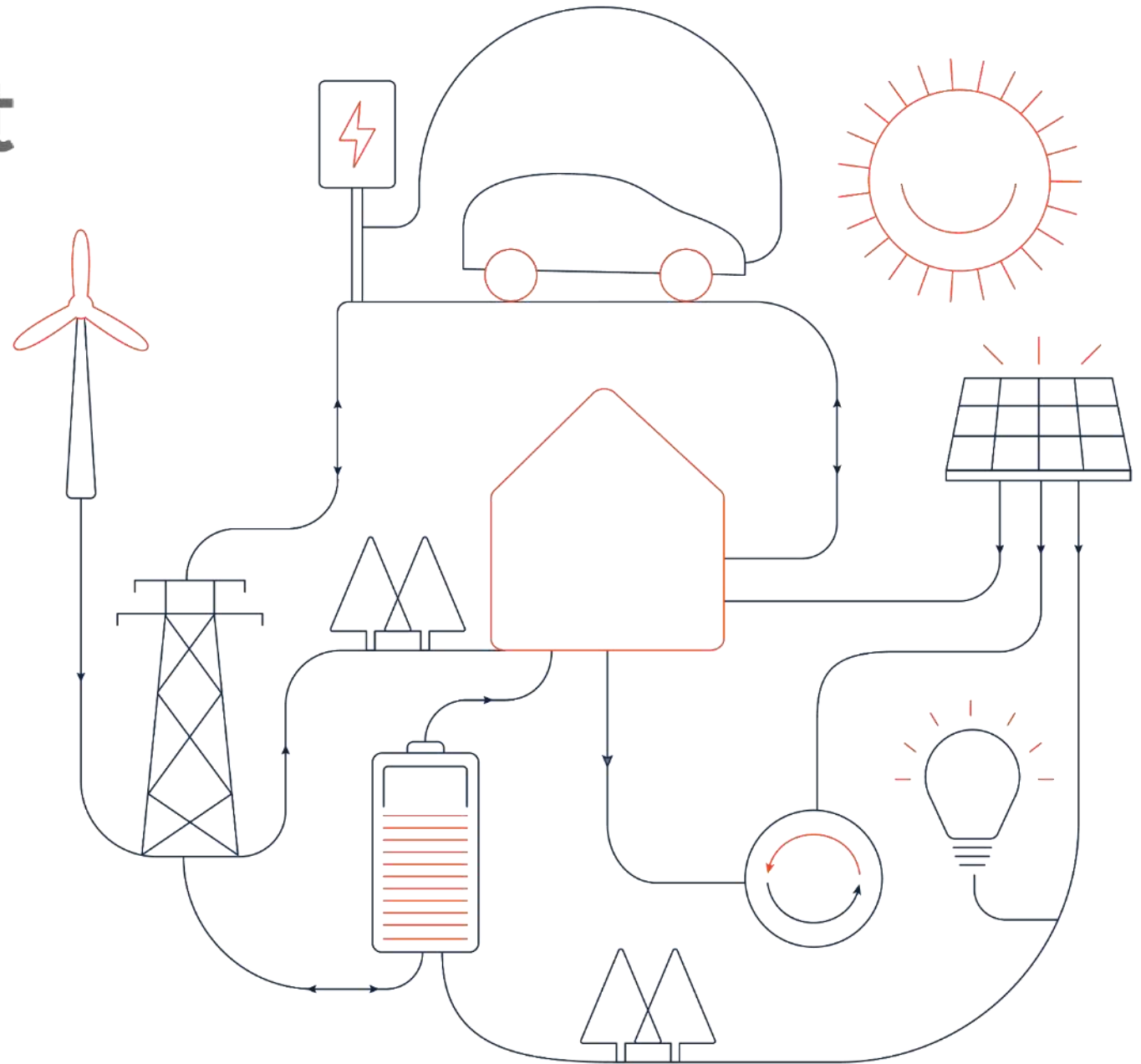


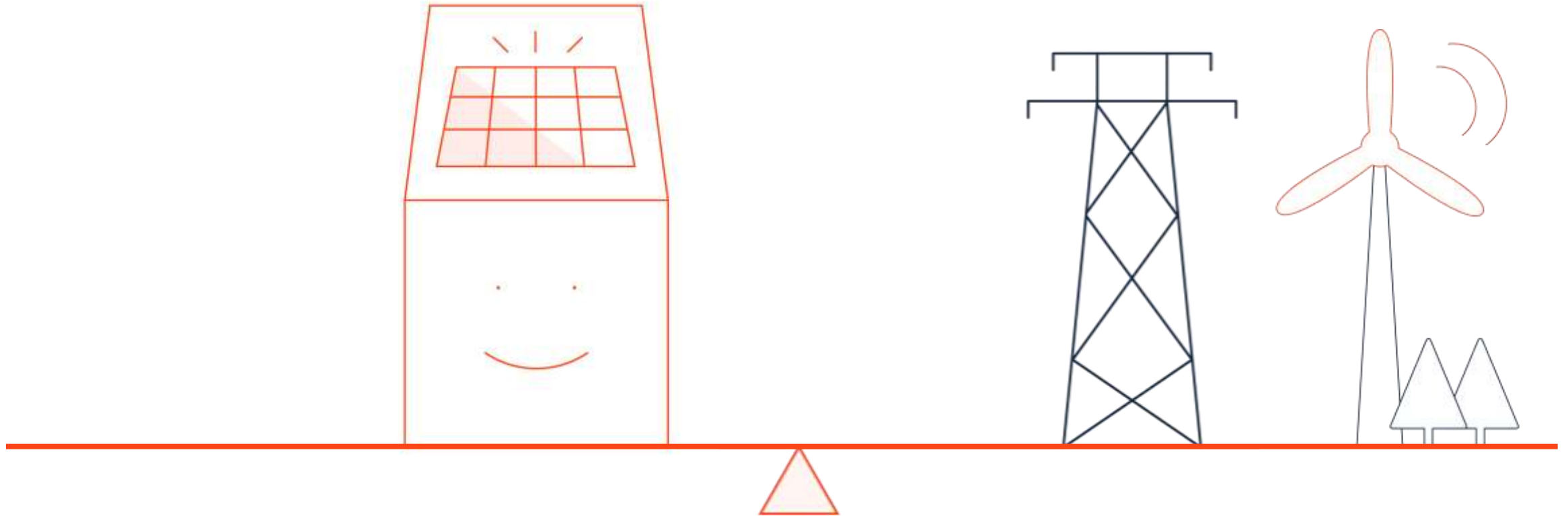
Optimised Retrofit

Decarbonisation of Existing Housing



What is Zero Carbon in Homes?

Because: Net Zero Regulated Energy isn't Zero Carbon

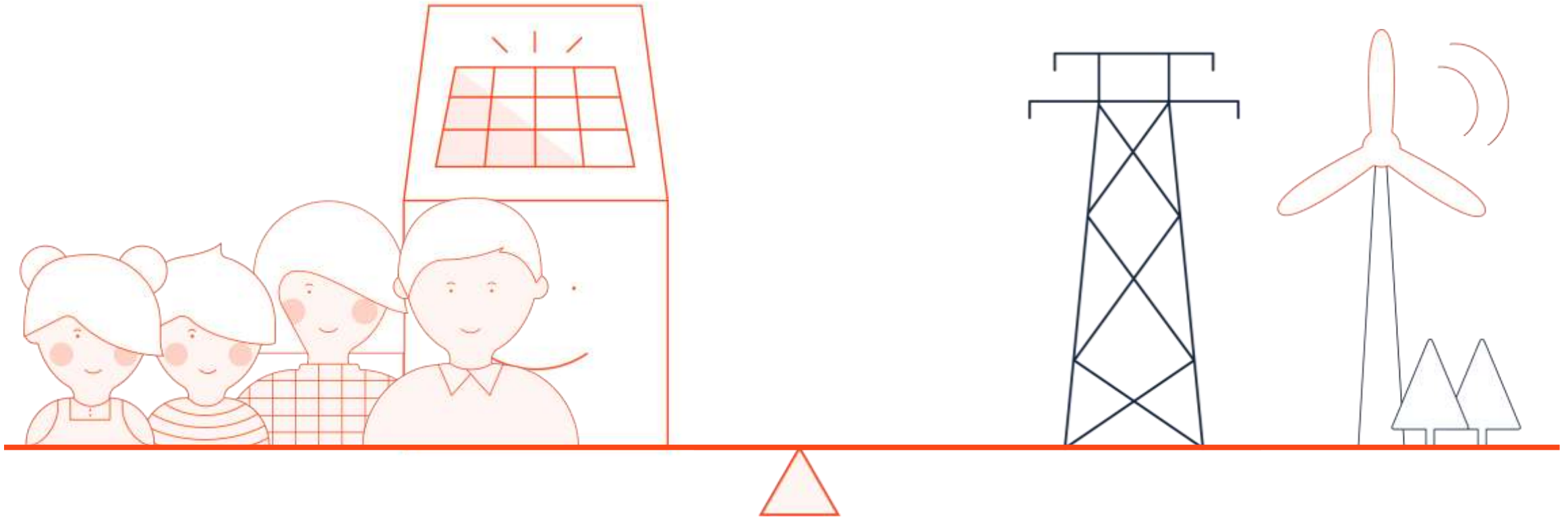


Regulated Energy in = Regulated Energy out

Is NOT zero carbon,
SAP100+ score or a top EPC "A", or old Code 5

What is Zero Carbon in Homes?

Because: Net Zero Energy isn't Zero Carbon



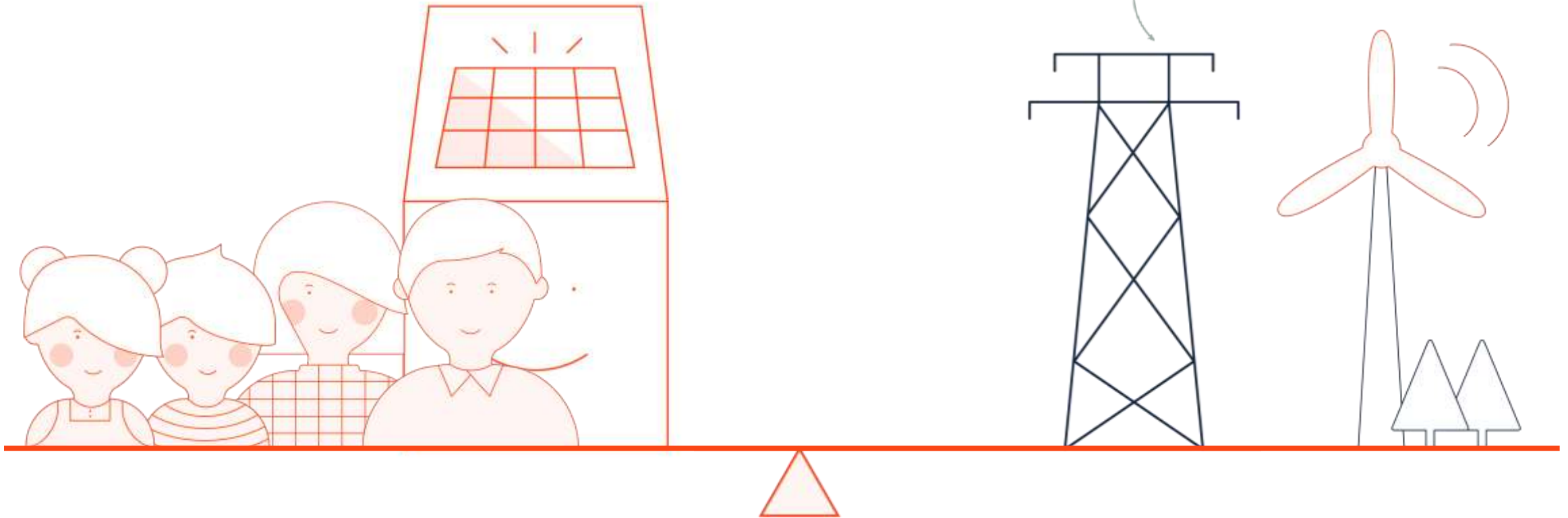
All Energy in = All Energy out

Is NOT zero carbon,
Beyond EPC "A", beyond SAP 125+, old Code 6

What is Zero Carbon?

Because: You've got to measure in Carbon to achieve Zero Carbon

Smart metering and grid reporting will give us actual Carbon impact of buildings

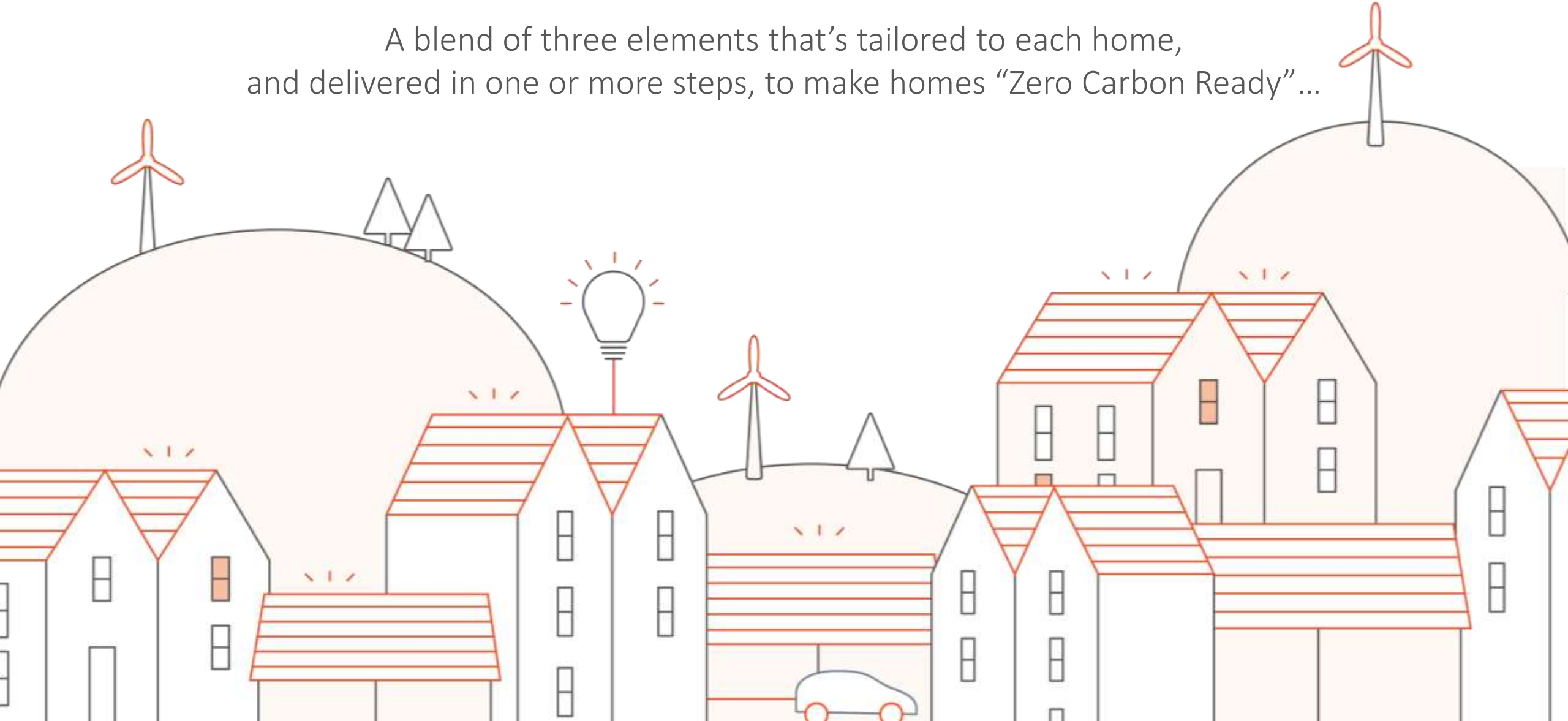


~~All Carbon in = All Carbon out~~

Energy In x Carbon Intensity = Energy Out x Carbon Intensity

What is Optimised Retrofit?

A blend of three elements that's tailored to each home, and delivered in one or more steps, to make homes "Zero Carbon Ready" ...



Optimised Retrofit

What current approaches exist? Why they are falling short

- EPCs? -
 - RdSAP data
 - generic measures
 - have little effect on desirability or valuations
- Mass 'measures led' retrofit lead to unintended consequences
- PAS2035? - mass market applicable?
- Planned maintenance software – not designed for the purpose, don't include carbon intensity from time of use
- Deep retrofit eg Passivhaus , Enerphit standard, mass market applicable?
- None of the above take into account the evolution of the grid

Optimised Retrofit

- There are c.29m homes in the UK, with c.1.4m in Wales
- A limited number of typologies encompasses the majority of these home
- This is commonly sufficient for overall financial planning or long term programme work

However...

- Each individual home has a unique combination of environmental conditions, original construction quality, previous alterations and historic operation
- Prior to undertaking any retrofit work it is, therefore, important to survey of the unique condition of that home and design and specify retrofit measures accordingly



Pathways to Zero

Whole Home Survey

- Captures all the information to create the carbon footprint baseline
- Provides additional guidance and background information on suitability of measures
- Ensures compatibility of measures for selection in the pathways tool
- Primary design is to capture elements or features that indicate a building is not “Retrofit Ready”
- Reduces the risk of Unintended Consequences



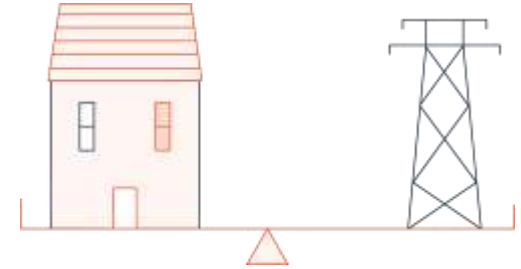
Optimised Retrofit



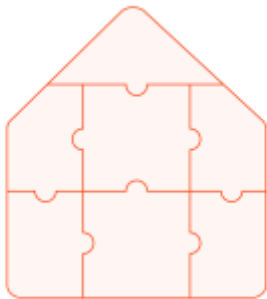
Each home is unique, with the best blend of measures tailored to fit.



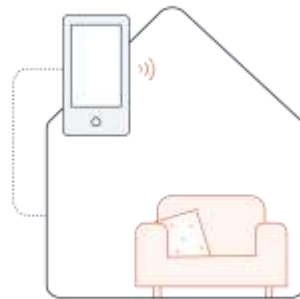
Homes can be forecast to be “Net Zero” by future predicted date.



Enables home to support the Grid to decarbonise (through demand shift).



Can be “whole house” or undertaken in planned stages over several years.



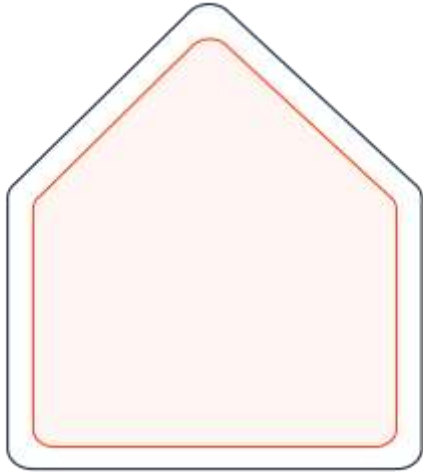
Smart home comfort and performance monitoring.



Homes insulated from worst increases in future energy prices.

Optimised Retrofit

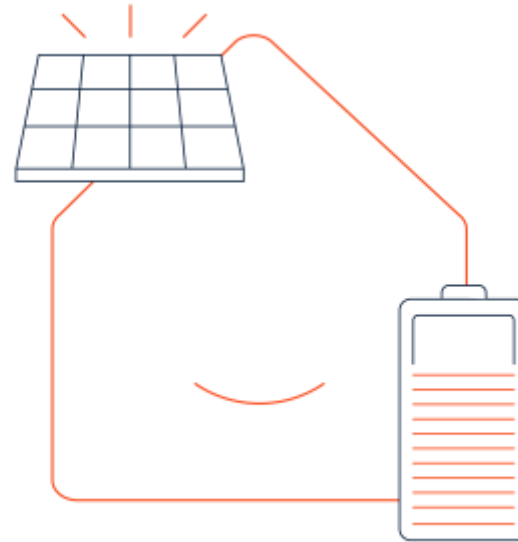
Fabric



“Do no harm” fabric measures that economically reduce energy demands in the home.

Such as... Airtightness & ventilation, loft insulation, high performance doors & windows, wall insulation and more...

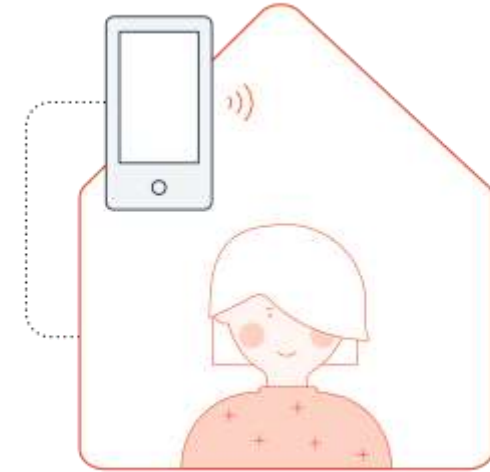
Technology



Low/zero carbon technologies that reduce, balance and generate energy as appropriate to each home.

Such as... Hot water tanks, battery storage, photovoltaic panels, mechanical heat recovery, heat pumps and more...

Intelligence

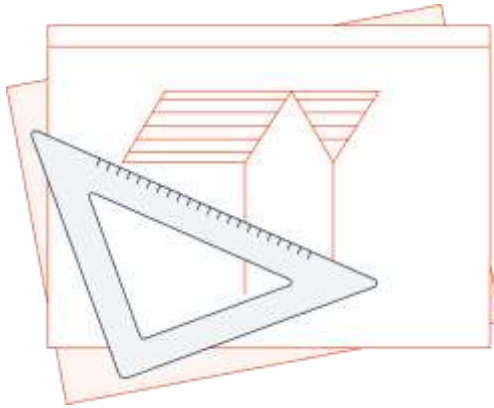


Smart, user friendly control of the homes to give easy control whilst providing Grid connectivity.

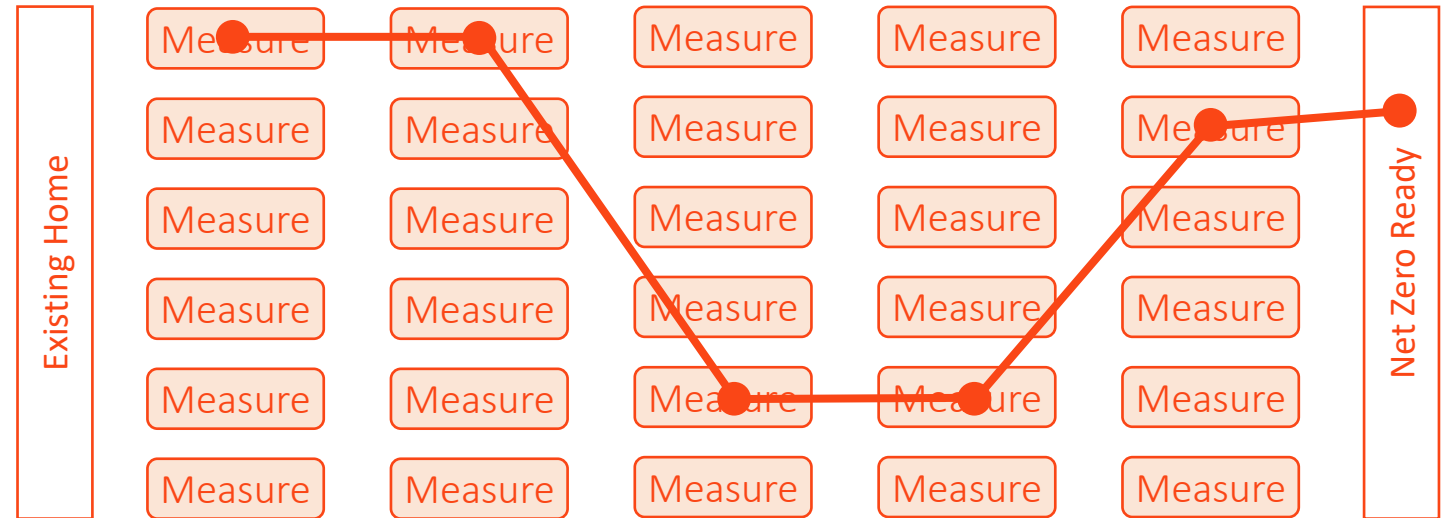
Such as... App-controlled heating, smart room sensors & controls, energy demand forecasting, and more...

Optimised Retrofit

Assessment & Design
Technical



Flexible routes to suit the owner's preferences, which can evolve with time and technology



- + PAS2035:2019 compliant Retrofit Assessor & Designer determines measures
- + Energy source option assessment & Fuel Poverty Check mechanisms integrated
- + Overheating, flood and extreme weather check tools included
- + Increasing support from AI to automate selection of measures
- + Multiple routes to zero carbon ready mapped to provide all available options
- + Routes can be taken in one step (whole house refurbishment) or incrementally
- + Digitally created and stored in 'Building Journey'.

Pathways to Zero

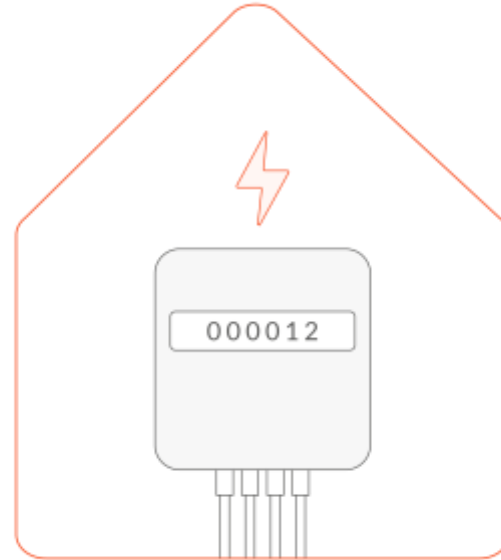


Data inputs



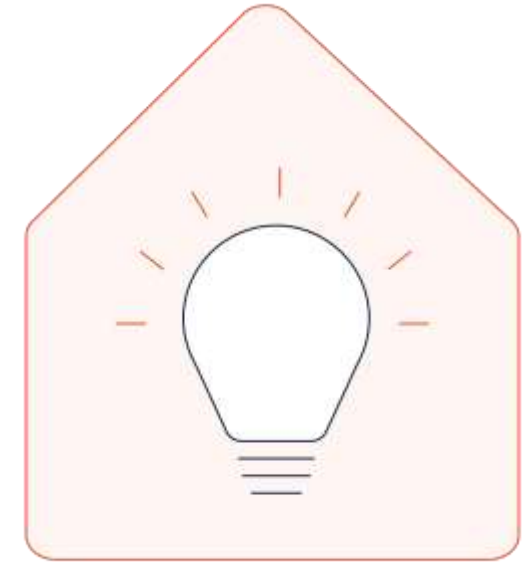
Whole Home Survey

- A comprehensive survey for every home
- Enables best decarbonisation measures to be specified for each individual home
- Tablet based app allows efficient on-site data capture



Smart Meters

- Usage metered automatically every 30 minutes
- Enables agile tariffs in combination with batteries, hot water storage and EVs
- Help decarbonise the National Grid by matching supply and demand

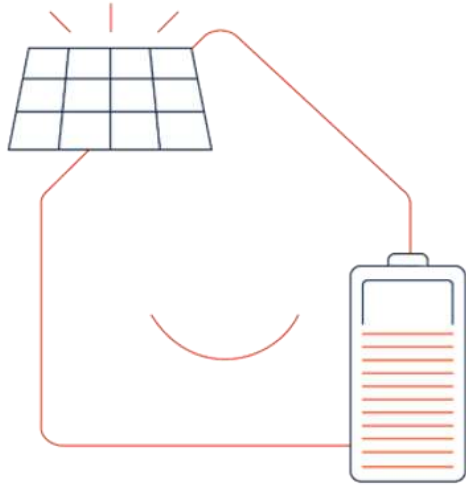


Intelligent Energy Systems (IES)

- A set of sensors, meters & transmitters controlled by a small computer
- Compares temperature, humidity & air quality with energy usage to 'learn' each home
- Can be used to control heating & hot water via an app if required

Pathways to Zero

What do users of Pathways to Zero want?



"As an **architect** I want to compare retrofit measures so I can communicate the benefits of Net Zero to clients undertaking refurbishment works"

- Refurb/extension an ideal time to retrofit

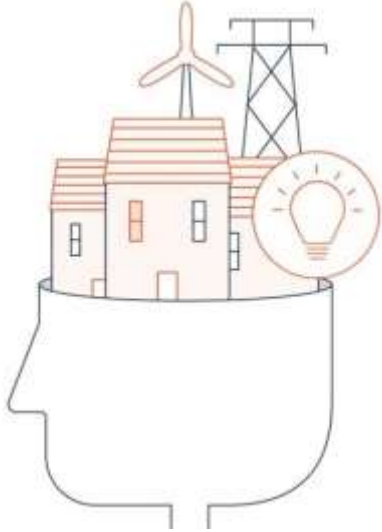


"As an **RICS Valuation Surveyor**, I need to assess the long term costs and benefits of retrofit so I can advise my clients on the impact of Net Zero on securitisation"

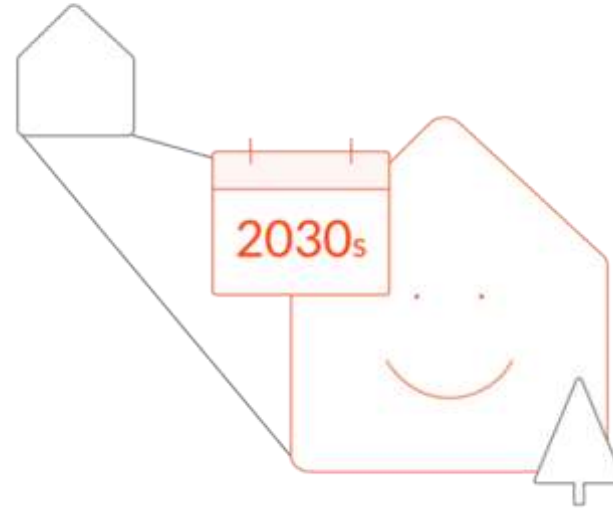
- Quote from Red Book?

Pathways to Zero

What do users of Pathways to Zero want?



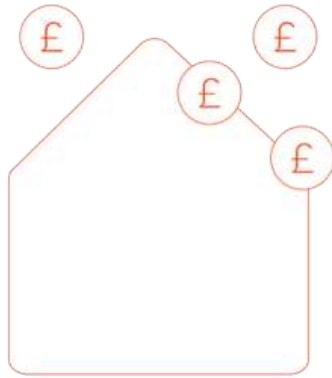
"As a **Pathways designer** I want to be able to select from all appropriate retrofit measures so I can specify the quickest/cheapest/best route to Net Zero with no unintended consequences for the building"



"As a **Maintenance Manager** at a Housing Association I want to align decarbonisation focused retrofit works with our planned maintenance programme so I can get the most from the budget"

Pathways to Zero

What do users of Pathways to Zero want?



"As a **lender** I want a Pathway for each property so I can assess the impact on value over the repayment period"

- Affordability test?
- Appreciating or depreciating asset?



"As Director of Property I want an aggregated view of Pathways so that I can report when my portfolio as a whole will reach Net Zero"



Your selected measures

1 Step One Retrofit Works

Zero Carbon By: 2045	Innovation: Proven Tech
Energy Bills: Down 3%	Cost Range: £3,000-£4,500
Overheating: Low Risk	Funding Options: RHI Grant, Arbed

2 Step Two Retrofit Works

Zero Carbon By: 2032	Innovation: Proven Tech
Energy Bills: Down 18%	Cost Range: £2,500-£4,000
Overheating: Low Risk	Funding Options: Energy Bill Sacrifice

3 Add Step?

+

Your available measures

Optimise

Pathways to Zero

sero

Overview
Property Management
Preferences
Saved Views
Energy Costs
Group Management
Alerts 2

Deploy pathway to group | Lifecycle | Add step | New pathway | Optimise | Save | Carbon neutral by 2040

Step 1 20/08/21 | Step 2 20/08/30 | Step 3 20/08/32 | Step 4 20/08/71

Zero Carbon by: 2045 | Overheating risk: Low | Innovation: Proven Tech | Energy Bills: +4% | Cost range: £5,000 - £8,000 | Funding option: RHI Grant

Alerts (2)

It is not recommended that Measure 27 be deployed prior to Measure 12.
3 mins ago

It is not recommended that Measure 14 be deployed prior to Measure 19.
3 mins ago

Suggested action: Deploy Measure 19 in a prior stage.
Resolve | Ignore

Repair rainwater pipes
Install cavity wall insulation
Install bathroom & kitchen centralized extract system with ducts
Install PV system on roof
Install house battery system and demand side response control system
Upgrade loft insulation
Replace windows with high performance double glazed units
Replace hot water cylinder with larger 200l thermal store for future heat pump
Upgrade grid connection to 3 phase and install high speed EV charger
Replace gas boiler with air source heat pump
Install additional external wall insulation
Extend roof eaves junction

Available Measures | All | Service | Maintenance | Fabric | Generators | Balancers | Reducers | Sort by

Cost
Carbon

External Wall Insulation
External wall insulation is solid insulation that is fixed on to external walls.

60 Carbon Saving	30 Bill Saving
95 Maintenance	95 Lifespan
80 Install Cost	70 Complexity
30 Risk/Innovation	

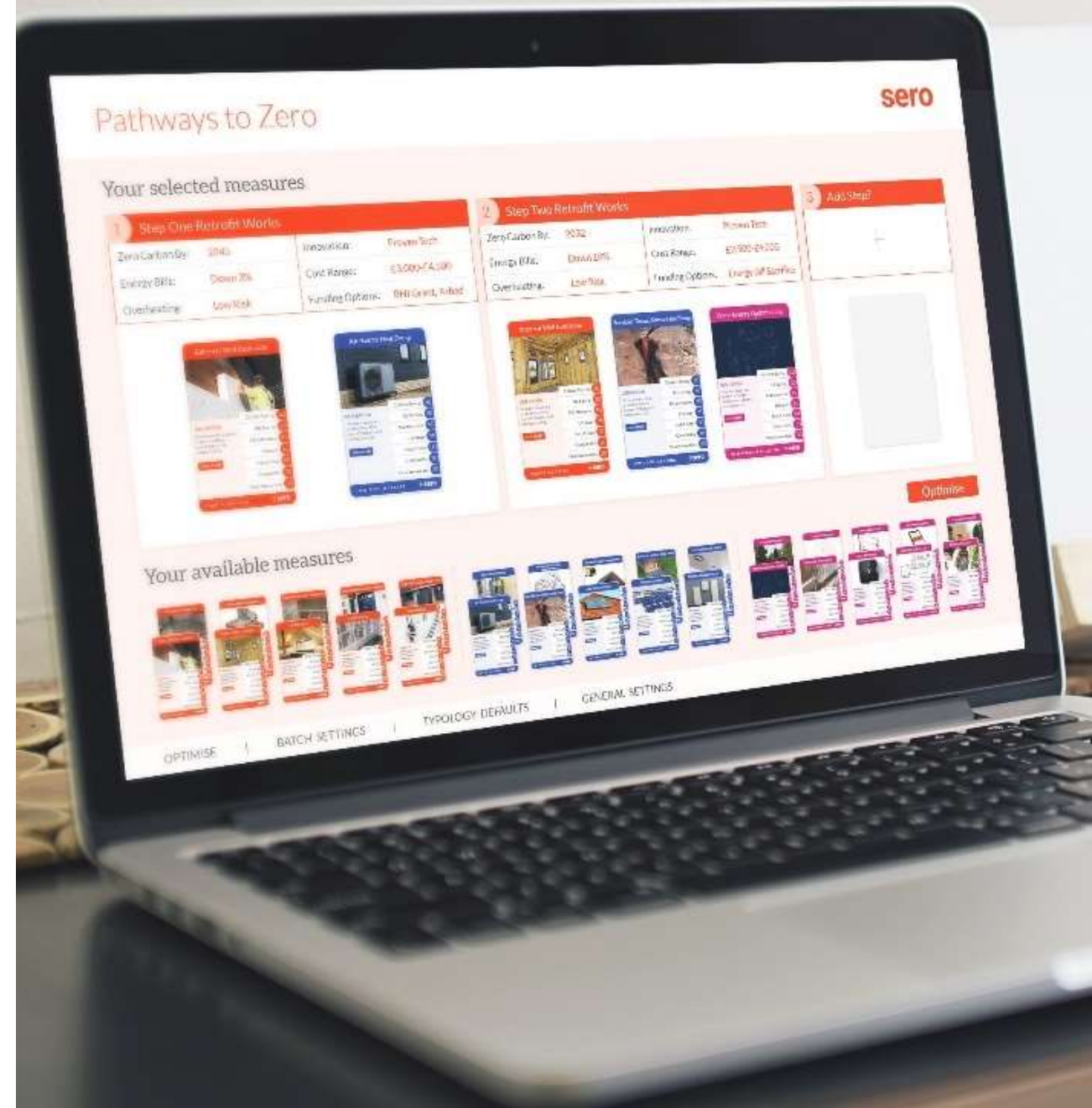
Internal Wall Insulation
Loft Insulation
Double Glazing
Triple Glazing
Underfloor Insulation
Above Floor Insulation
Intermediate Floor Insulation
High Performance Front Door
High Performance Back Door

100%

Pathways to Zero

In summary

- Innovative tool that informs PAS2035 “measures”
- Driven by competent designer
- Automated removal of incompatibilities
- Prioritisation of pathways
- “Zero Carbon By”™



Thank you

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Email: hello@sero.life

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