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# Delivering Low Energy & Healthy Homes

## *Deep Retrofit Pilot Programme*

Conor Hanniffy

Brian McIntyre

27/3/2019



Rialtas na hÉireann  
Government of Ireland



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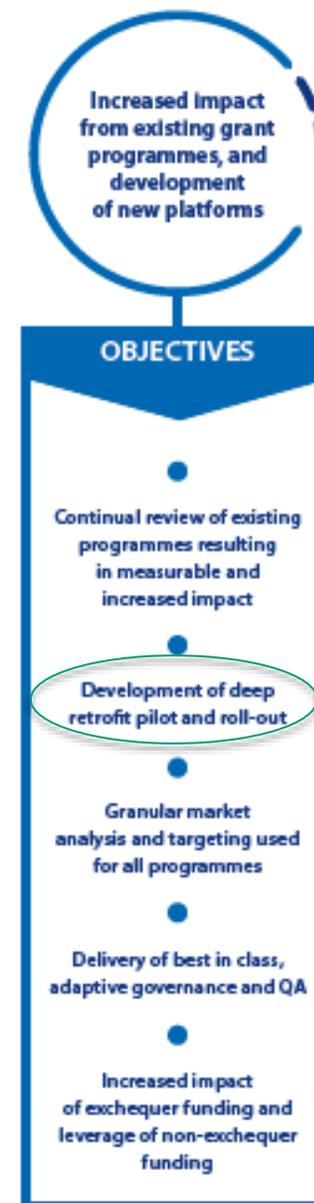
# Vision & Policy

## SEAI Strategy Statement 2017 - 2021

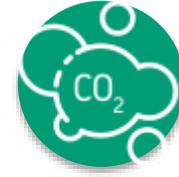
**Key Challenge for SEAI:** The requirement for large-scale and deeper retrofit within our built environment in order to maximise energy efficiencies

Associated challenges:

- development of suites of appropriate technical solutions
- consumer awareness, barriers and uptake
- finance – cost of works and potential financing options

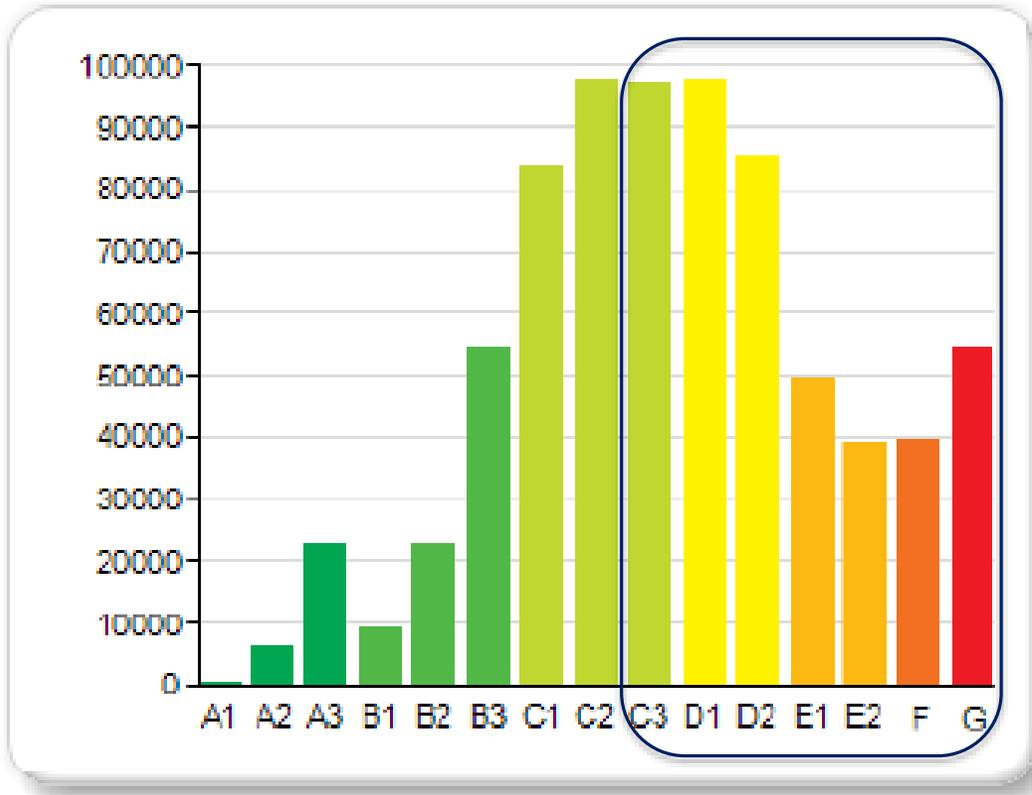


# Deep Retrofit Pilot Programme



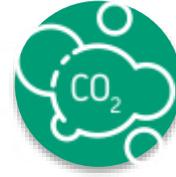
- Multi annual pilot programme 2017 -2019
- €5m budget allocation 2019
- Residential market only

# Target Market



- ~ 1,000,000 homes
- €35b estimated spend to 2050 to B3

# Deep Retrofit?



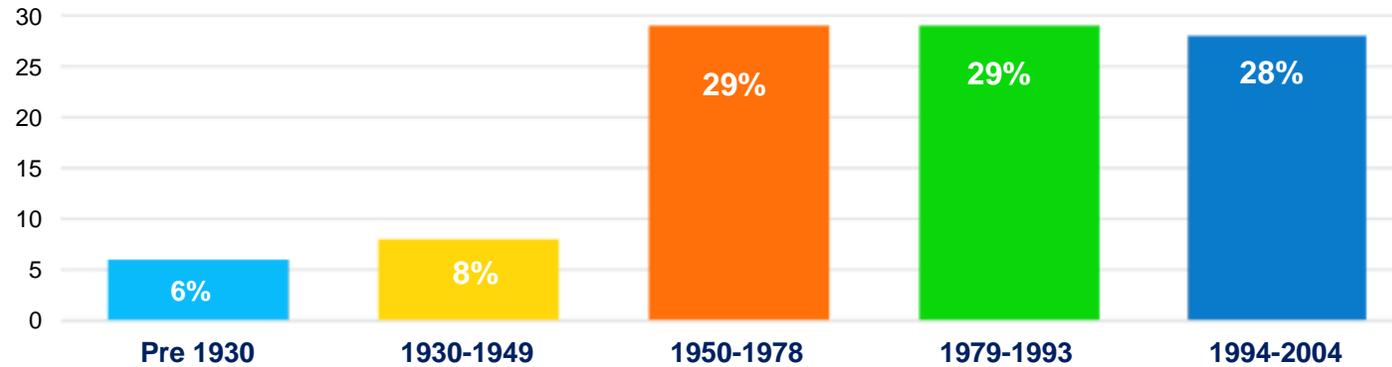
## Guiding Principles

- Minimum A3 Building Energy Rating and uplift of 150 kWh/m<sup>2</sup>/yr
- Whole house solution with an efficiency-first philosophy
- Renewable technologies only; fossil fuels are not funded
- Air permeability  $\leq 5$  m<sup>3</sup>/hr/m<sup>2</sup> (bonus for achievement of  $\leq 3$  m<sup>3</sup>/hr/m<sup>2</sup>)
- Mechanical ventilation required

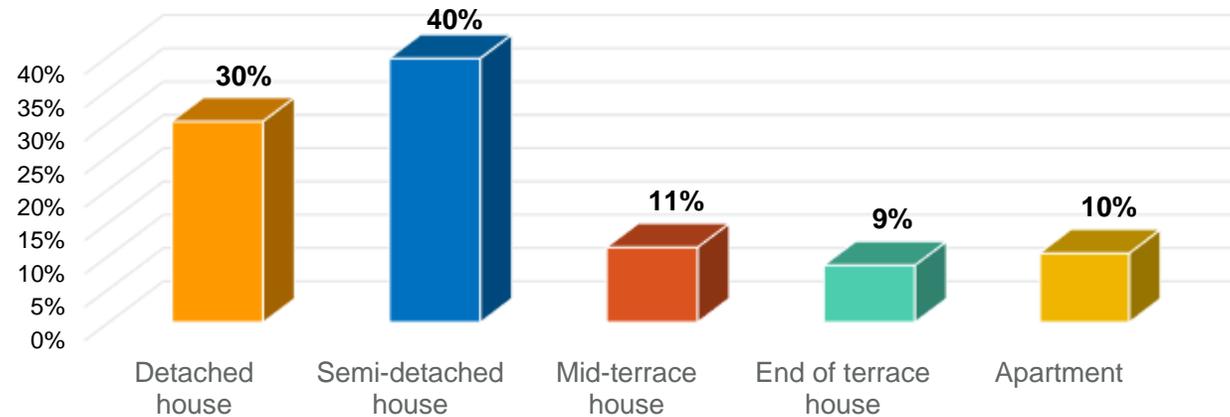
# Profile of Homes



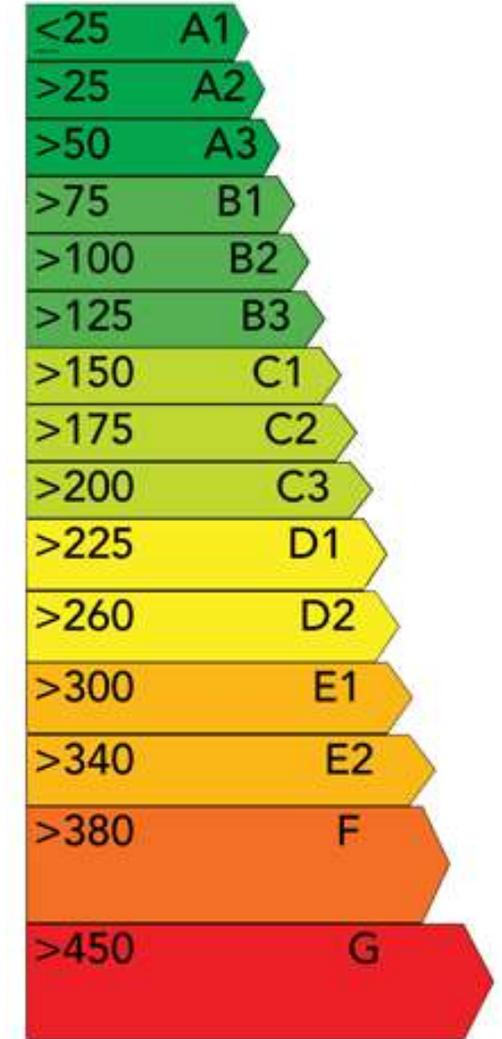
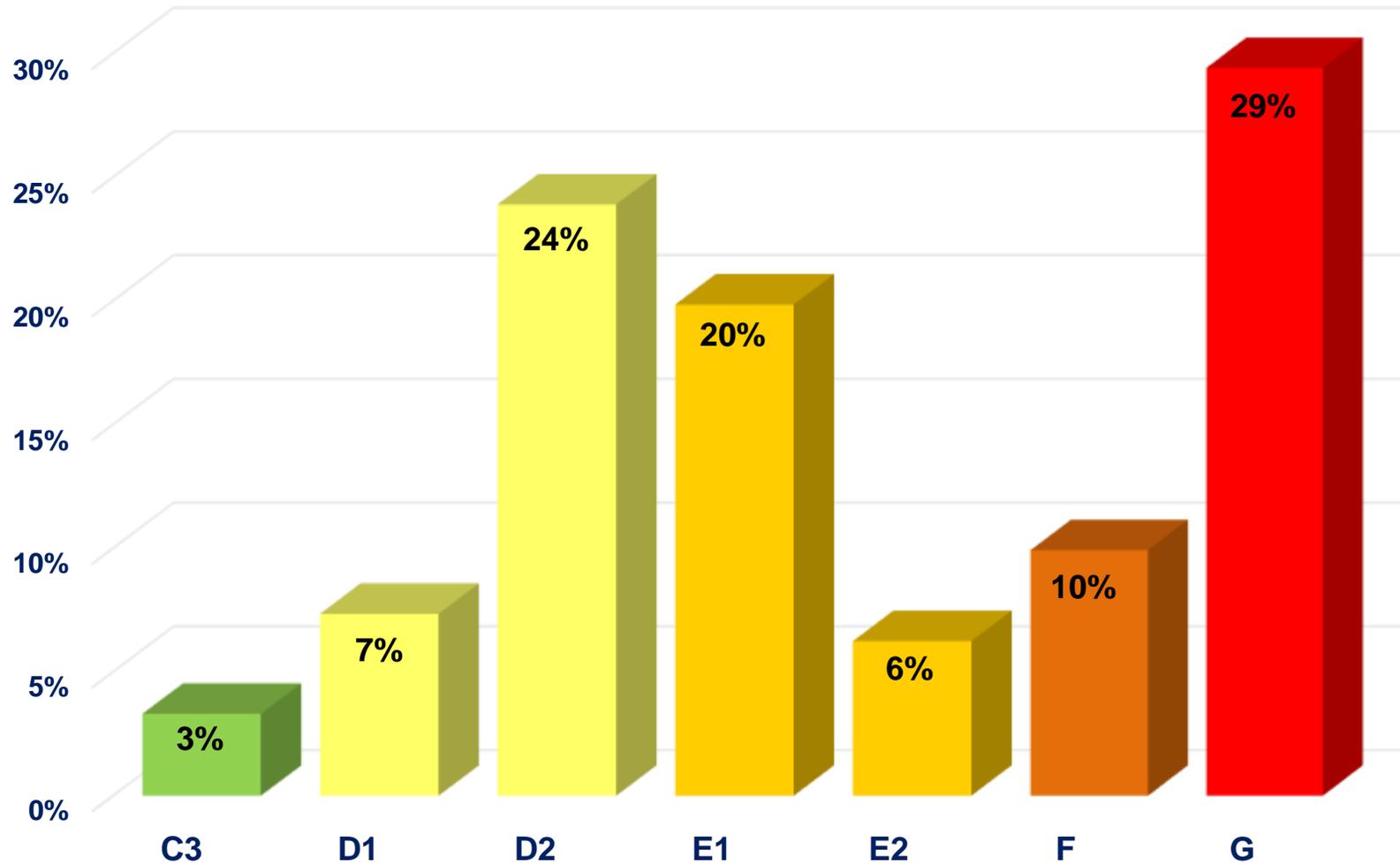
Age of homes



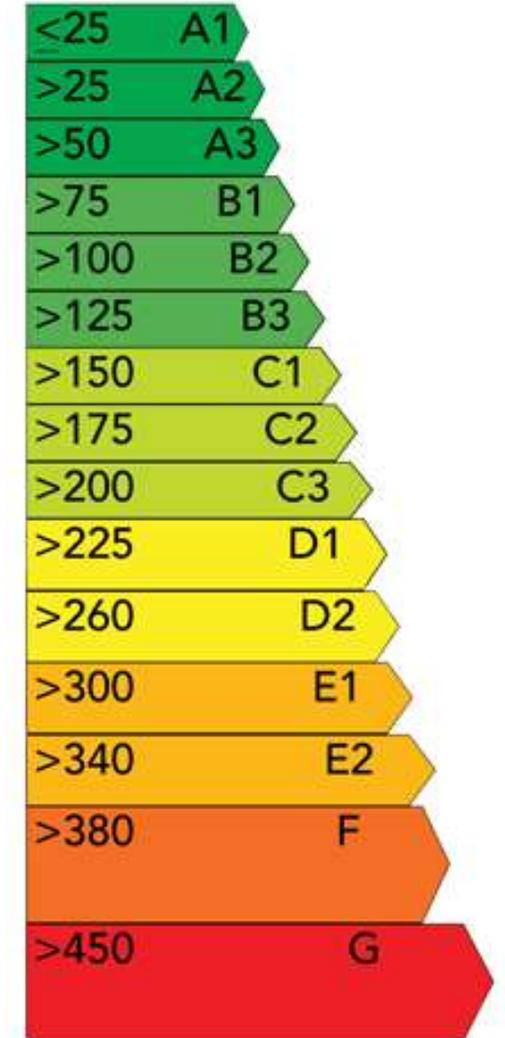
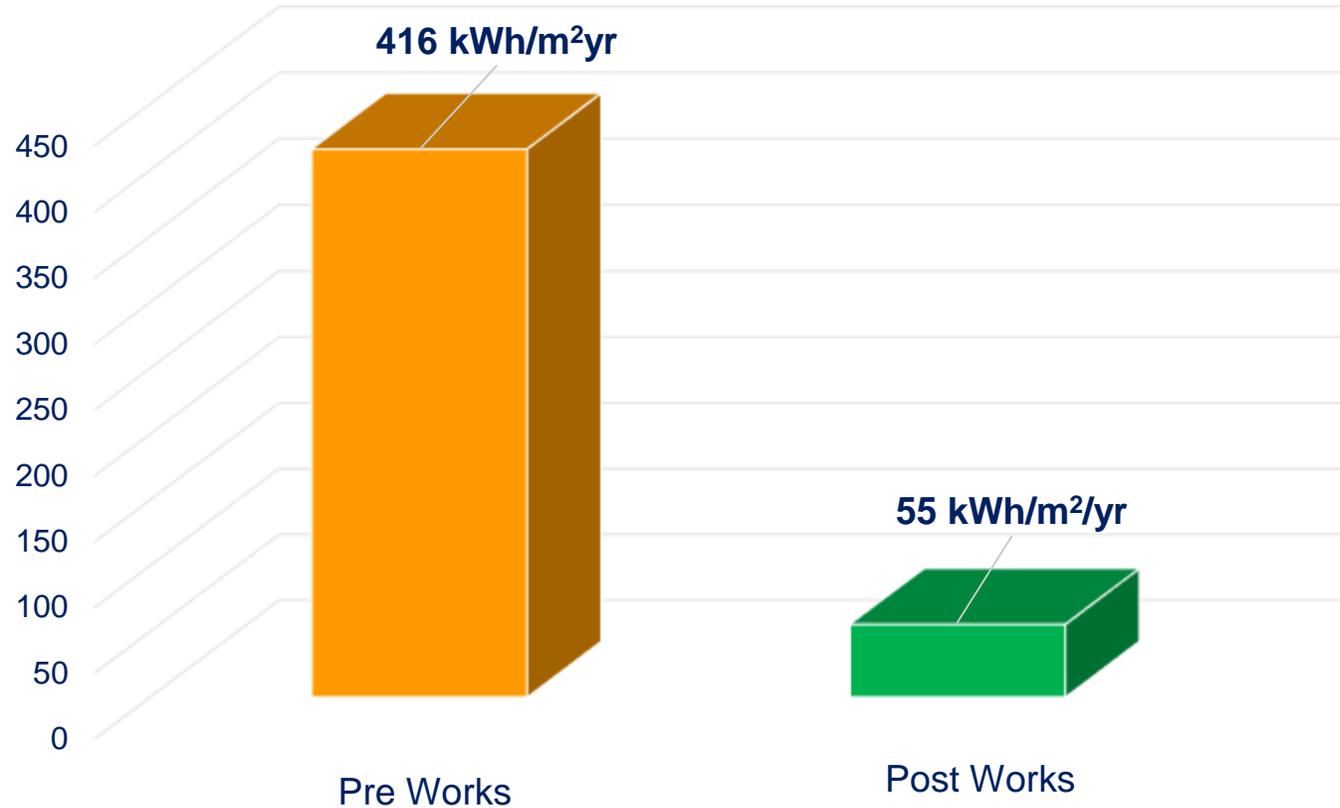
Building types



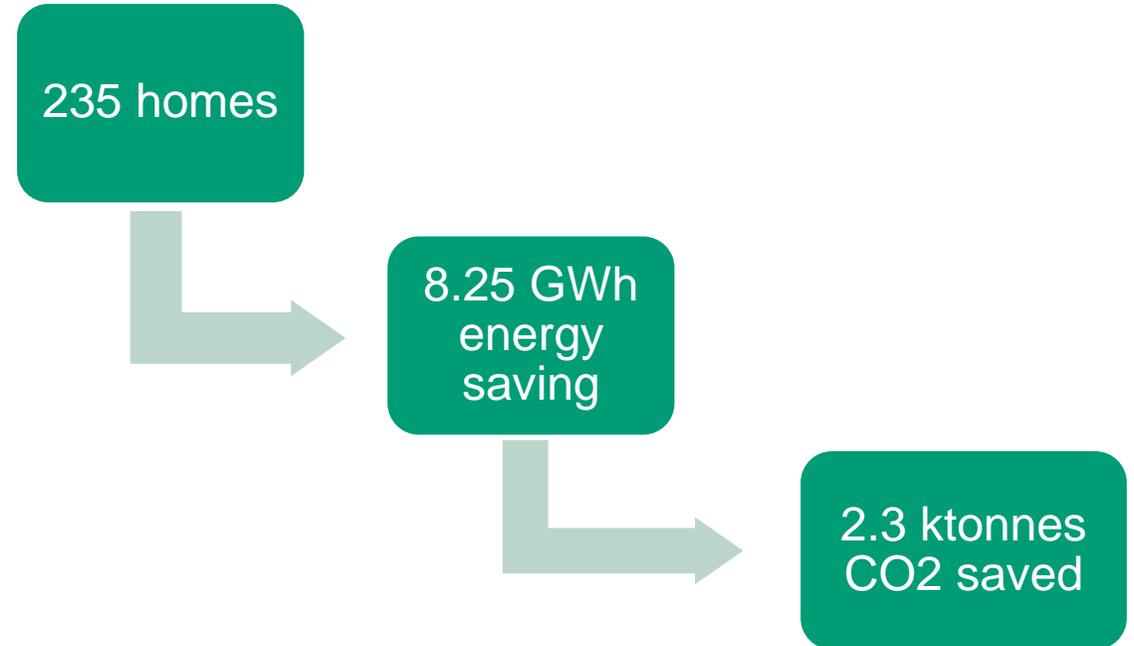
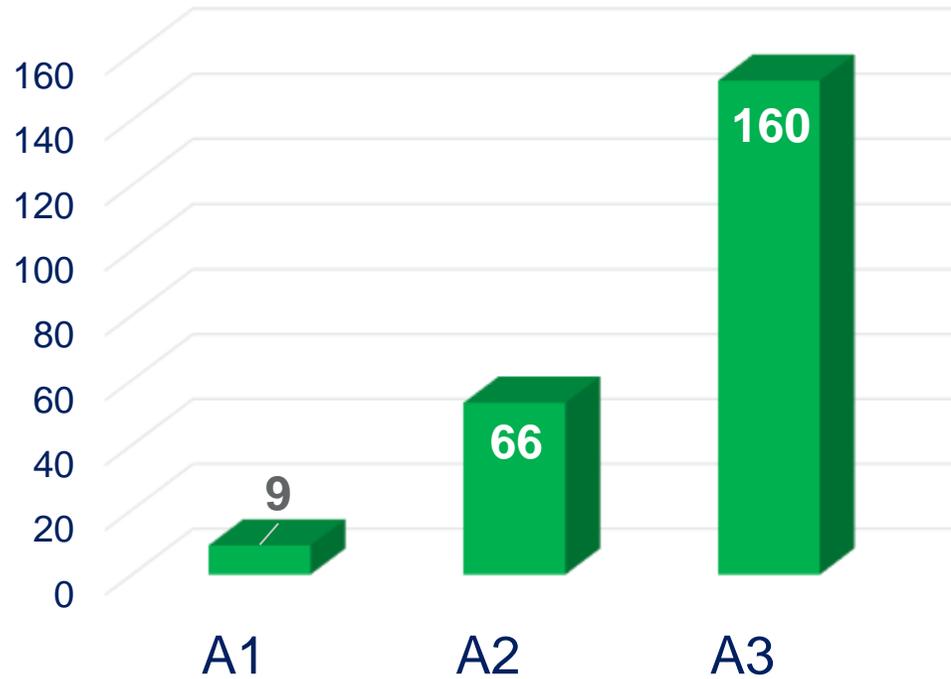
# Pre Works BERs



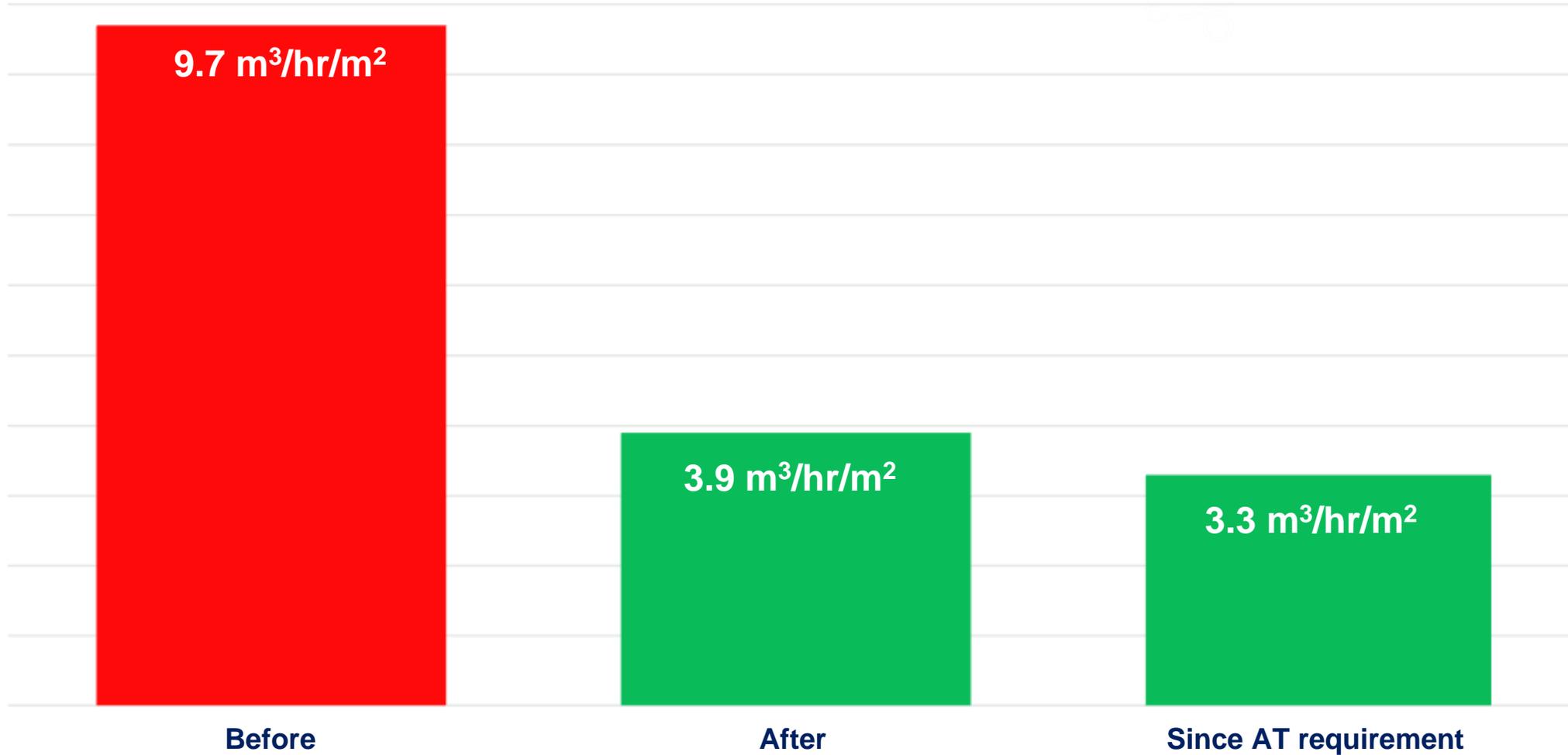
# Average BER and kWh/m<sup>2</sup> Uplift



# Results to date



# Airtightness



# Airtightness



- 38% had a pre-works air permeability of  $> 10 \text{ m}^3/\text{hr}/\text{m}^2$
- 28% have achieved  $\leq 3 \text{ m}^3/\text{hr}/\text{m}^2$  since start of Pilot Programme
- In 2018, brought in requirement  $\leq 5 \text{ m}^3/\text{hr}/\text{m}^2$  with bonus for achievement of  $\leq 3 \text{ m}^3/\text{hr}/\text{m}^2$ 
  - Since this, 43% of results  $\leq 3 \text{ m}^3/\text{hr}/\text{m}^2$  with an average of  $3.3 \text{ m}^3/\text{hr}/\text{m}^2$
- New builds in 2017 and 2018: average air permeability of 3.5

# Mechanical Ventilation



- Primarily (~ 80%) of applications would have Demand Control Ventilation
- Number of applications with MVHR increasing
  - Primarily where applicants have learned from previous project(s)
- Homeowner feedback that they feel the air quality has improved post-retrofit

# Homeowner Benefits

## Homeowner Feedback



**35%** find they have had **fewer trips to the doctor**



“I would have serious chest infections once the winter hit, and I’ll tell you, this year is the **first time in a long time where I didn’t have to go on an antibiotic**”



**94%** think the **air in their home is healthier**



“We had to have the fire on all winter before. My brother used to come up and he would be so chesty after. **Now we have the wood burning stove, and he hasn’t had a problem since.**”

# Delivering Low Energy & Healthy Homes

## *SEAI Research & Innovation*

Solène Goy

Programme Executive, RD&D Team

27/03/19



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# SEAI Research & Innovation Activities

1. SEAI Research, Development & Demonstration Programme
2. Ocean Energy Prototype Development Fund
3. SET Plan Steering Group
4. Horizon 2020 – Delegate for Energy
5. UNFCCC – Technology
6. International Energy Agency

**Lead & coordinate energy research funding in Ireland**



# SEAI Research & Innovation Activities

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# SEAI Research & Innovation Activities: RD&D Funding Programme

## 1. SEAI Research, Development & Demonstration Programme

- Funds innovative energy RD&D Projects
- Multi-year funding, co-funding partnerships

2. Ocean Energy Prototype Development Fund

3. SET Plan Steering Group

4. Horizon 2020 – Delegate for Energy

5. UNFCCC – Technology

6. International Energy Agency

Lead & coordinate energy research funding in Ireland



# Examples of awarded projects

**Indoor air quality, ventilation and occupant comfort in Irish domestic dwelling's pre and post Deep Energy renovations (ARDEN)**

**Lead Organisation: NUIG**  
**Collaborator: Department of Housing Planning and Local Government**  
**External Consultant: Institute of Occupational Medicine**  
**Duration: 26 months**

# Examples of awarded projects

Indoor air quality, ventilation and occupant comfort in Irish domestic dwelling's pre and post Deep Energy renovations

Lead Organisation: NUIG  
Collaborator: Department of Housing Planning and Local Government  
External Consultant: Institute of Occupational Medicine  
Duration: 26 months

**Assessment of Ventilation effectiveness via a Longitudinal indoor environmental study in 'A' rated Irish Dwellings: VALIDate**

**Lead Organisation: NUIG  
Collaborator: UCD  
Duration: 30 months**

# National Energy Research Database

The screenshot shows the SEAI National Energy Research Database search page. At the top left is the SEAI logo (Sustainable Energy Authority of Ireland). The navigation menu includes: Energy in Business, Energy Ratings, Grants, Sustainable Solutions, Teaching Sustainability, Resources, and a search icon. The breadcrumb trail reads: Home / Resources / SEAI Research / National Energy Research Database. The main heading is "National Energy Research Database". Below this is a search instruction: "Search our database for energy research projects in Ireland by topic, year funded, and keywords." The search filters include: Primary Topic (Choose topics), Secondary Topic (Choose topics), Funding Agency (Choose agencies), and Year Funded (From and To). A keyword search box contains the text "Search by keyword or phrase" and a blue "Search" button.

Search for previously funded energy research projects

**SEAI National Energy Research Database:**  
<https://www.seai.ie/resources/seai-research/research-projects/>

# National Energy Research Database - Examples

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Energy in Business Energy Ratings Grants Sustainable Solutions Teaching Sustainability Resources

Home / Resources / SEAI Research / National Energy Research Database / Assessment of Ventilation effectiveness via a Longitudinal indoor environmental study in 'A' rated Irish Dwellings: VALIDate

## Assessment of Ventilation effectiveness via a Longitudinal indoor environmental study in 'A' rated Irish Dwellings: VALIDate

ON THIS PAGE  
Project Description  
Project Details

← Back to your search results

This NUIG project aims to assess of the effectiveness of the ventilation system in 'A' rated dwellings

**Project Insights**

<b>€271,326</b> Total Project Costs	<b>3 yr</b> Project Duration	<b>2018</b> Year Funded
----------------------------------------	---------------------------------	----------------------------

**Project Description**

The proposed project is a longitudinal study aimed at conducting multi-site indoor environmental quality monitoring in 100 'A' rated energy efficient Irish residential dwellings. The project will monitor environmental quality (temperature, humidity, CO<sub>2</sub>, radon and VOCs) over two heating seasons and a cooling season. This will generate over 300 million time-series data points, which will be stored in a repository and freely accessible to all relevant stakeholders. This will provide an accurate representation of the effectiveness of whole-house ventilation as opposed to snapshots of individual rooms and periods. Questionnaires will be administered concurrently with the monitoring data to capture information on occupants awareness of their ventilation system, their thermal comfort and overall satisfaction, and identify any potential mould growth. An advanced modelling framework will be developed, parameterised based on the empirical data to establish a number of baseline scenarios. Simulations will examine the capability of achieving a balanced energy and ventilation performance in 'A' rated dwellings. Simulation-based assessment of the effectiveness of the ventilation systems will be carried out under different ventilation control mechanisms and projected future policies. Overall, a comprehensive and statistically robust assessment of the effectiveness of the ventilation system in 'A' rated dwellings will be carried out.

**Project Details**

Total Project Cost: €271,326  
Funding Agency: SEAI  
Year Funded: 2018  
Lead Organisation: National University of Ireland Galway

 **Miriam Byrne** | Lead Researcher(s)  
Area of expertise: Indoor air, Ventilation, Measurement, Airraid, Low energy buildings

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Energy in Business Energy Ratings Grants Sustainable Solutions Teaching Sustainability Resources

Home / Resources / SEAI Research / National Energy Research Database / Indoor air quality, ventilation and occupant comfort in Irish domestic dwelling's pre and post Deep Energy renovations

## Indoor air quality, ventilation and occupant comfort in Irish domestic dwelling's pre and post Deep Energy renovations

ON THIS PAGE  
Project Description  
Project Details

← Back to your search results

Deep Energy Renovations bring improved energy performance but what impact does this have on indoor air quality.

**Project Insights**

<b>€204,533</b> Total Project Costs	<b>2 yr</b> Project Duration	<b>2018</b> Year Funded
----------------------------------------	---------------------------------	----------------------------

**Project Description**

Deep Energy renovation (DER) adopts a whole building approach and achieves much larger energy savings than conventional energy renovations. DER includes the installation of mechanical ventilation, high levels of insulation and uses renewable energy technologies, to achieve building energy ratings (BER) of at least A3 and building air tightness levels greater than 3.0m<sup>3</sup>/m<sup>2</sup>. Ireland's DER NEAP identifies DER as a solution to achieve energy savings in the Irish residential built environment. The impact of energy efficient measures such as DER on indoor air quality (IAQ) is largely understudied internationally. Although research shows that improving the energy performance of a building improves indoor temperature and occupant comfort, the impact on IAQ is unclear. This proposal aims to measure the air concentration of key priority pollutants for health in 20 homes participating in SEAI's DER Pilot programme, before and after deep energy renovations. A questionnaire survey will also be used to collect information on occupant comfort and how occupants use the energy saving features in their home. This data is core required to support the implementation of SEAI's DER programme, beyond 2020. Research results will inform DECAP and SEAI's ventilation strategy for DER in Ireland. The data will also help SEAI understand and address information barriers to the adoption of energy efficiency measures, specifically related to the impact of deep renovations on occupant comfort and air quality in the home. This research will also make a significant contribution to international building energy research.

**Project Details**

Total Project Cost: €204,533  
Funding Agency: SEAI  
Year Funded: 2018  
Lead Organisation: National University of Ireland, Galway  
Collaborators: Dept. of Housing Planning and Local Government

 **Marie Coggins** | Lead Researcher(s)  
Area of expertise: Exposure Science, Indoor air quality (IAQ), Air Pollution, Environment,  
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# SEAI Research & Innovation Activities: IEA TCPs

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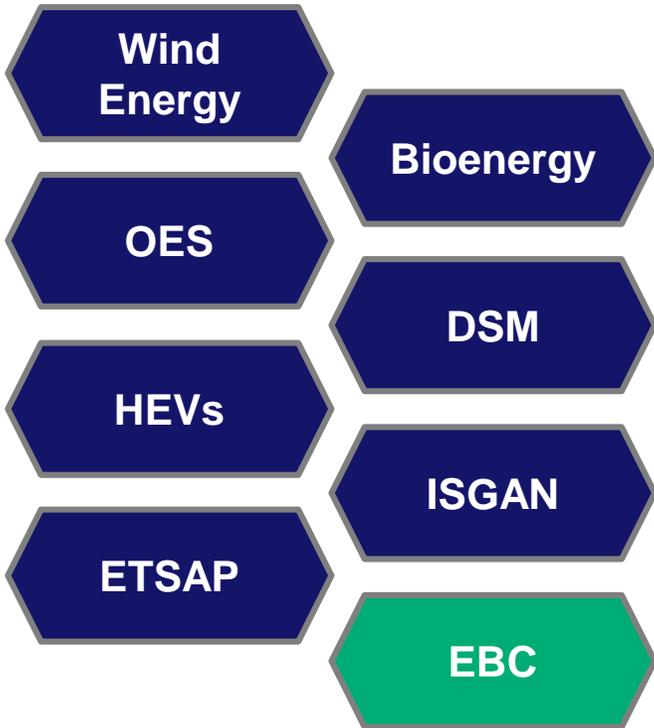
Lead & coordinate energy research funding in Ireland



# IEA Structure & Irish Involvement

Ireland is currently involved in **8 TCPs** and **~25 tasks**

**SEAI IEA Webpage:**  
<https://www.seai.ie/resources/seai-research/international-energy-agency/>



## Energy in Buildings & Communities SEAI National Contact Points: Brendan Cahill & Conor Hanniffy

Annex 5 - Air Infiltration and Ventilation Centre	Simon Jones (Aereco)
Annex 67 - Energy Flexible Buildings	Sarah O'Connell (NUIG) and Marcus Keane (NUIG)
Annex 70 - Building Energy Epidemiology: Analysis of Real Buildings Energy Use at Scale	Beth Massey (IERC) and Brian O'Regan (IERC)

# SEAI IEA TCP Appointment Call

**SEAI IEA Webpage:**  
<https://www.seai.ie/resources/seai-research/international-energy-agency/>

- **SEAI IEA TCP Appointment Call:**
  - Application form & CV
  - Q4 2018 Call: 31 Task Participants appointed
  - Regular Calls throughout the year

*Please check our website or send us an email at [EnergyResearch@seai.ie](mailto:EnergyResearch@seai.ie) to be added to our mailing list !*

# International Energy RD&D Opportunities

## Horizon 2020

- Check out H2020 WP 2018-2020
- H2020 Energy Contact Point  
[Philip.Cheasty@enterprise-ireland.com](mailto:Philip.Cheasty@enterprise-ireland.com)
- Post 2020: Horizon Europe/FP9

## ERA-Nets

- Smart Energy Systems – 2018 Call closed - 2020 Joint Call
- Ocean Era-Net Cofund – 2<sup>nd</sup> joint call EOI closed

## Innovation Fund

- Approx. €10 bn EC investment programme
- Low-carbon technologies
- First call for proposals expected in 2020

# Thank you

