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How energy efficient buildings could help at Spain's energy independence goals while deepening decarbonization

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AUTHOR

Peter Sweatman
Chief Executive at Climate Strategy & Partners

Supported by
Adriana Rodríguez
as researcher

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EXECUTIVE SUMMARY

Spain's buildings use around 30% of its final energy, and just over 20% of Spain's gas. Furthermore, over a third of Spaniards are dissatisfied with their home's insulation. At its core: 51% of Spanish primary residences were built before basic thermal insulation requirements were included in technical construction standards

In 2014, a national renovation plan was delivered by the Spanish authorities to the European Commission. If this plan had been delivered, the annual energy savings would have been close to the caloric equivalent of the 3.3 million toe of Russian gas that Spain imported in 2021.

Instead, Since 2014, and until 2019, Spain's real home renovation rate actually slowed down, and at just 0.08% it significantly lags other EU countries like France (1.75%) and Italy (0.77%), none of which reach the 3% target required to deliver the EU's Renovation Wave.

To correct this course and take the opportunity offered by renovation in Spain, this paper proposes a Marshall Plan for Spanish Buildings that can be executed in three steps: Identify, Finance and Execute:

Step 1. To best identify and target public and private renovation investments:

→ Get practical information to homeowners in buildings where energy renovation is likely to make good economic sense through instruments such as Energy Performance Certificates or estimates of the potential savings thanks to an eventual renovation

→ Enhance the use of the AI-machine learning data analytics tools already developed and deployed by leading European real estate valuation firms, which can infer the emissions and energy consumption of any residential building, to target investments by lenders

→ Local authorities can provide an 'informational bridge' between the potential supply for renovation and its demand: identification criteria should be proactively shared with renovation agents, renovators and local banks to facilitate co-processing of packages or grants and loans to qualifying homeowners with qualifying deep renovation projects. So called "one stop shops" have a role to play in coordinating this process regionally and in key cities,

→ Create and maintain a transparent network of accredited, well compensated and trustworthy renovation agents.

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Step 2. To ensure easy access to long-term, low cost finance and funding packages:

- → Enact a Mortgage Portfolio Standard (MPS) as defined in the recast EU Energy Performance of Buildings Directive (EPBD) to require the median energy performance of each bank's financed buildings portfolio to meet specific targets. This bank-level requirement will support better mortgage decisions and clear energy renovation information is offered to homeowners, enhancing energy efficient decision making by all private agents and the rationalisation of the renovation supply chain.
- → Launch an EU Renovation Loan instrument to offer zero-coupon financing targeting low income, no savings homeowners who today do not qualify for mortgages. Examples include pensioners and young income constrained families that constitute the working poor.
- → Dedicate recovery funding to, and set targets for, the emergency acceleration of deep renovations for the energy poor, using mechanisms to identify poor households in cold climatic conditions to be prioritised for deep renovations using a grant-based system.

Step 3. To ensure an effective and efficient execution, there are a number of key areas that Renovation Agents can start with:

- → Prioritise 'cavity walls', i.e. air gaps featured within walls that were historically used in Spanish construction and constitute a key home heat loss.
- → Insulate attics and floors, which constitute the "lower hanging fruit" compared to no-cavity walls and intricate façades.
- → Health-check thermostats to ensure they work correctly and reduce the energy wasted in periods, or areas, of no use or during the night.
- → Set targets for optimal air-source heat pump switches in Spain's milder climates where using these is more cost-effective than fossil gas or fuel-oil boilers.
- → Grow the use of solar water heaters to take advantage of Spain's privileged weather conditions.

Spain's Energy Security, Affordability and the Urgent Need to Renovate

The Russian invasion of Ukraine reveals Europe's fossil fuel dependency[1] and its untapped energy efficiency potential. Just as repowering the EU mandates an acceleration of the clean energy transition, it must also place energy efficiency first to deliver energy freedom and independence. Reducing energy demand, adding flexibility and switching to green energy sources would increase Europe's power to act against fossil-fuelled aggression, but will also reduce the economic pressure felt by households and businesses that suffer high energy prices, which peaked in March at ten times the level of the year before.[2]

In September 2021, the EU Commission recommended making energy efficiency the first fuel to strengthen Europe's energy independence, reduce costs for households, and to accelerate the achievement of Europe's climate objectives. Buildings' operational use is responsible for 36% of European greenhouse gas (GHG) emissions. They are also the sector with the highest embodied carbon contributing an additional 10% of annual GHG emissions in construction. In Spain, homes emit a third of national GHG emissions (including related construction activity. Climate change threatens our way of life and jeopardises the world's economies, food production systems, water supplies, health, infrastructures and communities, and the natural world in a few short decades.

Yet, energy efficiency remains a "secret weapon" hiding in plain sight, but with the greatest potential[3] to alleviate the increasing costs of this energy crisis. This is because Spain's buildings use around 30% of its final energy, and just over 20% of Spain's gas (5.6 million tonnes of oil equivalent (toe)[4]) when including all national gas use (including power and refining). Reliance on gas is not mandatory, and the Commission believes that reduced gas demand in homes can reduce overall EU gas use by 10% (a 34 million toe reduction by 2030) and European gas imports from Russia by a quarter.[5] Further, the Buildings Performance Institute Europe (BPIE) believes that EU buildings can reduce their heating needs by 14% just through a mass campaign to insulate roofs[6]: Would this work in Spain? And what else is possible?

1 Communication from the Commission. (2022). *REPowerEU: Joint European Action for more affordable, secure and sustainable energy.* Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN

2 Cinco Días. (2022). *El precio de la luz sube un 5,6% este lunes y supera los 230 euros/MWh.* Retrieved from: https://cincodias.elpais.com/cincodias/2022/03/27/companias/1648379840_894794.html#:~:text=El%20precio%20fijado%20para%20ma%C3%B1ana,544%2C98%20euros%2FMWh.

3 Brown, S. et al. (2022). *EU can stop Russian gas imports by 2025.* RAP. Retrieved from: https://www.raponline.org/knowledge-center/eu-can-stop-russian-gas-imports-by-2025/

4 Eurostat. (2018). *Energy Balances.* Retrieved from: https://ec.europa.eu/eurostat/web/energy/data/energy-balances

5 Communication from the Commission. (2022). *REPowerEU:* Joint European Action for more affordable, secure and sustainable energy. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN

6 BPIE. (2022). *Solidarity and Resilience: An Action Plan to Save Energy Now!* https://www.bpie.eu/wp-content/uploads/2022/03/Strategy-paper_Solidarity-and-resilience_An-action-plan-to-save-energy-now-1.pdf

It's important to differentiate between the immediate savings that can be delivered by behaviour change (like turning down buildings' thermostats by 1ºC), those delivered by fuel switching (such as replacing 10 million gas boilers with heat-pumps and accelerating the deployment of solar roofs) and the true energy efficiency delivering comfortable, healthy, low cost, and low emissions buildings for ever. While Spain's southern European climate, abundance of renewable resources and geographical situation makes freedom from Russian gas more easily achievable, it cannot ignore the deep renovation of a highly energy inefficient and old building stock.

Strangely, the Spanish government's first Decree containing measures that respond to the social and economic consequences of the Ukrainian crisis does not contain any building energy efficiency measures.[7] In this article, we look at how buildings' energy renovation has largely been ignored in Spain, yet how it can provide insulation from rising energy prices and independence from the fossil gas purchases funding the Russian campaign, and what can be done.

Buildings renovation: The energy security road less travelled

Spain is one of the EU countries with the highest potential for energy efficiency in its buildings.[8] Since 2010, an independent group of experts (*El Grupo de Trabajo sobre la Rehabilitación* - GTR[9]) has been calling for the cost effective renovation of Spain's buildings whose individual energy footprint - GTR writes - can be reduced by up to 80%.[10] In fact, Spain's first, and widely admired[11], long-term building renovation strategy (published in 2014) proposed the deep renovation of 2 million homes and 700,000 of its least efficient non-residential buildings by 2020.[12] Needless to say this did not happen, in fact actual renovation rates went down for the five years following its publication. If this 2014 ERESEE plan had been delivered, then by now, the annual savings would have been the caloric equivalent of the 3.3 million toe of Russian gas that Spain imported in 2021[13]. By 2022 the potential residential energy savings would have exceeded 2 million toe annually, and the tertiary buildings energy savings should have been 1 million toe, as shown here.

7 Real Decreto-ley 6/2022, de 29 de marzo, por el que se adoptan medidas urgentes en el marco del Plan Nacional de respuesta a las consecuencias económicas y sociales de la guerra en Ucrania.

8 Escribano, G. (2022). *Diez contribuciones de España a una seguridad energética europea autónoma de Rusia.* Real Instituto Elcano. Retrieved from: https://www.realinstitutoelcano.org/analisis/diez-contribuciones-de-espana-a-una-seguridad-energetica-europea-autonoma-de-rusia/

9 GBCe. (2022). *Grupo de Trabajo sobre Rehabilitación*. Retrieved from: https://gbce.es/blog/proyecto/gtr/

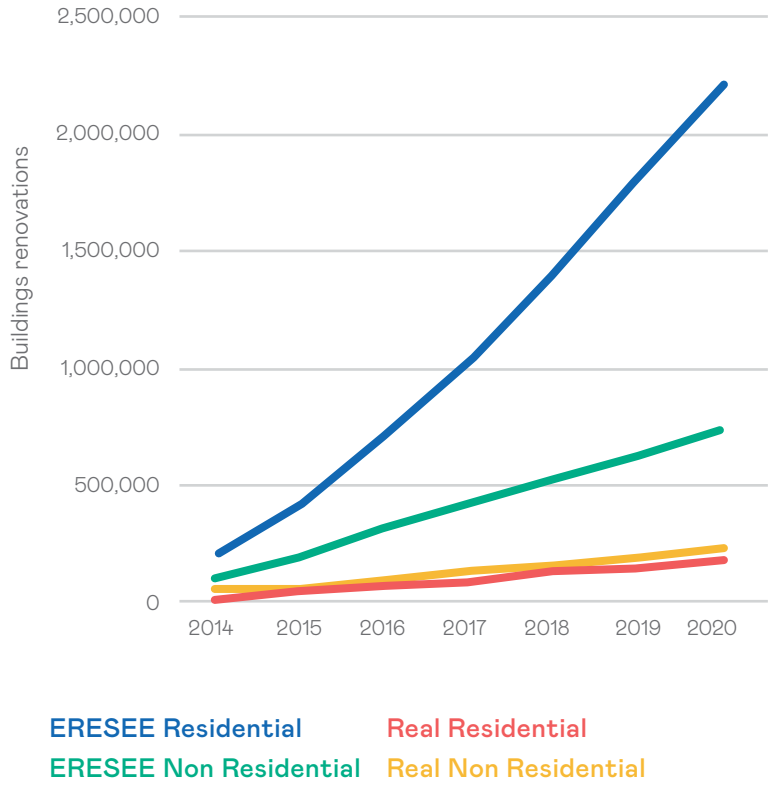
10 Cuchí, A. & Sweatman, P. (2012). *Informe GTR 2012, Una Visión-País para el Sector de la Edificación en España. Plan de Acción para un Nuevo Sector de la Vivienda.* Retrieved from: https://climatestrategy.es/es/informe_10.php

11 Castellazzi, L., Zangheri, P., & Paci, D. (2016). *Synthesis Report on the assessment of Member State's Building Renovation Strategies.* JRC. Retrieved from: https://publications.jrc.ec.europa.eu/repository/handle/JRC97754

12 MITMA. (2014). *Long-term Strategy for Energy Renovation in the Building Sector in Spain pursuant to Article 4 of Directive 2012/27/UE.* Retrieved from: https://www.mitma.gob.es/recursos_mfom/paginabasica/recursos/esart4enener2014010090000entra00.pdf

13 Spain only imports 6% of its gas from Russia which in 2021 was 3.3 million tonnes of oil equivalent (toe). Cores. (2021). *Importaciones y exportaciones de gas natural por países.* Retrieved from: https://www.cores.es/sites/default/files/archivos/icores/i-cores-imp-export-gn-dic21.pdf and Escribano, G. (2022). Diez contribuciones de España a una seguridad energética europea autónoma de Rusia. Real Instituto Elcano. Retrieved from: https://www.realinstitutoelcano.org/analisis/diez-contribuciones-de-espana-a-una-seguridad-energetica-europea-autonoma-de-rusia/ https://www.cores.es/sites/default/files/archivos/icores/i-cores-imp-export-gn-dic21.pdf

Figure 1.
Cumulative buildings renovations planned in the 2014 ERESEE vs. real renovations



2022 scenario if the ERESEE 2014 has been fully implemented

Euro 11 billion worth of energy and CO2 (2012-2020)

Over 3 million toe of energy saved in 2022 (predicted)

Yet in 2021, Spain imported 3.3 million toe of gas from Russia

A lack of political engagement, financial resources and a series of technical hold-ups have prevented Spain from delivering the three long-term building renovation plans it submitted to the EU Commission since 2014, and this leaves the country as reliant on imported gas as ever. Since 2014, and until 2019, Spain's real renovation rate actually slowed down,[14] and at just 0.08% it significantly lags other EU countries like France (1.75%) and Italy (0.77%), none of which reach the 3% target required to deliver the EU's Renovation Wave.[15] Shallow renovations (generating savings below 30%, which would not qualify as green under the EU Taxonomy) are also predominant in Spain and represent a higher share of the few renovations undertaken than in other EU countries.[16]

14 Confederación Española de Asociaciones de Fabricantes de Productos de Construcción. (2021). *Informe Coyuntura Económica.* Retrieved from: http://www.cepco.es/Uploads/docs/Informe_Coyuntura_CEPCO_Diciembre_2021.pdf

15 European Commission. (2014). *EU Buildings Factsheets.* Retrieved from: https://ec.europa.eu/energy/eu-buildings-factsheets_en

16 Arriba Segurado, P. (2020). *Rehabilitación energética de los edificios en España y la UE. Experiencia adquirida y principales recomendaciones.* ODYSSEE-MUREE. Retrieved from: https://www.odyssee-mure.eu/publications/policy-brief/spanish-building-retrofitting-energy-efficiency.html

Spain's buildings are valuable, and typically half of family savings are in their bricks and mortar, yet they are among the least efficient in Europe with more than 84% considered energy inefficient.[17] Of course, there is mild weather in many regions, and some houses are only occupied in specific seasons, which means that energy efficiency isn't a core concern for every building. Yet, over a third of Spaniards are dissatisfied with their home's insulation, the same proportion are concerned about noise, and nearly half of people are concerned about accessibility.[18] This is not surprising as 51% of Spanish primary residences were built before basic thermal insulation performance requirements were included in technical construction standards.[19]

As we've seen not all buildings are built or used equally, and older primary homes in colder climates will use more energy than modern second homes on the beach. But this means that there are still millions of very inefficient buildings in colder Spanish regions that are used all year around. And while some of these are owned or occupied by vulnerable and energy poor households, and these will require public support to renovate, yet the remaining majority need confidence, low cost financing and a clear roadmap for their future.

It turns out that renovating a country's building stock is not "a man on the moon mission" as it requires millions of people to participate - and not just a few highly trained engineers and astronauts. Massive scale building renovation takes political courage, cultural alignment, millions of financed projects, tens of millions of micro decisions a year and reliable and trusted renovation supply chains. Delivering the EU's Renovation Wave will take public and private resources, a facilitating policy framework to enable building-level decisions and long term political commitment, and a level of commitment and focus unseen in recent years, in other words "a Renovation Marshall Plan". With high and volatile energy prices, an immediate and long-term need to use less fossil fuel and a general awareness of the need to act in solidarity with Ukraine, there has never been a more appropriate time to alleviate our inefficient building-energy dependency.

This paper proposes comprehensive measures to address the gaps in knowledge, demand, skills and finance that would enable and promote a new wave of renovation action. A Marshall Plan for Spanish Buildings can be executed in three steps: Identify, Finance and Execute.[20] In this energy emergency, and with strong policy support from the EU, coupled with new legislation and Spain's recovery funding, the right people can be matched to the right renovations supported with the right mix of grants and finance.[21]

17 Gumbau, A. (2022). *Spain's rising energy poverty: A cautionary tale for Europe.* Energy Monitor. Retrieved from: https://www.energymonitor.ai/policy/just-transition/spains-rising-energy-poverty-a-cautionary-tale-for-europe and X-tendo. (2021). Energy Performance Certificates Assessing their Status and Potential. Retrieved from: https://x-tendo.eu/wp-content/uploads/2020/05/X-TENDO-REPORT_FINAL_pages.pdf

18 "With regard to energy efficiency being considered a problem by society, according to the 2018 Housing Barometer, 34% of Spaniards said that they were fairly (25.7%) or entirely (8.3%) dissatisfied with their home's insulation against cold and heat, which indicates greater concern with thermal comfort than with state of repair (regarding which only 17.7% said that they were fairly or entirely dissatisfied), but a very similar level to that for concern with noise (35.8%) or security against burglary (30.5%) and well below that for accessibility, which - as mentioned above - is the most significant concern (50.4%)." MITMA. (2020). *Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

19 Sunderland, L., Forona, C., Tobías, J. (2021). *Minimum energy performance standards: A tool for building renovation in Spain.* RAP. Retrieved from: https://www.raponline.org/wp-content/uploads/2021/07/ECODES-RAP-meps-for-spain-2021-july-7.pdf

20 Sweatman, P. (2020). *Making the renovation wave work: a Marshall plan for EU buildings in three simple steps. Energia, ambiente e innovazione.* Retrieved from: https://www.eai.enea.it/archivio/efficienza-energetica-avanti-tutta/making-the-renovation-wave-work-a-marshall-plan-for-eu-buildings-in-three-simple-steps.html

21 Sweatman, P. (2020). *Making the renovation wave work: a Marshall plan for EU buildings in three simple steps. Energia, ambiente e innovazione.* Retrieved from: https://www.eai.enea.it/archivio/efficienza-energetica-avanti-tutta/making-the-renovation-wave-work-a-marshall-plan-for-eu-buildings-in-three-simple-steps.html

Three Steps for Spain's Renovation Marshall Plan

When a neighbouring country is invaded, and strategic energy resources are impacted as a result, a war-footing is suddenly open to accelerate remedial measures. Our response should be two-fold: harness all immediate measures that eliminate Russian gas imports as soon as possible in line with the REPowerEU action plans, and strengthen Europe's energy independence and security to avoid future crises. The action plans take into account different time horizons to cut Spanish gas use in the short-term, and invest immediately (and without cease) to ensure a more energy-efficient building sector in the long-term.

So far, however, Spain's buildings are not preparing to welcome a Renovation Marshall Plan. It has been unexpectedly hard to find homeowners willing to cofund public money and renovate to save, notwithstanding sky-high energy prices. There is something so intangible about energy savings, that there are no lines of flag-waving homeowners waiting for EU money to upgrade their homes.

Spain has 26 million homes, of which three-quarters (20 million) are primary dwellings mostly lived in by their owners (of whom about a third have an outstanding mortgage), and 6 million are second homes or stand empty.[22] This means there are 9 million owner occupied primary homes with no debt[23] that could be renovated. Of these, over 5 million are likely inefficient homes located in the cold climatic zones that concentrate 80% of the residential sector's heating consumption.[24]

While there are millions of inefficient buildings housing families who can ill afford to upgrade them, there is also €6.8 billion of España Puede recovery funds that are available to support the energy efficiency upgrade of public and private buildings[25]. Yet, it's unclear that those eligible for public funding can find those funds, or that those with low-cost gas savings in inefficient homes can find contractors offering a turn-key integral renovation. General Marshall would have addressed this disorderly renovation challenge in three disciplined steps: Identify, Finance and Execute.

22 MITMA. (2020). 2020 *Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

23 MITMA. (2020). 2020 *Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

24 Own calculation based on MITMA. (2020). 2020 *Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf. "In terms of consumption, according to the consumption distribution model used for this 2020 ERESEE, 80% of the energy used for heating in the residential sector is concentrated in zones C, D and E, even though those zones only contain 65% of homes."

25 La Moncloa. (2021). *Plan de Recuperación, Transformación y Resiliencia. Componente 2.* https://www.lamoncloa.gob.es/temas/fondos-recuperacion/Documents/16062021-Componente2.pdf

Step 1 Identification: Who knows the energy performance of their home and what can be done about it ?

Energy performance is not an esoteric quality of a building, it determines how much you have to pay for heating and cooling, and probably whether you hear your neighbours and whether you feel comfortable and live well and healthily.

While all buildings are different, there are strong patterns and similarities among those built at the same time in the same place. Targeting the right buildings with the right transformational measures and funding-finance package requires the combination of two key criteria: the physical building's state and the occupants' eligibility for public support.[26]

Much is known, and documented, about the physical state of Spanish buildings, and the key is rooted in the building's age and its location. Spain's 2020 updated long-term buildings renovation strategy (ERESEE) contains the general physical characteristics and occupancy of Spain's buildings (including age, state of repair, ownership and fuel use). Previous editions drew upon architectural work detailing intervention menus for 10 "building hotspots" (buildings of similar typology, climatic region, occupancy and likely upgrade pathway) where activity could be concentrated to obtain more energy savings more quickly and industrialising renovation techniques to reduce costs.[27]

Yet it is unclear that homeowners know, or indeed care, about their energy performance and the transition pathway of their most valuable and cherished asset. Unlike cars, inefficient homes can be upgraded to efficient ones, and a significant part of the costs of that upgrade can be recovered through energy savings and sustainable, green value increases in the home's value.

The identification process needs to engage buildings owners and occupants in a renovation journey, and provide practical and accurate information to help support and guide owner expectations of an integral renovation. This would include:

- → **Getting practical information to homeowners in buildings where energy renovation is likely to make good economic sense:** Why is it that Energy Performance Certificates (EPCs), Building Passports and Technical Buildings Inspections are viewed as unnecessary overheads, and not important information for the health, safety and efficiency of a building? The characteristics of specific climatic zones and the physical state of inefficient buildings are usually evident at street level. However, the key to useful information is targeting and its provision from a trusted source. In general, owners of inefficient buildings in cold climates need an accurate energy performance certificate, building renovation passport or renovation estimate which they can compare with their own energy bills. Further, if there are any forms of public support available these homeowners should be made aware of local, regional and national alternatives.

26 Sweatman, P. (2020). Making the renovation wave work: a Marshall plan for EU buildings in three simple steps. Energia, ambiente e innovazione. Retrieved from: https://www.eai.enea.it/archivio/efficienza-energetica-avanti-tutta/making-the-renovation-wave-work-a-marshall-plan-for-eu-buildings-in-three-simple-steps.html

27 Cuchí, A. & Sweatman, P. (2012). *Informe GTR 2012, Una Visión-País para el Sector de la Edificación en España*. Plan de Acción para un Nuevo Sector de la Vivienda. Retrieved from: https://climatestrategy.es/es/informe_10.php

→ **Technology can significantly reduce the costs of energy assessments and simplify this process.** There is an AI-machine learning data analytics tool developed by the Spanish residential real estate valuation company Sociedad de Tasación[28], which can estimate the EPCs and physical climate risks of residential properties from public information. As a first estimate, it uses models that feed from land registries, statistical agencies and the company's own databases. This tool can infer the emissions and energy consumption of any residential building in Spain.[29] There are similar AI-machine learning tools emerging in Denmark, France, Italy, Germany and Austria that massively simplify and reduce the costs of getting information to homeowners.

→ **Local authorities must identify and prequalify homeowners with the potential to receive part public funding for an integral renovation.** The hardest thing for a vulnerable, energy poor or simply busy homeowner is to know what subsidies and financing instruments are available to promote a deep renovation of their home. Identification criteria can be proactively shared with agents, renovators and local banks to facilitate co-processing of packages or grants and loans to qualifying homeowners with qualifying deep renovation projects. This also is a component of a scheme of priority renovation zones and city-scale renovation to aggregate renovation works, as recommended by the larger construction firms.

→ **Transparent network of accredited, well compensated and trusted renovation agents.** The administration and documentation requirements for deep renovations are significant and include: licences, subsidies, approvals, project management, codecision making, application and acceptance of finance against project, verification of works done and completion. It's not just the patience and skills required to seek approvals, finance and an appropriate contractor, but it's also the time required to manage the administrative processes and the execution of the project itself, ensuring that the outcomes are those intended during planning. Some believe that these "hidden costs" of renovation when correctly valued can be between 10% and 30% of the renovation cost.[30] The German government resolves these project management issues by accrediting over 11,000 agents who are qualified to propose a energy renovation project, help raise finance from the State Bank KfW, co-sign the loan as a technical guarantor and then manage the works on behalf of the homeowner. To deeply renovate the millions of homes in Spain which are needed, a similar qualified project management agent network of some ten thousand people is needed.[31] Further, the role of the property administrator (*administrador*

28 Sociedad de Tasación. (2022). *EEMI Bauhaus - Let's Greenstorm! 11th Edition.* Retrieved from: https://www.st-tasacion.es/es/st-tv/st-tv-eemi-bauhaus-let-s-greenstorm-11th-edition-14-march-2022.html

29 Sociedad de Tasación. (2022). *EEMI Bauhaus - Let's Greenstorm! 11th Edition.* Retrieved from: https://www.st-tasacion.es/es/st-tv/st-tv-eemi-bauhaus-let-s-greenstorm-11th-edition-14-march-2022.html

30 Sweatman, P. (2021). *Finance & Investing in Decarbonising Europe's buildings. Climate Strategy & Partners.* Retrieved from: https://climatestrategy.es/en/informe_19.php

31 The figure of the "Agente Rehabilitador" was approved in a 2021 Government decree: Real Decreto 853/2021, de 5 de octubre, por el que se regulan los programas de ayuda en materia de rehabilitación residencial y vivienda social del Plan de Recuperación, Transformación y Resiliencia. The ERESEE 2020 update establishes as one of its key action points on the supply side the modernisation of the renovation sector through greater professionalisation, training and capacity-building (see page 348). The measures proposed within this action point include, among others: greater coordination among the renovation sectors and professionals to promote a comprehensive offer of turnkey projects and unitary packages of products; creation and strengthening of the professional training programs ("Formación Profesional" in Spanish) focused on the new needs of the construction and renovation sectors (digitalization, monitorization, rehabilitation techniques, maintenance of renewable energy installations, financing models, etc.); improvement of the training programs for renovation professionals in order to qualify them to carry out technical competences such as providing EPCs or conducting technical inspections ("ITE" in Spanish) and evaluation reports of the building ("IEE" in Spanish); development of technical support guides that promote the decarbonisation of the building stock with recommendations for the renovation professionals to make decisions on the different renovation options within a building and the substitution of heating installations for renewable energy sources (MITMA. (2020). *2020 Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain*. Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf).

de finca) is central to providing the trust and the forum to support the renovation information and co-decision making process with multifamily-block homeowners. Experts say that this role isn't sufficiently well compensated, and therefore - like in Germany where renovation project managers earn Euro 2,000 per successful project - this could be a regulated tariff only paid upon a successful delivery of proven energy savings.

Most building owners lack the skills and experience to plan, finance, contract for and manage a deep renovation project. Furthermore, while conceptually these skills may reside in the public sector, Spain's past inability to deploy European Structural and Investment Funds into renovation shows that while these skills may exist in theory - the closer you get to the project, to small cities and local authorities, project management capabilities are in short supply. Given that renovations do not happen without the full consent of the building owners, and that Spain has many qualified architects, engineers, administrators and experienced sole traders *(autónomos),* we think that this "Renovation Agent" role should be created and should be funded and empowered to create this market. Something odd is happening, and clearly the risk-reward balance for deep renovations isn't making sense to homeowners currently, but this can be addressed.

In sum, homeowners and their agents (and property administrators) need to be aware of the energy performance of their building in the same way as they are concerned for its structural integrity. Wasteful buildings are a structural weakness in Europe's energy policy and defence. This challenge and the responsibility to react can be translated into the precise steps for each individual building and then communicated proactively with funded solutions for their owners. It is insufficient now to wait for building owners to make independent inquiries about renovation, as this has been shown to result in renovations at rates that will not keep Spain and its citizens safe from price rises, supply shocks, future regulation and climate change.

Step 2 Finance:
Deep renovations require easy to access and process, long-term, low cost finance

After buying a home, the purchase of a new car is the single most valuable household transaction. In Spain in 2020, over one million new cars were purchased, and 20% of these were financed at point of sale through a "renting" contract.[32] With an average value of Euro 19,000, Spanish residents spent over Euro 17 billion in new cars in the same year.[33] In 2020, the market for home renovations didn't reach Euro 1 billion, and even at its projected peak in the 2014 ERESEE it was only expect to be Euro 10 billion per year, some 3-400,000 integral home renovations. Buying a car is clearly easier and provides more serotonin than upgrading your home, even though the car leasing costs are 7-10% per annum and its value depreciates immediately as you drive away from the dealer. There is clearly no strong "savings" motive to new car acquisition.

32 See page 54: Asociación Española de Renting de Vehículos. (2020). *Memoria Anual.* Retrieved from: https://www.ae-renting.es/libros2021/index.html#p=56

33 Agencia Tributaria. (2021). Matriculación de vehículos por origen y cilindrada. Retrieved from: https://www.agenciatributaria.es/AEAT/Contenidos_Comunes/La_Agencia_Tributaria/Estadisticas/Publicaciones/sites/matriculaciones/mes/jrubikf6a241f294349b5d223669fa3fbe23f77e77db4d0.html

Surveys undertaken in Spain suggest that access to finance is the main obstacle to undertaking building renovation. In a national survey, and a local one in Olot, 70% of all respondents reported that lack of financing and of technical knowledge about the complexity of the works prevented them from renovating their homes.[34] Clearly, something needs to be done to support the identification of the funding and financing for integral deep home renovation, and to smooth the execution of a massive emergency renovation response to the energy security crisis created by the conflict in the Ukraine.

Looking back, the ERESEE 2014 had expected to renovate 2 million homes with €9.5 billion of public funds and €45.4 billion of private finance.[35] €9.5 billion of public funds were never available to homeowners, and even the most successful renovation programme managed by IDAE has just a few hundred million. But now, Spain has access to historic European recovery Next Generation EU funds and its Recovery Plan has set the objective to target €6.8 billion of these funds for building renovation in the next 3 years.[36] While this must address energy poverty, which is only exacerbated during times of high prices[37], it can also be used to engage other actors in the private sector whose interests are increasingly aligned to enable building renovations to save gas and provide energy security. To improve the rate of financing and funding integral energy renovations, the following actions will help:

- → **Lever bank-homeowner relationships through Mortgage Portfolio Standards for Spanish lenders:** Over 300,000 new mortgages are signed each year in Spain for an average of Euro 135,000 each providing a total of over Euro 40 billion a year to house buyers.[38] While Energy Performance Certificates are required to be disclosed to these purchasers, the reality is that their considered importance by lenders, public notaries and estate agents is very low. Even upon request in the public notary with the lending bank, having a home energy performance explained or addressed is greeted with blank faces. This is a shame, and a missed opportunity, as great care is taken to educate home buyers on the characteristics of mortgages, and this time could and should also be dedicated to energy matters. We estimate that there are over 3 million clients with a mortgage living in inefficient buildings that could improve their economics and allow their lenders to "green" their mortgages through positive engagement.[39]

34 Ipsos. 2019. *Uncover the underlying motivations and barriers for energy efficient renovations.* Retrieved from: https://www.ipsos.com/sites/default/files/2019-03/ipsos-full-report-en.pdf and Klimovich, K. (2020). Accelerating Home Renovation. C4E. Retrieved from: https://c4eforum.net/kristina-klimovich-accelerating-home-renovation/#_ftn4

35 MITMA. (2014). *Long-term Strategy for Energy Renovation in the Building Sector in Spain pursuant to Article 4 of Directive 2012/27/UE.* Retrieved from: https://www.mitma.gob.es/recursos_mfom/paginabasica/recursos/esart4enener2014010090000entra00.pdf

36 La Moncloa. (2021). *Plan de Recuperación, Transformación y Resiliencia.* Componente 2. https://www.lamoncloa.gob.es/temas/fondos-recuperacion/Documents/16062021-Componente2.pdf

37 Gumbau, A. (2022). *Spain's rising energy poverty: A cautionary tale for Europe.* Energy Monitor. Retrieved from: https://www.energymonitor.ai/policy/just-transition/spains-rising-energy-poverty-a-cautionary-tale-for-europe

38 Idealista. 2021. *La firma de hipotecas retrocede casi un 8% en el año del covid y sufre su primera caída desde 2013.* Retrieved from: https://www.idealista.com/news/finanzas/hipotecas/2021/02/26/789273-la-firma-de-hipotecas-cae-en-el-ano-del-covid

39 "According to the data from the 2018 Continuous Household Survey, the tenure status of 76.7% of Spanish main dwellings is in ownership (14.2 million of a total of 18.5), compared with 17.8% in rental (3.3 million) and 5.5% under other forms of tenure (1.2 million; made available free of charge or for a price by another household, the company, etc.). Of the owned dwellings, 9.1 million (64%) no longer have ongoing mortgage payments, compared with 5.1 million (36%) that do" (MITMA. (2020). *2020 Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf).

Mortgage lenders are among the most powerful stakeholders in Spanish real estate and most have identified significant climate transition risk in their lending books. This requires action to identify these 3 million low-hanging fruit, and offer new products to address these inefficiencies and climate risks. A **Mortgage Portfolio Standard (MPS)**[40] is a regulatory mechanism that requires the median energy performance of a bank's portfolio of financed buildings to meet specific targets, by specific dates that are aligned with Spain's decarbonisation objectives. MPS were introduced in the EU Commission's recast EU Energy Performance of Buildings Directive (EPBD)[41] and will promote engagement by Member States with financial institutions to help identify and finance those buildings in their portfolios with the highest energy savings potential. This, in turn, will unlock financial opportunities for their homeowners to renovate, and accompany them in the process with the ultimate aim of achieving the bank-wide portfolio performance targets.

MORTGAGE PORTFOLIO STANDARDS TO UNLOCK PRIVATE FINANCE FOR THE RENOVATION OF BUILDINGS

A Mortgage Portfolio Standard (MPS)[42] is a regulatory mechanism that enables banks to pledge to work with their clients to increase the energy performance of the buildings which back their mortgages along a science-based trajectory.

Portfolio standards are proven regulatory tools that have been deployed in reducing US power and EU/US transport emissions. MPS is designed by reference to fleet emissions standards (FES), which in Europe are expected to reduce car and van emissions by 15% by 2025 (and over 30% by 2030),[43] and Renewable Portfolio Standards (RPS) that are responsible for around half of the growth in US renewable energy production (82 GW).

MPS are already being used voluntarily to reduce climate transition risks in mortgages by banks in the Netherlands and UK. With a loan portfolio of EUR 185 billion[44] for residential and commercial property (2/3 of its balance sheet), Dutch bank ABN AMRO finances over 10% of the buildings in the Netherlands. By 2030, ABN intends for its commercial real estate and entire residential

40 Sweatman, P. (2021). *Underwriting the Renovation Wave with Mortgage Portfolio Standards for Energy Efficiency.* Climate Strategy & Partners. Retrieved from: https://climatestrategy.es/en/informe_20.php

41 European Commission. (2021). *Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings* (recast). COM(2021) 802 final. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0802

42 Sweatman, P. (2021). *Underwriting the Renovation Wave with Mortgage Portfolio Standards for Energy Efficiency.* Climate Strategy & Partners. Retrieved from: https://climatestrategy.es/en/informe_20.php

43 European Commission. (2021). *CO_2 emission performance standards for cars and vans (2020 onwards).* Retrieved from: https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en

44 ABN AMRO. (2017). *ABN AMRO helps clients improve the sustainability of their homes.* Retrieved from https://www.abnamro.com/en/newsroom/press-releases/2017/abn-amro-helps-clients-improve-the-sustainability-of-their-homes.html

mortgage portfolios, and branch network, to have an "A" weighted average energy performance label. To achieve this it is working with the Partnership for Carbon Accounting Financials (PCAF) to assess the carbon intensity and the necessary measures for each building. Its interim goal for 2025 is for the bank's real estate portfolio to have a "C" label.

The United Kingdom is evaluating the improvement of the energy performance of homes through lenders in two regulatory proposals: Mandatory disclosure of energy performance for all registered mortgage lenders on their websites (and to Government annually), and that UK lenders should voluntarily agree to meet an average MPS of EPC level C by 2030.

The UK Government recognises the unique position that lenders have to influence their clients' perspective on energy performance at critical trigger points, such as home purchase, upgrade, or re-mortgage. Moreover, UK lenders are developing a renovation market as a way of reducing the risk of homes becoming stranded assets as minimum energy performance standards become stricter. The UK government also promotes a TrustMark scheme that banks can use where businesses are vetted to meet required standards and are required to provide robust consumer and financial protection.

Learning from these successful approaches, coupled with technical assistance and public guarantees, a strong MPS for banks would better align interests and resources to accelerate the transition of a highly disaggregated building sector in Spain.

The key MPS design elements for Spain are the following:

1. **MPS would target a 2050 whole portfolio destination with clear interim steps** to allow for long-term renovations and upgrade planning and financing by owners and finance providers alike;
2. **MPS targets would be aligned with Spain's National Energy and Climate Action Plan in a Paris Agreement-aligned trajectory,** with a stable, ramp-up over time and no sudden or uncertain shifts;
3. **MPS covers all Spanish mortgage lenders and mortgage debt holders** (as regulated parties), including final holders of mortgages housed in special purpose vehicles, securitisation companies and other intermediate bodies;
4. **MPS can rely on verified real energy or direct emissions data** from the property or an EPC as a proxy where real data is unavailable; and
5. **MPS rules would include non-compliance penalties** for those entities that fail to meet their stated interim goals.

→ **Dedicate recovery funding towards and set targets for acceleration of deep renovations for the energy poor.** Spain had in 2020 between 10 and 15% of its population suffering from energy poverty[45], for which long-term renovation is an identified solution. Further, the 15-30% (0.5-2.5 million) of the energy poor living in cold climatic regions (ERESEE 2020 gives 2.7 million in North Atlantic zone[46]) should be prioritised for deep renovations using recovery funds. Given the heritage for the energy poverty indicators, we believe that it would be useful for regions to apply these criteria to identify the buildings which require renovation and proactively share these lists with renovation contractors to ensure immediate focus.

To facilitate the access to these grants, massive awareness campaigns can be used as effective tools together with programmes that accompany vulnerable groups in the application to and implementation of the grants (see below the recommendation on one-stop-shops). These campaigns have been shown to positively feed into regulatory initiatives like renovation strategies and subsidies, leading to greater social acceptance and behavioural change.[47]

→ **Work with Bank of Spain to launch an EU Renovation Loan instrument designed for the millions of low income, no savings "just able to pay" households.** Hardworking and older homeowners with low incomes and no savings need a cost-effective way to unlock their stored home-equity for a deep renovation. An EU Renovation Loan (ERL)[48] provides a form of state-backed borrowing for older or low income homeowners who may not qualify for new or extended green mortgages. ERLs are designed with a zero-coupon structure with no cash repayments until the earliest of sale, transfer or 30 years. This instrument can complement the incentives created by a Mortgage Portfolio Standard offering client facing financial institutions another instrument to improve their stake in customers' renovations journey, and helping to reduce transaction costs for a speedier emergency response.[49]

45 Romero Mora, J.M. et al. (2022). *Informe de Indicadores de Pobreza Energética en España 2020.* Universidad Pontificia Comillas. Retrieved from: https://repositorio.comillas.edu/xmlui/handle/11531/65128

46 MITMA. (2020). *2020 Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

47 Escribano, G. (2022). *Diez contribuciones de España a una seguridad energética europea autónoma de Rusia. Real Instituto Elcano.* Retrieved from: https://www.realinstitutoelcano.org/analisis/diez-contribuciones-de-espana-a-una-seguridad-energetica-europea-autonoma-de-rusia/ https://www.cores.es/sites/default/files/archivos/icores/i-cores-imp-export-gn-dic21.pdf

48 Sweatman, P. (2021). *The European Renovation Loan: a new instrument to fund the renovation wave.* Agir pour le Climat. Retrieved from: https://www.agirpourleclimat.net/14387/ and Sweatman, P. (2022). *The European Renovation Loan: An innovative financial instrument to Repower EU.* Climate Strategy & Partners. Retrieved from: https://www.climatestrategy.com/press/EURenovationLoanSummApr2022

49 Sweatman, P. (2021). *Finance & Investing in Decarbonising Europe's buildings.* Climate Strategy & Partners. Retrieved from: https://climatestrategy.es/en/informe_19.php

EUROPEAN RENOVATION LOAN: AN INNOVATIVE FINANCIAL INSTRUMENT TO REPOWER SPAIN AND THE EU

Spain's residential buildings are estimated to be worth around €3 trillion[50] and comprise 26 million properties. In 2021, Spain had an outstanding mortgage debt balance of around €500 billion lent against around a third of its homes.[51] This means that Spanish homeowners have stored wealth of around Euro 2.5 trillion to pledge against the deep renovation upgrade of their homes to increase comfort, resale value, save energy costs and reduce energy poverty. The European Renovation Loan[52] (ERL) could provide these homeowners a new way to cost effectively unlock home-equity for a deep renovation with no cash repayment until the earlier of sale, transfer or 30 years.

An ERL needs to be an EU-backed instrument accessing the lowest costs of funds available only from the EU's own funding programme. ERLs could be provided through a re-cast of the largely untapped loan portions of the Recovery and Resilience Facilities. Long-term financing with a zero-coupon structure would allow homeowners to borrow the amount they require to transform their home through a deep renovation, and to not pay cash interest, which would accrue until the property is sold or transferred (or the loan matures in 30 years).

Not making cash interest payments makes an ERL cheap to manage for lenders, as they don't have to collect interest nor worry about default until maturity. Lenders could however make distribution fees through ERL origination (to cover deep renovation processing costs), they will improve the creditworthiness of their clients[53], green their mortgage books and reduce transition risks by aligning their assets with the Paris Agreement.

ERLs would hold a second and junior lien on the home (so as not to impact the senior "first" collateral available to the existing mortgage), payable upon sale or transfer, and can benefit from central bank liquidity for ERL holders to provide an attractive secondary market. All the cash savings (from lower energy bills and associated operational costs) will be felt immediately by the household, a benefit especially relevant for those in retirement.

50 1,709 €/m2 is the average price of a residence in Spain - around €150.000 for a 90m2 house, according to Sociedad de Tasación. (2022). *Informe de tendencias: Precio de la Vivienda.* Retrieved from: https://tools.st-tasacion.es/productos/Informe-de-tendencias/Precios-de-la-vivienda

51 Statista. (2022). *Total outstanding residential mortgage lending in Spain from 3rd quarter 2016 to 2nd quarter 2020 (in billion euro).* Retrieved from: https://www.statista.com/statistics/614756/outstanding-residential-mortgage-lending-spain-europe/

52 Sweatman, P. (2022). *The European Renovation Loan: An innovative financial instrument to Repower EU.* Climate Strategy & Partners. Retrieved from: https://www.climatestrategy.com/press/EURenovationLoanSummApr2022

53 EEFIG. (2022). *Report on the evolution of financing practices for energy efficiency in buildings, SME's and in industry.* Retrieved from: https://op.europa.eu/en/publication-detail/-/publication/a3032517-c761-11ec-b6f4-01aa75ed71a1/language-en/format-PDF/source-256242892

> If the EU borrows for 30 years at 1%,[54] and this is the base level for ERL lending cost then €20,000 borrowed at 1%, with interest rolling-up until the end in 30 years (including fees and charges of 0.5% running) would require a repayment in 2052 of €31,200. This new, zero-coupon 30-year "renovation loan", if made available widely through retail lenders to their customers, may be just the innovative renovation financing product that is missing. Secured on the property, junior to an existing mortgage, with no debt service for 30 years, the ERL could deliver energy savings directly to household pockets and be partly secured on the "green premium" resulting from a highly energy efficient house at sale or in the long-distant future.[55] It is hard to imagine, and inconsistent with the past, that the value increases due to that renovation investment and overall market trends would not cover this repayment by 2052.

The Next Generation EU recovery packages are an unique opportunity to access public money (grants and loans recast into ERLs) that, in the light of a critical geopolitical situation, can be urgently executed to accelerate the renovation of the identified hotspots with occupants that lack savings, or access to traditional finance. The grants should be available to both owners and tenants suffering from energy poverty and/or low incomes, establishing social safeguards that avoid unfair increases in renting prices.[56] An ERL would complement and improve the economics for those "just able to pay" and banks can help segment the homeowners into components where grants, ERLs and regular financing products can be deployed.

Step 3 Execution: The importance of a Renovation Agent (Agente Rehabilitador)

When projects (and priority buildings) are identified and financing-funding packages secured, the renovation works need to be contracted for, project managed and technical outcomes delivered. Germany, one of the more advanced EU countries in this area, provides a tool to identify from 11,000 accredited renovation agents that can be searched by region and skill type. [57] This list is maintained by DENA (Germany's public energy agency, like IDAE in Spain)

54 European Central Bank. (2022). *Euro area yield curves.* Retrieved from: https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html

55 Sweatman, P. (2020). *Making the renovation wave work: a Marshall plan for EU buildings in three simple steps. Energia, ambiente e innovazione.* Retrieved from: https://www.eai.enea.it/archivio/efficienza-energetica-avanti-tutta/making-the-renovation-wave-work-a-marshall-plan-for-eu-buildings-in-three-simple-steps.html

56 Ecodes. (2022). *La factura de la electricidad: Un tema crucial. Algunas Propuestas de ECODES.* Retrieved from: https://ecodes.org/images/que-hacemos/03.Energia_y_personas/pdf/Propuestas_Ecodes_Factura_electricidad_13032022.pdf

57 See the tool in the following link: https://www.energie-effizienz-experten.de/

and contributed to by 23 network partners[58] that provide candidates for accreditation drawn from multi disciplines (engineers, architects, facility and project managers) and help control quality with standards and spot-checks. Further, to ensure rigour and prevent financial fraud, the German energy efficiency agent cosigns the KfW loan used for the renovation to ensure that quality and performance traceability are aligned.

In Spain the figure of Renovation Agent *(Agente Rehabilitador)* is more recent and less well developed. In October 2021, the Spanish government approved a Royal Decree that gives a general definition of this agent in its Article 8, delegating to Autonomous Communities the competence of further defining its functions.[59] This person, or entity, can carry out actions to promote, monitor, manage public aid and access to financing, as well as the preparation of documentation or technical renovation projects.[60] Yet as the size of the energy shock that Europe will have to face next winter becomes clear, an approach which "opens the door" to voluntary action and supports local administrations may not be concerted enough to deliver much real activity on the ground.

In solidarity with Ukraine, we have - in reality - entered a "savings race", where instead of engaging industry in the production of war equipment ("arms"), we are asking the country to channel that energy to collectively invest in undermining war (by not paying for fossil fuels) by building peace through energy efficiency at home.

In steps 1 & 2, we identify Spain's most inefficient buildings in the coldest climates containing vulnerable and the energy poor, as well as those only just able-to-pay for renovations, and the finance-funding packages for them and others who are more wealthy. A military-style execution campaign is then required to renovate as much as possible, as fast as we can. The following are a few ideas as to how Spain can rally the technical and installation expertise required to deliver a million deep renovations, and more staged measures (those which support a building's trajectory towards efficiency, sufficiency and net zero emissions):

- → **Urgently address cavity walls:** There are ways to insulate key areas of inefficient homes which can be done very quickly, many homes at a time and deliver immediate results. Spain may have over a million cavity walls which can be insulated quickly and at a very low cost: There was a time when these "air gaps" were considered ideal for ventilation and the prevention of dampness, but in practice were used to simply dump construction waste. This is an immediate action which can save money and levers experience in other countries.

58 See the partners in the following link: https://www.energie-effizienz-experten.de/netzwerkpartner

59 Real Decreto 853/2021, de 5 de octubre, por el que se regulan los programas de ayuda en materia de rehabilitación residencial y vivienda social del Plan de Recuperación, Transformación y Resiliencia. See in the following link an example of Castilla-La Mancha on how to apply to become an agent that can manage renovation subsidies: https://www.anerr.es/2022/03/22/__trashed/

60 Real Decreto 853/2021, de 5 de octubre, por el que se regulan los programas de ayuda en materia de rehabilitación residencial y vivienda social del Plan de Recuperación, Transformación y Resiliencia.

→ **Insulate attics and floors:** Wall or facade insulation tends to be more costly and time consuming (when there is no cavity), but attics and floors are "lower hanging fruit". The EU Buildings Performance Institute (BPIE) believes that just insulating attics and roofs can save up to 14% of residential heating energy and cut gas consumption by 12%[61]. While many Spanish buildings have shared "trasteros" (lit storage) under the eves of their multifamily apartment buildings, there is space for better insulation both under the roof and horizontally. An immediate attic insulation drive, combined with a review of "easy to implement" underfloor insulation in single family dwellings would also have a strong impact. Implementing this insulation campaign would be a logistic effort but would not pose high technical barriers as long as it comes from a concerted effort among insulation manufacturers, local craftsmen, SMEs and DIY stores under the coordination of the national and local governments in Spain.[62]

→ **Health-check thermostats to ensure they work, and reduce waste:** What proportion of Spanish homes heat space that is unused, don't lower temperatures at night, have central heating set too high or heat on mild days because it's just one setting (on/off) or provide too much heat to southern lower ground flats while insufficient to the northern facing high-floor neighbours? While for sure, many homes are unable to afford sufficient heating, let alone to waste any, there are also others where simple fixes and adjustments can have huge returns. GTR's work from 2010-2015 found that just 10 million homes in Spain consume the majority of the energy (due to size, location, efficiency etc) and these "hotspots" would be the place to start to ensure thermostats are installed, working and (ideally) intelligent. Health checking thermostats for efficiency should be a part of all annual boiler reviews, repairs and remedial work, with the potential to save 5-10% of heating energy.[63] These checks can be complemented with the installation of thermostatic radiator valves and smart thermostats, a low cost intervention that would allow for a more efficient control of room temperatures.[64]

After 6 years of delay[65], in August 2020 the Spanish government approved a Royal Decree that mandates the installation of meters in central heating houses by May 2023[66], affecting 1.4 million homes built before 1998, with the exception of those located in the mildest climates, and estimating 25%-40% of energy savings mainly from behavioural changes.[67] Civil society organisations like ECODES also have useful awareness and informational programmes to promote energy-saving behaviours with personalised recommendations.[68]

61 / 62/ 63/ 64 BPIE. (2022). *Solidarity and Resilience: An Action Plan to Save Energy Now!* https://www.bpie.eu/wp-content/uploads/2022/03/Strategy-paper_Solidarity-and-resilience_An-action-plan-to-save-energy-now-1.pdf

65 MITECO. 2020. *Nota aclaratoria para la aplicación del real decreto 736/2020 de 4 de agosto, por el que se regula la contabilización de consumos individuales en instalaciones térmicas en edificios.* Retrieved from: https://energia.gob.es/desarrollo/EficienciaEnergetica/directiva2012/Documents/NOTA_ACLARATORIA_RD736_2020.pdf

66 Real Decreto 736/2020, de 4 de agosto, por el que se regula la contabilización de consumos individuales en instalaciones térmicas de edificios.

67 Bueno del Amo, J. (2020). *La calefacción central se apagará en 2023.* EL País. Retrieved from: https://elpais.com/economia/2020-11-27/la-calefaccion-central-se-apagara-en-2023.html

68 Ecodes. (2022). *La factura de la electricidad: Un tema crucial. Algunas Propuestas de ECODES.* Retrieved from: https://ecodes.org/images/que-hacemos/03.Energia_y_personas/pdf/Propuestas_Ecodes_Factura_electricidad_13032022.pdf

→ **Set targets for optimal air-source heat pump switches:** Spain has over 11 million heat pumps installed, 8.5 million in homes and 3.3 million in the non-residential sector. With 80% of these installed in the Mediterranean climate zone, half are only used for cooling even though they also have a heating function.[69] With lower heat and cooling loads, and in milder climates where heat-cool-degree days are less (eg. South, islands, etc.), there remain plenty of opportunities to switch gas boilers for heat pumps. Milder climates struggle to produce the economics that drive deep renovation, as the number of heating and cooling days is limited, and therefore the pure energy savings are worth less making insulation a less attractive option. Conversely, these milder climates are ideal for heat pumps which are more efficient when temperature gradients are lower (meaning the differential from outside temperature to desired inside one). Given the costs of transporting gas and storing it in temperate islands (like Canaries) or distributing it to rural parts of Spain's larger regions, there are strong environmental and economic cases for identifying and promoting high efficiency switches from gas or fuel boilers to more efficient electric heat pumps.

The Commission's REPowerEU communication has set to double its planned yearly pace of deployment of heat pumps to reach 10 million installations in Europe in the next five years, with the potential to save 10.8 million toe.[70] The IEA 10-Point Plan to Cut Oil Use also suggests this acceleration in the replacement of oil boilers for heat pumps.[71] In addition to a massive campaign to switch away from gas in temperate areas, an increase to innovation funding can boost Spain's already successful heat pump developers for colder climates.[72]

→ **Stop using gas to heat water and use the sun:** 8% of home energy in Spain is used to heat water. While 85% of households in Israel use solar water heaters (an energy sufficiency mandate following a different war, today saves Israel 280,000 toe annually), in Spain the figure sits at just 1.3%.[73] The economic break-even time for a solar water heater in Spain is 4-8 years depending upon water use, location and installation, while the expected life of the equipment is over 20 years. A mandatory "sufficiency" assessment can be provided by renovation agents alongside efficiency options, and of course all subsidies and national/ regional promotions should be made available to the network of these local solar water heater installers. Although Spain ranks among the leading countries for solar PV installations, and this month Spain's energy agency IDAE launched a new self-help website providing support to those who wish to install or have installed a solar panel array for self-production[74], support for solar water heaters is less clear. There is nothing as helpful as a motivated, technically educated and numerous "sales force" of accredited

69 MITMA. (2020). *2020 Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

70 Communication from the Commission. (2022). *REPowerEU: Joint European Action for more affordable, secure and sustainable energy.* Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN

71 IEA. (2022). *A 10-Point Plan to Cut Oil Use.* Retrieved from: https://www.iea.org/reports/a-10-point-plan-to-cut-oil-use

72 Bellini, E. (2022). *Residential heat pump produces water up to 75 C.* PV Magazine. Retrieved from: https://www.pv-magazine.com/2022/04/08/residential-heat-pump-produces-water-up-to-75-c/

73 MITMA. (2020). *2020 Update of the Long-term Strategy for Energy Renovation in the Building Sector in Spain.* Retrieved from: https://cdn.mitma.gob.es/portal-web-drupal/planes_estartegicos/en_ltserb.pdf

74 MITECO. (2022). El IDAE abre la Oficina del Autoconsumo para atender las dudas y consultas de la ciudadanía en el despliegue del autoconsumo. Retrieved from: https://www.miteco.gob.es/es/prensa/ultimas-noticias/el-idae-abre-la-oficina-del-autoconsumo-para-atender-las-dudas-y-consultas-de-la-ciudadan%C3%ADa-en-el-despliegue-del-autoconsumo/tcm:30-539368

technicians who can provide financed-funded offers to install thermal solar water heaters alongside efficiency measures. For this reason, renovation agents and "one stop shops" whose design is to promote efficiency, should also always contemplate home sufficiency as well. Solar water heaters can save gas needlessly use to heat water.

Finally, one-stop-shops that can train and connect rehabilitation agents, administer public funds, inform and accompany buildings owners and occupants in identifying the necessary energy efficiency and sufficiency measures are positive regional and city-level developments. These can also be supported by local social agents (NGOs, consumer organisations, energy communities, etc.) that can proactively target the vulnerable and energy poor communities.[75] In Navarra, the publicly owned building promotion firm Nasuvinsa is a good example that has been working for years in local communities.[76]

Spain isn't alone with an under-perfoming building renovation sector, as illustrated by recent assessments of the potential in France[77] and Italy[78] for efficiency there to respond to our addiction to gas which also reaches similar conclusions. In all cases, the new energy crisis forces a deeper look at ways to insulate families from high energy prices, remove fossil-finance from an expansive Russia and support the vulnerable and energy poor.

Speed is of the essence to avert another energy price spike and supply shock in the winter of 2022 and yet the speeds and implementation resources are markedly different in different regions. Given the national security importance of delivering energy efficiency and resilience, regions and local actors to whom devolved competences in matters pertaining to the execution of buildings renovation and energy sufficiency must be aligned, and a "burden sharing agreement" (modelled on the EU climate and energy targets) should be implemented to assure the delivery of real energy savings. Individual regional targets can be attached to the recovery and EU structural and investment funds and can be based upon a calculation of potential, together with wealth and ability yet regions can tailor individual solutions as long as they do not deviate negatively from a national standard.

We believe that the deep renovation of six million low efficiency, high usage primary homes can deliver gas savings of the amount that Spain imports from Russia. Further, we believe that six million interventions that include one or more of the urgent actions identified here could be undertaken in just three years, with the alignment of public resources and competences (urgently leap-frogging the traditional national-regional-city frictions which have dogged building renovations for decades). The urgency of a Marshall-Plan-like ramp-up should be felt by Spanish citizens in their homes by the winter of 2022. There is no time to waste.

75 Alianza por la Rehabilitación de Viviendas sin dejar a nadie atrás. (2022). *Manifiesto.* Retrieved from: https://ecodes.org/hacemos/energia-y-personas/rehabilitacion-energetica-de-viviendas/alianza-por-la-rehabilitacion-de-viviendas-sin-deja-a-nadie-atras/manifiesto-de-la-alianza-por-la-rehabilitacion-de-viviendas-sin-dejar-a-nadie-atras#:~:text=La%20alianza%20une%20a%20organizaciones,hacer%20frente%20a%20la%20pobreza

76 See their website in the following link: https://www.nasuvinsa.es/

77 Rüdinger, A. (2022). *Buildings Renovation: if Europe had started a decade ago it wouldn't have a Russian oil & gas problem.* Energy Post. Retrieved from: https://energypost.eu/buildings-renovation-if-europe-had-started-a-decade-ago-it-wouldnt-have-a-russian-oil-gas-problem/

78 Ecco. (2022). *Halving Italy's Russian Gas Dependency Through Energy Savings And Renewables.* Retrieved from: https://eccoclimate.org/wp-content/uploads/2022/03/Phasing-out-russian-gas-analysis.pdf