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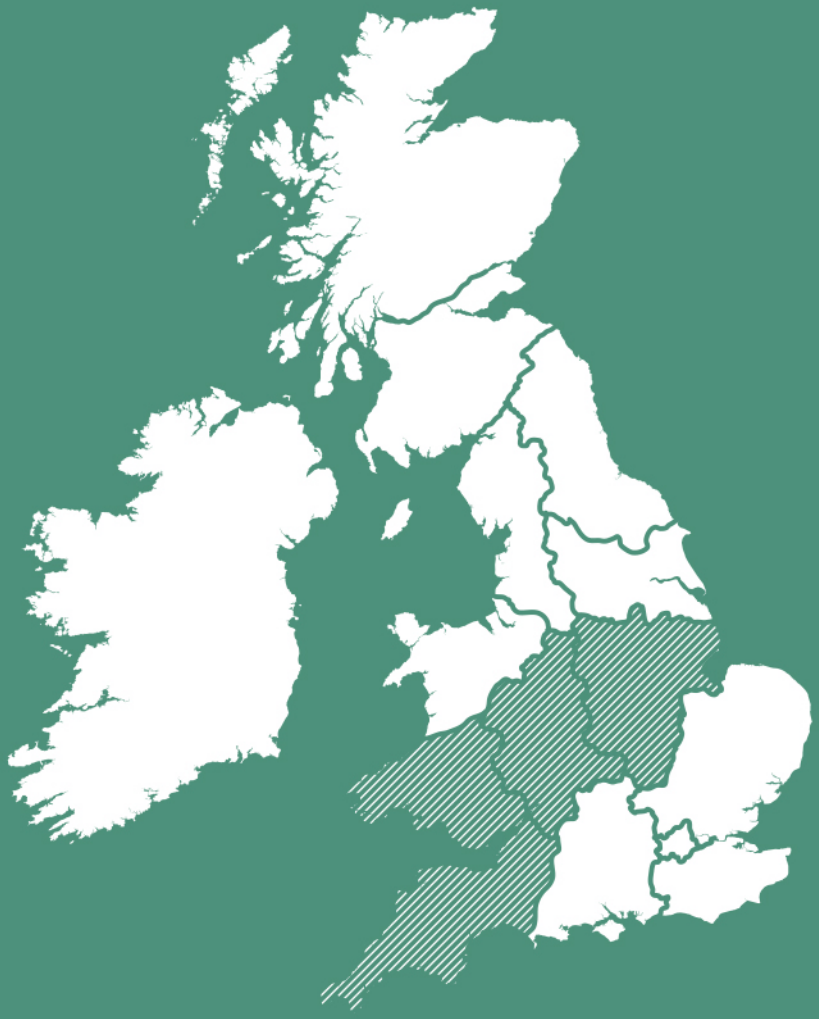
SUNSHINE TARIFF

CLOSE DOWN REPORT



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Contents

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Glossary

Abbreviation	Term
DNO	Distribution Network Operator
DSO	Distribution System Operator
DSR	Demand side response
DUoS	Distribution Use of System
EHV	Extra High Voltage
FAQs	Frequently Asked Questions
HH	Half Hourly
kW and kWh	Kilowatt and Kilowatt-hour
kV	Kilovolt
LBU	Local Balancing Unit
LLF	Line Loss Factor
MW and MWh	Megawatt and Megawatt-hour
PV	Photovoltaic
WPD	Western Power Distribution
WREN	Wadebridge Renewable Energy Network

Executive Summary

The rapid increase in deployment of distributed generation since the introduction of the Feed in Tariff has led to the distribution networks becoming constrained. Several areas of the network now require extensive reinforcement before additional generation can be connected. This can add significant time and costs to generation projects and can often make them unfeasible.

This project sought to develop and trial the feasibility of an 'offset connection agreement', which would enable generation customers to connect to the network on the basis that they could change the pattern of local demand on the network to offset the power generated.

The first phase of the trial was a feasibility study that looked at the commercial viability of a time of use tariff – the Sunshine Tariff – that would act as the incentive to shift demand. The second phase trialled the tariff in the town of Wadebridge in Cornwall.

The findings suggested that an offset connection agreement alongside a time of use tariff does not provide a straightforward solution to the network capacity problem in current markets. Persuading customers to switch suppliers and change their consumption patterns was challenging. Furthermore the shift in consumption to the middle of the day for customers without automation control technology was small. The findings suggest that 650 customers would be required to offset the generation from a 250 kW solar farm.

However, in the future, it may be more viable. The findings demonstrated that customers with automated control technology were able to shift 13 percent compared to 5 percent for those without. And the larger energy users tended to have more flexible load, such as a hot water immersion system or electric vehicle, and as a result were able to shift 18 percent of their daily demand into the Sunshine Tariff period. Therefore, as smart appliances and energy storage become more widespread, fewer customers would be required to sign up to the Sunshine Tariff to support an offset connection agreement.

Looking more generally at the viability of domestic demand side response, learning from the Sunshine Tariff trial shows the importance of key market developments:

- High penetration of smart metering and domestic half hourly settlement
- Simpler and more efficient supplier switching
- Increases in domestic flexible loads
- Increases in penetration of automation technology.

The findings also suggest that those that are more engaged in energy issues are more likely to sign up to demand side response schemes. This suggests that a price incentive alone is not enough and that education will need to accompany the introduction of time of use tariffs and automated control technology.

1 Project Background

1.1 Problem

Distribution Network Operators have an obligation to provide connections to customers in the most cost effective manner. However, due to the high penetration of distributed generation, several areas now require extensive reinforcement before additional generation can be connected. This can add significant time and costs to projects and can often make them unfeasible.

Even with the introduction of alternative connections, where reinforcement costs are avoided on the acceptance of export constraint, the curtailment can be too severe for projects to be viable.

As such there is continued interest in ways of connecting additional generation at minimal costs without compromising the security and quality of supply to existing customers.

1.2 Method

This project investigated the feasibility of an 'offset' connection agreement. With such an agreement, connection to a constrained network would be accepted with evidence that additional demand can be sourced to offset the generation.

By incentivising domestic demand shifting to times of peak PV output (10am-4pm, April to September), generation should be absorbed locally and have no effect on constraints at higher voltage levels.

This project trialled a reduced 'Sunshine Tariff' to determine the effect on demand profiles and its viability as the basis of a connection offer.

1.3 Scale

The proposed method for controlling load was to engage around 240 homes with four levels of intervention as follows:

1. Manual interventions (≈60 homes)

   Customer directly turns on appliances based on the reward of a reduced tariff at a pre- arranged time of day.

2. Manual interventions with feedback (≈60 homes)

   As above but with regular feedback from the local community energy cooperative – Wadebridge Renewable Energy Network (WREN) – on money saved and kW shifted, with both benchmarked against others in the trial.

3. Automated hot water controller (≈60 homes)

A controller pre-set to bring on electrical water heating at the time of reduced price, either by means of a timer, or by remote switching.

4. Automated load switching (≈60 homes)

   Tempus Energy (the supplier) to identify the flexible loads in the customers' premises and add the ability for remote switching to it.

In addition to the trial subgroups there was a fifth, additional group which acted as a trial control:

5. Control group (≈60 homes)

   The control comprised customers that reside just outside of the trial catchment area, but wanted to be involved in the trial. They received a smart meter and were put on a flat rate tariff of 13.4p/kWh. As there is no financial incentive for control-group customers to shift their demand, their consumption during the trial was used as a comparison to the other subgroups.

1.4 Geographical area

The study area considered was the area fed from Wadebridge Primary substation. As there were no other in-feeds to the local network in normal running, any generation increases could be directly offset by demand on the same network.

Wadebridge is in an area where the renewable energy resources (wind and sun) are very good and consequently, the distribution network is constrained and the Extra High Voltage (EHV) network is generally considered to be at capacity. The potential increase in demand would allow extra local generation with zero net effect on the higher voltages.

Wadebridge was also selected due to the presence of the Wadebridge Renewable Energy Network (WREN), a community energy cooperative with over 1100 members. WREN has recently had a proposed 250kW solar array project postponed due to high grid connection costs.

Other factors include the desire to connect additional local renewable generation to a constrained 11kV network and a large number of off-gas-grid customers.

2 Scope & Objectives

The project had 2 phases; the first investigated and reported on the commercial viability of the tariff, exploring current and future value streams to fund it. Whilst there was clear value to the generator, we also explored the value for both supplier and DNO. Phase 2 was the domestic demand side response trial. With a tariff subsidised by the supplier, we investigated the effects of the tariff on demand, exploring the extent and reliability of any increase. Four levels of intervention were trialled: tariff only; tariff and feed-back; basic automated water heating; and fully automated flexible load switching. The tariff was managed and administered by Tempus, however the customer engagement was conducted by the local energy cooperative WREN.

We envisaged that this type of connection could be of particular interest to community energy groups, such as WREN, who don't have the movability of commercial developers but would have the links to change customer behaviour.

No generator was connected as part of the trial due to the inherent financial risk. Also the technical systems for regulating or disconnecting such a generator were not be trialled as the systems required were dependant on the knowledge this trial sought to gain.

Objective	Status
Whether and how an offset connection agreement could be structured to be commercially viable for a generator?	✓
Whether and how an offset connection agreement could be structured and implemented to provide confidence to a DNO that the network will remain within operating limits?	✓
What mix of low tariff, behavioural signals and technology options would be most effective in shifting demand?	✓
What scale, longevity and reliability of demand side response would be achieved by the most effective method?	✓

3 Success Criteria

Success Criteria	Status
Understanding of feasibility of an offset connection agreement for both DNO and developer (including legal arrangements)	✓
Understanding of the capacity, longevity and reliability of domestic demand side response	✓
Recruitment of over 200 participants in the trial, on time and on budget	✗
Retention of at least 80% of participants through to the end of the trial	✓
Learning gained in the project successfully disseminated	✓

4 Details of Work Carried Out

The project had 2 phases: the first investigated and reported on the commercial viability of the tariff between July and November 2015; and the second was the domestic demand side response trial, which ran from November 2015 until January 2017.

4.1 Phase 1: Feasibility

Phase 1 of the project investigated the commercial viability of a new time of use tariff, the 'Sunshine Tariff' (off-peak pricing from 10am-4pm daily for 6 months of the year).

The study explored:

- Potential sources of value for a Sunshine Tariff by looking at the current supplier market and use of system charging methodologies,
- Barriers to roll out in current markets,
- Current tariff viability,
- Potential changes to the supply market and the DNO model in the future,
- Future sources of value,
- Future tariff viability, and
- Permutations of an offset connection agreement, including the requirements for generator confidence in the offset and the control system, as well as timescales.

The outcome of the study determined whether phase 2 went ahead or not. A viable tariff in current markets was required to justify investing in a field trial.

4.2 Phase 2: Trial delivery

Phase 2 was the domestic demand side response trial. The activities can be grouped into design and build; delivery; and analysis and reporting, as set out below.

4.2.1 Design and build

The design and build stage ran from November 2015 to the launch of the tariff on 1 April 2016, and included the following activities:

- Final tariff structure agreed by all partners.

The supplier, Tempus Energy, presented three tariff options to partners. WREN chose the 5p/kWh Sunshine Tariff option, as this was closest to the income for a solar farm from the Feed-in Tariff.

- Supplier backend systems and processes established.

Tempus Energy was required to establish different systems to process Sunshine Tariff customers. For example, the development of the online data platform and alternative billing systems.

- Engagement strategy and customer journey agreed.

WREN developed an engagement strategy for the recruitment stage with input from partners. This detailed all the engagement and marketing techniques to be used.

The step-by-step customer journey was also articulated, to ensure that the customers' needs were always put first and all partners were clear on their roles and responsibilities in relation to customer engagement. This included a complaints procedure.

- Media strategy and Q&A written and agreed by all partners.

The engagement strategy included use of the media to promote the trial to potential participants. It also included a Q&A of difficult questions that the media, key stakeholders or potential customers could ask.

- Sunshine Tariff recruitment launch.

The tariff was launched at the beginning of January 2016 with an event with the partners, local MP, key stakeholders and local press.

- Data management systems put in place and tested, in line with data protection policies.

Each partner handling personal data had to have a data protection policy in place. Data management systems were then designed to ensure that personal data was protected and that data flows between partners were effective.

- Marketing material designed and published.

Marketing material was put together by WREN and Tempus that reflected the local context in Wadebridge and used the familiar branding of WREN. The marketing material included a poster, customer information booklet, Frequently Asked Questions (FAQs) booklet, customer charter and customer journey

- Comparative baseline study carried out.

Baseline data was not available for any of the Sunshine Tariff customers, as smart meters were installed in the month before the tariff was launched. Consequently, an alternative comparative baseline needed to be established.

Regen looked at a number of datasets, including Elexon profile data and average smart meter profiles provided by Ovo for its Cornwall customers, and made recommendations on which data provided the most useful comparative baseline to then be reviewed when data from the control group became available.

4.2.2 Delivery

The Sunshine Tariff started on 1 April 2016. During the delivery stage, the following activities were carried out:

- Review of sign-ups and population characteristics assessment.

Regular reviews of customer sign-ups were carried out during the recruitment process and any problems addressed by partners. An assessment of the population characteristics was also carried out, which then fed into the final findings.

- Technology installations.

Installations needed to be scheduled for smart meters, hot water immersion timers and smart switches. A technology installation plan was put in place. The installation process involved the meter manufacturer, the meter operator, a local plumber, Tempus and WREN.

- Maintenance of a complaints register.

A complaints procedure was established to ensure resolution within five working days and WREN maintained a register of any complaints.

- Online data platform.

Plans were put in place for an online data platform where Sunshine Tariff customers would be able to login and monitor their electricity consumption. However, problems with the smart meters meant that Tempus were not able to populate the platform and it was never launched.

- Regular billing.

Tempus was not able to accurately bill customers throughout the trial period due to problems with the smart meters. Therefore, all customers were settled at 5p/kWh at the end of the trial.

- Feedback to subgroup 2.

20 customers signed up for subgroup 2, which included regular feedback from WREN on their performance. This was not possible due to the problems with the smart meters. Consequently subgroups 1 and 2 were combined in the analysis as they both had the time of use tariff alone.

- Project review and change request.

A project review was carried out due to the limited customer sign-ups and the smart meter problems. This resulted in the shortening of the trial and the reduction in the quantitative analysis conducted. The project budget was reduced in line with these changes and an amended PEA produced.

- Switch customers away from Sunshine Tariff.

The original plan was to automatically switch customers from the Sunshine Tariff to Tempus' Evolution Tariff on 1 October 2016, so that no action was required from the customer unless they wanted to switch to an alternative supplier. However, Tempus Energy closed the supply arm of its business in September 2016, so WREN and Tempus assisted all customers in switching to alternative suppliers to ensure that no customers ended up with the Supplier of Last Resort.

4.2.3 Analysis and reporting

The final stage of the project was the data collection, analysis and reporting of findings, as set out below:

- Manual collection of half hourly customer data.

The problems with the smart meters meant that data had to be manually downloaded from each meter. This activity was carried out by WREN in 53 of the 61 properties.

- Provision of clean dataset including academic assessment of value.

Not every minute or half hour time period generated data for every household. In some cases, hours, days or weeks' worth of data was missing from the data sets. Therefore, in order to compare data streams, a certain amount of data processing had to be undertaken before analysis could take place.

Furthermore, the low number of sign-ups meant that the confidence level of any findings was in question. Therefore an academic assessment of the value of the data was sought from Exeter University to help shape the analysis and presentation of results.

- Post tariff survey and interviews.

Qualitative data was also collected from Sunshine Tariff customers through an online survey and follow up interviews. Out of 46 customers, 34 responded to the survey and 10 customers were interviewed.

- Findings reports.

The quantitative and qualitative analysis was carried out by Regen and the findings were summarised in a report, 'The customer response'.

- Dissemination.

In addition to publishing learning reports on the lead DNO's website, the Learning Portal and the Network Innovation conference, partners:

- Ran a webinar,
- Issued a local press release,
- Held and event in Wadebridge to thank participants,
- Published reports on Regen and WREN websites,
- Partners to speak at relevant events/conferences.

5 Outcomes

5.1 Phase 1: Feasibility

The Feasibility Study concluded that the Sunshine Tariff was viable in current markets, which was proven by the existing time of use tariffs that use a combination of increasing the peak tariff to compensate for a lower off-peak tariff with reflecting lower costs from both wholesale prices and DUoS charges. The potential for a subsidy on top of existing methods to bring off-peak tariffs down would make the Sunshine Tariff not only viable, but attractive and competitive in the current market.

Sources of funding identified for a subsidy were:

- Avoided network reinforcement costs to both the developer and DNO. Estimation of the potential contribution from the generator is a subsidy of 1p/kWh,
- The value of being able to connect and generate for a developer that would otherwise find the reinforcement costs prohibitive is estimated to be worth 1p/kWh (depending on market conditions),
- The value to the supplier of community buy-in is worth approximately £50 per household.

The study also looked at the Sunshine Tariff model in future markets and found that they could enable further funding streams to support the reliability and sustainability of a Sunshine Tariff. These future funding streams included:

- A Local Balancing Unit (LBU) that reduce both use of system and balancing costs,
- Bilateral contracts between either the supplier or generator and the Distribution System Operator (DSO) to pay for system balancing services,
- Lower DUoS charges where there is reduced pressure on the distribution network through local balancing and/or time of use that supports load flattening,
- Reduced line loss factors (LLFs) where energy is balanced and used locally.

New local supply models could also help facilitate a Sunshine Tariff through greater flexibility in the price paid for generation, the way tariffs are set and the relationship between the generator and customer. Furthermore, the increase in time of use tariffs available in the market will make propositions such as the Sunshine Tariff more attractive to a wider range of suppliers, as well as lead to greater understanding from customers on how they work and how to maximise the benefits.

More details on the feasibility work can be found in the Feasibility Report located on the WPD innovation website: https://www.westernpowerinnovation.co.uk/Document-library/2017/Sunshine-Tariff/Final-Sunshine-Tariff-Feasibility-Report.aspx

5.2 Phase 2: Trial delivery

5.2.1 Customer recruitment

Encouraging households to switch suppliers is more challenging than expected. The target number of households was 240 plus a control group. However, despite having enquiries from 380 people, only 89 households attempted to sign up and 46 took part in the trial (plus 15 in the control group).

Considerable learning was gained from the recruitment and switching process. The key findings are as follows:

Participant demographics – those that were already engaged in energy issues were more likely to sign up. And the participating households tended to be more affluent than the wider population in Cornwall, which may result from being more engaged in energy issues, having more flexible load to shift and being more willing to take the risk of signing up to a trial.

Timescales required – The timescale for recruitment was significantly reduced to eight weeks, which contributed to lower than hoped numbers of participating households. The target number of households to take part was 240, however, only 46 were successfully recruited. The increased time would have allowed greater impact by word of mouth and potentially reached a much wider audience. Furthermore, allowing more time for switching and installing technology would have enabled a number of households to remain in the trial.

Tariff Attractiveness – It is, however, questionable that the extra time would have made a significant difference to the number of sign ups. There were several factors that made the tariff less attractive than hoped, which are set out below:

- Tariff design – The most common reason cited for choosing not to sign up to the tariff was that it didn't make financial sense for the customer.
- Market changes – The Sunshine Tariff was attractive when the project launched and sign up was high. However, after six weeks, the energy market conditions changed and the tariff was less competitive, which reduced sign-up significantly.
- Length of trial period – The six month trial period put some households off, as they were concerned about switching again at the end of the trial period.

Value of trusted local advice - Almost three quarters of the households that signed up for the trial were WREN members, suggesting that those already bought into the organisation trusted their advice. Evidence suggests that trust is a significant contributing factor to customers' switching patterns.

Challenges with switching – There were a number of barriers that prevented customers from switching suppliers, which had an impact on the number of sign ups.

More details on the customer recruitment can be found in the Customer Recruitment Report located on the WPD innovation website: https://www.westernpowerinnovation.co.uk/Document-library/2017/Sunshine-Tariff/Final-Sunshine-Tariff-Customer-Recruitment.aspx

5.2.2 The customer response

The quantitative data indicates that participants on the Sunshine Tariff shifted between 9 and 10 percent of their demand into the Sunshine Tariff period compared to the control group, and between four and seven percent compared to the Ovo baseline data. Most of the shift is from the evening period into the Sunshine Tariff period, with a reduction in the proportion of electricity used in the evening peak of approximately three percent against the control group.

The average consumption shifted into the Sunshine Tariff period compared with the control group was approximately 150 kWh over the Sunshine Tariff period from April to September. In order to offset the generation from a 250 kW solar farm, this finding suggests that approximately 650 Sunshine Tariff customers would be required.

The households with automation technology were able to shift 13 percent of their consumption into the 10:00-16:00 period compared to 5 percent for those without automation. The qualitative findings correlated with this. Overall, automated control technology was perceived to be helpful in shifting electricity consumption to the middle of the day and the customers with automation were more likely to sign up to a time of use tariff again in the future.

The findings from the households with automation technology suggest that 360 customers would be required to offset a 250 kW solar farm. Therefore, the concept of an offset connection will become more viable as automated control technology becomes more widespread and households have a greater flexible load, for example from electric vehicles and other forms of energy storage.

Other comparisons within the dataset indicated that:

- The retired/unemployed group were able to shift seven percent more demand to the middle of the day than the employed/self-employed, potentially due to being at home more during the day.
- The high energy users were able to shift a greater proportion of their consumption (18 percent) into the Sunshine Tariff hours than the low and medium energy users. This is most likely due to having a larger flexible load, such as hot water immersion or an electric vehicle.
- Although the sites with PV imported less power than those without PV, they tended to shift one percent more of their consumption into the 10:00-16:00 period than households without PV. The interviews and survey revealed that some customers

with PV had already established habits of using more power during the middle of the day and therefore didn't find it challenging to shift their consumption.

- Wadebridge Renewable Energy Network (WREN) members shifted up to three percent less consumption than non-members. There are several reasons why this might be the case. Firstly, there was a lower proportion of WREN members in subgroup B, which generally had higher loads and automation technology. Secondly, the customer survey revealed that when signing up, customers were more motivated by supporting WREN than saving money.

When customers were asked about how they changed their behaviour, their perception of how much they shifted was greater than the smart meter data indicated. This may be due to a lack of understanding of how much electricity appliances use. For example, it may require considerable effort to use a washing machine in the middle of the day instead of the evening, but the impact is relatively small.

Overall, customers reported a positive experience of taking part in the trial and when asked if customers would switch to a time of use tariff again in the future, nearly three quarters said they would.

More details on the customer response can be found in the Customer Response Report located on the WPD innovation website:

https://www.westernpowerinnovation.co.uk/Document-library/2017/Sunshine-Tariff/Final-Sunshine-Tariff-Customer-Response.aspx

6 Performance Compared to Original Aims, Objectives and Success Criteria

Objective	Performance
Whether and how an offset connection agreement could be structured to be commercially viable for a generator?	Findings from the trial suggest that an offset connection agreement is not viable in current markets. This is due to the challenges in persuading customers to switch suppliers and change their consumption patterns. Furthermore the actual shift in consumption to the middle of the day for customers is small. Therefore the generator would need to recruit a large number of customers to have any confidence in the offset being effective.
Whether and how an offset connection agreement could be structured and implemented to provide confidence to a DNO that the network will remain within operating limits?	As above.
What mix of low tariff, behavioural signals and technology options would be most effective in shifting demand?	The findings demonstrated that customers with automated control technology were able to shift 13 percent compared to 5 percent for those without. And the larger energy users tended to have more flexible load, such as a hot water immersion system or electric vehicle, and as a result were able to shift 18 percent of their daily demand into the 10:00-16:00 period.
What scale, longevity and reliability of demand side response would be achieved by the most effective method?	The scale of the demand side response is set out above. An assessment of performance over the trial period indicated that there was a decrease in the proportion of electricity used between 10:00-16:00 for those without automation technology during the last month of the trial. This is in contrast to those with automation technology that maintain consistently high electricity use during the sunshine period in the last two months, suggesting that the automation technology supported a more consistent approach.

Success Criteria	Performance
Understanding of feasibility of an offset connection agreement for both DNO and developer (including legal arrangements)	**Met** – Findings from the trial suggest that an offset connection agreement is not viable in current markets. See table above for more information.
Understanding of the capacity, longevity and reliability of domestic demand side response	**Met** – The quantitative and qualitative data provided an indication of capacity, longevity and reliability of domestic demand side response with the caveat that the results could not be extrapolated with confidence due to the sample size.
Recruitment of over 200 participants in the trial, on time and on budget	**Not met** – 46 participants were recruited. This resulted in a project review to ensure any further work maximised value for customers. An amended PEA was produced with a reduced project budget.
Retention of at least 80% of participants through to the end of the trial	**Met** – 100% of participants were retained throughout the trial period.
Learning gained in the project successfully disseminated	**Met** – Dissemination through a number of reports, an event and a webinar.

7 Required Modifications to the planned approach during the course of the project

A number of unforeseen issues arose during the trial, which resulted in modifications to the planned approach. The table below sets out the issues and modifications.

Issues	Modifications to approach
Lower than expected levels of recruitment	The recruitment period was extended from 31 March to 16 April to attempt to increase numbers. This meant that there wasn't a full dataset for those recruited after 31 March. A survey was carried out of the WREN membership that did not sign up to the tariff (450 households) to find out the reasons why they did not sign up. The smaller sample size resulted in a greater focus on qualitative findings from the customer survey and interviews, as well as seeking some academic advice on what could and couldn't be inferred from the quantitative data.
Connectivity problems with smart meters leading to limited consumption data	Despite ongoing work, Tempus was not able to accurately bill customers throughout the trial period or launch the online platform that allowed Sunshine Tariff customers to monitor their consumption behaviour and savings. As a result, all customers were settled at the lower 5p/kWh for all consumption at the end of the trial. WREN was to provide regular feedback to 20 subgroup 2 customers, but the lack of data made this impossible. Therefore they were informed that they would not be receiving this feedback and they were grouped with subgroup 1 customers for analysis purposes. Regen was to provide an Interim Report and updates on the data analysis throughout the trial delivery period. However, these were cancelled due to the lack of data. Costs were reduced accordingly. Problems collecting data meant that running the trial for an extra month would bring no additional learning. As such, to maximise resource and minimise cost, it was decided to bring the trial to an early end. This required submitting a change request form to Ofgem in August 2016.

	The data was manually downloaded from the meters by WREN following the early termination of the tariff. This was a resource-intensive exercise, but created a dataset for analysis.
WREN shop closure	WREN had to close its high street shop in Wadebridge at the end of July 2016. This meant that the Sunshine Tariff customers would not be able to receive face-to-face support from WREN by dropping into the shop. Therefore, a modification was made to the Customer Communications Plan.
Tempus Energy exit of supply market	Tempus announced in August 2016 that it was closing the supply arm of its business. This meant that the Sunshine Tariff customers would not be able to remain Tempus customers at the end of the trial, as stated in the marketing material. The short timescales also meant that WREN and Tempus had to ensure that all customers switched to a different supplier to avoid being automatically switched to the Supplier of Last Resort. This was achieved successfully.

8 Significant Variance to Cost and Benefits

The original project budget was reduced from £325,000 to £305,000 following the shortening of the trial.

Activity	Budget	Actual	Variance
WPD Project Management	35,500	39,256	-10.6%
Regen Costs	118,495	118,412	0.1%
WREN Costs	120,505	116,188	3.6%
Contingency	30,500	0	100%
Total	**305,000**	**273,856**	**10.2%**

The total project was delivered approximately 10% under the revised project budget. This is due to the contingency budget not being spent.

Managing the modifications to the project caused the WPD project management budget to be overspent by £3,756. This was offset by WREN delivering the customer engagement under budget.

9 Lessons Learnt

A number of lessons were learnt in addition to the findings set out in section 5 above. These are grouped by project management, recruitment, smart meters and data management, and dissemination.

9.1 Project management

A number of lessons were learnt around project management:

- Allow twice as much time to appoint a supplier and have back-up partners in mind for if any drop out in the early stages of the trial.
- Also allow time for setting up a collaboration agreement between partners with clear roles and responsibilities. The agreement should include a plan of how to deal with a partner dropping out.
- Fully understand the requirements of the Customer Communications Plan before setting the timeline for the approval process. It took several months for all partners to agree the approach to customer engagement, which included agreeing a Customer Charter and Customer Journey.
- Engage Ofgem at an earlier stage to pre-empt questions on the Customer Communications Plan to help speed up the approval process.
- Establish an external/media enquiry process at an earlier stage to avoid confusion or mixed messages. This is particularly important when there are a number of different partners.
- Innovation around Non Traditional Business Models, is challenging is due to the rapid changes in wider market around the project.

Further lessons around timescales are set out in the sections below.

9.2 Recruitment

Lessons learnt suggest that testing the tariff and marketing techniques before launching could have provided feedback on what was both attractive and unattractive about the tariff. It is also important to monitor the market to check for competitiveness and either adjust the fixed tariff before launching or track against a variable rate to ensure the tariff reflects changes in the market. Having multiple suppliers could also help mitigate this issue, as there would be more than one Sunshine Tariff available in the market.

Looking more generally at the viability of domestic demand side response, learning from recruiting for the Sunshine Tariff suggests that some external factors might need to change:

- All customers will need smart meters and in will need to be half hourly settled.
- Customers reluctance to switch suppliers must be addressed.

- Households will need to have more flexible loads, these may arrive in the form of Electric Vehicles, Domestics Storage and new heating systems.
- Households will require greater automation; this may require retrofits for existing equipment or the development of new standards for new Low Carbon Technologies.
- Some Time of Use tariffs will not be compatible with onsite generation.

Some of the above issues are being addressed through government policy and others will change as the smart energy and storage market evolves over the next few years. Therefore, this type of time of use tariff may become much more attractive in the future.

9.3 Smart meters and data

Tempus Energy installed a new model of meter, which had unique features and benefits such as being able to communicate in real time, compared to other meter providers that only send data consumed during half hour or wider time periods.

However, there were telecommunication problems that the meter supplier was unable to resolve, which resulted in difficulty retrieving the data from the meters. It would have been preferable to have used a meter that had been tried and tested in the UK. Therefore, data was manually downloaded directly from some of the smart meters at the end of the trial, which provided half hourly data, rather than minute-by-minute. This was a time consuming exercise that did not produce a full dataset.

The smart meter installation also took longer than planned, despite having an installation plan in place with risks and a mitigation strategy identified. There were issues with scheduling appointments and then connectivity problems with the meters.

The problems with the smart meters resulted in having a range of data sets, depending on whether data were transmitted by the smart meter or manually downloaded. Therefore, in order to compare data streams, a certain amount of data processing had to be undertaken, which was time consuming.

Ideally, the shift in consumption would have been measured against the average demand curve for each household from the previous summer. However, this dataset was not available and most of the smart meters were not installed until the start of the tariff. Therefore a comparative demand profile and a control group were established, against which a shift could be measured.

Learning around smart meter installation will be shared through the appropriate industry forums.

9.4 Dissemination

A media engagement strategy was compiled early in the trial with the goals of initially promoting the trial and then disseminating the learning. The trial received a significant amount of interest, in part due to national discussion about smart meters. The table below lists the coverage:

Date	Publication/broadcast
16-Oct-15	PV-magazine.com
19-Oct-15	Business Green
02-Nov-15	Daily Telegraph
19-Nov-15	Guardian
14-Dec-15	The Telegraph
06-Jan-16	Cornish Guardian
12-Jan-15	Pirate FM
13-Jan-16	Western Morning News
14-Jan-16	North Cornwall Advertiser (p22)
22-Jan-16	BBC SW Website
22-Jan-16	BBC Spotlight
22-Jan-16	Pirate FM
22-Jan-16	Western Morning News
24-Jan-16	Cornish Guardian
25-Jan-16	Solar Power Portal
26-Jan-16	Energy Live News
26-Jan-16	Business Green
26-Jan-16	BBC Radio Cornwall
01-Feb-16	The Times
01-Feb-16	North Cornwall Advertiser
01-Feb-16	The Bridge
01-Feb-16	Local Eyes
01-Feb-16	Community Energy Update
01-Apr-16	BBC Radio 4 - Today Programme
01-Apr-16	BBC Business
02-May-16	Sun & Wind Energy
03-Jan-17	Business Green
20-Feb-17	Solar Power Portal

At the end of the trial, the findings were disseminated in the following ways:

- Four learning reports were published on the WPD Innovation and Regen SW websites.
- A press release was disseminated to local press in Cornwall.
- A webinar was broadcast to 143 viewers.
- An event was held in Wadebridge to share findings and thank key stakeholders.
- A blog was published on the Regen SW website.

10 Planned Implementation

The offset connection agreement will not be rolled out by WPD. In current market conditions, with the limited demand that can be shifted and the challenges of engaging and keeping customers, domestic DSR isn't currently a feasible alternative to conventional reinforcement. WPD would expect this to be the case until certain key enablers such as half hourly settlement, widespread automation and the ability to gain value from multiple sources are common place. This would allow customers to access the full value of their flexibility with minimal intervention. As such, in order to continue delivering maximum value to the end customer, WPD will initially be focussing on transitioning the more mature, industrial and commercial DSR to business as usual.

11 Facilitate Replications

The other DNOs can benefit from the learning gained through the Sunshine Tariff trial. All findings are set out in the published reports:

- Feasibility study – Conclusions on the feasibility of time of use tariffs in current and future supply markets.
- Customer recruitment report – Learning gained from the recruitment and switching process, along with the implications for domestic demand side response mechanisms in current markets.
- The customer response – The qualitative and quantitative findings from the trial. The quantitative findings are descriptive and do not attempt to provide statistical association or correlation due to the small sample size. The qualitative analysis provides insight into the underlying attitudes of the participants to the study.

Both the raw and analysed data from the trial will also be available on request from WPD.

12 Contact

Further details on replicating the project can be made available from the following points of contact:

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