients and boosting the health and well-being of staff. Considered together, these benefits clearly prove that energy performance contracting is a viable model for high occupancy, public buildings.



Completed exterior of the Karlovac Hospital, Croatia  
(Photo provided by Rudan d.o.o)

Measures implemented		Results	
<ul style="list-style-type: none"> <li>• Cover entire façade with ETICS** system.</li> <li>• Replace all external windows and doors; insulate walls and roof; install low-energy lighting.</li> <li>• Disconnect building from district heating and install six thermal sub-stations, comprising solar collectors coupled with heat pumps, an EMS, new thermostatic valves. Back-up heating using natural gas.</li> </ul>	Energy savings*	<b>54%</b>	
	Floor area of works	<b>36,0000m<sup>2</sup></b>	
	Total investment	<b>€8.6m (€240 per m<sup>2</sup>)</b>	
	*per year		
<b>Partners</b>	Government of Croatia • Rudan d.o.o. (ESCO company)		
**ETICS = external thermal insulation composite systems for façade insulation.			

## INCREASING CLIMATE AMBITIONS FOR 2030 AND 2050: BUILDINGS HAVE A CENTRAL ROLE

Thanks to a strong push by the International Partnership for Energy Efficiency Cooperation (IPEEC), energy efficiency is on the G20 agenda, with buildings recognised as a key sector. Insights from IPEEC offer food for thought for the European Green Deal.

In its role as advisor to G20 governments, IPEEC makes the case that energy efficiency is central to achieving the goals of the COP21 Paris Climate Agreement. In [its 10-year report](#), Executive Director Benoît Lebot made a strong call for more strategic action to secure energy efficiency's place as "the first fuel" and to appropriately "fuel" its role as such. Arguing that every unit of energy NOT produced and consumed has the highest value to climate change objectives and to a just, clean energy transition, IPEEC identifies three disconnects that governments need to address:

- **Low understanding:** Many stakeholders, from individuals to CEOs of multinational companies to policy makers, do not recognise energy efficiency as the quickest, greenest and most cost-effective way to address the challenges of energy security and climate change while also ensuring economic growth. Nor do they grasp how lower energy demand at national level can enable meeting their commitments to international agreements.
- **Insufficient investment:** Because key players do not yet consider energy efficiency as a "resource", the level of investment is extremely low. Governments accept that economic development requires reliable supplies of energy and have invested heavily each time a new source has been discovered (such as coal, oil, natural gas, nuclear and renewables), supporting research and development (R&D) to create "market push" for new technologies and building human, institutional, technical, legal and financial capacities. Energy efficiency needs this level of engagement to advance to "market pull" that will attract private investors.
- **Lack of vision:** Energy efficiency suffers from its perceived role being limited to "quick wins". In reality, these can lead to sub-optimal action and marginal improvements. Scenario modelling shows the long-term value of energy efficiency when applied strategically at large scale, including the prospect of larger paybacks.

Cleverly, IPEEC, framed the call as '**2-Es that need 6-Ds**', saying that the '**desirable**' goal of a global transition that supports universal access to modern energy services while also achieving the emissions reduction will require **disruptive** action in four key areas: **decoupling, decarbonisation, decentralisation** and **digitalisation**. It is time policy makers to take the lead in demonstrating energy efficiency as a mechanism to:

- **Decouple** economic growth from energy demand;
- **Decarbonise** both supply and demand;
- Optimise **decentralisation**, as lower demand requires less infrastructure; and
- Integrate **digitalisation** through energy management systems to collect more data and optimise operations.

The IPEEC membership<sup>1</sup> identifies buildings and energy management systems as key areas (along with appliances, networked devices, energy production and transportation). Renovate Europe believes it bears

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<sup>1</sup> IPEEC members include EU countries plus Australia, Argentina, Brazil, Canada, the People's Republic of China, India, the Republic of Korea, Japan, Mexico, the Russian Federation, South Africa, the United Kingdom and the United States.

pointing out that a large portion of activities across all of these areas takes place in buildings, ergo ensuring the EU buildings stock is as energy efficient as possible warrants high priority.

As we've shown, it also makes good sense from the perspective of shifting to a resource- and energy-efficient economy that meets climate goals *and* improves the lives of all EU citizens.

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Renovate Europe is a political communications campaign with the ambition to reduce the energy demand of the building stock in the EU by 80% by 2050 compared to 2005 levels through legislation and ambitious renovation programmes. This will bring the energy performance of the entire building stock in the EU to a Nearly Zero Energy (NZEB) performance level.

Renovate Europe brings together **37** partners from across the building value chain (trade associations, companies, trade unions, city networks and **14** National Partners):

