

## Ofgem Strategic Innovation Fund Alpha End of Phase Report Template

### Completion Information

In accordance with the [SIF Governance Document](#), the End of Phase Report (EOPR) is designed to facilitate learning and knowledge dissemination and demonstrate that a project satisfies the SIF Eligibility Criteria.

The continuation of your project into the next phase dictates whether or not an End of Phase Report is required, and when it needs to be provided.

- If you are not applying to the next phase, your EOPR must be submitted **within one month of project completion** to your Internal Monitoring Officer (IMO) by email or link to a file sharing site and must be published on the [Smarter Networks Portal](#).
- If you are applying to the next phase, but are unsuccessful, you are required to retrospectively complete and submit your EOPR **within one month of receiving your unsuccessful notification** to your IMO and upload it to the [Smarter Networks Portal](#).
- If you are applying to the next phase and are successful, you are not required to submit an EOPR at this stage.

All projects, regardless of whether applying to the next phase must present findings at a public Show and Tell webinar arranged by Innovate UK. A copy of the Show and Tell presentation must be submitted to the [SIF mailbox two days prior](#) to your allocated Show and Tell slot. Any other publishable project outputs must also be provided to your IMO and published on the [Smarter Networks Portal](#) **within one month of project completion**.

The EOPR template is broken into 7 sections that all require completion. The responses can be up to 400 words long per section and should only provide information that focuses on the key elements of the project, in a manner that is easily reviewed and accessible to a range of stakeholders. You may include diagrams, hyperlinks and appendices to support this document.

The EOPR template has been designed to correlate with the application questions as much as possible, to help support easy completion for those who are not successful.

<b>Project Number</b> 10085870	<b>Project Title</b> Net Zero Terrace
<b>Date</b> Oct '23 – Apr '24	<b>Author and Contact Details</b> ENWL InnovationTeam@enwl.co.uk

<b>Section 1 -</b>	<b>Alpha Phase – Project Summary</b>
Please provide a summary of the key findings from your Alpha Phase Project. Describe the innovative aspects of the work including any new findings or techniques. Please provide a short factual summary of the most significant outcomes of your work.	
You should describe: <ul style="list-style-type: none"> <li>• how your Project has met the aims of the specific <a href="#">SIF Innovation Challenge</a></li> <li>• how your perception of the problem and opportunity has evolved</li> <li>• why the problem relates to energy network functions, and the potential role of energy networks to realise future opportunities</li> <li>• the innovative, novel and risky aspects of the work, including any new findings or techniques.</li> </ul>	

Net Zero Terrace (NZN) investigated the problem of decarbonising terraced streets where space and noise constraints restrict access to air source heat pumps. The counterfactual to heat pumps is electric boilers which lead to increased costs and network demand.

The project addressed Innovation Challenge 1, “Supporting a just energy transition”, and Project Scope 2, “Supporting decarbonisation of heat... for those consumer groups with reduced access to opportunities for decarbonisation”; Primarily, the innovation is driven by delivering affordable warmth with no upfront costs, to provide a solution to those that might otherwise get left behind. This means:

- Ground source heat loops were selected to meet the space constraints
- community owned generation is included in the design to supply power at a lower than market rate
- a Smart Local Energy System (SLES) is required to optimise the unit price for households by enabling peer-to-peer trading of local energy, accessing flexibility markets and optimising operation for the comfort and cost benefits of households
- community ownership and operation through a non-profit model will also mean the price and service benefits for customers can be maximised
- integration into the DNO network to avoid private wires to reduce the overall cost of connections to customers and avoiding reinforcements.

In addition, the project aimed to develop a solution for deployment across the UK at pace. The innovation lies in the integration of the sub-components, the operation and financing of the scheme and the planned approach to roll out through working with DNOs, local authorities and communities.

The alpha phase developed the solution further by researching community engagement methods, system design and integration, integration with the DNO, the planned approach and scalability. Our understanding evolved in the following ways:

- the majority of sub-systems are readily available and early stage inter-operability testing showed no major issues. However, further development is required particularly to enable optimisation for comfort and costs.
- the techno-economic model showed there are challenges to make it “affordable” and showed where future development must focus to meet affordability criteria.
- integrating the NZT SLES into a DNO network is achievable but certain local network conditions may necessitate active network management which is not used at low voltage currently and could significantly add to the costs.
- however, the NZT solution is the lowest cost option for decarbonising terrace streets as the network demand is significantly reduced (1.6kW heat pump compared to 12kW electric boiler).

<b>Section 2 -</b>	<b>Alpha Phase – User Needs</b>
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Please summarise who your prioritised users are and their specific needs relating to your project. Please include how you have translated these into your project design and requirements.

You may want to describe:

- how you have defined and justified your scope boundaries
- what would need to happen to make the user journey as a whole work as well as possible (in particular, you are able to talk about other services that are part of the same journey, and the opportunities and challenges involved in making changes to those services)
- how you have tested your own assumptions against the needs of your users
- how the approach you have taken will minimise the burden on your future users and

avoid duplication of effort through user journeys

- how you have considered the wider interactions of your outputs with the energy sector and other sectors. Please include a description of the product's user journey, processes, or wider services

The primary users for NZT will be households, predominantly those that might be in vulnerable circumstances. Their requirements have been at the heart of the NZT project since its inception within Rossendale Valley Energy (RVE) who sought to address the issues of how to decarbonise the most difficult to treat parts of their community. The wider community of Rossendale and the households in the target areas have been involved with development of the NZT SLES and the delivery of the Alpha Phase in a number of ways:

- RVE, a project partner, have been involved in the design and delivery of Alpha Phase and their membership includes residents of Bacup, Rossendale
- a workshop was held, in Bacup with members of the local community, to gain insights on the development of the customer journey and support processes. The feedback received from the community was incorporated into the service design model
- a key Alpha Phase work package tested the most effective methods for engaging the community with the householders in Bacup. This work package also included focus groups to test the design and function of the Fairer Warmth app and the feedback gained was used to inform the app specification and development.

Local Authorities and community energy groups are a key user group because NZT provides a solution which can be used in the delivery of Local Area Energy Plans. As a project partner, Rossendale Borough Council provided input into the design work packages.

In addition, the project team held a dissemination and feedback event for interested Local Authorities and community energy groups and asked them to consider replication and scaling. The session included a discussion seeking views on what should be included and offering attendees the opportunity to share their successes and challenges.

Other DNOs are key user groups to demonstrate that NZT is scalable and can be delivered across GB. As project partners, UKPN and NPg, provided comment on the suitability of NZT for their respective networks.

Supply chain companies are also key to delivering NZT and they have been engaged with the project by:

- attending, and providing input to, the service design workshop and bilateral meetings to discuss how NZT will be delivered
- providing input on how their systems operate to the systems integration work packages.

### **Section 3 - Alpha Phase – Impacts and Benefits**

Describe your expected net benefits to consumers and justify any changes in proposed impacts since the Application stage. Please provide details of any changes that have been made to the Project and why these were necessary.

If an application for Beta **has** been submitted for this Project, please provide the full Cost Benefit Analysis submitted as part of the Beta application.

You may want to describe:

- if the project should be pursued outside the SIF, and if so, why is it cost effective to pursue and how you plan to take it forward?
- how the Project has progressed towards the benefits outlined in your Alpha application
- an indication on quantitative measurements for associated benefits. These could be related to the:
  - end consumer
  - economic benefits resulting from the project to your users and any other parts of the supply chain, broader industry, and the UK economy, such as productivity increases and import substitution
  - impact on government priorities and any associated benefits
  - environmental impacts, either positive or negative
  - any expected regional or wider energy supply resilience benefits
  - impact on consumers of the whole energy system (both individuals, and collectively), including those with any vulnerabilities or experiencing fuel poverty

The CBA shows early and planned replacement of gas boilers with ground loop heat pumps is financially sensible from a societal perspective (savings in carbon), a customers' perspective (lower energy costs, warmer homes, lower reinforcement costs) and a network's perspective (minimum reinforcement, minimum disruption).

The CBA evaluated two solutions - the scale of the impact and the extent of the remedies varies depending on the volume of terraced houses converted to heat pumps:

### **1. Innovative traditional/BAU solution**

- Increased network demand is addressed by overlaying low voltage (LV) cables and increasing local transformer capacity.
- Increased generation is addressed by installing a transformer with an on-load tap changer to mitigate voltage excursions.

The 20-year NPV of the benefits range from -£17.06m with a pessimistic level of investment for a penetration rate of 0-20% up to £16.95m with an optimistic level of investment for a penetration rate of 80-100%.

### **2. Smart SLES/LV ANM solution**

- An LV Active Network Management (ANM) system is installed to monitor the network and interact with the SLES Community Energy Management System to reduce demand and generation as required.
- Some network demand is addressed by overlaying LV cables and local transformer capacity.
- Some generation impact is addressed by installing a distribution transformer with an on-load tap changer to mitigate voltage excursions.
- The ANM and SLES is able to reduce the demand and/or generation and mitigate the need for reinforcement.

The 20-year NPV of the benefits range from -£17.61m with a pessimistic level of investment for a penetration rate of 0-20% up to £14.75m with an optimistic level of investment for a penetration rate of 80-100% for a NZT Smart SLES/LV ANM solution.

The preferred option is 1. Option 2 is also a feasible solution however the demand side response elements are as yet unproven and unquantified.

Additionally, the community-owned PV, included in the solution, can provide the following local benefits:

1. Residents will be invited to purchase shares and, in return, receive interest payments for the lifetime of their investment as well as their investment re-paid.
2. Any profit from operating the PV will be used to create a community benefit fund which will be invested in the local area.
3. The PV co-operative can subsidise the cost of electricity for the local community.

The counterfactual of individually owned PV does not provide these community-owned benefits.

#### **Section 4 - Alpha Phase – Risks, issues, and constraints**

Please provide a copy of the final updated project risk register outlining the risks and issues you are currently aware of, including a likelihood and impact estimate, and mitigating actions.

If an application for Beta **has not** been submitted for this Project, what constraints (if any), such as technical, political, policy, commercial, managerial etc., have you encountered during your project that have hindered your ability to progress this project further?

You may want to describe:

- any actual or potential constraints in regulation, legislation, commercial contracts, or legacy technology that affect the innovation you are developing
- any barriers for innovations to be delivered into business as usual which could be relevant to future projects
- how you will create an innovation that meets user needs while working within these constraints
- if you have identified constraints that can be removed over the short or long term, how have you overcome them and what is your plan for mitigating future risks? (if there is an intention to carry on with some or all aspects of your project via a different route)

The 22 risks identified in the NZT risk register have been monitored and mitigated through the project lifecycle. These risks encompass policy changes, economic instability, social engagement, technology issues, legal and/or regulatory challenges, environmental constraints, financial and commercial arrangements and project management risks.

The risks with greatest likelihood/ impact scores and the related mitigations are:

- commodity prices may push up supply costs, to help mitigate this the business model includes sensitivities and economies of scale.
- a lack of interest may affect community buy in; this risk is addressed by the community engagement undertaken.
- customer fatigue is addressed by use of the Fairer Warmth app to keep people interested through regular touch points.
- difficulty in identifying owners of privately owned roads may affect obtaining permission to install boreholes. Early identification of ownership in pilot study areas will reduce this risk.

Six risks relate to project delivery and are now closed. The remaining majority of risks relate to the overall technology development and deployment of assets in customers' homes to allow testing and demonstration. These will remain open for future stages of Net Zero Terrace.

In order to fully test the NZT solution, the project requires a level of private investment to enable the installation of non-network assets. This will likely be an ongoing challenge for future stages of the project.

Therefore, although the project team strongly believe NZT has value it was felt that, at the present time, additional SIF funding is not the best route and a Beta application has not been submitted.

## **Section 5 - Alpha Phase - Working in the open**

How have you worked openly during the Alpha phase and engaged stakeholders in a transparent and constructive manner? What have you learnt from the approach you have taken?

You might want to describe:

- ways in which you have talked publicly about the project
- how you have invited challenge and external input of your approach to the project
- how have you shared learning, to avoid duplication of work by others and accelerate industry progress on related initiatives
- how your team has been working openly and have started building relationships with organisations and teams responsible for other parts of the user journey. These could include infrastructure/data owners, regulators, policy makers, investors, and others
- any learnings from engaging with stakeholders that would be relevant for future projects
- a description of any data or insights that you have produced/published from the project, and where they may be found or requested (other than documents to be hosted on the Smarter Network Portal)

All reports on the work completed are publicly available on the Smarter Networks Portal and the Innovation pages of Electricity North West's website. This demonstrates the progress made during the Discovery and Alpha phases and provides learnings for stakeholders interested in this area. If further information is needed stakeholders can contact Electricity North West directly.

There has been a high level of collaboration and cooperation between the partners throughout the project. In line with other Electricity North West projects, the team used a secure online workspace to share project documents promoting an open culture and ensuring that everyone had access to the latest relevant information.

Additionally, regular project update meetings were held to discuss updates on individual partner's progress.

During Alpha phase the NZT team has instigated a wide range of engagement and dissemination activity, enabling the project to share our aims, outcomes and project learning in a variety of interested stakeholder groups. These include:

- learning share events with UKPN, NPg and teams from other innovation projects e.g. LEO-N, RetroMeter.
- a workshop for key stakeholders on the project and stakeholders who could potentially benefit from the project.
- 'Preparing for Net Zero Terrace Streets' presentation for interested Local Authorities and community energy groups to tell them about NZT and gather their feedback.
- the NZT system architecture has been made available to the academic and industrial

- partners for dissemination through their channels to subject-specific audiences.
- the NZT public Show and Tell webinar.
- events disseminating NZT progression and learning to audiences interested in network innovation through channels such as the Smarter Networks Portal and network innovation conferences including a poster presentation at the Energy Innovation Summit.

**Section 6 - Alpha Phase – Costs and value for money**

Please give a description of how funds were spent with reference to the original forecasted budget, explaining any significant variations and any additional contributions made over and above that which was set out in the Project Direction. Explain how the project has delivered value for money to consumers.

Please complete the table below with the final project expenditure. Please indicate any figures that are yet to be confirmed as final (we will request confirmation of final amounts 6 weeks after the project has ended).

All funds spent were as planned in line with original forecasted budget.

No variations or additional contributions were required over and above what was set out in the Project Direction.

The project has delivered value for money to customers by demonstrating:

1. The NZT solution requires three times less demand from the network than the electric boiler counterfactual.
2. The community demand led model and use of PV as part of a SLES make it innovative.
3. The majority of sub-systems are already available on the market and early stage inter-operability testing has shown there are no major issues but further development is required to provide the functionality required for NZT.
4. The techno-economic model has demonstrated that it is challenging to make NZT “affordable” and shows sensitivities for the end price to the customer.
5. The NZT approach is suitable for terraced streets across GB.

The project has also delivered value for money to consumers by advancing learning in key areas of the project scope:

1. Definition of the NZT offer to members of the community in the NZT blueprint, including refining which engagement method is the most appropriate through pilot testing and evaluation.
2. A refined architecture for delivery of the SLES including further development of subsystem interfaces and overall functional requirements specification. This included creating a shortlist of Home Energy Management System options which provide the features and capabilities required for the solution.
3. Review of the NZT/ DNO interface and DNO connections processes identifying how to maximise the value to customers and fully quantify the network benefits from rolling out the solution. This identifies how to manage the connection of a SLES to a distribution network in the most cost-effective way whilst at the same time maximising benefits for customers.

All of the above pave the way for a full scale trial in the future.

Project partner name	SIF funding requested	Total actual project spend	Total project contribution made (incl. contributions in kind)
Electricity North West Limited	£104,296.00	£115,884.00	£11,588.00
Urbanchain Ltd	£31,364.00	£35,410.00	£4,046.00
Rossendale Borough Council	£9,900.00	£11,000.00	£1,100.00
Northern Powergrid (Northeast) Limited	£1.00	£7,140.00	£7,139.00
Centre For Energy Equality Ltd	£44,890.00	£67,000.00	£22,110.00
Rossendale Valley Energy Limited	£66,150.00	£73,500.00	£7,350.00
Uk Power Networks (Operations) Limited	£1.00	£1875.00	£1,874.00
University Of Salford	£44,980.00	£49,980.00	£5,000.00
Buro Happold Limited	£190,420.00	£211,577.00	£21,157.00
Kensa Utilities Limited	£2,500.00	£3,000.00	£3,000.00

**Section 7 - Alpha Phase – Special Conditions**

If applicable, please describe how you have met the requirements of any project specific conditions set out in the Project Direction.

The project had one project specific condition to make reasonable endeavours to engage with Community Energy Scotland and Community Energy England, Local Energy Scotland, and HeatSource during the Alpha Phase to discuss any opportunities for collaboration and dissemination of the Project's findings, and for informing the Project on any of the existing work already underway.

During Alpha phase the project had regular engagement with Community Energy England through the community low carbon heat working group and held meetings with Local Energy Scotland and Reheat UK.

The opportunity created by this stakeholder engagement led to sharing project progress and disseminating findings in a NZT presentation given to Community Energy England.