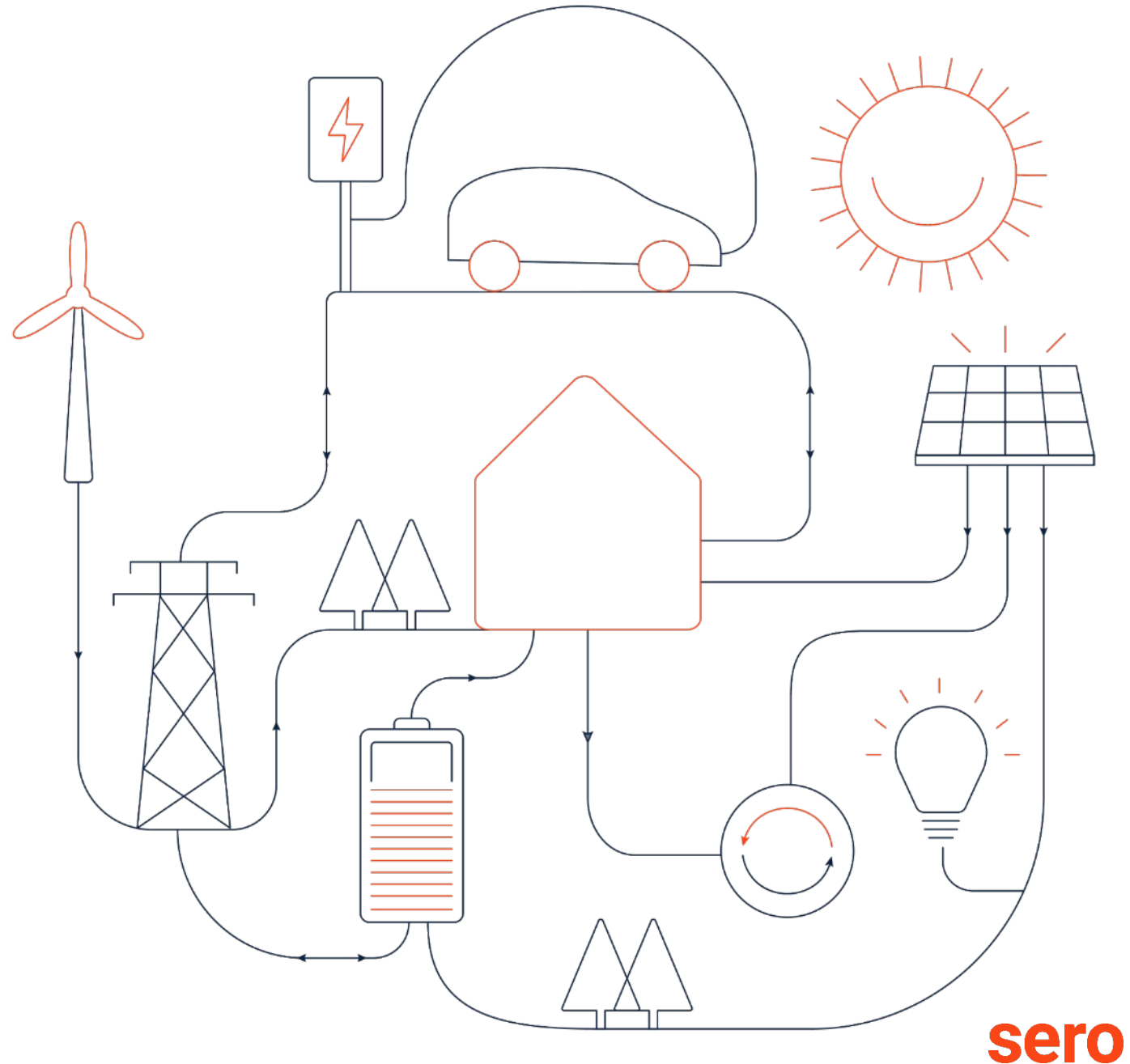# Tools for Taking Homes to Net Zero

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What really is Net Zero?
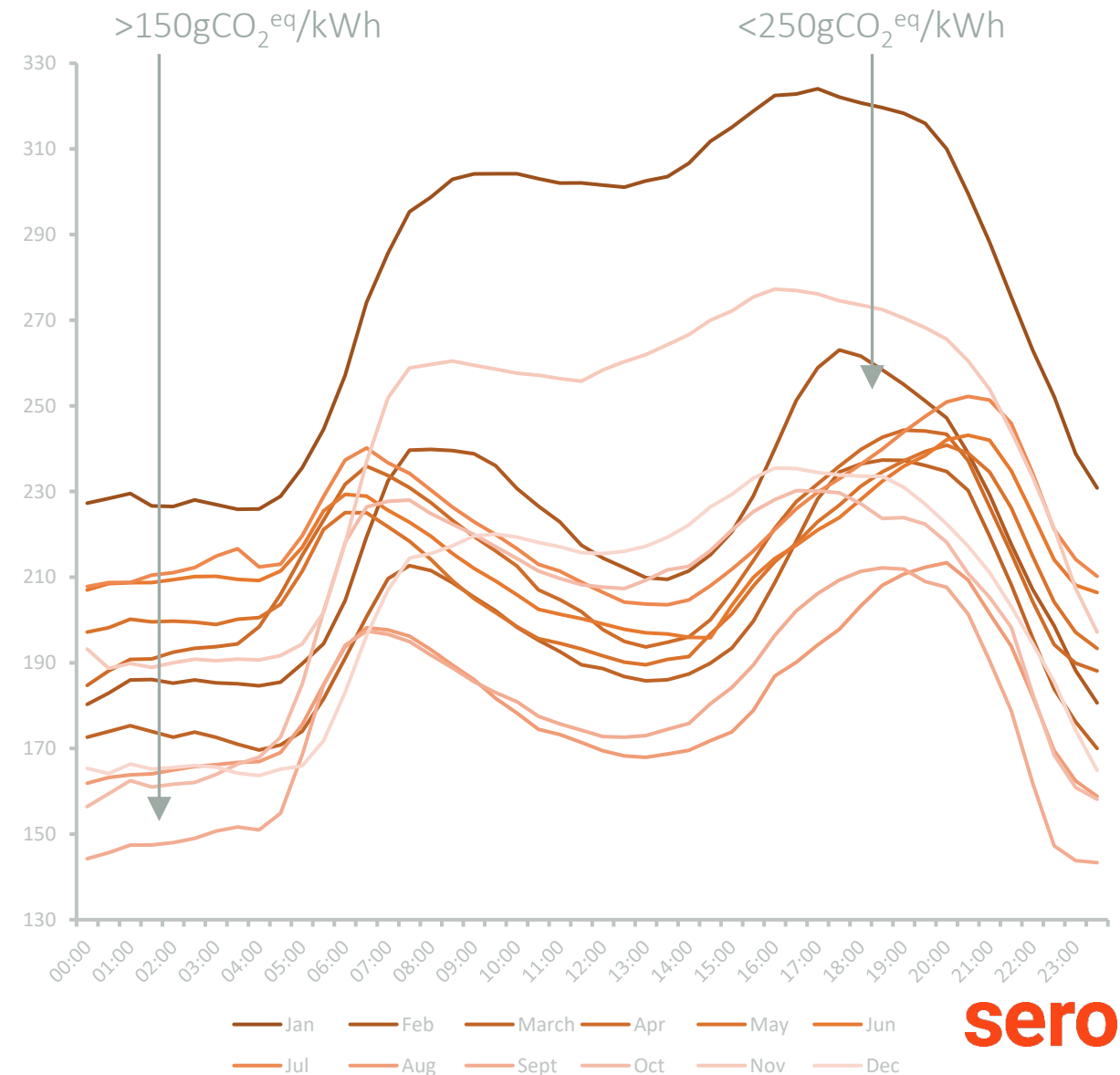
Homes with Humans

- In homes, energy demands split roughly as;
  - Heating = 1/3 new build, 3/4 existing
  - Hot Water = 1/3 new build, 1/8 existing
  - Unregulated = 1/3 new build, 1/8 existing

- Many new schemes focus on heating, but this is only 1/3 of the energy usage and similar carbon footprint (averaged)

- To achieve net zero, you have to look at all the energy used in the home – homes **with** humans in them

- This aligns with the UK Green Building Council definition of Net Zero Operational Carbon from 2019

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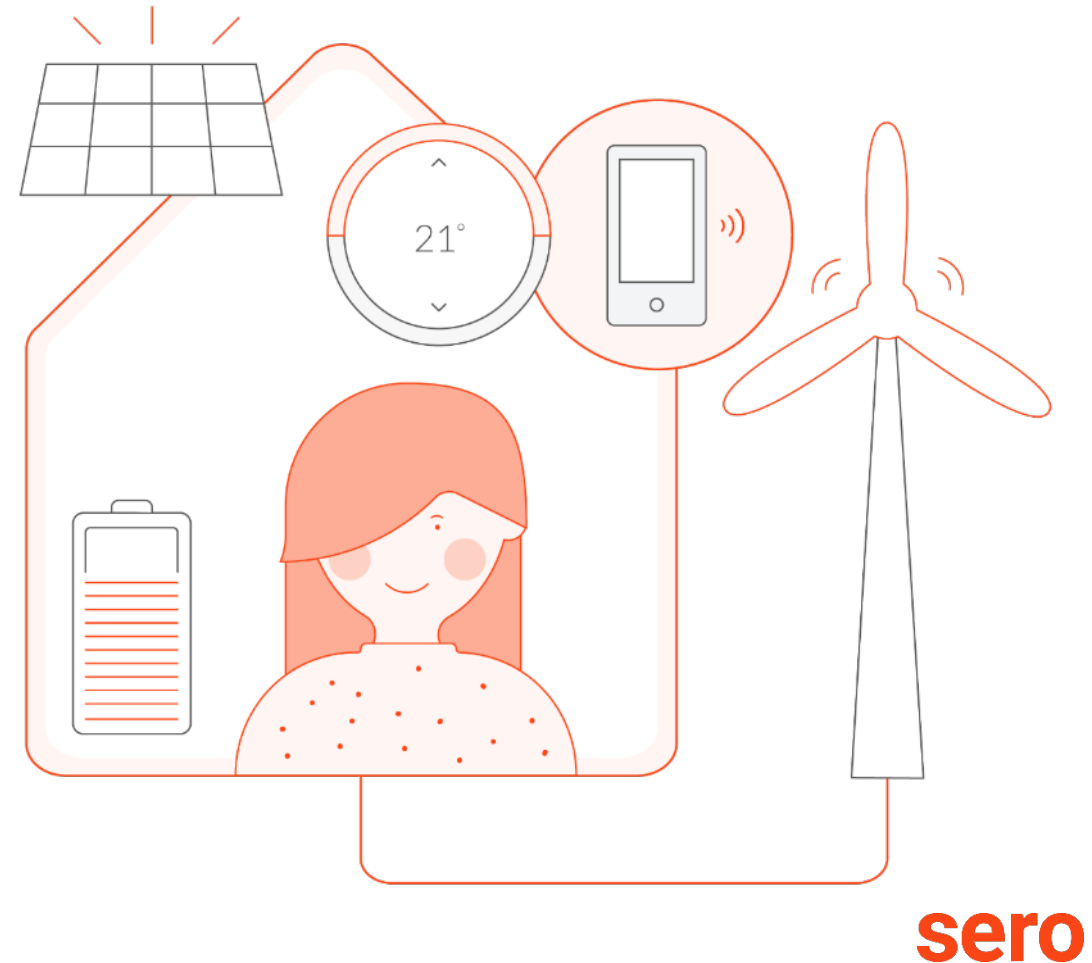
What really is Net Zero?
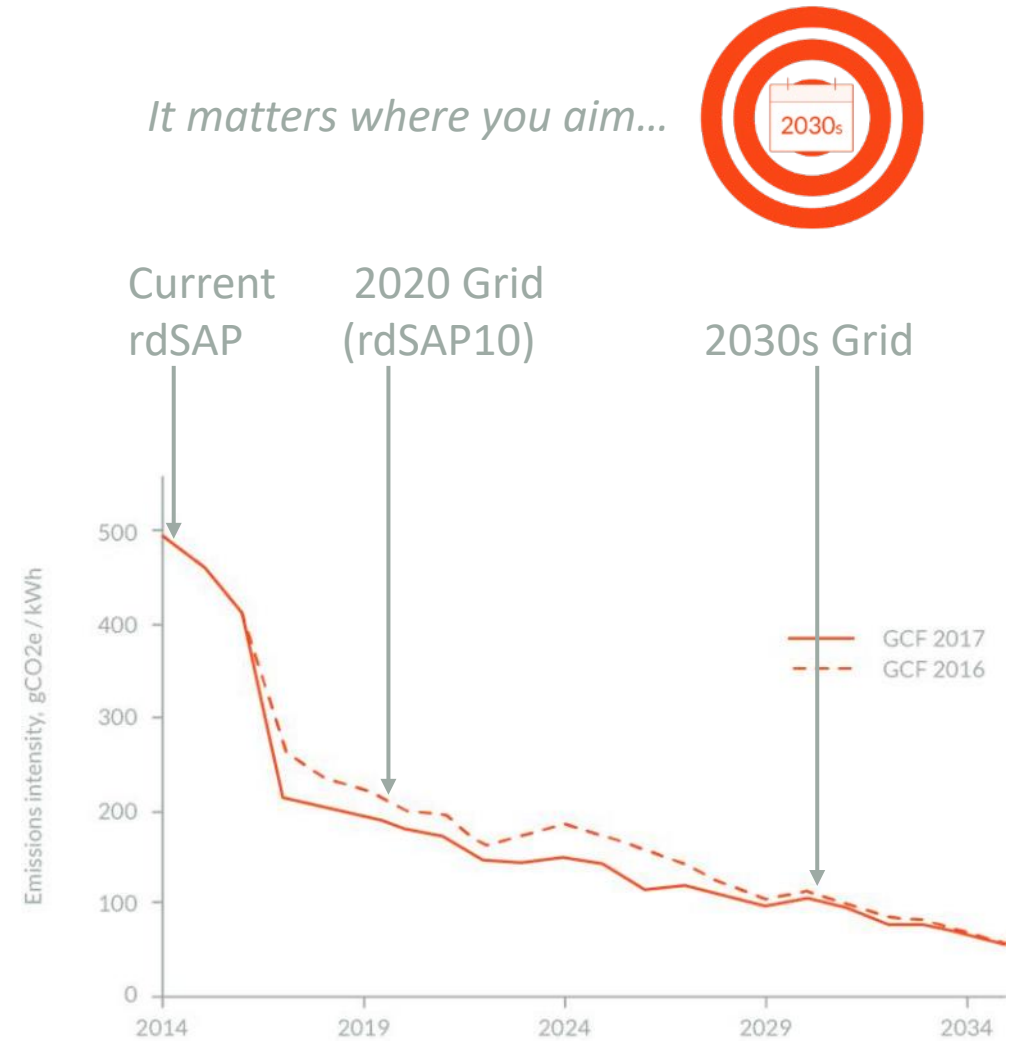
Not All Kilowatt-Hours Are Born Equal

- Electrical energy has a variable carbon footprint: If you want to achieve zero carbon, you have to measure in carbon, you can not measure in energy

- The carbon of 1kWh changes every ½ hour of every day – a typical day might see 50% changes, extremes can be 300% from peak carbon to minimum carbon

- If you measure in energy, 1kWh sent to the grid balances 1kWh drawn from the grid = net zero energy

- If you measure in Carbon, 1kWh sent to the grid at solar noon saves c.$<150gCO_2^{eq}$, but 1kWh drawn from the grid at 6pm costs c.$>250gCO_2^{eq}$ = **not** net zero carbon

$>150gCO_2^{eq}/kWh$ $<250gCO_2^{eq}/kWh$

Legend: Jan, Feb, March, Apr, May, Jun, Jul, Aug, Sept, Oct, Nov, Dec

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What really is Net Zero?

It's A Marathon Not A Sprint

It matters where you aim…

- In the last decade or more, the electricity grid has achieved massive decarbonisation, which is planned to continue

- For the built environment, ignoring this grid decarbonisation makes the task of achieving net zero significantly more difficult and more expensive for buildings

- Understanding this also means you can change you mindset, if you're getting the designs right, then
    - it's not about **if** you achieve net zero carbon,
    - it's about **when** you achieve net zero carbon

- You can anticipate grid decarbonisation and create homes that will become Net Zero, without any future physical changes, by factoring the grid in, giving Zero Carbon by 20XX

Current rdSAP   2020 Grid (rdSAP10)   2030s Grid

GCF 2017
GCF 2016

Emissions intensity, gCO2e / kWh

500
400
300
200
100
0

2014   2019   2024   2029   2034

This graph shows the predicted emissions intensity of the UK Grid in grams of CO_2 equivalent for each kWhr of electricity supplied for the years up to 2035. The data for 2014 to 2016 comes from DEFRA, the projections from 2017 onwards were published by BEIS in January 2018.

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Optimised Retrofit Phase 1

Optimised **Retrofit**

Supported by the Welsh Government IHP Year 4 ORP Stream

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Collaboration Goals

Create A Way To Decarbonise ¼ Million Homes in Ten Years

The main priorities of the project are to;

- Build the processes to enable pragmatic and efficient decarbonisation in homes across Wales (and beyond)

- Ensure these processes enable the development of Welsh skills & local economy benefits as part of decarbonisation

- Create the robust evidence dataset of performance and operation from which to measure and improve in future

- Embed the principles of Net Zero to include unregulated energy impacts and working in harmony with the Grid

Plus as an additional benefit;

- Set 1,724 homes on their Pathway to Zero this year

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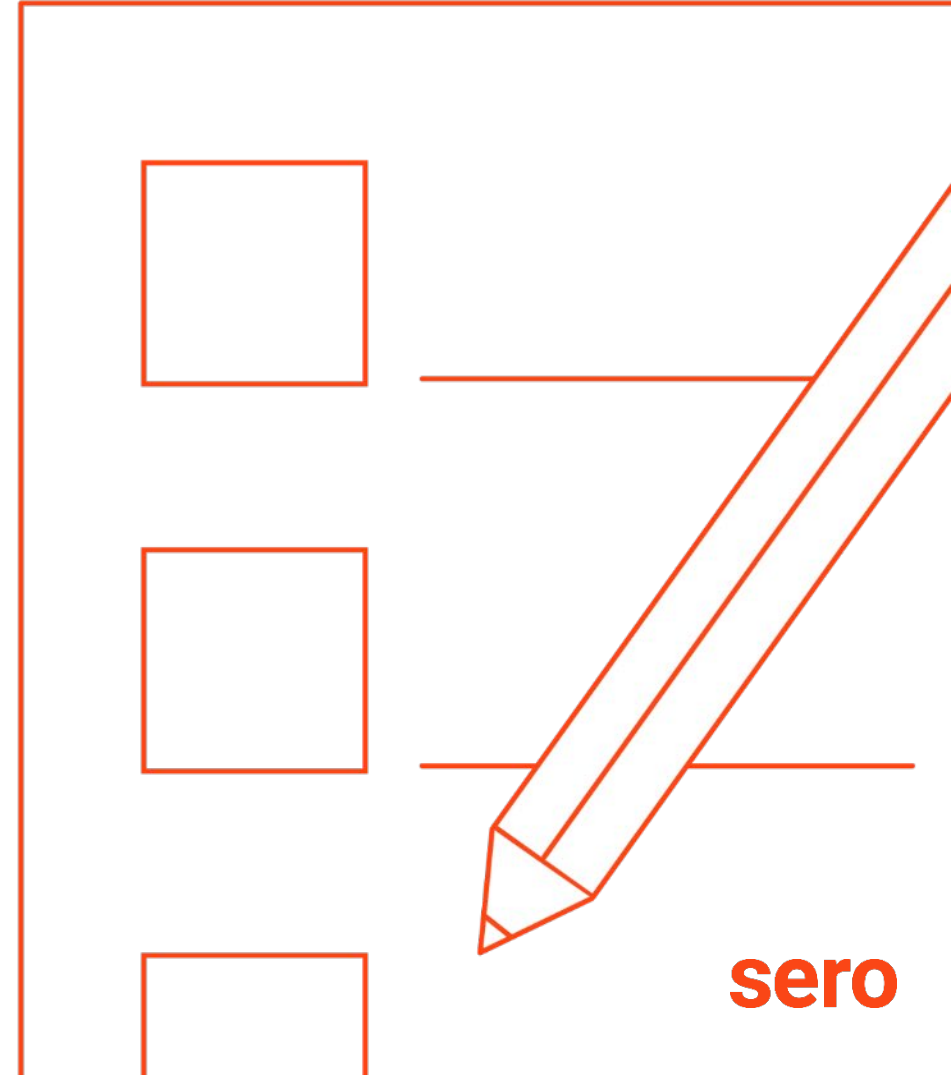
Pathfinder Homes

Delivering In Real Homes Now

28 Social Landlords (Phase 1) Covering All Wales

1,724 homes in 2021

House Type
End Terrace = 101
Mid Terrace = 309
Semi detached = 354
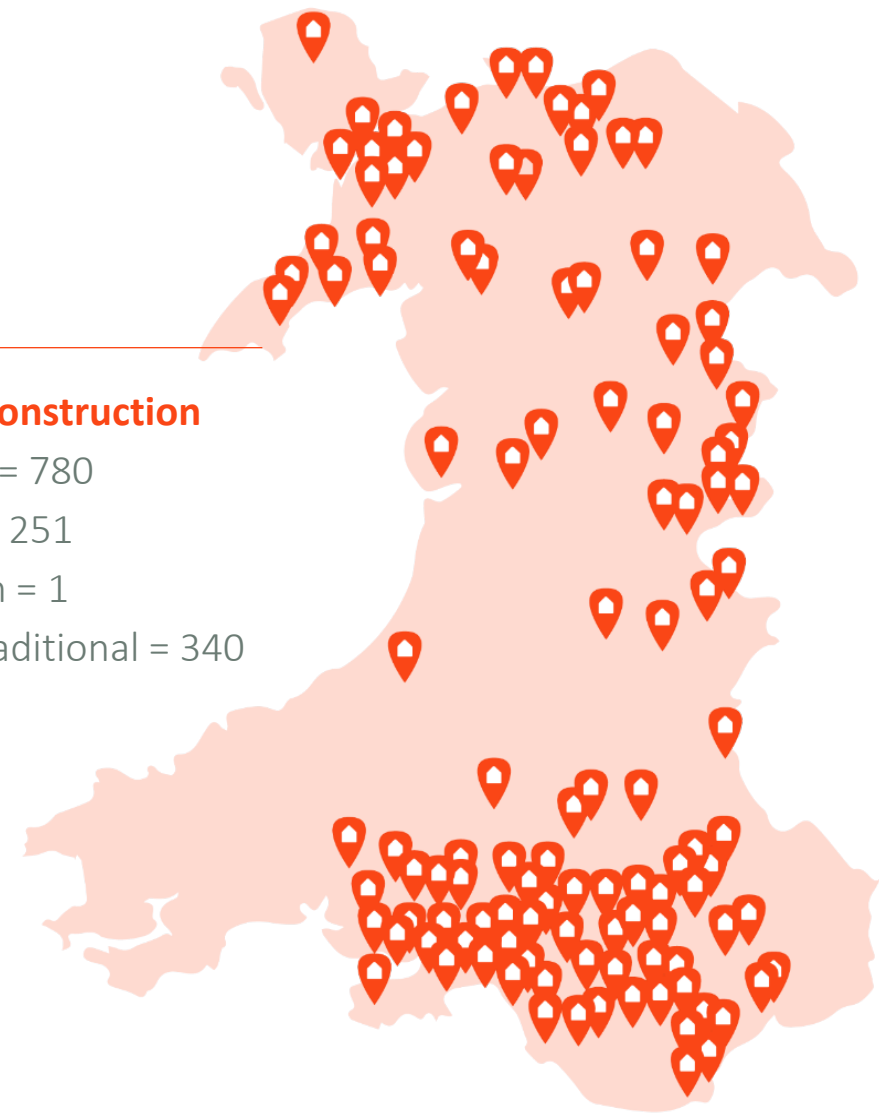Other = 5
Detached = 52
Flat = 551

Age
Pre 1900 = 36
Pre 1919 = 184
1919 – 1944 = 97
1945 – 1964 = 222
1965 – 1990 = 494
Post 1990 = 339

Fuel
Oil = 7
LPG = 22
Solid Fuel = 63
Electric = 263
Gas = 962
Other = 45

Wall Construction
Cavity = 780
Solid = 251
System = 1
Not Traditional = 340

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Foundational Economy

Tackling Hurdles to Decarbonisaton

- More than 20 projects under Optimised Retrofit tackling a wide array of challenges to delivering decarbonisation

- Skills & training activities include identifying and supporting competency from client to installer, tackling quality issues and finding gaps and solutions

- Procurement & SME activities including balanced public sector Dynamic Purchasing System to support and encourage the 'Repair, Maintenance & Improvement' sector to engage

- Financial activities including supporting leaseholder and private landlord engagement to deliver financial tools that help them to decarbonise

- Post occupancy work to identify and understand resident comfort & quality of life, so net zero feels like progress
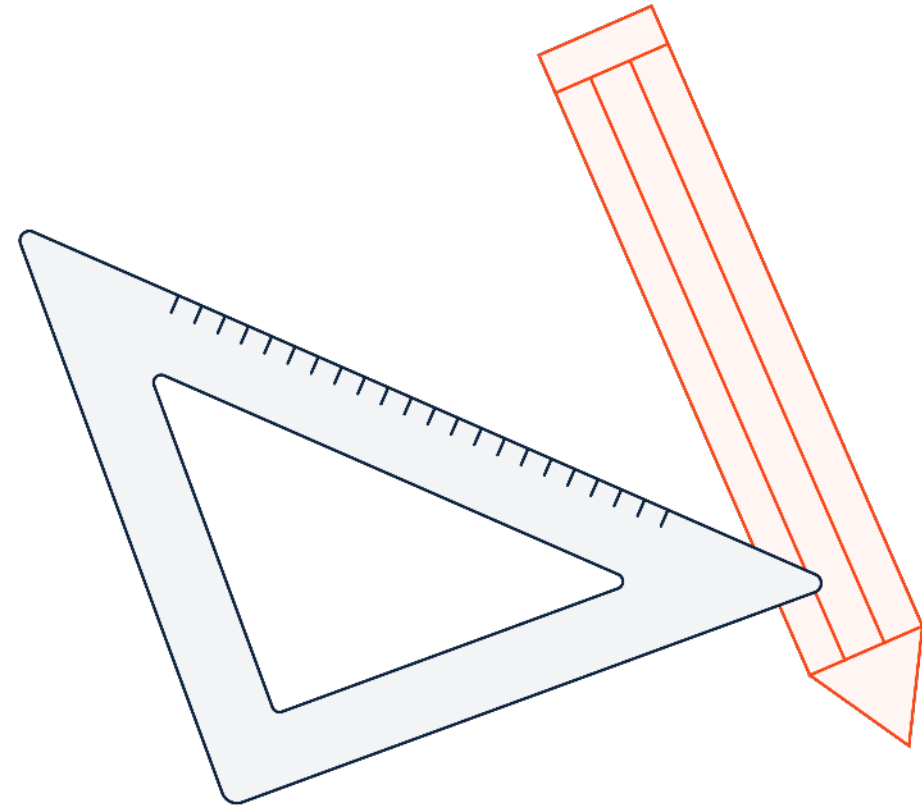
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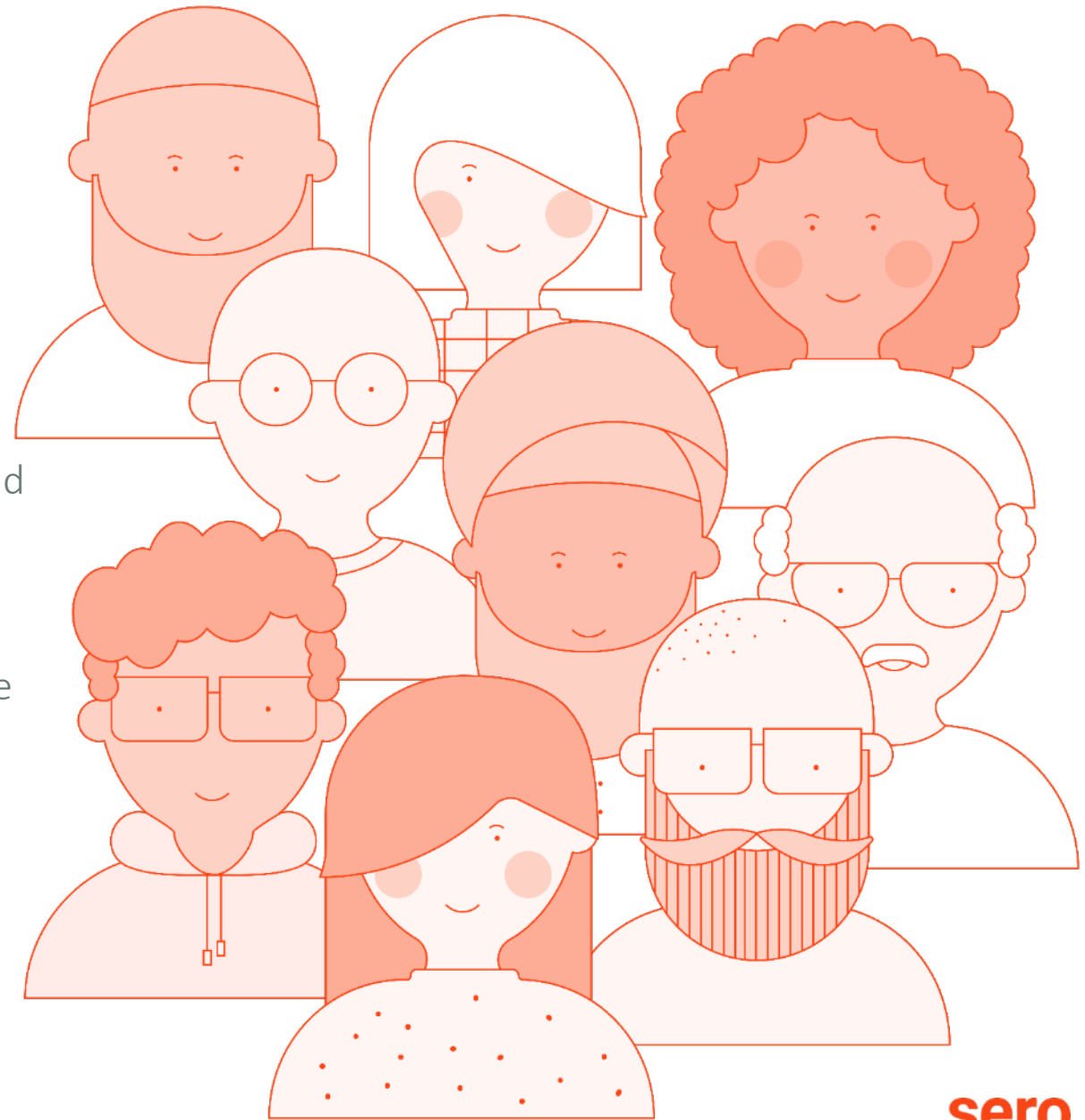
Digital Tools

Design Principles

- Interoperable & best practice standards
  - Intelligent Structure
  - System Interoperability
- Secure & robust data
  - Encryption in transit (TLS)
  - GDPR data stored in isolation
  - Encryption at rest (AES-256)
- Replaceable elements
  - Micro-service architecture
 - Individual home requirements

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Digital Tools

Capture Survey

- The collaboration are developing and testing a comprehensive home survey digital tool

- This will capture all information required to assess what retrofit measures are not suitable for that home

- The intention is to enable a whole home survey to be delivered in under an hour, making it a realistic price-point

- Over time, automated data analytics will provide a further level of quality assurance to assure a robust basis for decisions

Optimised Retrofit
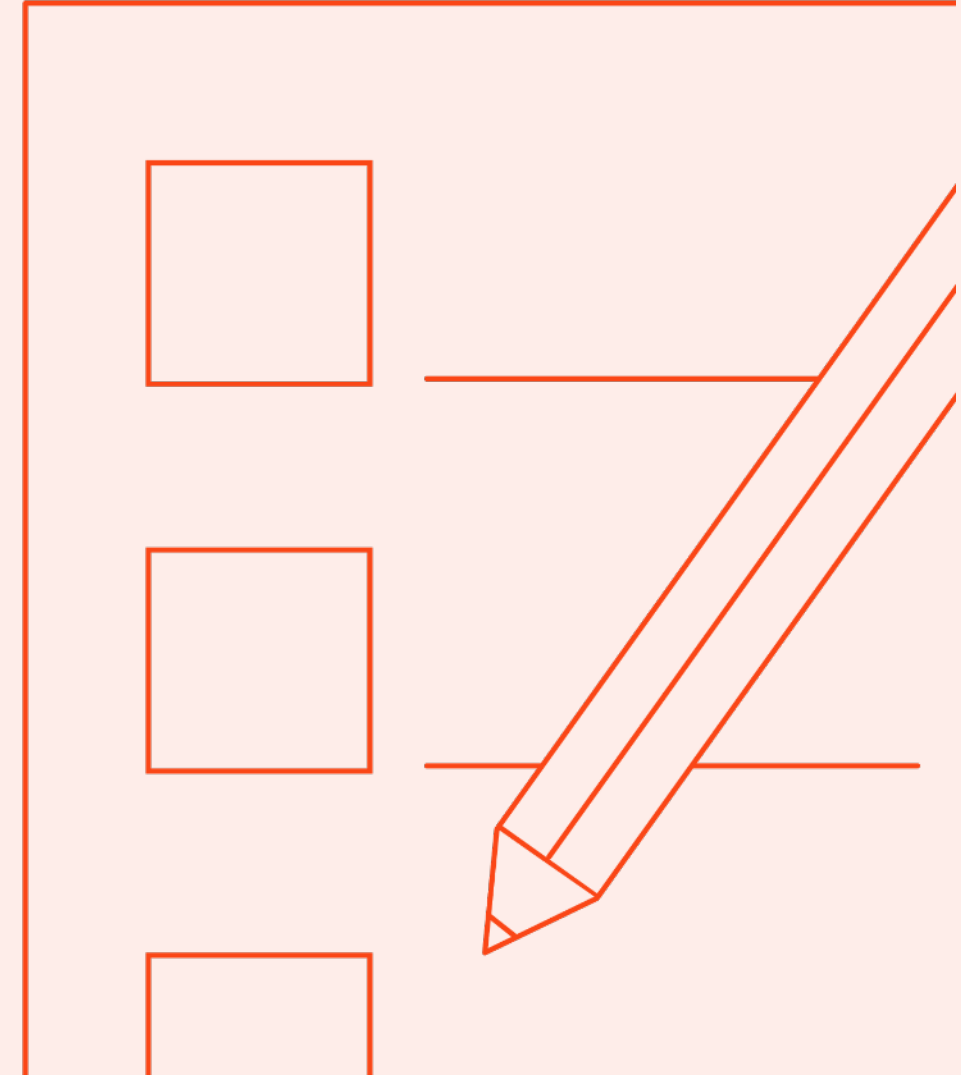
Digital Tools

## Capture Survey - PAS2035 and beyond

- The survey undertaken is in line with the principle of PAS2035, but requires the recording and capturing of more extensive data to reduce the risk of Unintended Consequences

- A new British Standard is being created to cover the extent of the Retrofit Assessment requirement, and Sero are inputting into this Standard

- The risk assessment requirements, including significance and heritage are required as part of the survey, as well as detailed assessment of ventilation and condition
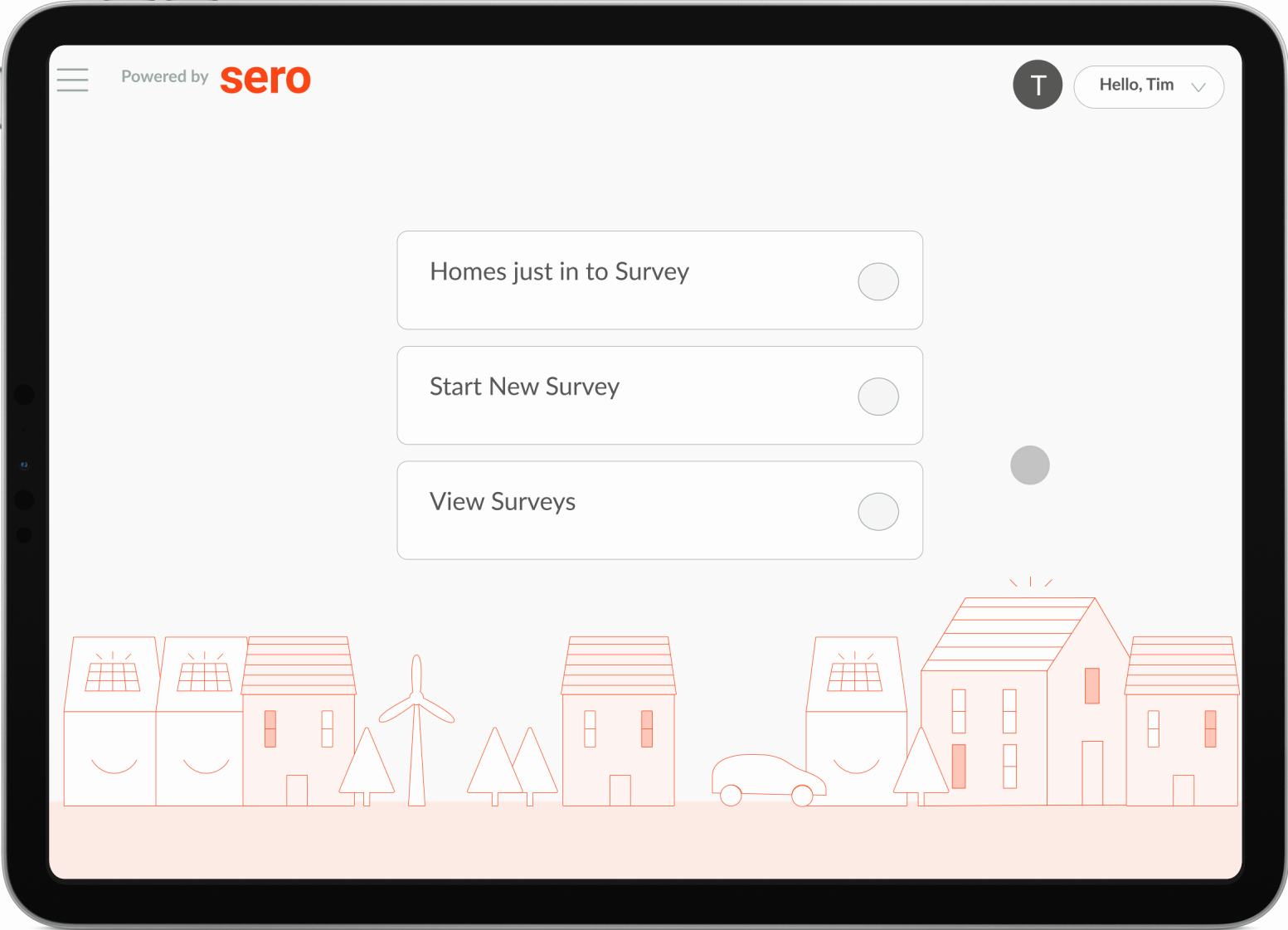
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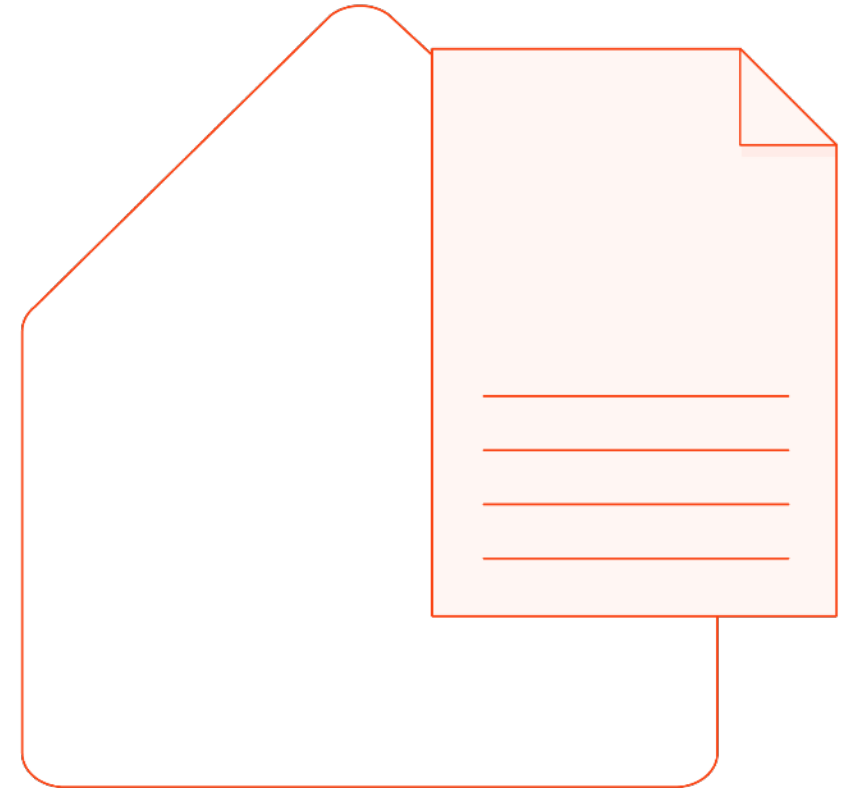
Digital Tools

Capture Survey – the 4 C's

- The survey incorporates the principles of the 4 C's to retrofit risk assessment and management.

  - **Context** (condition, location, occupancy, ventilation, significance) to eliminate any measures the property is not "Retrofit Ready" for

  - **Capacity** (to ensure the building fabric is not over optimised and pushed to hard, resulting in failure).

  - **Coherence** (to ensure that all the contextual information is used to determine the correct specification and measures) It require a building suitable approach, not predetermined measures.

  - **Caution** (where there are any unknowns or uncertainties, then apply caution when setting the targets)
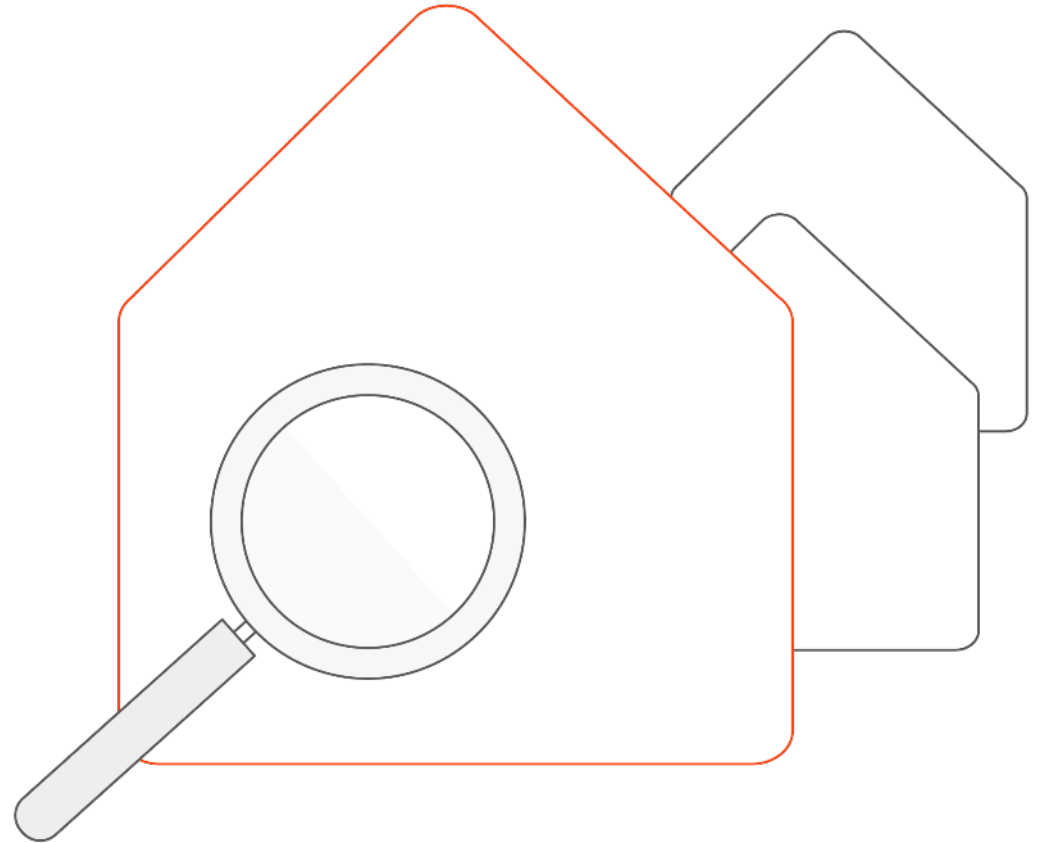
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Digital Tools

Capture Survey

Digital Tools
Capture Survey

Property Details

Powered by **sero**

1 — 2 — 3 — 4 — 5

Properties Considerations

Radon zone — No / Yes / Unknown

Exposure zone (according to part C) — 1 / 2 / 3 / 4 / Unknown

Listed building — No / Yes / Unknown

Flood zone (or previous history of flooding) — A / B / C1 / C2 / Unknown

Access Considerations

Property fronts directly onto footpath/public highway

Inadequate access to erect scaffolding

Rights of way notification to neighbours required

Inadequate space for scissor lift if required

Surveys Home   Back   Next

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Digital Tools and Standards

Capture Survey

- Captured digitally and captures all the information and parameters using the 4 C's principle

- Captures all the information to create the carbon footprint baseline

- Provides additional guidance and background information on suitability of measures.

- Ensure 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"

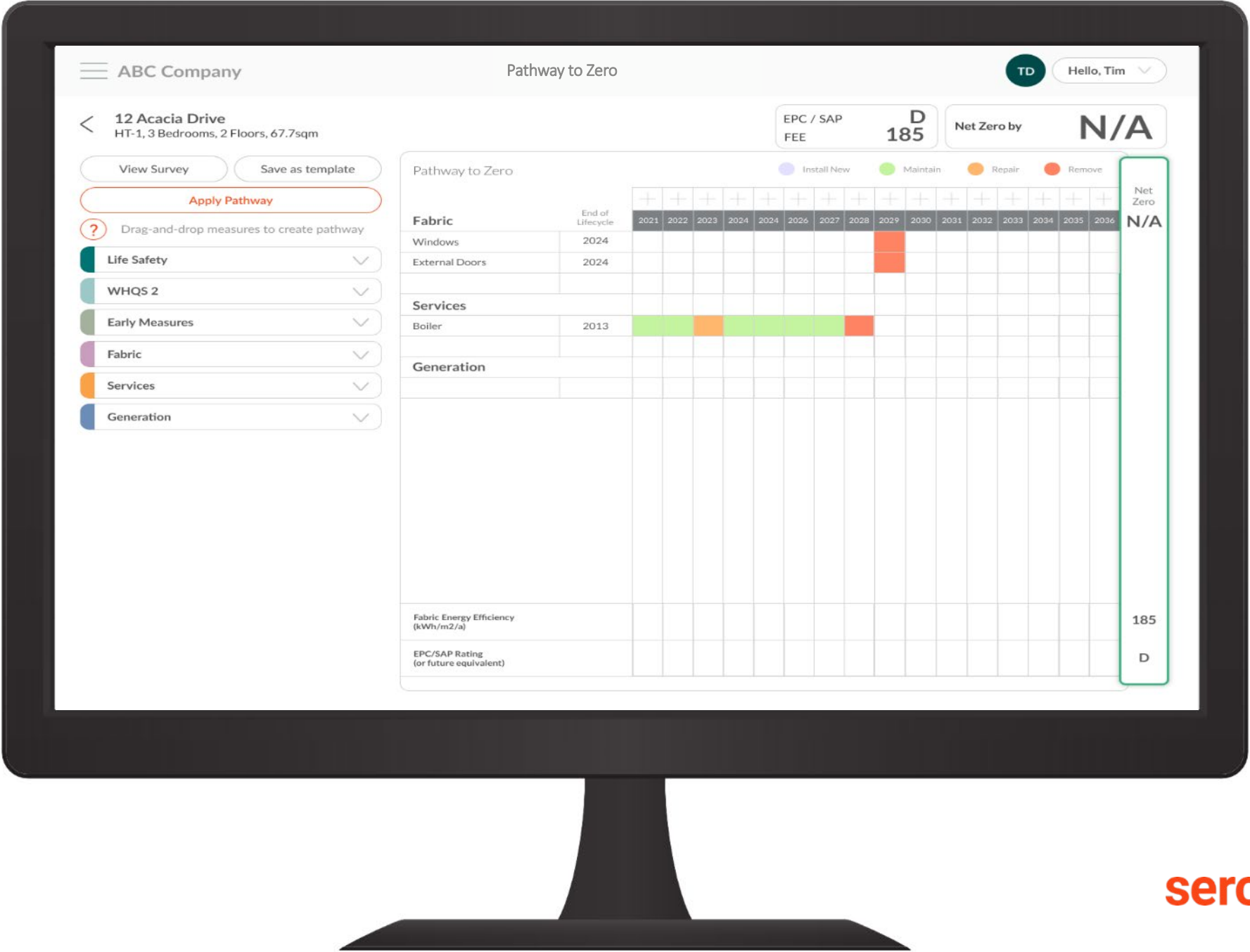- Reduces the risk of Unintended Consequences
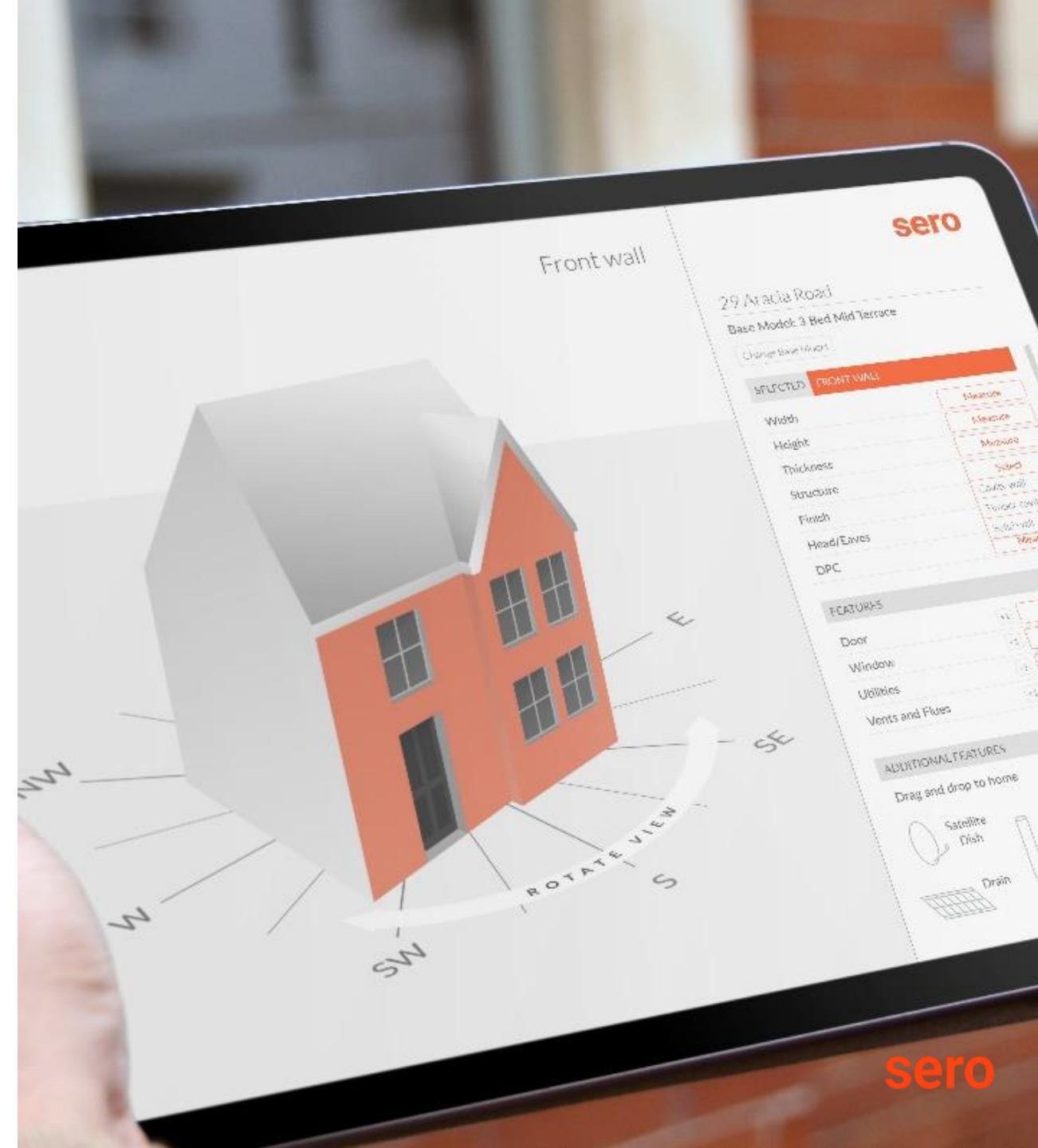
Digital Tools

Pathways to Zero

- Innovative tool to inform PAS2035 aligned retrofit measures selection by the property owner

- Driven by competent designer but with technically robust automated checks to minimize 'wrong' outcomes

- Automated filtration of incompatibilities with each home based on survey and previously selected retrofit measures

- Cloud-computing driven energy engine running granular energy and carbon forecasts for each unique home

- The journey of the home can be planned in Steps, but retaining coordination between measures across years

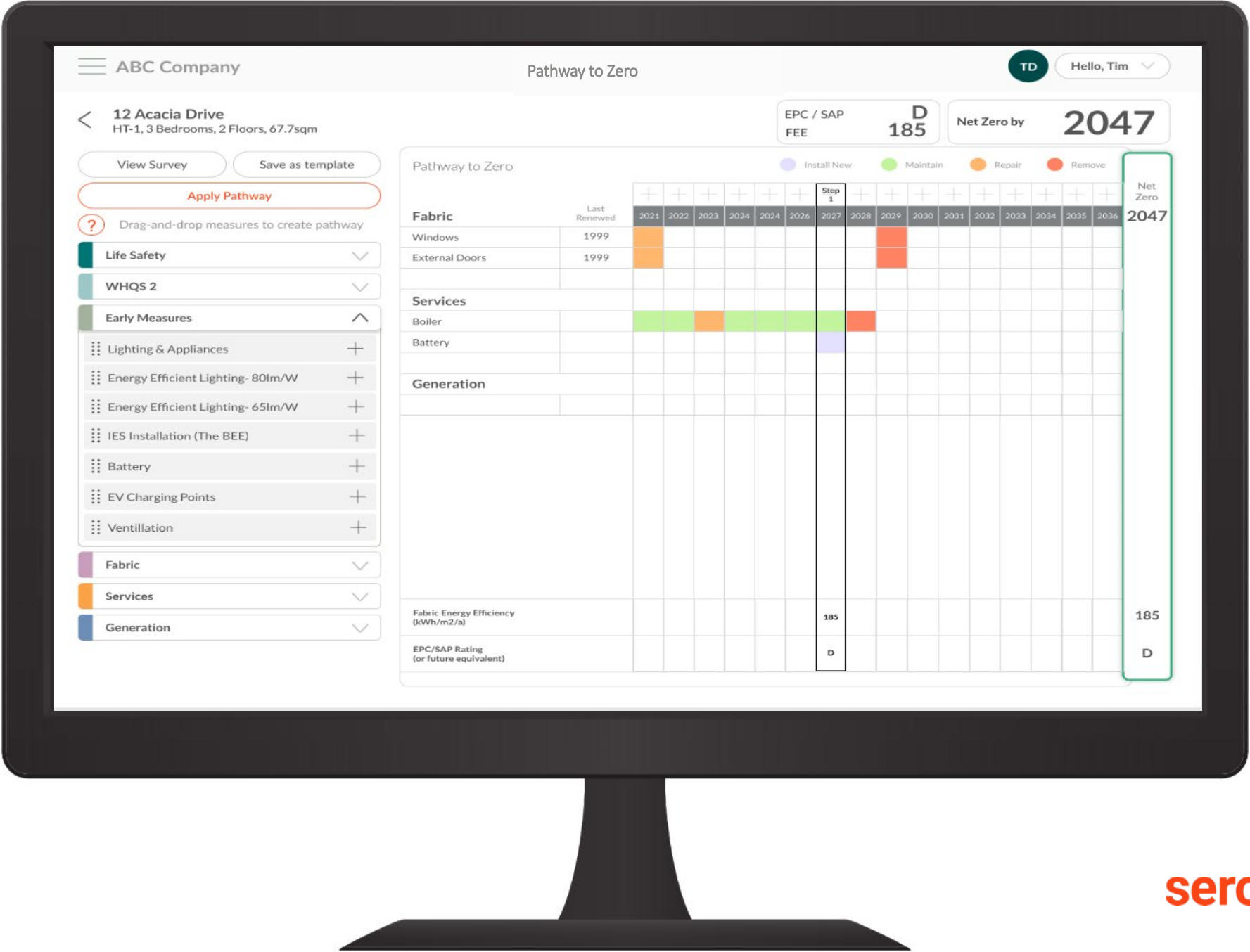- Generates forecast "Zero Carbon By" year, as well as fuel bill/fuel poverty, ventilation and overheating checks
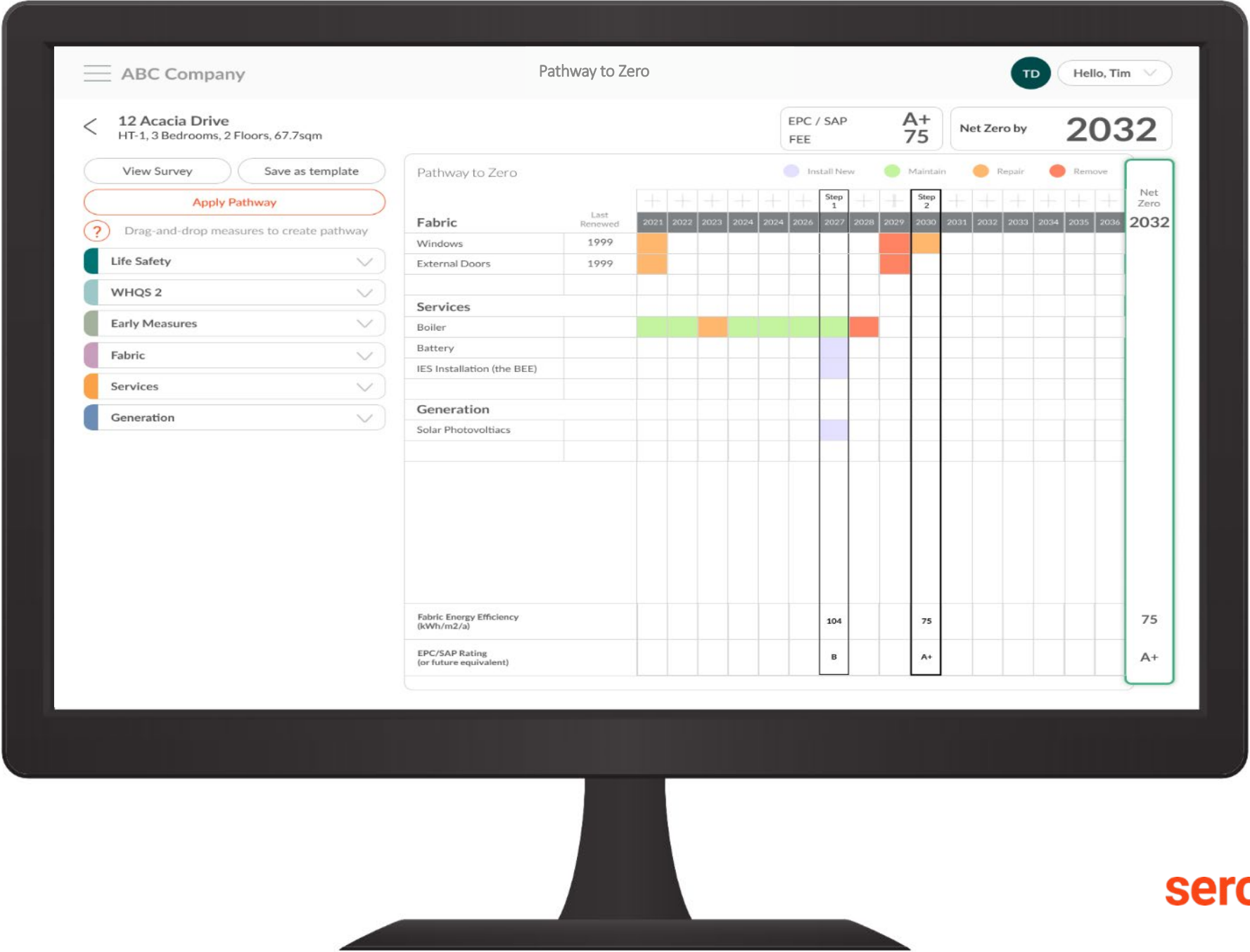
Digital Tools

Pathways to Zero

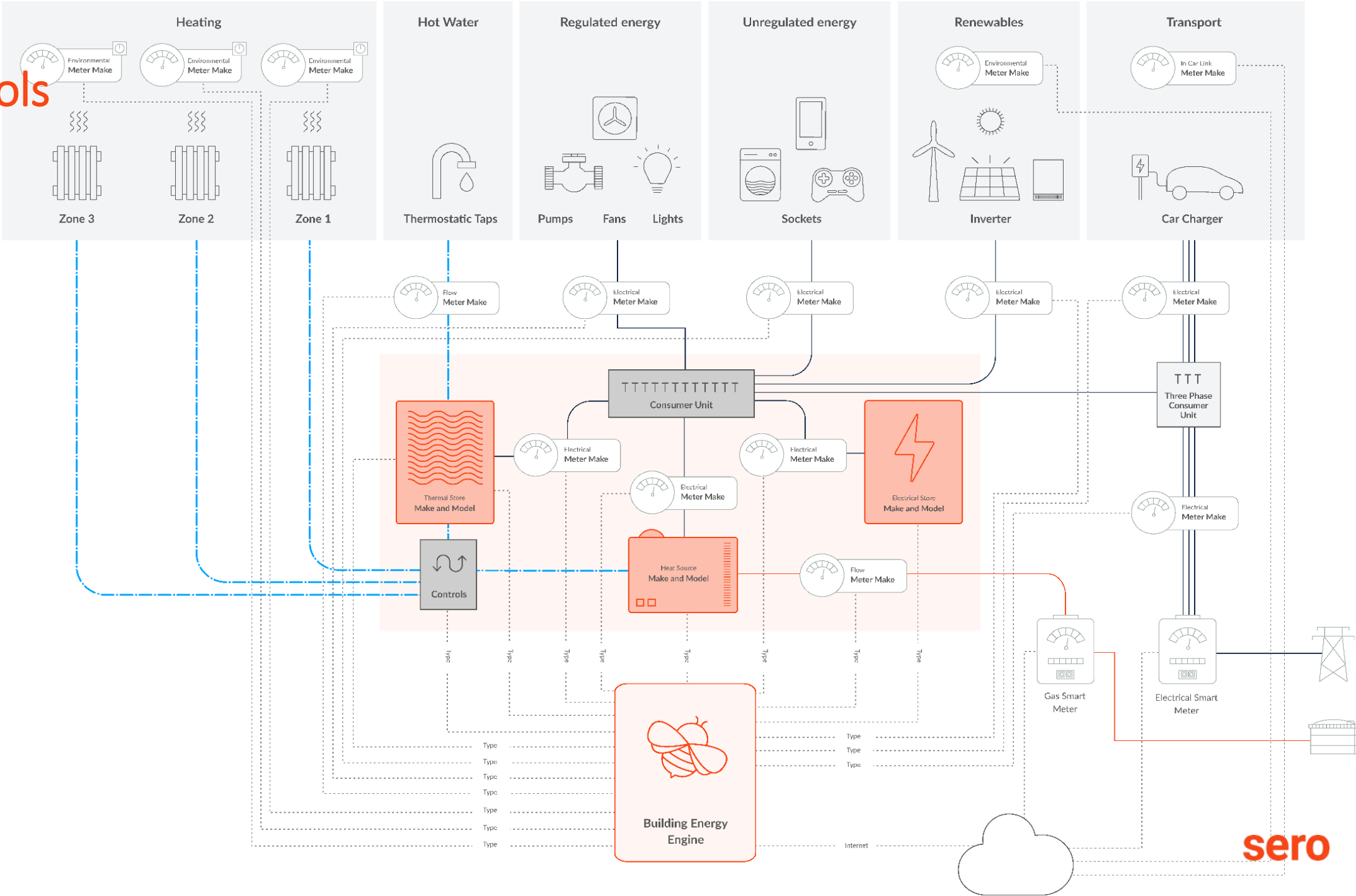# Digital Tools

Pathways to Zero

The image shows a computer monitor displaying the "Pathway to Zero" digital tool interface.

ABC Company — Pathway to Zero — **TD** Hello, Tim

12 Acacia Drive
HT-1, 3 Bedrooms, 2 Floors, 67.7sqm

EPC / SAP FEE: **D 185**

Net Zero by: **2047**

View Survey | Save as template

Apply Pathway

Drag-and-drop measures to create pathway

- Life Safety
- WHQS 2
- Early Measures
  - Lighting & Appliances
  - Energy Efficient Lighting- 80lm/W
  - Energy Efficient Lighting- 65lm/W
  - IES Installation (The BEE)
  - Battery
  - EV Charging Points
  - Ventillation
- Fabric
- Services
- Generation

Pathway to Zero

Install New | Maintain | Repair | Remove

Net Zero 2047

Fabric — Last Renewed
- Windows: 1999
- External Doors: 1999

Services
- Boiler
- Battery

Generation

Fabric Energy Efficiency (kWh/m2/a): 185 ... 185

EPC/SAP Rating (or future equivalent): D ... D

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Digital Tools
Pathways to Zero

Digital Tools

BEE - Building Energy Engine

- Effectively provides Post Occupancy Monitoring of the home for the life of the installation

- Residential client-side Building Management Server (BMS)

- Manages local data collection and dispatch
  - Standard transmission protocols (MQTT, UDMI)

- Container architecture
  - Device is service provider agnostic
  - Profile and expansion
  - Reconfigurable for other service providers (no monopoly tie-in)

- Modular physical interfaces designed for home's full Pathway

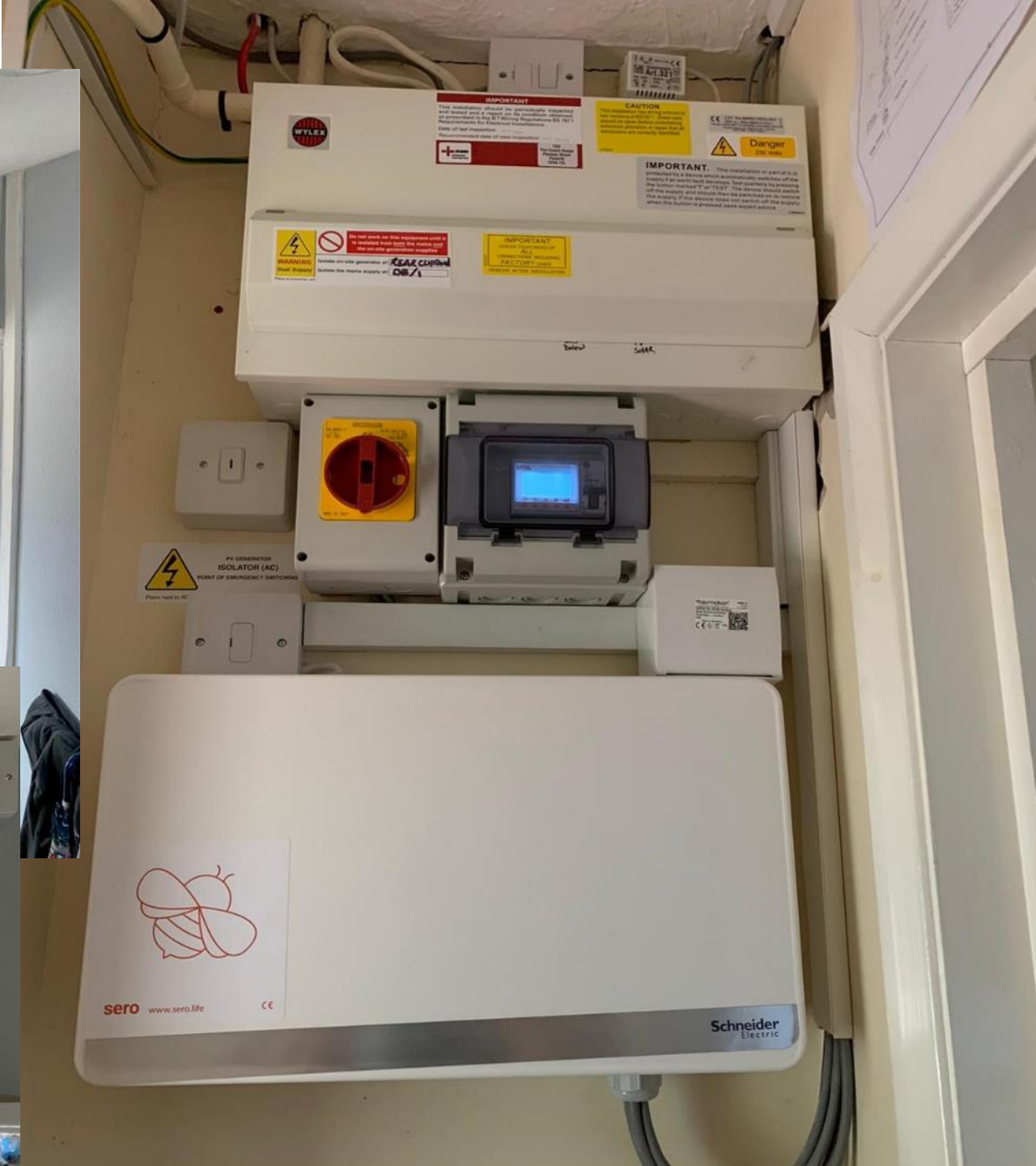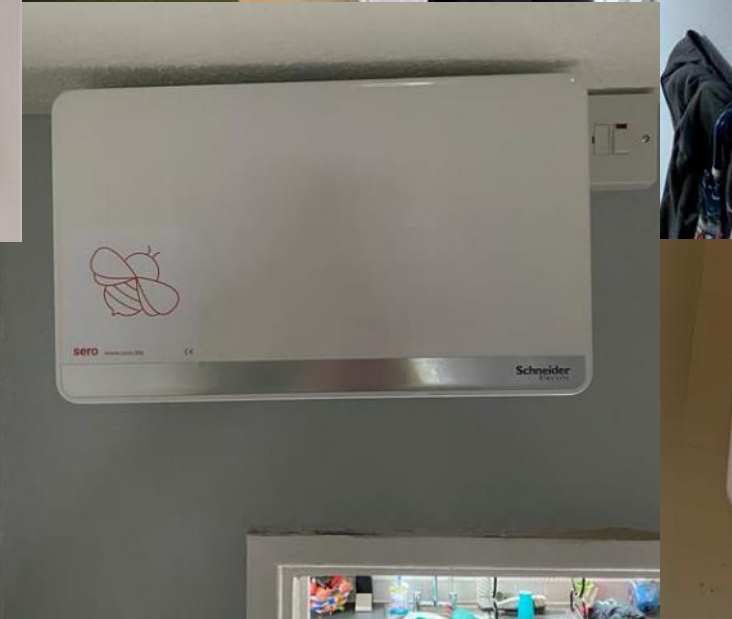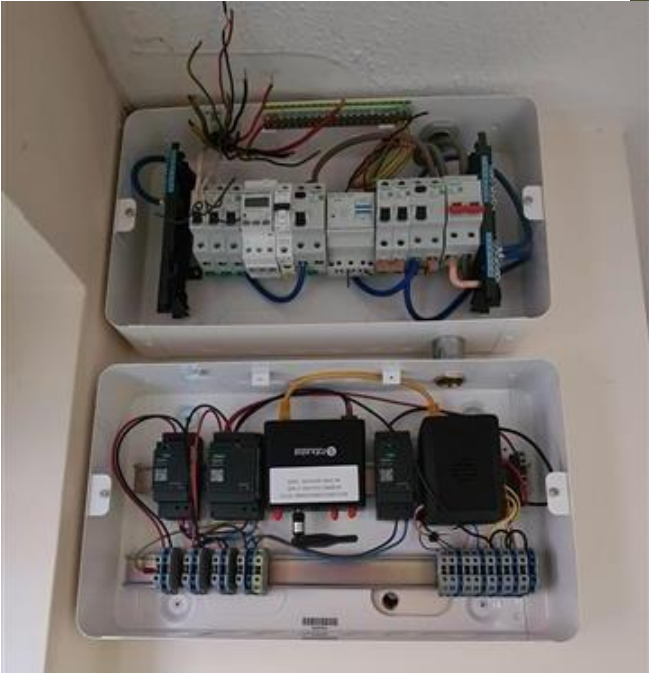- Future proof cabling specification (CAT6 / 23AWG)


BEE v2

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Digital Tools

BEE

Digital Tools

Sero Passport

- Digital representation of the building's physical and performance attributes, maintained over time, including;

  - Building Operational data

  - Survey & Commissioning updates

  - Pathways to Zero creation & updates

  - RSL O&M integration and third-party interfaces

- Performance data;

  - Sensor readings

  - Meter data

  - ML Integrations

- Forms a Digital Model, Digital Shadow or Digital Twin depending on the hardware and occupant options
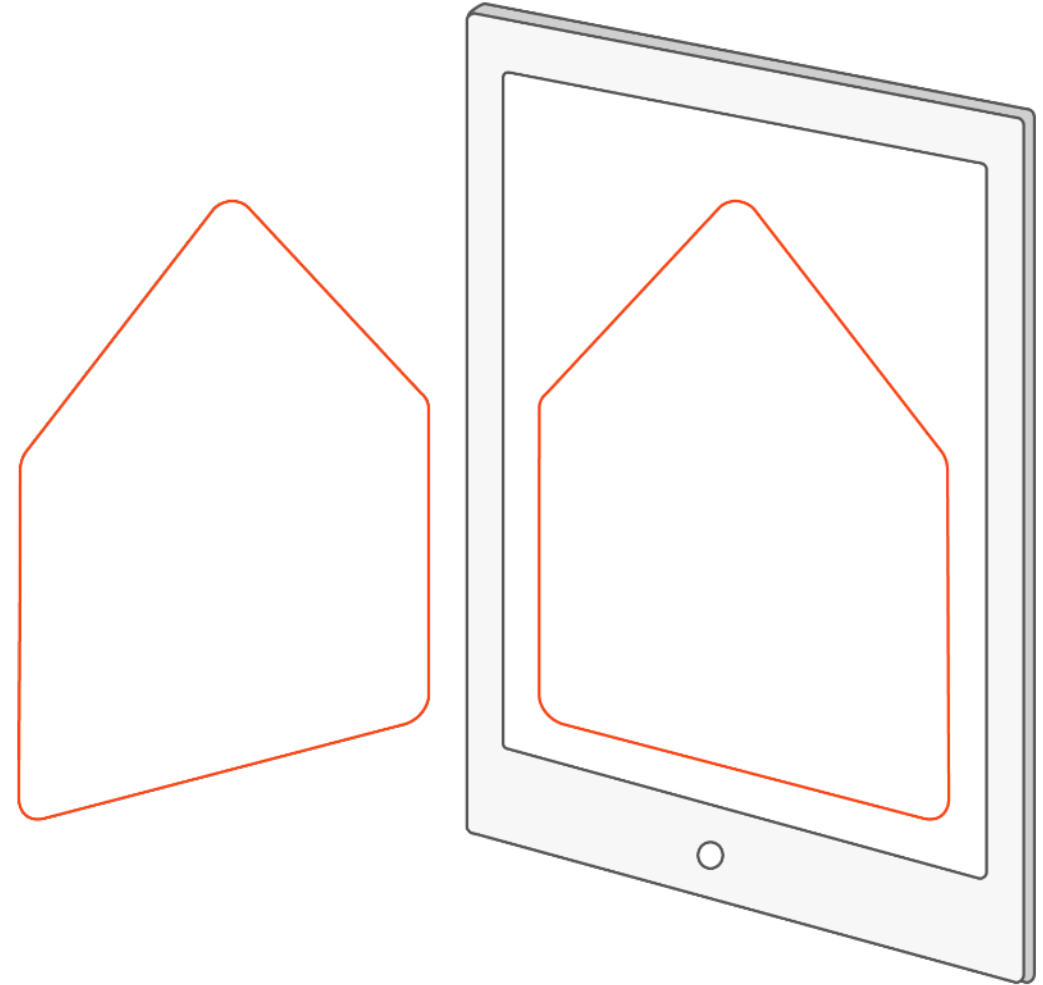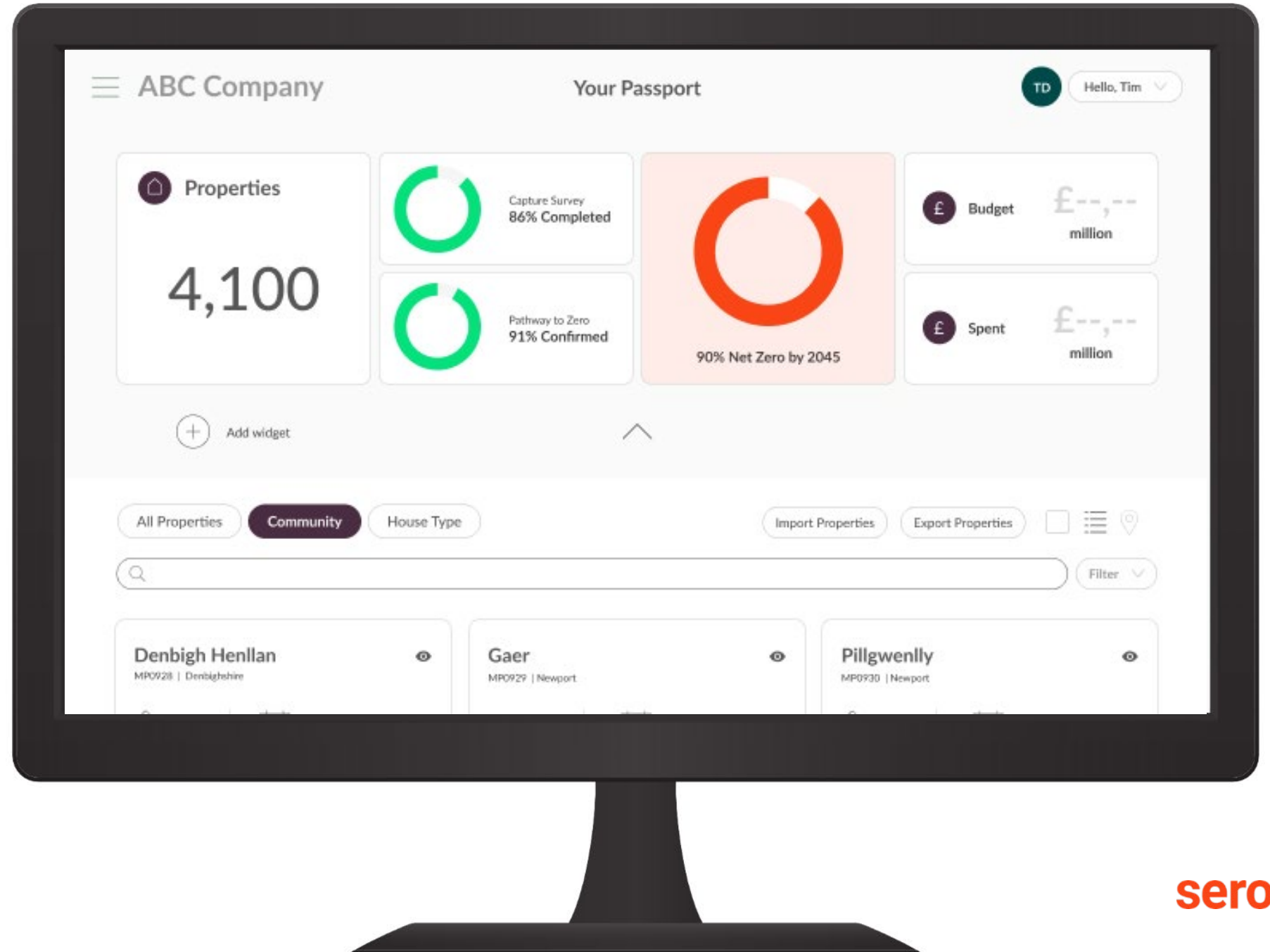
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Digital Tools

Sero Passport

- Designed to help take homes to Net Zero carbon
- Able to integrate with other maintenance platforms and stock-modelling tools

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Digital Tools

Sero Passport

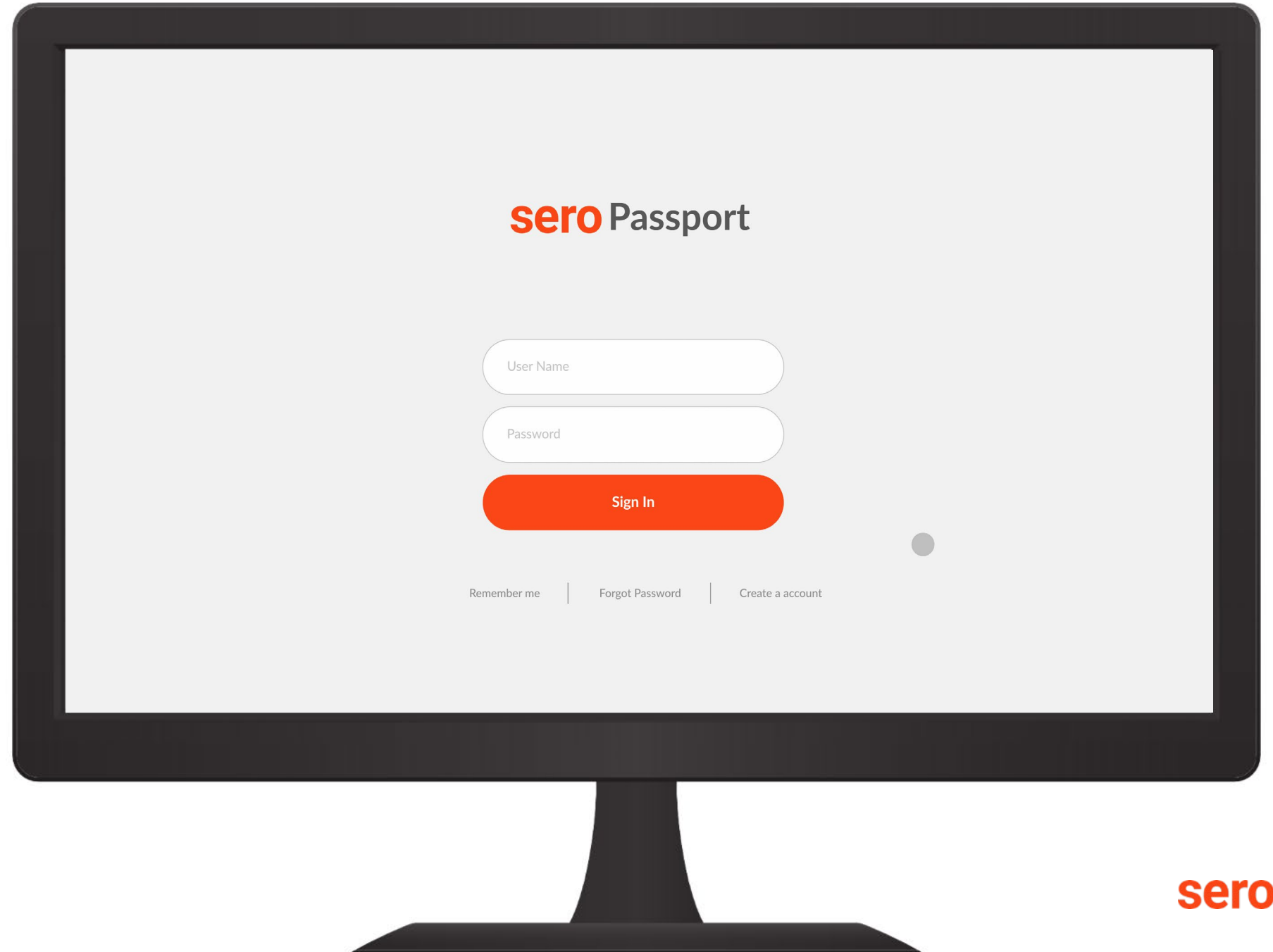- Launch Edition first for Wales

- Able to "log-in" the New Year

Andy Sutton

Co-Founder &
Chief Innovation Officer

Visit: www.sero.group
Email: hello@sero.life
Tweet: @sero_group

sero Passport

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Password

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Remember me | Forgot Password | Create a account

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