NZEB in Practice,
SuperHomes Ireland Case Studies

26th November 2019

About Superhomes & TEA

- **Tipperary energy Agency**
- **21 years old**
- **36 staff**
  - 28 technical staff
  - 8 administration, marketing & communications staff
  - Motivated, Entrepreneurial, Innovative.

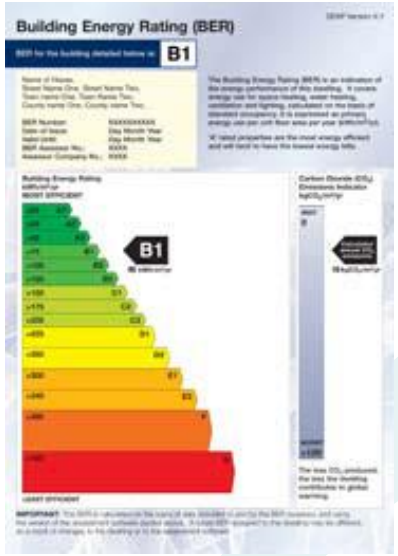
- **Public Good Social Enterprise**
  - Non profit

- **Services**
  - Full building services engineering consultancy (residential & commercial)
  - Specialising in NZEB & renewables (don't do fossil fuel)
  - We do other stuff: Energy Management, retrofit management, energy consultancy, Environmental NGO.
  - Design deep renovation of homes under SuperHomes brand (260 homes by end 2019)

"To Lead and Support the Energy Transition in Ireland"

The Journey Deeper into Retrofit

Super Homes was developed through collaboration with National Energy Agency (SEAI), Large Utility (ESB), Research (LIT) and delivered by TEA to demonstrate & test the decarbonisation pathway.



2006 House of Tomorrow Shallow Retrofit **80** homes (F to D)

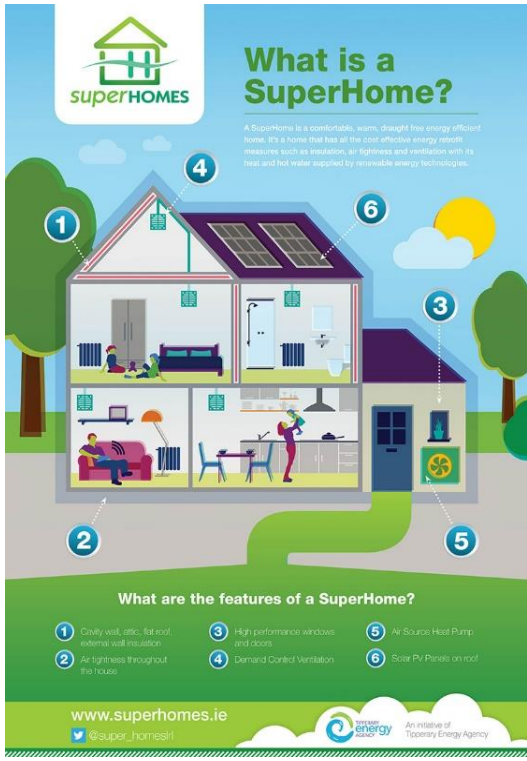
SERVE project **400** buildings E1 to B2

EU Concerto

2013-2015 ~**1000+** fuel poverty/ Shallow F to E

260 Super-Homes

D2 to A2/3 Deep Retrofit



What is Superhomes:

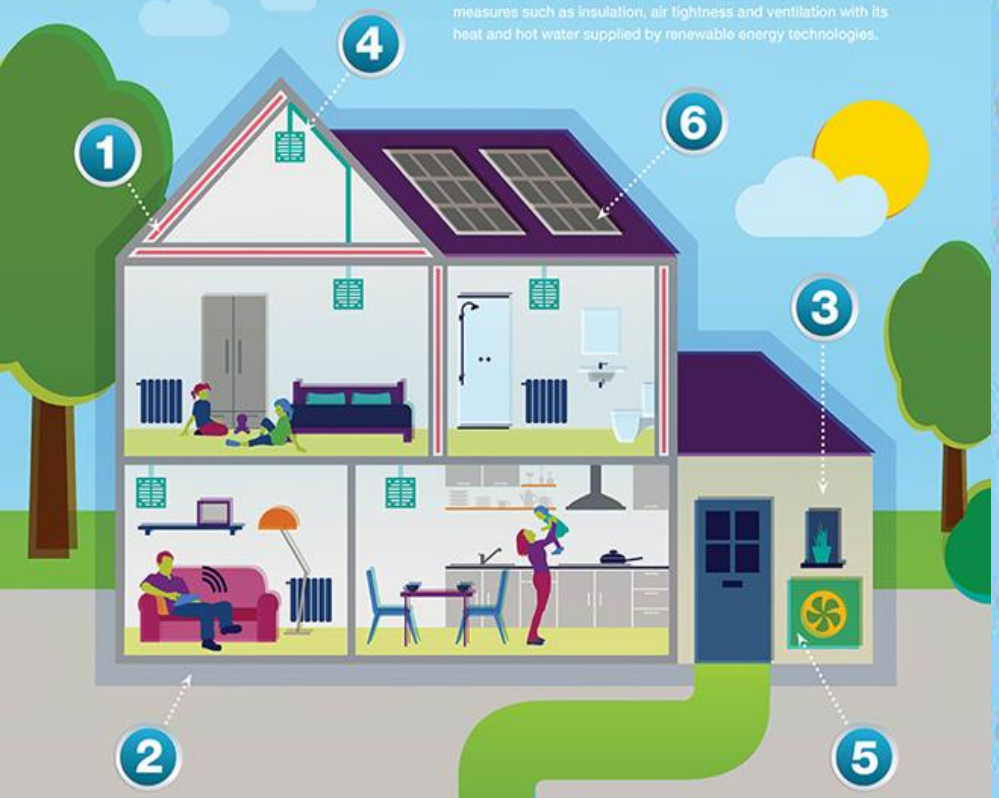
- Independent expert led renovation: Grants, trained contractors, quality control.
- Research, policy, innovation.
- 1-stop shop modelled on Picardie Pass Renovation
- PDA from European investment bank ELENA

Co-funded by the Horizon2020 programme of the European Union

superHOMES

What is a SuperHome?

A SuperHome is a comfortable, warm, draught free energy efficient home. It's a home that has all the cost effective energy retrofit measures such as insulation, air tightness and ventilation with its heat and hot water supplied by renewable energy technologies.



What are the features of a SuperHome?

1. Cavity wall, attic, flat roof, external wall insulation
2. Air tightness throughout the house
3. High performance windows and doors
4. Demand Control Ventilation
5. Air Source Heat Pump
6. Solar PV Panels on roof

www.superhomes.ie

@super_homesIrl

TIPPERARY energy AGENCY

An initiative of Tipperary Energy Agency

MINIMUM MANDATORY MEASURES:

1. Renewable Primary heating system (air source heat pump or pellet boiler)
2. Advanced ventilation (heat recovery or demand controlled ventilation)
3. Air permeability reduction.

OTHER RELEVANT MEASURES:

1. Cavity wall, attic, flat roof and external wall insulation
2. Windows or energy saving glazing replacement
3. Front and Back Doors
4. Renewable Stove
5. Solar photovoltaic (PV) systems

Energy Efficiency in Ireland and Challenges

- **So far:**
- 400,000 homes have received some form of Government assisted energy efficiency upgrade
- Average spend in Better Energy Homes - €3.5k
- For homeowners, living in warmer, more comfortable homes with lower energy bills
- For the country, reduced CO2 emissions, imported fossil fuels displaced with domestic jobs

- **But:**
- 1.7 million homes in Ireland
- To deliver 2030 & 2050 climate and energy goals investment per home of between €25k-€35k needed
- Total Investment Requirement = €42 - €60 Billion!

Climate Action Plan

Buildings

500,000
existing homes to upgrade to **'B2' equivalent BER** by 2030

600,000
heat pumps installed by 2030
(of which 400,000 will be in existing buildings)

New retrofitting delivery model,
which will group retrofits together, leverage smart finance, and ensure easy pay-back methods

Electricity

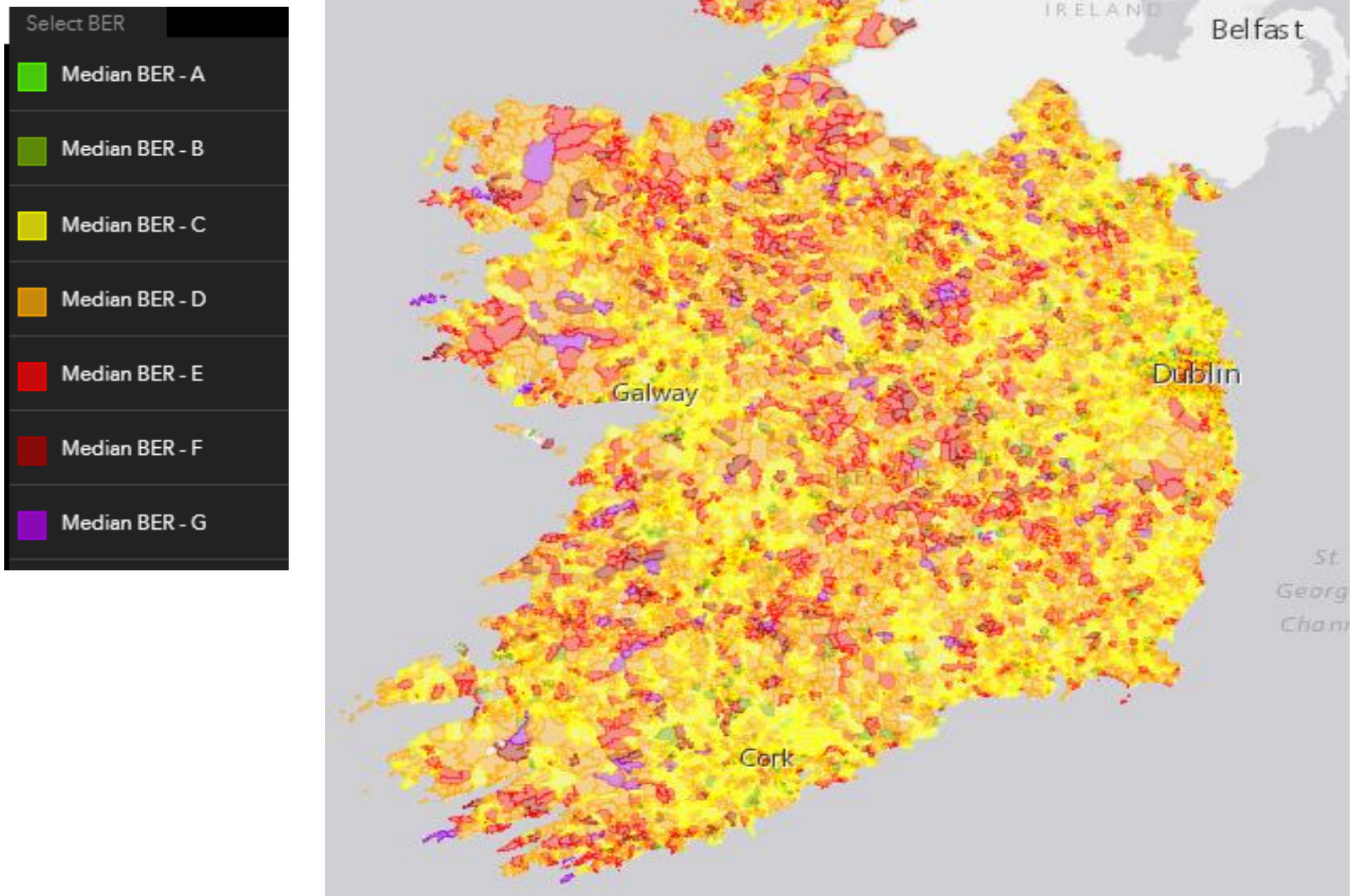
70% **Electricity generated from renewable** sources by 2030

Phase-out Coal and Peat electricity generation

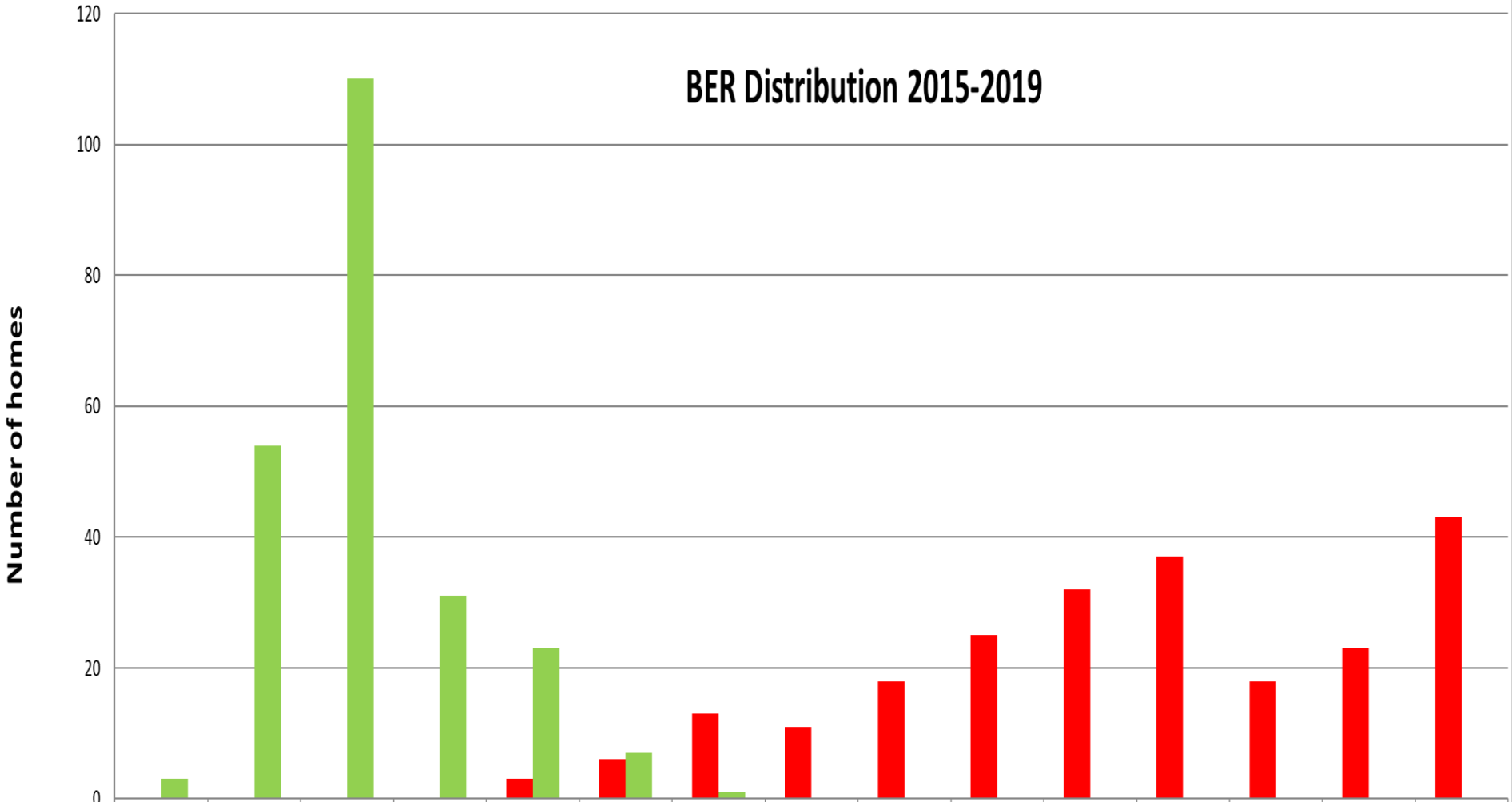
Homeowners to generate their own electricity and sell back to the grid under scheme for **micro-generation**

Progress so far…

How to turn this map Green ?



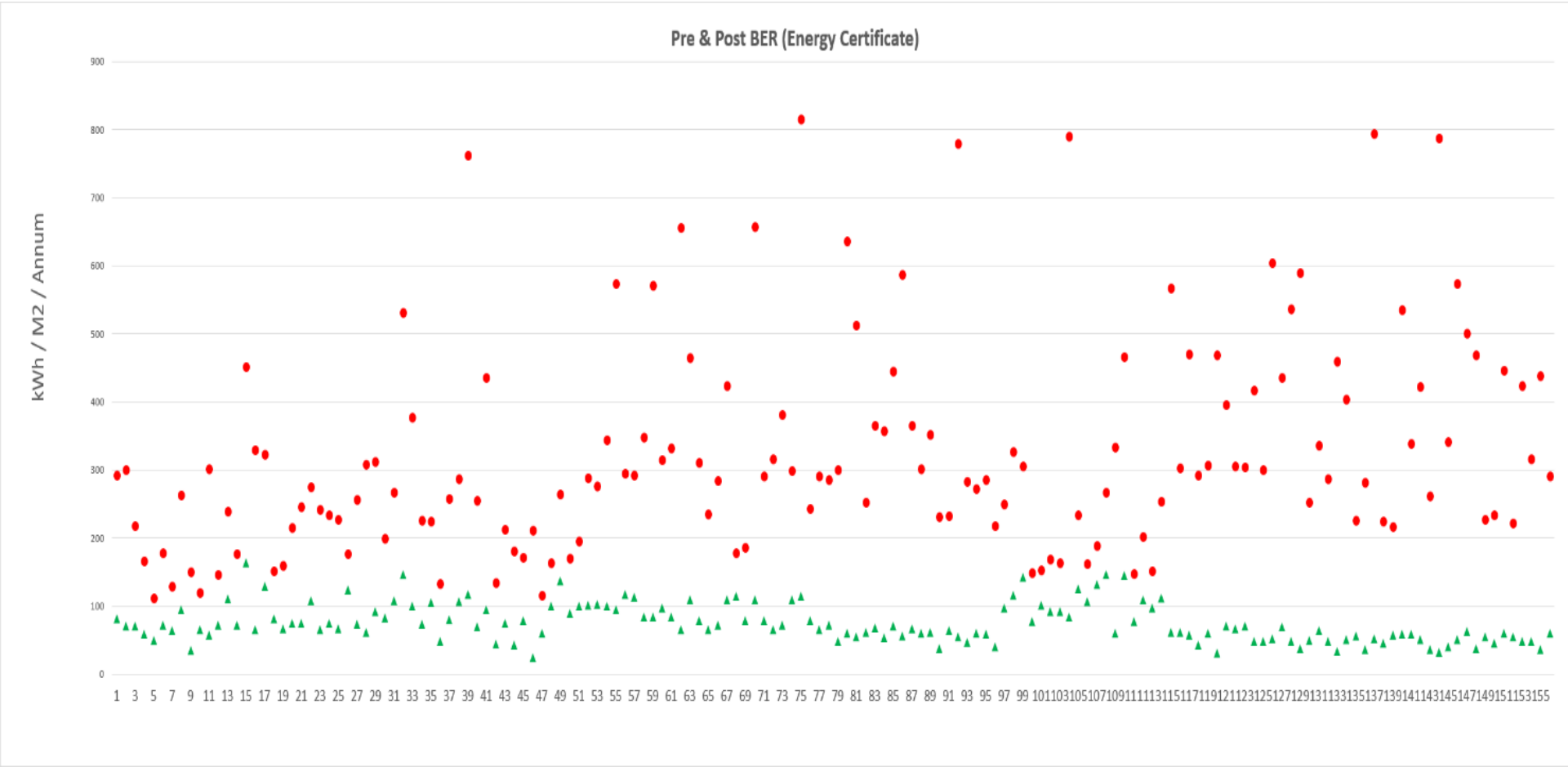
Progress so far…



	A1 <25	A2 <50	A3 <75	B1 <100	B2 <125	B3 <150	C1 <175	C2 <200	C3 <225	D1 <260	D2 <300	E1 <340	E2 <380	F <450	G >450
PRE BER	0	0	0	0	3	6	13	11	18	25	32	37	18	23	43
POST BER	3	54	110	31	23	7	1	0	0	0	0	0	0	0	0

Energy Efficiency in Ireland and Challenges

- 71% Primary Energy Savings on average
- Technically settled on methodology to deliver deep retrofit
- Average BER of 54kWh/m2
- Still building market capacity (Surveyors / Contractors/ Finance)

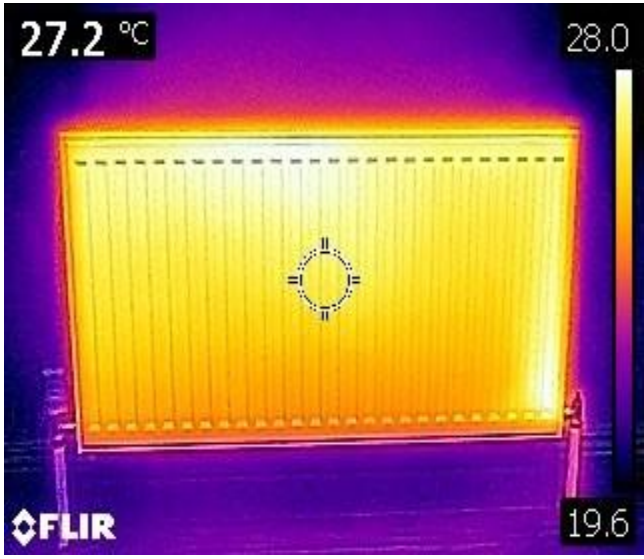


Approach to NZEB Retrofit with ASHP

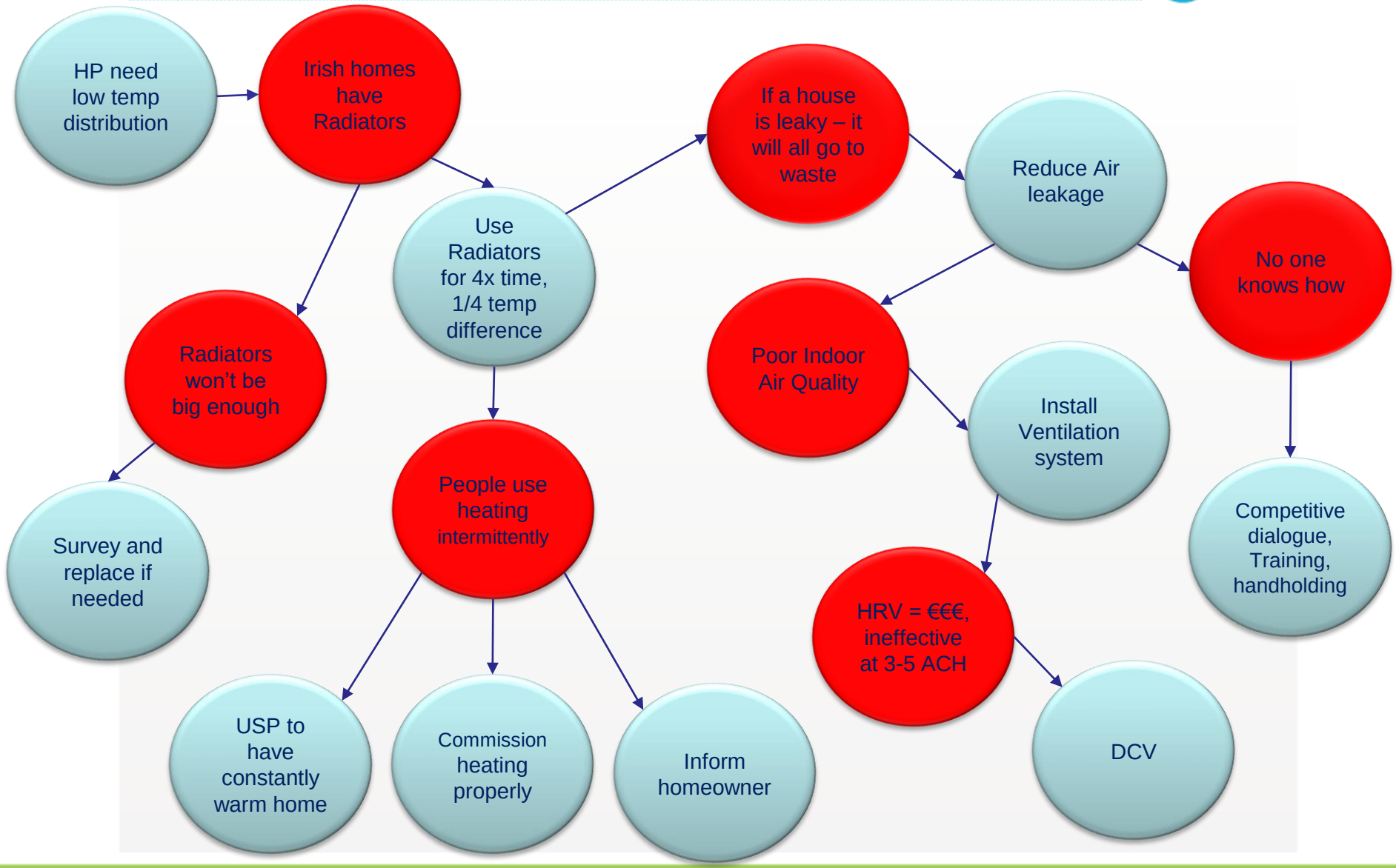
- Upgrade fabric insulation (cost effectively)
- Reduce air leakage to AC 5 or better
- Install ventilation system

- Look at each room and design radiator for the load
  - Calculated on Fabric loss and designed background ventilation rate (not peak ventilation rate)
  - Temperatures as per CIBSE except kitchen as living area.

- Weather compensation down in mild weather
- Add all radiators and size HP for 22 hours operation at -3.
- Don’t add factors of safety to the HP size!!!!!!!



Enabling Air Source Heat Pumps – The approach



SuperHomes Process

How we do it:

I^st^ stage: Homeowner online application

- Potential homeowner completes online application with set questions.
- Gives overview of current condition of the house including building fabric and heating method
- Questions: Existing running Costs, method of finance, acceptable payback time etc. Research based.

2^nd^ stage: Homeowner phone call

- 45mins phone call to homeowner to discuss the scheme and appropriate measures and savings for their home.
- Trusted independent advice, One stop shop
- Calculate net cost less SEAI grant of 35%
- Method of finance for the remaining cost of works - 65%
- Ask if wishes to go ahead to survey stage

SuperHomes Process

How we do it:

3rd stage: Survey

- First face to face meeting with Superhomes representative.
- Full house survey including BER assessment
- Evaluation of the current heating system, radiator sizing, insulation levels, windows etc.
- Identify and discuss potential upgrade measures
- Renovation designed to meet standards by engineer

4th stage: Tender and heat load calculation

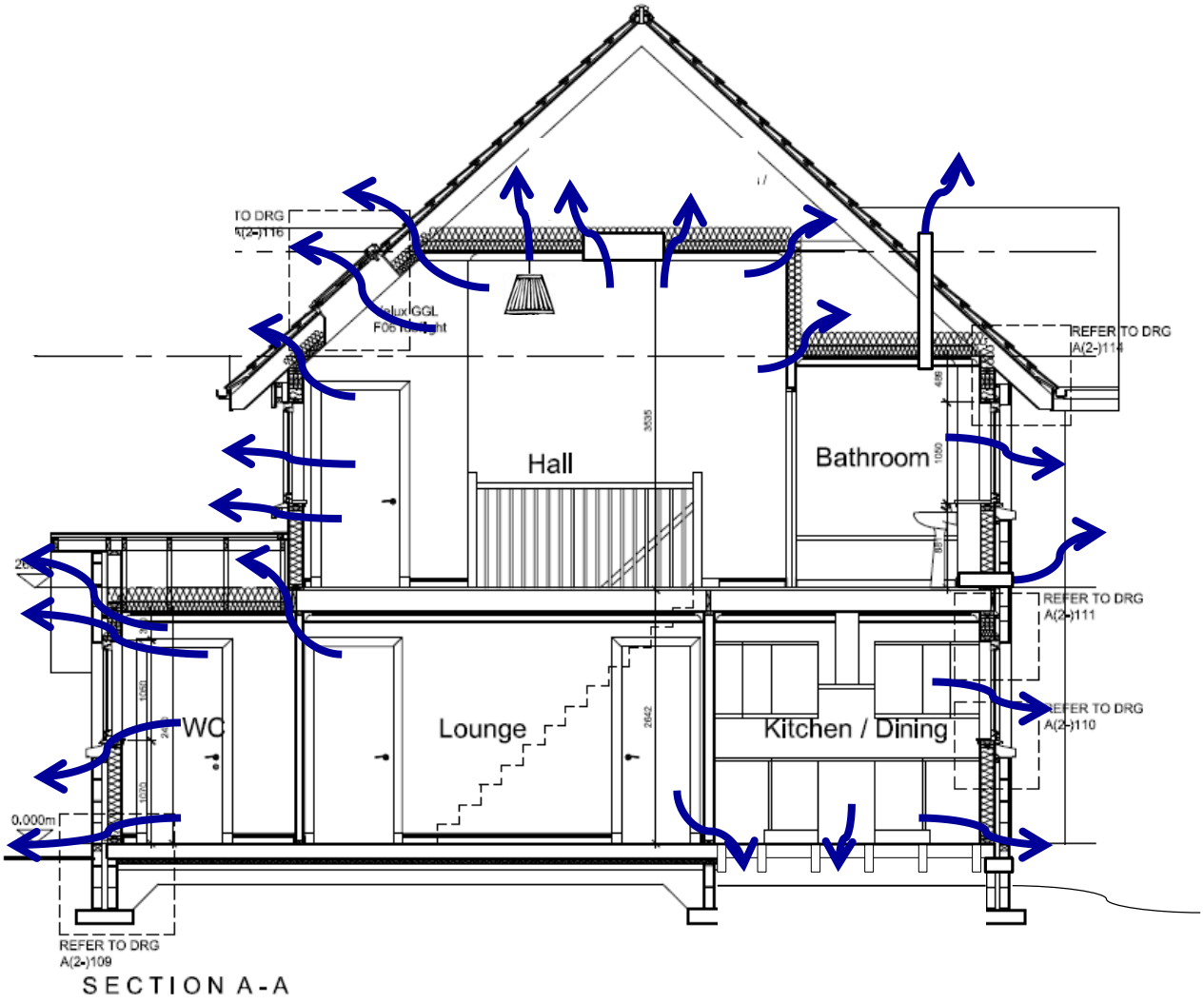
- Individual tender package based on NZEB requirements
- Heat load calculation with heat pump and radiator sizing.

5th stage: Energy Report

- Advising on the most suitable for that particular house
- Expected energy savings and estimated payback period
- Scope of works / price from tendered contractor(s)

Key Measures

- Air tightness Measures

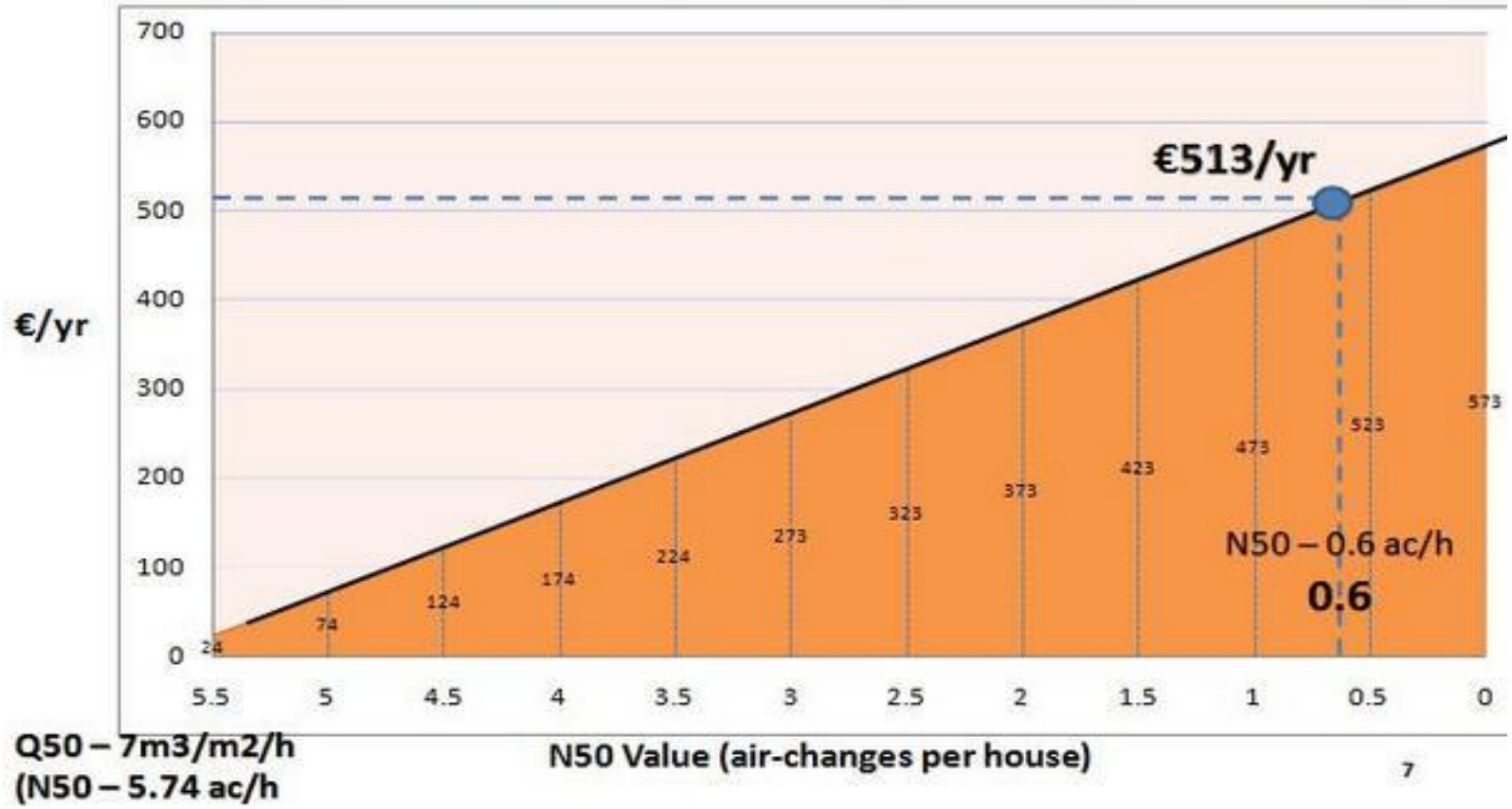


- Service penetrations
- Partition junctions
- Suspended floors
- Window and door surrounds
- Loft hatches
- Light fittings
- Gaps in air barriers

Why Airtightness ?

Savings from making building airtight

Based on a 200m2 two storey Dwelling , based on €0.12/kwh using oil of gas.
Compared to Naturally Ventilated Building that meets Part Q50 of 7m3/m2/h



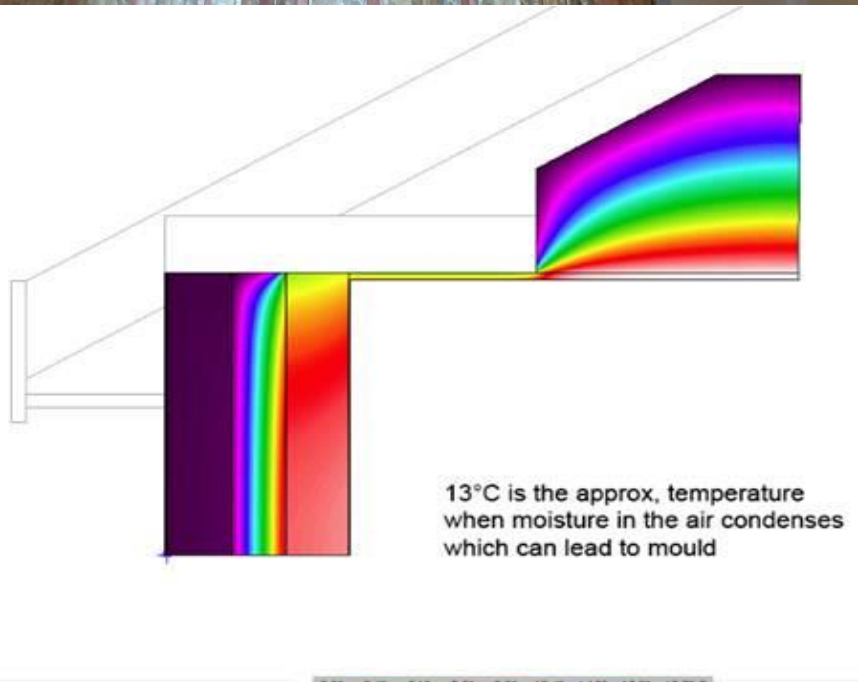
Airtightness Q50 of 10 improved to 5
results in approx. €340/yr saving on energy

Switching to a heathy home

From Fossil fuels

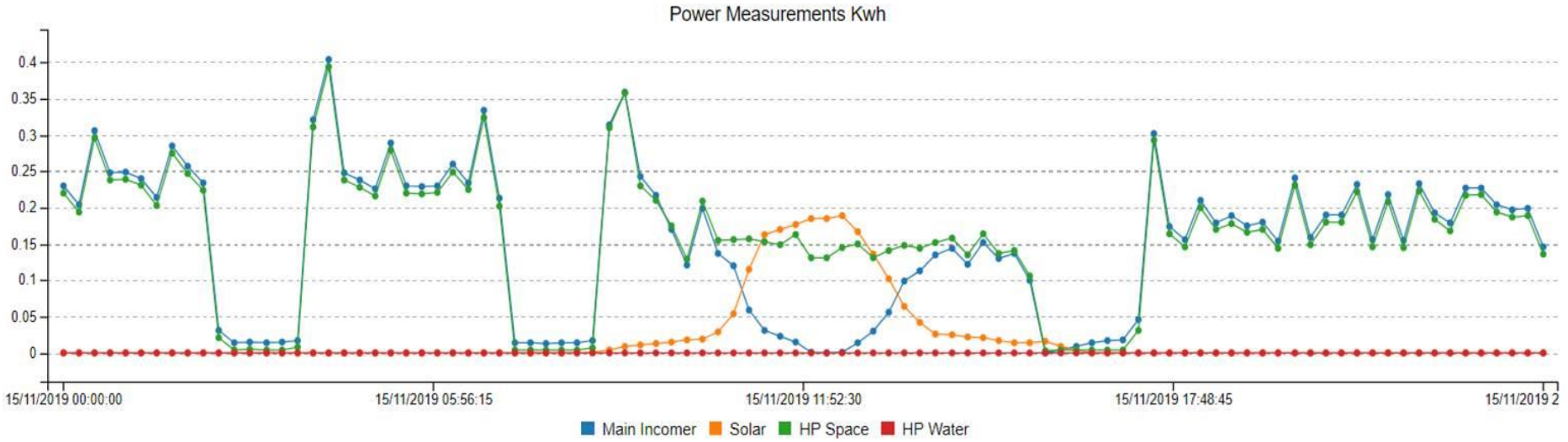
Renewable Heat pump

Thermal Bridge detail

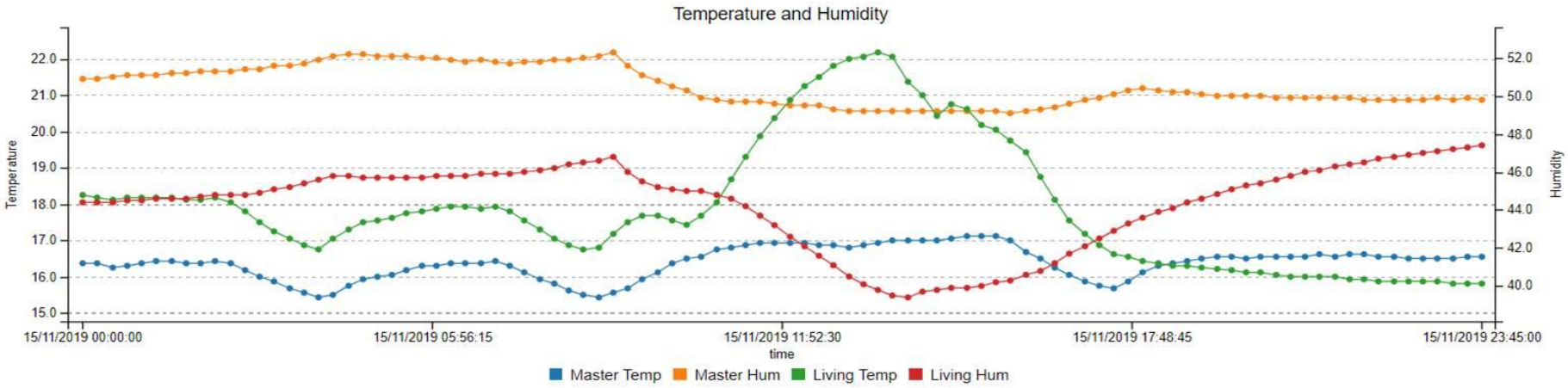


Energy Monitoring

Graphs



Graphs



Building Physics & Health

- Ireland has some of the poorest houses in terms of interior humidity and low temperatures.

- Houses with cold surfaces and high relatively humidity encourage mould growth.

- Poor Heating and / or ventilation widely considered to exacerbate:
  - COPD (Marmot Review Team, 2011)
  - Respiratory infection, allergies and asthma (Fisk et al 2007) &
  - Asthma (Preval et al., 2010 & Sommerville et al., 2000)

- Upgrades including Ventilation system, improved insulation, constant low grade heat (air source heat pump) creates stable healthier comfort levels.
  - Reduces humidity, pollution, dust.
  - Increases and stabilises temperatures
  - Lower mould growth.
  - *Less risk of respiratory Illness, COPD, asthma.*

Balancing act for NZEB retrofit

What to Do?

Which Contractor?

What Products to Use?

Oh the Hassle!!

Grant applications

Uncertainty – who to trust- what is value for money

What if I sell my house?

High bills but no capital available.

Who will make sure it is done correctly?

One Stop Shop (Surveys, Technical solutions, contracts, contractors, grants, certification, hand holding,

Selling the solution, engaging, educating, proving, Selling!!

Trusted partner – case studies, testimonials independence, partners (ESB, EIB, SEAI), Research.

Supply Chain Engagement

Supply Chain Engagement

What type of houses?

Examples

BEFORE G BER

AFTER A3 BER

Example

BEFORE G BER

AFTER A3 BER

Step		Primary Energy (kWh/m2/yr)	Reduction in Primary Energy per step	BER Score
0	Original State	604.17		G
1	100mm EWI Fabric Upgrade	439.42	165	F
2	300mm Attic Insulation	404.87	35	F
3	Windows & Doors Upgrade	356.99	48	E2
4	100% Low Energy Lighting	353.38	4	E2
5	Solar PV 1.59kWp (6no Panels)	273.60	80	D2
6	100% Draft proofing	269.90	4	D2
7	Block up Fire Place and remove Secondary heating	227.73	42	D1
8	Air to Water Heat Pump & new cylinder	56.53	171	A3
9	Air Tightness below 5 ach	50.07	6	A3
10	DCV Ventilation system 2no Wet Rooms	52.58	-3	A3
	Total primary Energy Reduction		**548**	

Examples

BEFORE F BER

Examples

AFTER A3 BER

Future Goals

- Customer demand for Superhomes approach is high
- The opportunity is clear for large scale renovation.
- Solution is now clear and has political support
- Key enablers
  - Long term policy/ programmes for deep renovation support
  - Low cost finance
  - Upskilling of full supply chain
  - Increasing capacity of supply chain
  - Integration of Solar, batteries, flexible HP demand key to enabling 70% RE Ireland.
- Superhomes aims to be a key enabler and maintain market leadership.

Joint Oireactas Committee visit to “super-school”

2020 Scheme

Now Accepting Applications

Any Questions ?

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