Project Case Study: Project Sojourner

Project theme:

Improving the customer journey for heat pumps

Project lead:

EDF Energy R&D UK Centre Ltd

Partners:

EDF Energy Customers Ltd, Kestrix Ltd, Barclays UK

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What were the objectives of the project?

Project Sojourner aimed to engage and motivate EDF Energy customers to improve the energy efficiency of their homes before installing a heat pump. The project had three main objectives:

- **Accelerate domestic retrofit uptake:** Provide customers with a simple, personalised plan for decarbonising their home.
- **Minimise home survey site visits:** Use available data and drone-mounted thermal imaging to reduce the need for home surveys.
- **Create innovative financial propositions:** Understand the types of financial propositions that would motivate customers to invest in building fabric energy efficiency measures.

What activities were funded?

Project Sojourner funded the development of an end-to-end digital platform to guide homeowners through the early stages of retrofitting their homes for low-carbon heating, specifically targeting the integration of energy efficiency improvements before heat pump installation. The funded activities included:

- **Development of a customer-facing digital platform:** This web application provided users with a personalised home decarbonisation plan, including retrofit recommendations, visualisations of potential heat pump installation sites, indicative costs, estimated carbon and energy bill savings, and available grants. Several new technical modules were developed to support this, including:
    - A **boiler lifespan estimator**, predicting the remaining life of a user's current gas boiler to encourage timely planning for low-carbon alternatives.
    - A **grant eligibility engine**, enabling users to see what financial support might be available for retrofit measures.
    - A **quote engine** for calculating indicative installation costs.
    - A **Heat Transfer Coefficient (HTC) calculator**, using EDF's proprietary Deconstruct+ tool to estimate overall building thermal performance.
- **Drone thermal imaging development and deployment:** Partner Kestrix enhanced their existing drone-mounted thermal survey technology to deliver automated building heat loss analysis. Key developments included:
    - Algorithms to recommend retrofit actions and visualise heat pump siting options.
    - Benchmarking of 3D thermal scans for geometric accuracy.
    - Integration of Kestrix data into the EDF platform through an Application Programming Interface (API).
- **Customer trial and user testing:** EDF launched a real-world trial to test the proposition with 79 customers, offering them a free drone thermal survey (conducted via two flights – one optical scan by day and one thermal scan by night) and access to the web application. Feedback was collected through user testing to assess engagement and usability.
- **Financial proposition development:** Barclays conducted customer research to explore what types of financing would make retrofit measures more appealing. This included evaluating five different finance models (e.g., personal loans, mortgage advances, leases), analysing consumer preferences, and identifying key motivators and concerns.
- **Business model exploration:** The project team explored different commercial models and routes to market, including a potential B2B offer for local authorities and housing providers to support large-scale uptake.

What did the project achieve?:

Project Sojourner tested the viability of an integrated digital retrofit journey that combined remote assessment, personalised recommendations, and finance options. The main proposition tested was whether a user-friendly, low-effort digital journey – incorporating drone-based thermal surveys, tailored recommendations, and financial modelling – could better motivate homeowners to undertake fabric upgrades ahead of installing a heat pump.

Key achievements included:

- **Deployment of a digital customer platform:** The team successfully launched a working prototype of the platform, offering users a personalised Heat Loss Report. This included visual thermal imagery, estimated installation costs, payback calculations, a roadmap of recommended actions, and finance options.

- **Real-world user trial:** 79 homeowners completed drone thermal imaging surveys and accessed the Heat Loss Report through the platform. These users were recruited through a targeted EDF campaign, with flights carried out at night for thermal imaging and by day for contextual visuals.
- **Customer validation and feedback:** Initial user testing found the proposition was well received:
    - Users appreciated the visualisation of heat loss and found the report informative and easy to navigate.
    - The most engaging elements included the product recommendation cards and financial projections.
    - However, usability issues were noted, particularly with the interactive 3D heatmap and navigation through the thermal report, which some users found confusing or overlooked entirely.
    - Some users skipped straight to the model visualisation without fully exploring the rest of the information, although many returned later to review their report in more detail.
- **Lessons for future development:**
    - User interface improvements are required to make the platform's more technical features easier to use.
    - Follow-up user research is planned to better understand drop-off points, overall engagement, and customer satisfaction across the journey.
    - The findings validated that drone-based surveys and a digital-first customer experience can offer a scalable way to engage customers early in the retrofit journey – but also highlighted that the approach may be most cost-effective when deployed in high-density areas.

Overall, the project demonstrated that a streamlined, visually engaging digital tool can support the early stages of decision-making around retrofit and low-carbon heating. However, further refinement is needed to optimise the user experience and ensure the proposition is commercially viable for scale-up.

Project objective 1: Accelerate domestic retrofit uptake

Why is this important?:

Lowering a home's heat demand by installing energy efficiency measures before a new heating system can be financially advantageous. Around 38% of homes in England and Wales are below energy performance certificate (EPC) C, while current retrofit rates are approximately 1% of all homes. Prior to 8th May 2024, the Boiler Upgrade Scheme (BUS) required properties to have no recommendations for loft and/or cavity wall insulation listed on their EPC, unless exempt. Although this requirement has been removed, EDF still advises customers that a 'fabric first' approach – prioritising insulation and airtightness before installing low-carbon heating – is always best practice to ensure the customer's house is as thermally efficient as possible to help reduce running costs. However, recent research suggests that this approach may not be optimal in all cases. Studies have shown that many homes are already suitable for heat pump installation without extensive fabric upgrades, and that a 'fabric first' approach could delay decarbonisation and increase upfront costs without commensurate longer-term savings in heating costs. A more flexible, case-by-case approach – balancing heat loss reduction with timely heat pump deployment – is increasingly viewed as a more pragmatic and effective alternative.

Providing customers with a personalised home retrofit plan addresses two key issues. Firstly, many homeowners do not proactively plan or save for energy efficiency upgrades, typically only considering their options when a failure occurs, such as a gas boiler failure. Secondly, homeowners seeking energy-efficient improvements often struggle to access accurate, reliable, and affordable information. Assisting users in identifying and applying for relevant grant schemes reduces the financial burden on homeowners looking to undertake suggested upgrades.

What activities were funded?:

The Sojourner project funded the development of an integrated, user-friendly Heat Loss Report, which brought together and enhanced several pre-existing elements into a cohesive digital tool. These components included:

- Personalised thermal imagery highlighting heat loss through different fabric elements of the home, using existing tech developed by Kestrix.
- A newly developed service offering advice on reducing carbon footprint, including preparatory works for a heat pump and related product and service recommendations.
- Estimated costs of retrofit works and projected return on investment, developed from an existing tool to cover a more diverse range of retrofit measures.
- A visualisation of potential heat pump installation locations, which was built on and improved from existing technology.
- Grant eligibility checks using a new grant engine, developed for the Sojourner platform.
- An estimated timeline until the end of the boiler's life, carried out using a new boiler lifecycle check.
- Projected annual financial and carbon savings, using existing projections integrated into the tool.

- Multi-product consumer finance options, for which a new approach was developed and tested.

The project funding enabled these elements to be bundled into a seamless customer experience, enhancing usability and accessibility. It also supported the creation of the web application interface, integrating drone thermal imaging into the customer journey, and the delivery of personalised retrofit roadmaps, making the overall proposition more engaging and actionable for homeowners.

What were the project findings and did the project achieve this objective?

- EDF trialled the Heat Loss Survey service as part of the Sojourner project, aiming to evaluate customer engagement with drone-based thermal imaging and the accompanying digital retrofit tools. While the trial has concluded, EDF has yet to gather and analyse detailed insights from the customers who participated. Neither the total number of customers involved in the trial nor how many progressed through different stages of the journey, from initial sign-up to receiving and interacting with their personalised Heat Loss Report, have been disclosed yet. This data will be critical in assessing the effectiveness of the service and identifying key drop-off points in the user journey.
- Initial user testing, however, provided some early indicators. Most users expressed interest in the proposition and found the sign-up process intuitive and easy to navigate. The overall concept was well received, and the personalised nature of the report was seen as a valuable tool for decision-making. That said, several usability challenges were identified. Many users did not engage with the navigation features within the thermal report or found them confusing. Similarly, interaction with the 3D heatmap was limited, suggesting that some elements of the interface may require clearer guidance or more intuitive design.
- To address these issues, further improvements to the customer UI/UX experience are planned. These may include simplifying navigation, enhancing onboarding instructions, and improving the interactivity of visual elements. EDF is also expected to conduct follow-up research with trial participants to gain deeper insights into user behaviour, satisfaction, and perceived value. This feedback will inform future iterations of the platform and help refine the customer journey.

Project objective 2: Minimise home survey site visits

Why is this important?

Thermal imaging can promote energy conservation, with one study finding that householders are nearly five times more likely to install draught-proofing measures after seeing a thermal image.[1] Project partner, Kestrix, uses mass thermal image capture and AI to build heat loss models of buildings that enable home energy efficiency retrofits to be planned, priced and validated. Use of this technology to minimise home survey site visits could reduce costs and time commitment for both residents and installers and deliver a more accurate assessment of the efficacy of a home's insulation. It is common to find poorly installed or failed historical cavity wall insulation, which would not be picked up by an EPC without a thermographic survey of the property or an intrusive inspection – neither of which are undertaken routinely. Developing an automated drone survey method to customise proposals for heat pump installation and prior retrofit measures could offer a scalable solution to the need for mass assessment of homes.

What activities were funded?

Kestrix's activities included:

- Development of an air source heat pump siting algorithm.
- Benchmarking of the geometric accuracy of Kestrix's 3D scans.
- Development of a retrofit actions algorithm.
- Development of an API for EDF to integrate Kestrix's data.
- Demonstration of the solution for EDF customers.

What were the project findings and did the project achieve this objective?

Customer recruitment was more challenging than expected, increasing the cost of drone surveys

EDF's targeted outreach campaign for the Heat Loss Survey free trial faced challenges in customer recruitment and survey costs. The project originally hoped to trial up to 500 properties. However, only 20-30 properties responded to the original invitation to participate in the trial. Expanding the target area increased the number of customers expressing interest in the trial to 181 of which 162 were eligible. Some customers were ineligible due to being located in a Flight Restriction Zone.

Due to the expanded target area resulting in longer travel distances for the drone pilots and longer than anticipated flight times for each, only 80 properties could be surveyed within the allocated budget. the sparse distribution of the properties across the expanded target area meant that each property required dedicated flights, rather than achieving efficiencies of multiple property scans per drone flight[2]

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[1] Goodhew J, Pahl S, Auburn T, Goodhew S. Making Heat Visible: Promoting Energy Conservation Behaviours Through Thermal Imaging. Environ Behav. 2015 Dec;47(10):1059-1088. doi: 10.1177/0013916514546218. PMID: 26635418; PMCID: PMC4639755.

[2] To improve the economics of their scans, Kestrix usually aims to scan hundreds of properties in a contiguous area per drone flight and then licence the data and analysis to a range of different stakeholders.

In addition, each property required two flights (one daytime optical flight, one nighttime thermal flight), with each flight requiring both a drone pilot and an observer, who could complete around 8 property surveys (16 flights) per day, compared to an original target of 30 properties per day.

Weather conditions also affected the flight schedule, with two flying days suspended due to poor weather – highlighting the uncertain viability of flights during those months of the heating season with more challenging weather.[3] These factors, combined, resulted in a cost of £195 per home compared to a target of around £20 per home.

The Sojourner project highlighted that the business case viability for the residential market becomes more commercially sound when the properties being scanned are close to each other in a street or neighbourhood. By focusing on local authorities, councils and housing associations, drone flights could be conducted across a higher density of buildings, achieving a more commercially viable outcome.

[3] Kestrix estimates that there are flight windows in around 150 days of the year, based on local weather analysis of 15 cities in the UK. Wind and rain are the primary types of challenging weather for drone flights. Wet surfaces also result in a poor thermal reading. The thermal scans also require a minimum temperature difference of 10°C between indoor and outdoor temperature. As internal temperature is unknown, assuming an 18°C internal temperature would mean that the maximum viable outdoor temperature for thermal drone scans is around 8°C.

Project objective 3: Create innovative financial propositions for retrofit

Why is this important?

Research undertaken by Barclays UK, one of the project partners, highlighted that cost and value are the biggest barriers for homeowners adopting low carbon heating. This insight is supported by a targeted survey (conducted via UserTesting.com) of 101 UK-based individuals in employment aged 30-50, who expressed interest in low carbon technologies. Among these 'able to pay' respondents, 49% cited cost as the biggest barrier, whilst 76% cited reducing energy bills as the main driver for retrofitting. Finding the right finance model is critical to adoption of heat pumps and retrofit measures. A combination of lending, grants and economies of scale in the supply chain can help homeowners to overcome significant upfront costs. But with green mortgage providers seeing low uptake of green financial products, novel financial propositions are required to drive greater uptake.

What activities were funded?

Barclays undertook the following customer research:

Customer perception of net zero home energy solutions – this study explored customer perceptions of net zero home energy solutions, including insulation, air source heat pumps, solar PV with battery storage, double glazing and EV chargers. The goal was to assess which solutions customers believed provided the highest return on investment and which were perceived to add the most value to their property.

Insights into new finance propositions – Barclays gathered customer feedback on five finance propositions, aiming to understand the attractiveness of these options, the reasons behind customer preferences and common themes influencing desirability.

- **Greener Home Loan** – A personal loan for energy-efficient home improvements. Loan amounts ranged from £7,500 to £25,000, repayable over 2-5 years with up to £250 cashback available.
- **Further Advance** – a mortgage further advance, allowing customers to access a pre-approved credit line at a fixed rate for green home improvements.
- **10-Year Fixed Mortgage** – for funding sustainable home upgrades, separate from the customer's existing mortgage term.
- **Consumer Finance** – point-of-sale (POS) consumer finance offered by a third-party partner at the time of purchase. This short-term financing option allowed for instalment payments.
- **Product Subscription/Lease** – a long-term lease or subscription model (20 years) where monthly costs included monitoring and maintenance.

Behavioural insights – customer behaviour was analysed in two financing scenarios – £10,000 and £25,000 – to identify trends affecting the desirability of each finance option.

What were the project findings and did the project achieve this objective?

Full development and deployment of new Sojourner finance options were outside of the project timeline, however, the market research undertaken by Barclays revealed the following insights:

- **Concerns Over Finance Terms and Product Lifespan** Many participants (22/50 in the £10k study, 25/51 in the £25k study) expressed concerns that the length of the financing terms meant they would finish paying for an item just as it reached the end of its lifecycle, necessitating a replacement.
- **Attraction to Low or No Interest Rates** The most attractive finance options (Greener Home Loan and 10-year fixed mortgage) offered low or zero interest rates, interest-free credit, and flexible repayment terms that allowed for early resettlement without penalties.
- **Evaluating Interest Rates and Total Costs** Customers prioritised evaluating both interest rates and overall costs, including monthly repayments, before selecting a finance option.
- **Concerns About Financial Burden and Commitment** High interest rates and long loan terms were major concerns, with participants citing these as significant financial burdens.
- **Preferences for Term Lengths** Customers were hesitant about very short (2-year) and very long (20-year) terms. Short terms resulted in high monthly costs while long terms increased overall expense. Notably, the 20-year subscription/lease model received mixed reactions, with some indicating it would be more appealing if shortened to around 10 years.

Potential further research

Opportunities for future research

The Sojourner project has identified a number of areas for further research and development:

- **Enhance user experience** – address usability issues identified in user testing, particularly with the navigation of thermal reports and interaction with the 3D heatmap image.
- **Expand market reach** – explore B2B opportunities to leverage the Sojourner solution beyond residential consumers, targeting business and organisations involved in energy efficiency and retrofit projects.
- **Refine finance options** – as well as refining the Greener Home Loan, 10-year Fixed Mortgage and Further Advance finance options, Barclays could also explore additional finance propositions that offer low/no interest rates and flexible repayment terms to attract a wider audience.
- **Improve trial logistics** – address logistical challenges encountered during the trial, such as flight restriction zones (FRZs) and weather conditions, to ensure smoother implementation in future trials.
- **Automation of image analysis** - Kestrix is looking to automate some of the features of its thermal imagery analysis, such as the identification of thermal anomalies (e.g. resulting from poor cavity wall insulation) and the generation of thermal transmittance values – a measure of how well a building element conducts heat – from Kestrix's U-value simulation model.

Summary:

What impact could this have on accelerating the heat pump rollout?:

Where homeowners are seeking to install fabric retrofit measures to reduce their property's heat demand prior to installing a heat pump, the Sojourner platform could support and accelerate their customer journey. One of its most powerful features is the heat loss drone mapping, which provides a visual representation of exactly where heat is escaping from the home. This imagery helps build customer confidence by clearly illustrating the potential benefits of targeted retrofit actions. Additionally, the ability for customers to visualise how a heat pump would look when installed at their property using the same drone imaging technology offers additional reassurance, helping to demystify the installation process.

However with the removal of the Boiler Upgrade Scheme requirement for no recommendations for loft and/or cavity wall insulation listed on its energy performance certificate (EPC) (unless exempt from this requirement), there is now less pressure for energy efficiency measures to be implemented prior to a heat pump installation. Customers may instead choose to voluntarily install those cheaper, easier retrofit measures (such as loft insulation and draught proofing) without a full thermal survey and then move to installing a heat pump.

What next?

The customer journey will continue to evolve beyond the Heat Pump Ready project, incorporating feedback and new functionalities as appropriate. One area identified for future development is a local authority 'multi-property' view, which EDF aims to include in its product roadmap. Looking ahead, the project team is exploring opportunities for further development, including broadening the scope of retrofit recommendations, integrating real-time eligibility checks for grants and finance, and enhancing the visualisation of proposed heat pump installations. These enhancements aim to increase customer confidence, improve engagement, and ultimately support the wider adoption of low-carbon heating solutions.

Where to find out more

https://www.edfenergy.com/heating/get-free-heat-loss-survey

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