Solent Achieving Value through Efficiency
OPTIMISING PROJECT LEARNING THROUGH TRIAL ITERATION ADJUSTMENT AND HOUSEHOLD MONITOR EQUIPMENT CHANGE
Change Request 001

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Manual Version Control

Version	Date	Author	Change Description
1.8	17/03/15	Alexander Howison	Submitted Document inclusive of Appendix 3. Question Response
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1.1	20/01/15	Alexander Howison	Initial draft following detailed review with project partners

1   Introduction

The Solent Achieving Value through Efficiency (SAVE) is a Low Carbon Network Fund Tier 2 project selected during the 2013 funding round. This four year project is focussed on the low voltage (LV) network and aims to robustly trial and establish to what extent energy efficiency measures can be considered as a cost effective, predictable and sustainable tool for managing peak demand as an alternative to network reinforcement. The project targets domestic customers only and trials include technological, financial and engagement solutions.

As a result of changes in material factors and learning since the Full Submission, SEPD are proposing changes to delivery in two aspects of the project; trial iteration design and household monitoring equipment.

The first aspect of the change proposal is to modify the active trial periods laid out within the Full Submission to optimise the potential for positive effects on load consumption and learning from the trial methods. The proposed change will not affect production of agreed SDRCs, Project delivery timetable or result in additional project cost.

The second aspect of the change proposal is to alter household monitoring equipment from optic sensors as identified within the Full Submission to clip-ammeter monitors. The proposed change will not affect production of agreed SDRCs, Project delivery timetable or result in additional project cost.

 This Change Request document identifies and explains the:

- current proposals within the Full Submission and areas of proposed change;

- process of identifying increased learning opportunities and reviewing of mitigation;

- proposed change to ensure all learning is delivered within the overall project; and

- why the proposed change is in customers' best interests

2   Trial design specifics and equipment detail within the Full Submission

2.1   Trial Design Background

The Full Submission for the SAVE project included the trial design plans:

> *"An iterative development approach – there are planned to be two trial periods which allows learning from the first period to be assessed and used to inform the approach for the second trial period. This will include learning from both aspects that worked, and those that didn't work" (page 7 Full Submission)*

The planned trial periods are further detailed:

"**Phase 3 – First trial iteration**, will last for one year (January 2016-December 2016). Both trial iteration phases are split into two six-month periods. The first period will give time to install technology, start tariffs and begin engagement campaigns; whilst the second period will allow a full six-month period of monitoring participant responses to the different methods deployed against the original July-December monitoring period. During this time, data will be collected, the customer response model will be updated and hypotheses will be refined.

Phase 4 – Second trial iteration, has a very similar format to Phase 3 (this time running from January 2017-December 2017). However, in this case, the first six-month period will be used to review the outcomes and learning from the first trial iteration in order to update the approach for each method. This will either be to improve delivery (e.g. how to target participants that did not engage in the first iteration), or to simply do things differently or more cheaply (e.g. to offer a lower rebate, or engage with participants on a more sophisticated basis through analysis of their appliance usage)." (Page 10 Full Submission)*

The trial iterations were visualised in Appendix K Project phasing diagram (below)
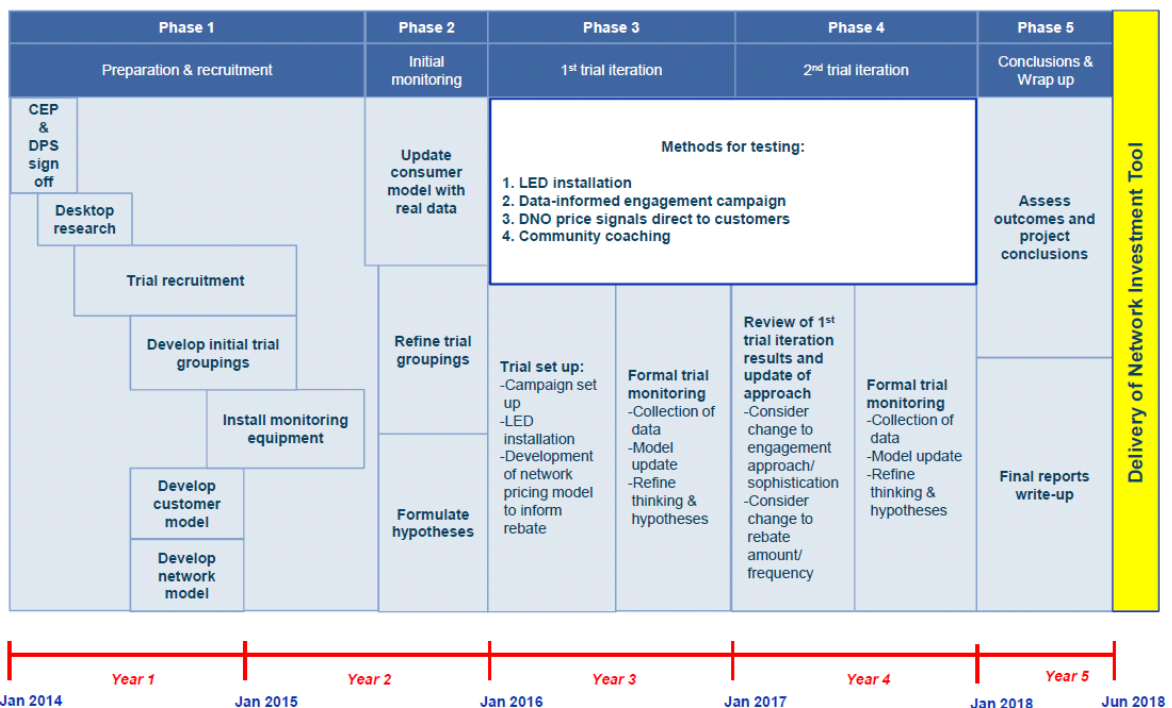
(Full Submission Appendix K, Project phasing diagram)

2.2 Optic Sensor Background

The Full Submission for the SAVE project included mention of equipment to be used in the household monitoring solution:

> "*Customers will be required to participate for the full period of their trial and for methods 1-3 this requires the installation of monitoring equipment supplied by Wireless Maingate ("Maingate") to record electricity consumption.*" *(Page 9 Full Submission)*

The monitoring equipment was then defined more fully as an optical sensor in Appendix L:

> ***"4 – Solution Overview***
> *The intended solution for the Save project consists of the following elements which fit in with the Maingate solution detailed within section 3 (figure 5), and consisting of the following components:*
> *· Power Reader – This is an optical sensor capable of reading consumption from both mechanical and solid state meters. Power readers will also be installed in every home. (Appendix L Full Submission)" (Appendix L, Maingate Proposal)*

The specific optical sensor monitoring solution was also defined within the SDRC timetable:

6	Install 80% of optic sensors and smart meters	Successfully install 80% of the optic sensors and smart meters within the properties of customers successfully recruited to trials, ensuring ability to retrieve data from both	Produce report detailing installation figures and indication of communications capability	Jun-2015

(Page 43, Full Submission)

2.3 Progress to date leading to Change Request

As reported in December 2014 Project Progress Report SDRCs 1, 2.1 and 7.1 have been completed in accordance with the Full Submission. SDRC 1 reviewed learning from energy efficiency projects completed before SAVE implementation and produced a report offering preferred approaches for the application of energy efficiency measures and engagement techniques for DNO's to adopt. The implication of this was that the learning captured would directly effect the SAVE projects trial design, the associated dissemination process identified seasonal peaks as a core focus for energy efficiency and DSR activities for DNOs.

 These findings were investigated by SEPD and Project partner DNV GL resulting in the hypothesis that by adjusting the 'two-phase' trial approach to offer greater coverage of the higher peak demands associated with the winter periods, both potential learning and overall demand reduction could be

improved. Initial discussions covered efficiency of Project trial methods, financial impact, ease of implementation, seasonal effect on household appliance use and adherence to the Full Submission.

This proposal was discussed during September-November 2014 Project Review Boards. All partners assessed potential risks of the option prior to agreement and due diligence was applied during the identification and mitigation process which proved no negative effects would be sustained on current or future work packages. While acknowledgement was raised as to the reduced focus given to summer months, the nature of the methods trialled by the project, especially that of the LED and media led engagement would offer sustained, measurable load reduction over those periods, which, once combined with the monitoring of usage which would continue throughout the year, gave reassurance to the Project Partners that sufficient learning would still be generated over these periods. The final proposal was approved by all project partners at the December 2014 Project Review Board.

Coinciding with this investigation Wireless Maingate had identified an alternative to the NorthQ optical sensors described in the Full Submission. The Aeon labs clip-ammeter gave comparable accuracy but a more efficient fitting process and the added advantage of not securing to the individual meter, resulting in reduced installation time and reduced risk of connectivity or communication loss during or following meter recertification.

As anticipated in the December 2014 report, the project now seeks a Change Request to update:

1) The configuration of trial iterations set out in the Full Submission to realise the increased learning and demand reduction potential

2) The monitoring equipment definition set out in the in the Full Submission

3   Change to Trial Design Iteration

3.1   Description of the Change

Active trial periods will allow the Project to trial the effects of energy efficiency methods 1-4, analyse the effects of these methods and use the learning to inform the next iteration. The Full Submission detailed the trial periods as;

> "**Phase 3 – First trial iteration**, will last for one year (January 2016-December 2016). Both trial iteration phases are split into two six-month periods. The first period will give time to install technology, start tariffs and begin engagement campaigns; whilst the second period will allow a full six-month period of monitoring participant responses to the different methods deployed against the original July-December monitoring period. During this time, data will be collected, the customer response model will be updated and hypotheses will be

refined.

> *Phase 4 – Second trial iteration*, *has a very similar format to Phase 3 (this time running*
> *from January 2017-December 2017). However, in this case, the first six-month period will*
> *be used to review the outcomes and learning from the first trial iteration in order to update*
> *the approach for each method. This will either be to improve delivery (e.g. how to target*
> *participants that did not engage in the first iteration), or to simply do things differently or*
> *more cheaply (e.g. to offer a lower rebate, or engage with participants on a more*
> *sophisticated basis through analysis of their appliance usage)." (Page 10 Full Submission)*

This Change Request proposes that the trial design be adjusted to:

Phase 3 – First trial iteration, will last for 9 months (January 2016-October 2016) . The first period (January-March 2016) will give time to install technology, start tariffs and begin engagement campaigns; whilst the second period will allow a full six-month period of monitoring participant responses to the different methods deployed against the original, pre-trial July-December monitoring period. During this time, data will be collected, the customer response model will be updated and hypotheses will be refined.

Phase 4 – Second trial iteration period, similar format to Phase 3 (this time running from October 2016 to December 2017) the first six month period (October 2016-March 2017) will allow the refined methods to be trialled following review of the outcomes and learning provided from the first trial iteration. This will either be to improve delivery (e.g. how to target participants that did not engage in the first iteration), or to simply do things differently or more cheaply. The second period (March-October 2017) will allow analysis of the trials' effects and further refinement of the methods while data is collected on the sustained impact. The final period (October 2017-December 2017) will allow the final refined methods to be trialled following review of the outcomes and learning provided through periods one and two.

The key differences between the original and updated iterations are:

- The updated trial iteration offers three active trial periods totaling 12 months, giving greater focus on higher seasonal demands over the winter months while still recording sustained effect of methods 1-4 during summer months. The original trial iteration offered two active trial periods totaling 12 months with trials active through summer months when Distribution Networks are less constrained.

- The updated trial iteration allows for more focused learning and review periods between active trials, increasing effectiveness and ensuring greater success of methods 1-4. The original trial iteration allowed for only two review periods structured consecutively across 12 months between active trials, effectively restricting the Project to only one opportunity to improve the methods before re-trialing.

This change request proposes that Appendix K be updated to reflect the change as follows:

Appendix K Project phasing diagram
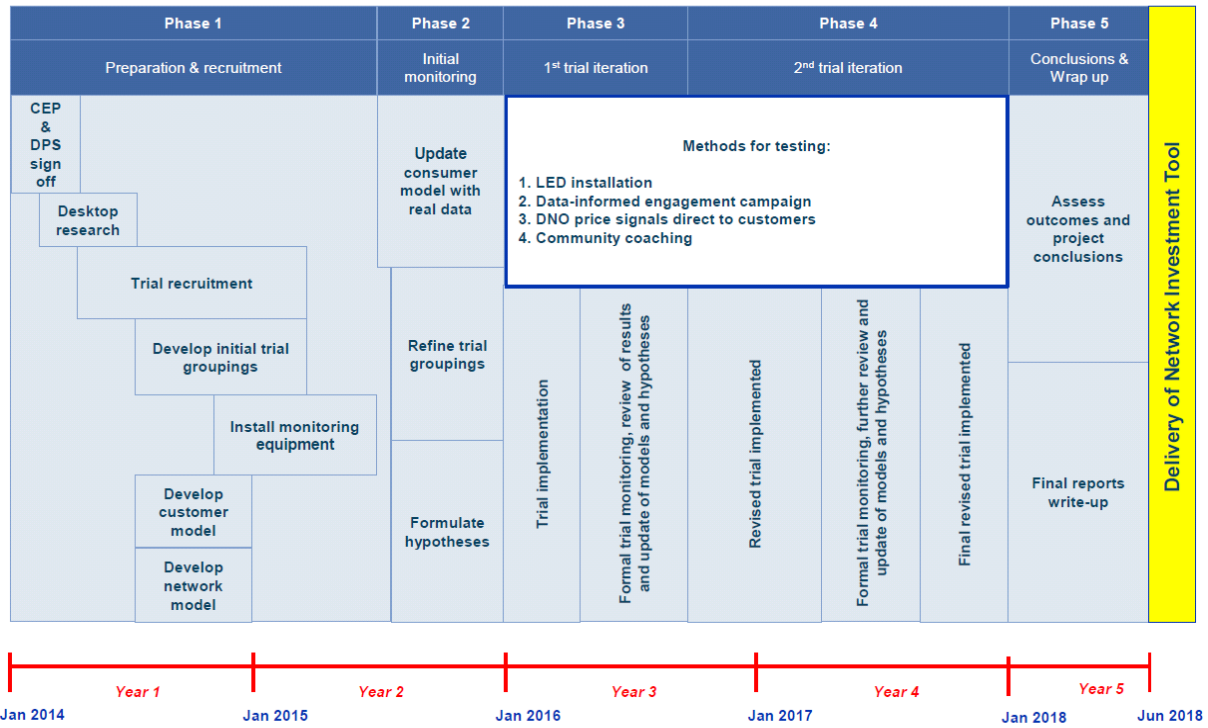
3.2 Reason for the Change

The update to the trial iteration design is based on the identification of a more effective trial structure offering listed benefits against the original proposal and available with no increase to project budget required.

3.3 Why the change is in the best interests of customers

The trial iterations are a core aspect of the Project, used to test the effectiveness and sustainability of the Project's methods and will result in the successful completion of SDRCs 8.3, 8.4, 8.7 and 8.8. The trial's success will also increase the accuracy and validity of the final Network Investment Tool which the Project aims to produce and report on within SDRC 8.2.

The updated trial iterations remain consistent with the Full Submission learning delivery, timescales and do not increase project cost while improving the validity and value of the learning potential gained through increasing the number of trial iterations.

The updated trial iterations increase the potential demand reduction effect of each method by allowing a further period of learning, assessment and trial refinement followed by a further active trial period to evaluate the effect of refinements.

Seasonal peaks offer the most difficult periods for DNOs to manage demand/capacity, and by focusing the trial periods and utilising an additional trial iteration along with an additional assessment and improvement period, the Project maximises the potential effect the trial measures will have against peak demand. This change will also result in the potential for increased learning from the additional trial iteration and improvement period which will allow both overall energy efficiency savings and peak demand savings to be specifically tested across separate trial periods.

Summer peak reduction will still be explored with continuous monitoring and residual load reduction captured throughout the Project lifespan. The trial methods are each designed to give sustained load reduction which will continue to effect peak and overall loads beyond active trials, by focussing active trials at times of greatest network constraint the Project will maximise the financial value of the Projects learning and still provide year-round data on load reduction.

4　Change to Household Monitor Equipment

4.1　Description of the Change

Household monitoring will be installed in up to 4,600 properties within the Project recruitment phase. The Full Submission proposed the following sensor array would be part of this solution;

> "Power Reader – This is an optical sensor capable of reading consumption from both mechanical and solid state meters." (Appendix L Full Submission)

This proposal was defined within SDRC 6 of the Full Submission:

6	Install 80% of optic sensors and smart meters	Successfully install 80% of the optic sensors and smart meters within the properties of customers successfully recruited to trials, ensuring ability to retrieve data from both	Produce report detailing installation figures and indication of communications capability	Jun-2015

This Change Request proposes that the type of sensor used within the monitoring solution be updated to:

> Aeon Clamp – This is a clip-ammeter capable of reading consumption across all meter

types.

This Change Request proposes that SDRC 6 is updated to:

6	Install 80% of clamp sensors and smart meters	Successfully install 80% of the clamp sensors and smart meters within the properties of customers successfully recruited to trials, ensuring ability to retrieve data from both	Produce report detailing installation figures and indication of communications capability	Jun-2015

The key differences between the original and new equipment specifications are:

- The new equipment monitors energy consumption through a clip connection on the meter tails whereas the original equipment was reliant on achieving a secure and accurate fitting to the meter. While accuracy of load monitoring from the units is comparable the new equipment is much easier to install providing greater efficiency during the recruitment process

- The new equipment monitors energy consumption from the meter tails of a customer's installation whereas the original sensor required connection to the meter unit. The new equipment offers greater mitigation against loss of connection during meter replacement or recertification

- The new equipment connection is less invasive to the meter installation and offers a more secure connection for monitoring, reducing the risk of accidental interference during the project lifespan against the original equipment

- The new equipment can be easily redeployed to assist with managing churn in recruited properties thanks to the design of its clamp whereas the original equipment would require replacement attachment fittings to be used

4.2   Reason for the Change

The update to the proposed monitoring equipment is based on the identification of more effective equipment offering listed benefits against the original proposal and available with no increase to project budget required.

4.3   Why the change is in the best interests of customers

The requirement for household monitors within the project remains unchanged- the data obtained from the monitoring of household consumption is essential to the accuracy and validity of the network investment tool the project aims to produce.

The updated equipment is consistent with the original Full Submission in terms of the information collected, however it offers greater security in connection and ongoing communication with the project by mitigating against forms of accidental interference or adverse adjustment during meter replacement.

The updated equipment also offers easier installation resulting in less intrusion on customers during the installation process, reduced potential for problems with meter readings, greater efficiency during the recruitment phase and does not increase cost to customers.

5 Appendices

To illustrate the decision process that has been undertaken concerning both proposed changes, the following appendices have been included:
1. DNV GL – Trial option Evidence Statement
2. Wireless Maingate – Sensor change Letter of Support
3. Ofgem questions - response

DNV·GL

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Date:
28/01/2015

Dear Alex,

Thank you for seeking our written views on the new approach to the trial periods design of the SAVE project.

Having reviewed the initial trial periods as stated in the bid and having explored in detail other potential approaches, we think that the proposed changes are in customers' best interests. Based on our involvement in the SAVE trials, we would like to state that changing the trial periods to Jan-Mar 2016, Oct 2016-Mar 2017 and Oct-Dec 2017, has the advantages of:

- Testing whole winter period (Oct 2016-Mar 2017) when distribution networks are particularly under stress;

- Introducing an extra trial period, during which we could further improve trialled interventions or introduce new ones;

- Sticking to the calendar year approach and matching the initially planned overall trial duration; and

- Achieving dual outcome, by promoting overall energy efficiency savings during the first trial period and focusing on network peak demand savings during the last two trials.

The proposed deployment plan ensures:

- the delivery of all stated learning outcome in the original bid; and

- robustness and learning while still meeting project timelines.

We hope this letter is helpful for SSEPD to secure the necessary approvals from Ofgem. If we can be of any further assistance please let us know.

Sincerely yours,
for DNV KEMA Ltd

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30th January 2015

Decision to change from Optical Sensors to Monitoring Clamps for the SAVE project

Initially the project had intended to use the NorthQ optical sensor, however prior to equipment ordering the new Aeon labs power monitoring clamp became available, which better suited the project for the following reasons:

- Ease Of Use - The Aeon clamp has a comparable accuracy level to the NorthQ sensor, but brings with it the advantage of being easier to fit. Regardless of the meter type (mechanical, solid state, smart meter), the fitting process is exactly the same and is also a lot simpler. The NorthQ sensor requires some time to fit accurately due to requiring exact placing on the meter itself, whereas the Aeon sensor is a simple clamp that connects to the cable running from the meter to the consumer unit and not directly attach to the meter. This has 2 main advantages:
  - Firstly the time and skill required to fit the clamp is considerably less, with the chance of error being dramatically reduced.
  - Secondly, as the clamp can be re-used, it means that should the project wish the clamp can be reclaimed and reused (for example if a household leaves the trial or moves house).

This not only saves the project money, but supports participant numbers being kept as high as possible.

- Increased Options – As the NorthQ optical sensor requires attaching directly to the meter, monitoring buildings where the meter is a large distance from the living area (e.g. flats) is not possible. Because the Aeon clamp can be attached to the cables just prior to the consumer unit, distance between the meter and consumer unit is no longer an issue. This increases the options for the project.

David Owen
Managing Director
Wireless Maingate Ltd.

maingate

Appendix 3 - Ofgem questions received 13/03/15 & SEPD response

Trial Iterations
Phase 3 – First trial iteration
- You propose to reduce the first period; time to install technology, start tariffs and begin engagement, from six to three months. Please explain the implications of this time constraint and how the plan has been adapted to fit a six month activity into three months? How are you ensuring things are set up to the same standard as to what was originally planned?
- DNV GL in partnership with SEPD are planning trial iterations early to ensure readiness for the initial trial period with all media and engagement material prepped for the January start date. The trial activity is not being compacted from six months to three months, it is being split into two separate trial periods each of three months allowing for further improvements to be made to our approach in the interim periods. Standards of engagement, technology and trial management will remain at Full Submission expectations or above thanks to the additional assessment and improvement period. It is essential to clarify that there has been no overall reduction in 'active' or 'inactive' trial periods so the quality of data and effectiveness of methods will not be negatively affected by this change.

- Originally you allowed for a full six month period to monitor participant responses, from July to December 2016. This could then be compared to the original July - December monitoring period. This change means you will be comparing monitoring data from ~April - October, with the July – December data. The two data sets will now be for different seasonal periods. How will the seasonal variations you have introduced here affect this analysis? What is being done to ensure the learning potential from this analysis is not reduced from this change?
- Household monitors and the data they provide are being installed on site from March 2015. We will therefore have a record of usage from a percentage of participants from March 2015 increasing to 100% of respondents by June through to December 2015. Two analytic approaches will then be used:
    o The January – April 2016 intervention period will be analysed using a predominantly matched case-control approach using multivariate and/or propensity score –based techniques to compare the intervention groups with the control and to take into account potential differences in initial behaviour within the trial groups. This is standard practice in e.g. medical research projects where no pre-trial data collection is possible. 'Before and after' analysis will also be conducted for the subsample of respondents who were already being monitored by April 2015. Insights from combining these analyses will provide initial findings and support iteration of the trial design during mid 2016
    o The October – December 2016 intervention period will make use of the 100% 'before vs after' nature of the data to explicitly control for initial starting behaviour and thus to enhance our ability to isolate causal relationships and so understand the reason for any behaviour change revealed..

Phase 4 – Second trial iteration period
- The new third final period introduced only lasts for 3 months. The original periods were sixth months. We recognise the value of having an additional period to allow for final refined methods, that wasn't originally planned for. However, how can you ensure the three months of monitoring data collection offers enough for robust analysis? Were other options/monitoring periods looked at? (this also goes for the first three month trial period)

- The new trial iteration period was rigorously assessed by SEPD and Project partners before submission with the University of Southampton approving the analysis periods for the proposed change. There is emerging evidence from other trials and experiments that most observable behavioural change would take place within the early stages of the intervention and also that adaptions (and novelty effects) would have settled to a steady state by the end of month three. Other potential options for extending the active trial periods beyond January 2018 were discounted due to the reduction in required analysis and reporting periods. Starting active trials earlier and extending the overall trial period available was also discounted as these would have reduced the monitoring of 'base' usage prior to active trials. The proposed change maximises the use of 'inactive' periods to assess and improve method implementation without adversely affecting analysis, reporting or base monitoring periods of the Project. Monitoring of project participants will continue unhindered throughout both active and inactive periods of the Project providing sufficient data to UoS across seasonal, demographic and geographic variations to produce robust analysis.

Changing sensors

- Are there any cost implications to changing the type of meter sensor? The Maingate support letter also alludes to cost savings from the new type of sensor. Please explain.
- The change of meter sensor does not directly affect the financial cost of the project as the units were comparable in price when secured for the project. The potential to re-use these monitors result in cost savings post installation and post Project, with sensors able to be re-sited after installation changes in participants properties or participants moving house. The original optic sensor did not offer this flexibility without replacement of the adhesive patch which would have resulted in additional cost/loss of participant to the project. The new clamp enables the project to retains participants and maintain a statistical degree of accurate data as the expected reduction in sample size over the project lifespan can be mitigated. In addition to this increased flexibility the 4,600 sensors can potentially be re-used post completion of SAVE in other projects where a need to monitor household usage is defined, which could result in cost reduction of future innovations projects.