WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

SUNSHINE TARIFF

FEASIBILITY REPORT

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Contents

Glossary

Abbreviation	Term
ANM	Active Network Management
BSC	Balancing and Settlement Code
CoMC	Change of Measurement Class
DG	Distributed Generation
DNO	Distribution Network Operator
DSO	Distribution System Operator
DUoS	Distribution Use of System
EHV	Extra High Voltage
E7 and E10	Economy 7 and Economy 10
HH	Half Hourly
HV	High Voltage
kW and kWh	Kilowatts and Kilowatt hours
kV	Kilovolts
LBU	Local Balancing Unit
LLF	Line Loss Factor
LV	Low Voltage
MW and MWh	Megawatts and Megawatt hours
NHH	Non-Half Hourly
NTBM	Non Traditional Business Models
WPD	Western Power Distribution

Executive Summary

The Sunshine Tariff trial seeks to develop and test the feasibility of an 'offset connection agreement', which would enable generation customers to connect to the grid on the basis that they can change the pattern of local demand on the network to offset the power generated.

The purpose of this feasibility report is to set out the findings of a study into the commercial viability of a new time of use tariff, the 'Sunshine Tariff', to determine whether the second phase of trialling the tariff in a community should go ahead.

The paper concludes that the Sunshine Tariff is viable in current markets, which is 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 Distribution Use of System (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 are:

- 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 was estimated to be worth approximately £50 per household.

The study also looked at the Sunshine Tariff model in future markets and found that there was potential for further funding streams to support the reliability and sustainability of a Sunshine Tariff. These future funding streams include:

- A Local Balancing Unit (LBU) that reduces both use of system and balancing costs
- Bilateral contract 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.

The report then goes on to look at how to create a successful offset agreement, specifically how to ensure that the Sunshine Tariff incentivises a consistent and sustainable shift in demand, and what the options are for a reliable system for measuring the offset and controlling curtailment.

1 Background

The purpose of this feasibility report is to set out the findings of work carried out by Regen SW for WPD on 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 explores: whether a static time of use tariff is viable; the benefits to generators, DNOs and local demand customers; and if an offset connection agreement could be developed into a sustainable commercial product for developers.

2 Description of the Sunshine Tariff trial

2.1 Project scope

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

The trial will address the following questions:

- 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 statutory 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.

The project will involve two phases: phase 1 will investigate and report on the commercial viability of a Sunshine Tariff; and phase 2 will trial the Sunshine Tariff in a community.

2.1.1 Phase 1

In order for an offset connection agreement to be rolled out across WPD's area, the offset mechanism – in this case, the Sunshine Tariff – will need to be commercially viable and sustainable over the lifetime of the generating project. This raises questions around how the tariff will be funded and how the generator can be sure to achieve the desired offset to avoid curtailment.

Phase 1 will look at the feasibility of a Sunshine Tariff in the current market context, different models to fund the tariff over the long term and possible barriers to roll out. It will also look at potential future models, as the supplier market is changing rapidly and new models of supply are emerging that may help make the Sunshine Tariff concept more attractive.

2.1.2 Phase 2

The Sunshine Tariff trial will take place in Wadebridge, Cornwall, and use incentives and education to achieve a demand side response from domestic customers. The trial will monitor existing generator output and model how often they would have been constrained off, what the effect would be on their income and, therefore, whether and how an offset agreement could work for a generator.

The trial will not try to match the output of the generator with demand minute by minute. Instead it will stimulate the demand response between 10-4pm in the summer months (the times it would be constrained off under a timed connection), monitor the change in load against a baseline and model the impact this would have on a solar farm with an offset connection.

The proposed method for controlling load is 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 –10am to 4pm during summer months.

2. Manual interventions with feedback (≈60 homes)

   As above but with regular feedback the local community energy cooperative on money saved and kW shifted, with both benchmarked against others in the trial.

3. Automated hot water controller (≈60 homes)

   A controller is 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) will identify the flexible loads in the customers' premises and add the ability for remote switching to it.

2.2 Business case

There is an obligation on DNOs to continue to connect distributed generation (DG) on to the distribution network in the most cost effective way. Due to existing high DG penetration, several areas have significant reinforcement costs associated with further DG connections.

WPD is rolling out alternative connections to give developers a cheaper connection option that doesn't require reinforcement. However, the level of curtailment associated with the alternative connection agreement will determine whether the project is still bankable for the developer. It is possible that the reduction in income, and the fact that the risk of being disconnected is unquantifiable, makes many of the projects unviable.

This project seeks to develop and trial the feasibility of an 'offset connection agreement', which would enable generation customers to connect to the grid on the basis that they can change the pattern of local demand on the network to offset the power generated. It would be based on the timed alternative connection agreement but would give the developer the opportunity to shift local demand to the time of peak output from their generation.

It is expected that this might prove to be particularly attractive to community energy groups that are more able to influence demand and are more geographically limited than commercial developers, which can move around to find the most financially attractive sites.

For the purposes of this trial, the generator is already connected and energised. The findings will enable us to model the tariff level and number of households required to shift the necessary level of demand to enable a new project to be connected under an offset connection agreement. This feasibility study will model the different options for structuring the tariff and ways of funding it over the long term. If a sustainable model is identified in phase 1, phase 2 will then go ahead.

2.3 Project aims and outputs

- Understanding of feasibility of an offset connection agreement for both DNO and developer
- 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
- Project completed on time and on budget
- Learning gained in the project successfully disseminated.

3 Sunshine Tariff model in current markets

3.1 Current supplier market

Our electricity system was designed around a centralised market, where large power stations generate energy, national suppliers buy and sell this energy and the whole system is balanced on a national scale.

The market is complex and involves a number of parties, which are set out in the diagram below.

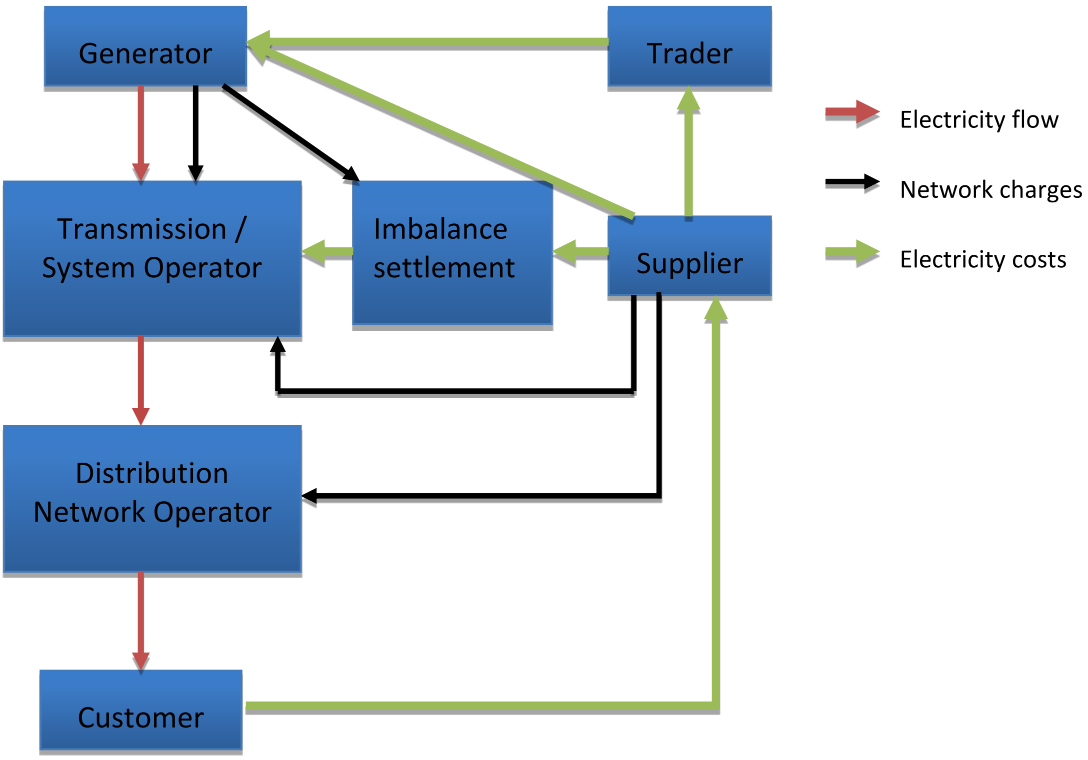

Figure 1: Current supplier model

Suppliers have various options for buying electricity, including a contract with a generator, through a trader over an energy exchange or within their own company if they are vertically integrated.

3.1.1 Balancing and settlement

A key part of the supplier's role is to ensure that electricity supply matches demand as closely as possible. Trading and balancing of electricity happens in half hour settlement periods. The supplier estimates how much their customers are going to need and buys enough generation to match this amount. After gate closure the System Operator monitors real-time demand and supply and has the ability to pay generators to switch off or on to help balance the system.

Metered data is collected from suppliers and generators and compared with the amounts contracted. This is either carried out on a half hourly basis or reconciled over a period of approximately 14 months to reflect later and more accurate consumption figures. This depends on the type of meter installed. The process of imbalance settlement is carried out by an organisation called Elexon and follows the rules set out in the Balancing and Settlement Code (BSC).

DNOs provide Elexon with line loss factors (LLFs) which are used to adjust the metering system volumes to take account of losses on the distribution network. This adjustment is made to ensure that energy bought or sold by a user, from/to a customer, accounts for energy lost as part of distributing energy to and from the customer's premises. LLFs are calculated in accordance with BSC Procedure (BSCP) 128, which determines the principles that DNOs must comply with when calculating LLFs.

3.1.2 A changing electricity market

The electricity supply market has long been dominated by the 'big six' energy companies. But we have seen a recent wave of new entrants with independent suppliers increasing their share of the market from just 0.2 percent to 7.6 percent over the last five years.[1] Ofgem has recognised that increasing competition, especially with the introduction of non-traditional business models (NTBMs), can help deliver lower bills and better social and environmental outcomes.[2]

More local supply models have emerged in recent years, such as local tariffs associated with a local generating station (e.g. Good Energy's local tariff for Hampole wind farm) and local white label tariffs (e.g. OVO Communities). Both of these tariff models require derogations from Ofgem's Retail Market Review rules, which prohibit any supplier from offering more than four core tariffs to a domestic customer at any time and in any region throughout Great Britain.

The roll-out of smart meters is also starting to change the way suppliers buy and sell energy. Their ability to record half-hourly (HH) consumption and be remotely read presents an opportunity to improve the accuracy and timeliness of the settlement process. There is already a process for settling consumers using HH data. Currently around 120,000 (predominantly larger) sites are settled through this process. It is possible to include smaller domestic sites, as long as a Change of Measurement Class (CoMC) is made, but it is not mandated and so it not widespread. Tempus Energy registers all its customers for HH settlement in order to benefit from being able to help customers shift their demand to cheaper times of the day.

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[1] Cornwall Energy, 2014

[2] https://www.ofgem.gov.uk/sites/default/files/docs/2015/02/non-traditional_business_models_discussion_paper.pdf

3.1.3 Typical electricity bill makeup

A typical electricity bills is made up of a number of elements. The chart below shows Ofgem's estimate of a typical large supplier's annual costs and pre-tax margin across a rolling 12-month period.[3]

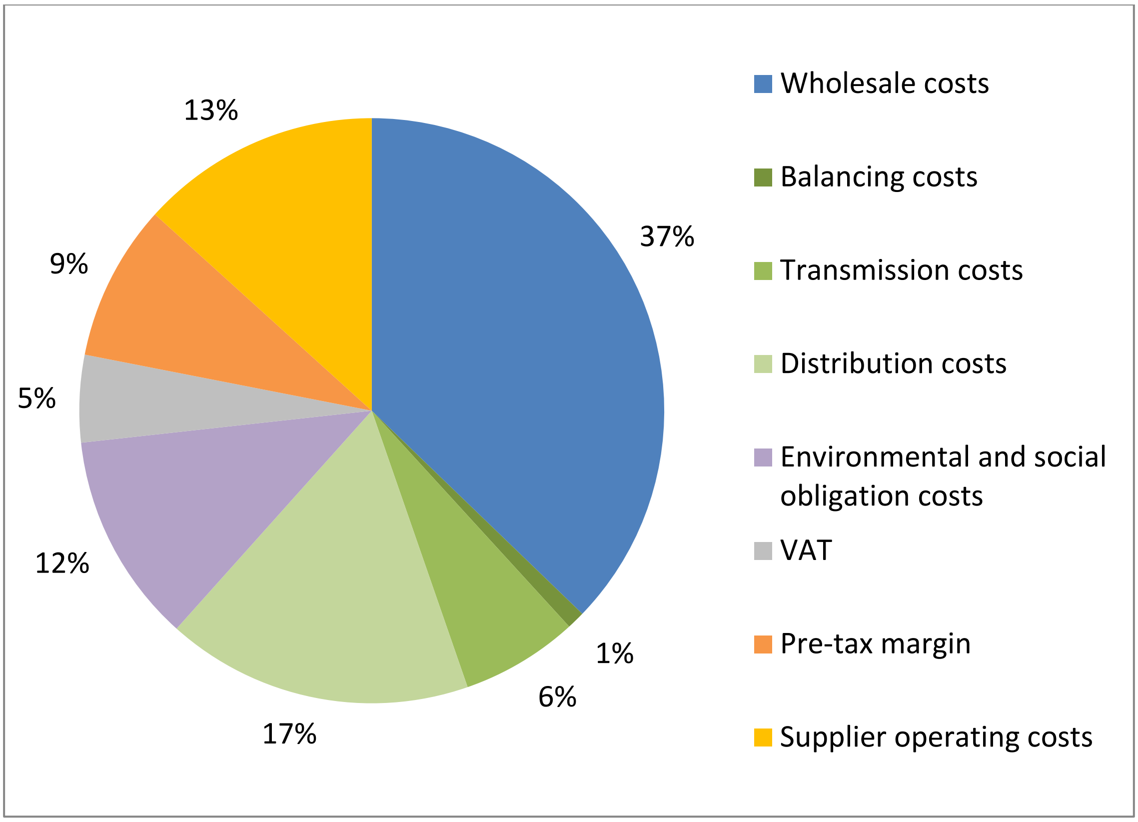

Figure 2: Typical large supplier's annual costs and pre-tax margin

3.1.4 Typical tariff structure

Suppliers are able to offer up to four different tariffs and each must be structured using only a single unit rate and, if they choose, a standing charge. In addition, a supplier may offer up to four core time of use tariffs for each meter that can support such tariffs (e.g. two rate meters for economy 7 tariffs, or smart meters). For consumers with multi-rate meters e.g. Economy 7, suppliers will able to offer more than one unit rate. Time of use tariffs will be permitted as long as there is only one unit rate applicable for any particular time period.[4]

Examples of tariff structures and estimation of annual bills are shown in the table below. These are taken from two suppliers (one of the 'big six' and one smaller supplier) and are based on Ofgem's annual domestic consumption figure of 3,200 kWh and assumes that 40 percent of power is consumed on the economy 7 night time rate.

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[3] Ofgem Charts: Outlook for costs that make up energy bills. Available at https://www.ofgem.gov.uk/publications-and-updates/charts-outlook-costs-make-energy-bills

[4] https://www.ofgem.gov.uk/ofgem-publications/39350/retail-market-review-final-domestic-proposals.pdf

Tariff	Standard / Economy 7	Standing Charge £/month	Unit Price £/kWh	Annual bill £
OVO Greener Energy	**Standard**	**8.31**	**0.1472**	**570.76**
	E7 Day	8.31	0.1666	419.59
	E7 Night	-	0.0854	109.31
	E7 combined	**-**	**-**	**528.90**
OVO Simpler Energy	**Standard**	**9.63**	**0.1387**	**559.40**
	E7 Day	9.63	0.1571	417.19
	E7 Night	9.63	0.0774	99.07
	E7 combined	**-**	**-**	**516.26**
OVO Better Energy	**Standard**	**8.31**	**0.1279**	**509.00**
	E7 Day	8.31	0.1444	376.97
	E7 Night	-	0.0734	93.95
	E7 combined	**-**	**-**	**470.92**
British Gas Fixed (May 2015 - DD)	**Standard**	**7.91**	**0.1133**	**457.48**
	E7 Day	7.91	0.1436	370.72
	E7 Night	-	0.0833	106.58
	E7 combined	**-**	**-**	**477.30**
British Gas Fixed (Sept 2015)	**Standard**	**10.04**	**0.1179**	**497.73**
	E7 Day	10.04	0.1737	453.95
	E7 Night	-	0.0495	63.36
	E7 combined	**-**	**-**	**517.31**

Table 1: Example tariff structures and estimated annual bills

The economy 7 daytime tariffs are set higher than the standard tariff to compensate for the lower night time tariff.

3.2 Current Distribution Use of System (DUoS) charging methodologies

DUoS charges make up approximately 17 percent of a typical electricity bill (see figure 2 above). DNOs utilise two billing approaches for non-EHV connected customers depending on the type of metering data received:

1. The 'Supercustomer' approach is used for Non-Half-Hourly (NHH) metered, NHH unmetered or aggregated Half-Hourly (HH) metered premises. Invoices are calculated on a periodic basis and are reconciled over a period of approximately 14 months to reflect later and more accurate consumption figures
2. The 'Site-specific' approach is used for HH metered or pseudo HH unmetered premises. The site-specific billing and payment approach makes use of HH metering data at premise level received through Settlement.

The HH meter allows different DUoS charges to apply to different time bands, which incentivises customers to use energy in the off-peak times. The tables below set out WPD's time bands for HH metered properties along with the charges for a range of premises. [5]

Time Bands for Half Hourly Metered Properties			
Time periods	Red Time Band	Amber Time Band	Green Time Band
Monday to Friday	17.00 - 19.00	07:30 to 17:00 19:00 to 21:30	00:00 to 07:30 21:30 to 24:00
Weekends		16:30 to 19:30	00:00 to 16:30 19:30 to 24:00
Notes	All the above times are in UK Clock time		

Table 2: Time bands for HH metered properties in the south west

	Open LLFCs	PCs	Unit rate 1 p/kWh (red/black)	Unit rate 2 p/kWh (amber/yellow)	Unit rate 3 p/kWh (green)	Fixed charge p/MPAN/day
Domestic Unrestricted	10, 20	1	2.910			4.56
Domestic Two Rate	30, 40	2	3.355	0.204		4.56
Domestic Off Peak (related MPAN)	430	2	0.181			
Small Non Domestic Unrestricted	110	3	2.056			7.32
Small Non Domestic Two Rate	210	4	2.523	0.195		7.32
Small Non Domestic Off Peak (related MPAN)	251	4	0.191			
LV Medium Non-Domestic	570	5-8	2.301	0.171		37.03
LV Sub Medium Non-Domestic	540	5-8	2.150	0.153		22.71
LV Network Domestic	202	0	28.255	0.630	0.210	4.56
LV Network Non-Domestic Non-CT	203	0	26.840	0.538	0.184	7.32
LV HH Metered	570	0	20.511	0.361	0.129	9.38

Table 3: WPD charges for a range of premises in the south west

Section 5.3.3 below looks at how energy use at different times of day can affect the DUoS charge and the tariff.

3.3 Current sources of value for a Sunshine Tariff

The Sunshine Tariff needs to provide an incentive for customers to shift consumption to the times of day when solar PV is generating. Therefore it needs to be significantly cheaper than at other times of the day. There are several ways of achieving a lower price:

1. Increasing the peak tariff to compensate for a lower off-peak tariff
2. Subsidising the lower tariff

[5] http://www.westernpower.co.uk/docs/system-charges/2015-Charging-Statements/SWEB-LC14-Complete-2015-V1-10-publish.aspx

3. Using smart meters to pass on the benefits of real-time wholesale prices and system charges in the tariff.

The following sections will address each in turn.

3.3.1 Increasing the peak tariff to compensate for a lower off-peak tariff

The time of use tariffs that are currently on the market use a slightly higher peak tariff to compensate for a lower off-peak tariff. Economy 7 (E7) and 10 (E10) use this approach, along with lower night time wholesale electricity prices and lower DUoS charges, to offer a lower tariff overnight.

An example of a standard tariff compared to an E7 tariff from one supplier is shown in the table below. The estimated annual cost is based on consumption of 11 kWh per day, with 30% of total electricity used in the cheaper 7 hours in one example and 40% in the other.

Tariff			Estimated annual cost	Total estimated annual cost
Standard standing charge	0.2542	£/day	£92.78	
Standard unit price	0.1268	£/kWh	£509.10	**£601.88**
E7 standing charge	0.2542	£/day	£92.78	
E7 unit price day	0.1402	£/kWh	£394.03	
E7 unit price night (30%)	0.0699	£/kWh	£84.19	**£571.01**
E7 standing charge	0.2542	£/day	£92.78	
E7 unit price day	0.1402	£/kWh	£337.74	
E7 unit price night (40%)	0.0699	£/kWh	£112.26	**£542.78**

Table 4: Comparison of annual costs for standard and E7 tariffs

The peak tariff is increased from 12.68p/kWh to 14.02p/kWh to help compensate for an off-peak tariff of 6.99p/kWh. The total estimated annual cost is still lower than the estimated cost from a standard tariff by up to 10 percent, which is due to the ability of the supplier to reflect lower wholesale costs and DUoS charges overnight.

In summary, slightly increasing the peak tariff compensates for a significantly lower off-peak tariff, which means that the supplier is not required to reduce its profit margin. This approach is already in use with existing time of use tariffs, such as E7 and E10, alongside other cost saving measures.

3.3.2 Subsidising the lower tariff

There are several potential value streams that could be used to subsidise a lower tariff, including the saving from avoided network reinforcement, the ability to connect and generate for the generator and the potential value from having community buy-in to the scheme.

Avoided network reinforcement provides value to both the developer and DNO. Solar PV developers tend to cap the amount they are willing to pay for a connection at around £100,000/MW.[6] The average cost of connection without reinforcement in early 2015 in the WPD area was £21,822/MW, which suggests that the developer could be saving approximately £78,000/MW on an offset connection that avoids network reinforcement. When this is broken down over the 20 year lifetime of the generating scheme and a discount factor of 6% applied, a subsidy of £5322 pa could be made available, which equates to 1p/kWh of generation (rounded down) during the sunshine hours.[7]

There is also value to the DNO from avoided reinforcement costs, which is apportioned between the generator and DNO (this cost to the DNO, paid for by bill payers, is capped at £200/kW). But it is harder to get to a £/MW figure as it is project and location specific, so each project would need to be evaluated separately. There is also a question of whether this saving should be socialised, so that all customers benefit, or whether it should be used to benefit those that are load shifting.

The ability to connect and generate for a developer that would otherwise find the reinforcement costs prohibitive can also be taken into account, as a smaller profit is of better value than no connection. Discussions with developers suggest that 10% is the upper limit of revenue forgone. But each project is, of course, different with some being very marginal and others having more room to play with. The prevailing market conditions also vary very significantly depending on government policies.

Under the proposed trial the developer would require a demand reduction for about 50% of their generation – so a 20% reduction in income during this period would be equivalent to a 10% reduction in income overall.

Under the Feed-in Tariff, generators received 4.28p/kWh for power they generate and 4.85p/kWh for power they export for a stand-alone solar project.[8] Some PPA providers will provide a top up on this price but for the sake of this calculation we will estimate the income at 9p/kWh. 20% of 9p/kWh gives us a potential subsidy of 1.8p/kWh during the sunshine hours.

It is worth noting that the level of saving from avoided network reinforcement will have an impact on the upper limit of revenue forgone. The combined figures come to 2.8p/kWh during sunshine hours, which is 1.4p/kWh over the year or 15.5% of revenue. In order to make sure that we are not double counting and that the subsidy is viable for the developer, it is likely that only one method is used to calculate the subsidy rather than a combination.

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[6] Anecdotal evidence from conversations with developers in early 2015. Conversations later in 2015 suggest that they were willing to pay much more – in some cases up to £200,000/MW. However, with lower subsidies that figure is likely to drop. The actual amount will depend on the specific project and the market conditions prevailing at the time.

[7] Based on estimate that a 1 MW solar farm would generate 963 MWh per year, approximately half of which would be generated within the Sunshine hours (10.00-16.00 April to September)

[8] October 2015 Feed-in Tariff rate

However, if government's proposals for more significant cuts to the Feed-in Tariff are approved, generators will receive only 1.03p/kWh for power they generate and 4.85p/kWh for power they export, bringing down the income to 5.88p/kWh from January 2016. As this subsidy cut is not in line with a reduction in costs for the developer, it will significantly decrease the profit margin and therefore the availability of a subsidy for the tariff. However, once costs have come down, a subsidy of 1p/kWh may become available.

Value from community buy-in can also be considered. If the generation is community-owned, the shareholders may be more inclined to reduce the profit margin as they could benefit in other ways, such as through having a lower local electricity tariff and the ability to connect and generate locally.

Furthermore, evidence suggests that a partnership with a community does have value to a supplier, as they are a trusted intermediary that can bring in new customers. For example, fairerpower, which was set up by East Cheshire Council in partnership with OVO Communities, is recruiting customers 19 times faster than the standard OVO business model.[9]

Consequently the OVO Communities offer works on a 'cost plus' model. OVO set out their price of buying power, their administrative costs, what they will pay per customer acquisition (approx £50) and charge a 3% margin. They also offer a PPA if the community has generation. The community partner can decide how to balance these elements and what tariff they will offer. They can, for example, agree time of use tariffs, or reduce their income from generation in order to fund a reduced tariff.

In the current market, the effect of this is essentially to ensure those switching get one of the lowest rates on the market and to provide a budget of around £50 per household. Although this would not provide a significant subsidy over a 20 year lifespan of a solar project, it could be used as a marketing budget for the tariff.

In summary, the distribution of value from the generator's ability to connect and generate without paying reinforcement costs could create a subsidy of 1p/kWh during the sunshine hours (depending on prevailing market conditions). In addition, the value to the supplier of community buy-in is worth approximately £50 per household.

3.3.3 Using smart meters to reflect real-time wholesale prices and system charges

The introduction of smart meters will enable real-time electricity prices to be reflected in the tariff the customer pays. At present, the majority of energy is settled 'non-half hourly' (NHH), using estimates of 'half-hourly' (HH) consumption. This is because most sites do not have meters that can record real-time energy consumption. But this is already changing as the smart meter roll-out gets underway.

Under the current arrangements set out in the Balancing and Settlement Code, larger non-domestic consumers must be settled against their actual HH consumption. However, a supplier can also elect to enter any consumer with an appropriate meter into HH

[9] Phone call with fairerpower at end of August 2015 after launch in March 2015.

settlement. Ofgem's ambition is for all consumers to be settled using HH consumption data.[10]

Tempus Energy are demonstrating that they can reduce different elements of customers' bills by settling them on a half hourly basis, as illustrated below:

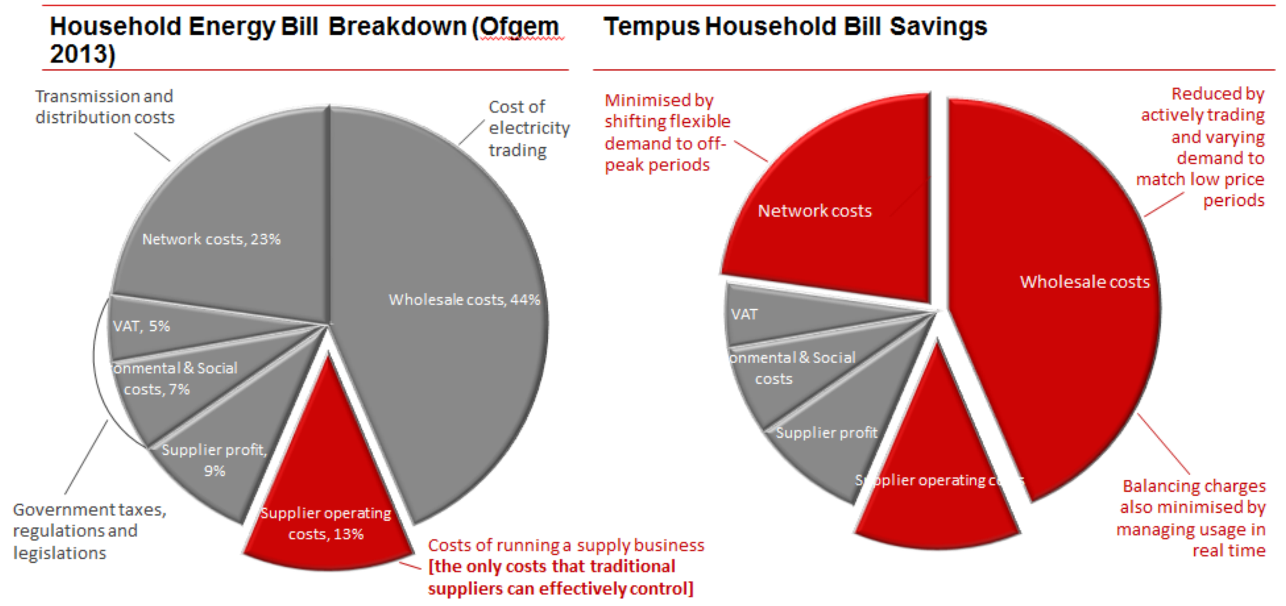

Figure 3: Tempus Energy bill optimisation

Wholesale electricity prices fluctuate over the 48 HH settlement periods, as illustrated in the graph below. At times of peak demand, the average cost of electricity tends to be higher than at off-peak periods. Customers that are HH settled can benefit from lower prices if they are able to shift demand away from these peak periods. This is one of the reasons why E7 and E10 can offer lower tariffs at night. However, there is also the risk that bills will be higher if flexibility is not found.

[10] https://www.ofgem.gov.uk/publications-and-updates/update-electricity-settlement-project

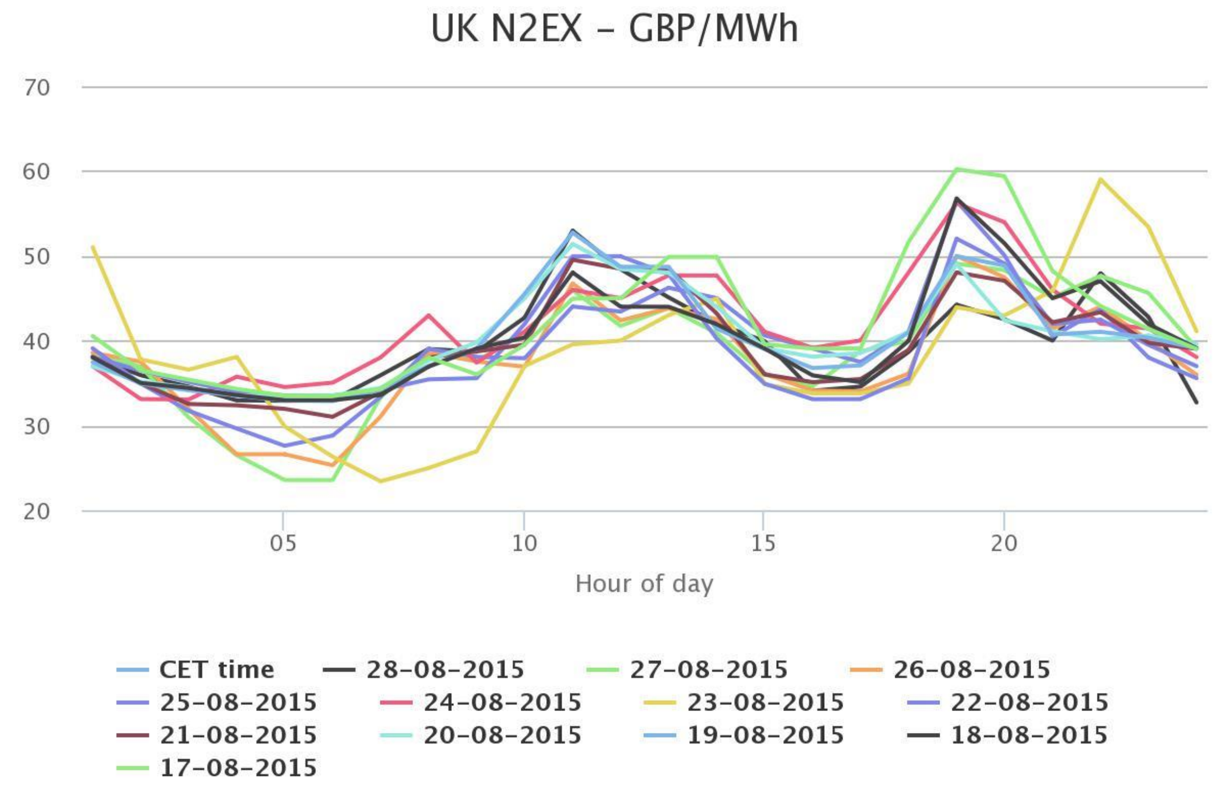

Figure 4: Day ahead electricity prices over 24 hour period[11]

The graph above shows that electricity prices increased by up to 50% from daytime to evening prices, for example from £40/MWh at 15:00 to £60/MWh at 19:00, demonstrating that the supplier could make savings by settling customers on a HH basis and reflecting these savings in time of use tariffs. Similarly, Tempus Energy's analysis of energy prices in 2014 shows an even larger difference between maximum and minimum prices in a day, as shown in the figure below:

[11] Nord Pool Spot - http://www.nordpoolspot.com/

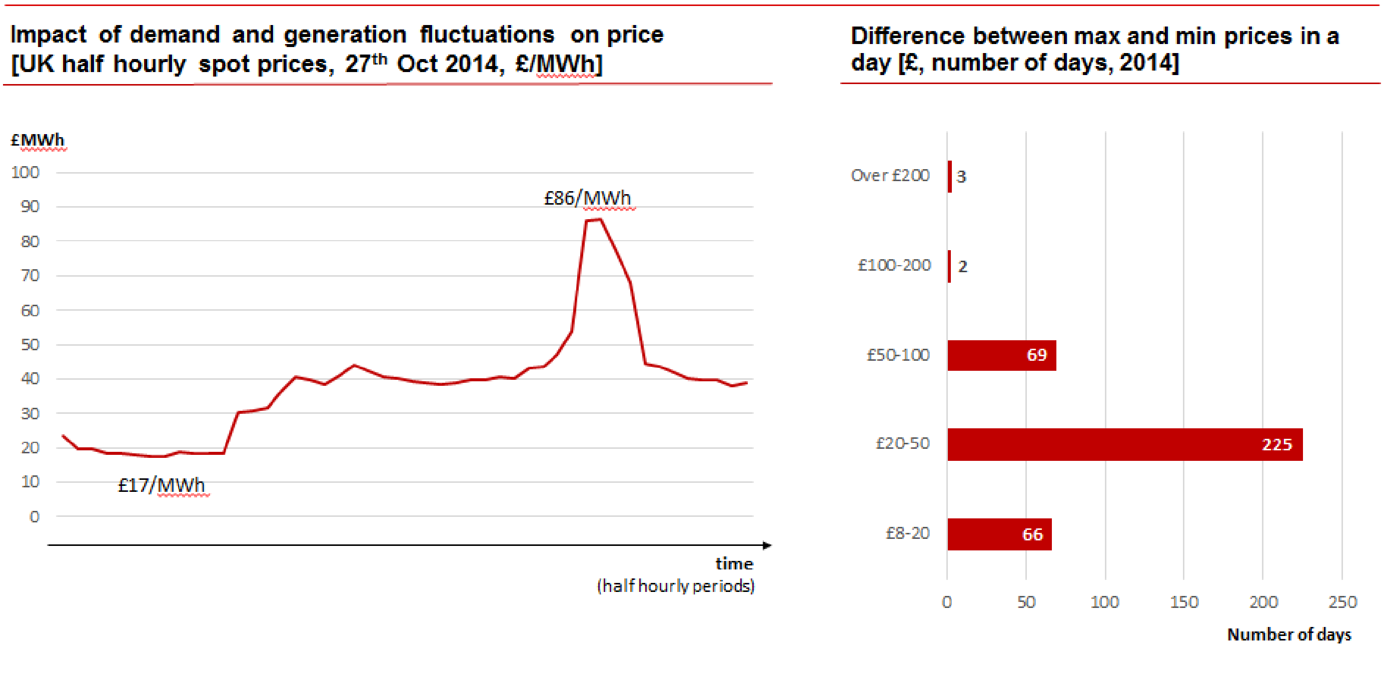

Figure 5: Tempus Energy analysis of energy prices

The table below compares wholesale costs[12] for different consumption patterns one week in autumn 2015 using Elexon consumption data for profile 1 customers.[13] If the customer is able to shift all of its consumption out of the peak band (5pm-7pm), there is a reduction in the daily wholesale cost of just under 9% using the average auction price over the week. However, when we use the day ahead prices for the most peaky day of the week, this reduction increases to just over 23% of the wholesale cost.

Consumption profile	Average auction price week of 28 Oct 2015 £/day	Average auction price on 4 Nov 2015 £/day
HH consumption based on average profile 1 data	0.46	0.56
100% of peak (red band) consumption shifted to amber band	0.42	0.43
50% of peak (red band) consumption shifted to amber band	0.44	0.49
Daily consumption spread equally across HH settlement periods	0.44	0.52

[12] Day ahead prices taken from Nord Pool Spot - http://www.nordpoolspot.com/

[13] https://www.elexon.co.uk/reference/technical-operations/profiling/ The average daily consumption of profile 1 customer is 11 kWh, with 11.6% consumed in the red time band, 57.6% in the amber time band and 30.8% in the green time band.

Table 5: Estimated wholesale electricity charge for different consumption profiles

However, prices would need to be looked at over a longer period of time for a more comprehensive analysis, as there will be seasonal as well as daily differences in prices (as illustrated in figure 5, the prices within one day can fluctuate as much as £200). It is also worth noting that the Sunshine Tariff trial will focus on shifting energy to the sunshine hours from any other time of the day, not necessarily out of the peak band. Therefore, the impact on prices might be different.

Furthermore, it is worth noting that most suppliers are not exposed to spot prices or unbalance charges in the same way as Tempus Energy as they buy blocks of power for a 12 or 24 hour period to hedge their risks. This means that they would not benefit from the potential savings.

System charges also fluctuate over a 24 hour period. Settling consumers against their HH consumption data will expose suppliers to the actual costs of transporting energy through the different DUoS unit rates for the three time bands (see section 5.2 above). Different unit rates already apply to E7 and E10 tariffs, which contributes to lower rates offered by suppliers.

If we use the Elexon consumption data for profile 1 customers to compare DUoS charges for 'domestic unrestricted' and 'LV HH metered', the average 'domestic unrestricted' customer would have a daily cost of approximately 36.6p compared to 38.3p for a 'LV HH metered' customer. However, if the customer is able to avoid peak hours between 17.00 and 19.00 on weekdays and shifts 100% of its consumption into the amber time band, it is able to reduce its DUoS charges to 12.6p per day. And when we look at how much energy customers are likely to shift as a result of a time of use tariff, the Low Carbon London trial findings[14] suggest that the most responsive participants shifted 0.12 kWh in a peak HH settlement period, which would result in DUoS charges of 33.5p per day.

It is worth noting that new tariffs will come into force on 5 November 2015 for domestic HH metered customers, which will switch from 'LV HH metered' to 'LV network domestic'. This will generally increase the charges unless the customer is able to significantly decrease consumption in the peak period.

The table below sets out how variations in a domestic HH metered customer's consumption profile affect the estimated daily DUoS charge for 'domestic unrestricted', 'LV HH metered' and 'LV network domestic' customers.

[14] Imperial College London (2014) Residential consumer responsiveness to time-varying pricing. ukpowernetworks.co.uk/innovation

Consumption profile	'Domestic unrestricted' p/day	'LV HH metered' p/day	'LV network domestic' p/day
HH consumption based on average profile 1 data	36.6	38.3	45.3
100% of peak (red band) consumption shifted to amber band	36.6	12.6	10.1
50% of peak (red band) consumption shifted to amber band	36.6	25.4	27.7
Daily consumption spread equally across HH settlement periods	36.6	30.8	34.9
Example of 'most responsive' participants in Low Carbon London trial	36.6	33.5	38.7

Table 6: Estimated DUoS charge for domestic HH metered customers

In summary, there is potential for HH settled domestic customers to save money on their electricity bills by reducing the wholesale electricity costs and DUoS charges. The level of this saving depends on the amount of flexible load available, as well as how much of the saving the supplier chooses to pass on to the customer. There is however, a risk that bills will be higher if flexibility is not found.

3.4 Barriers to roll out

There are several potential barriers to the roll-out of a Sunshine Tariff in the current electricity market. These are:

- The tariff requires a smart meter to be installed in every participating property. This is essential both for accurate billing, as well as for the supplier to benefit from entering the customer into the HH settlement
- Very few domestic customers are currently HH settled. There is a new model in the market provided by Tempus Energy that uses HH settlement to better reflect the real-time costs to the customer. However, this model is new and not yet widely used. There is also a small cost to the supplier for the Change of Measurement Class (CoMC) is made
- There is no tried and tested mechanism for distributing value from the developer and DNO from avoided network reinforcement costs to the customer through a tariff. Currently, any saving to the DNO is passed onto all customers through the DUoS charging system as a standardised discount. There is currently not a mechanism for locational specific savings, which therefore may require regulatory changes. There is also uncertainty around the actual saving that would be achieved by the developer and DNO as this will vary between different sites
- The reductions in the subsidies for solar PV may result in a significant cuts to the profit margin for developers, and therefore a reduced subsidy for the tariff
- The developer and its financiers would require confidence in the offset to be sure of achieving the required level of revenue to make the project viable. This means that

the tariff will need to remain attractive to customers over the lifetime of the generation project (up to 20 years) and be low enough to incentivise a shift in electricity consumption.

3.5 Current tariff viability

Simple time of use tariffs already exist on the market, such as E7 and E10, 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. Tempus Energy is also demonstrating that it is possible to lower wholesale costs and DUoS charges through settling all customers on a HH basis. Tempus is then able to reward the more flexible customers that shift demand away from peak times, demonstrating that there is significant value in the market alone.

In the case of the Sunshine Tariff, there is also potential to distribute value from the developer and DNO from avoided network reinforcement costs to the customer by subsidising the tariff. In addition, a developer may be willing to forego some of its profit when an offset connection enables its project to go ahead that would otherwise not be able to. This will be more likely where the developer is community owned, as there are additional community benefits from enabling a local project to go ahead along with the savings the community could achieve from having a local tariff.

In summary, 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.

4 Sunshine Tariff model in future markets

The electricity market is changing as we move towards a smarter, more efficient and competitive energy system. These changes include new products and services, such as DSR and storage, as well as new players, new roles and responsibilities and a changing commercial and regulatory context. Some of these changes mean that the distribution of value through a Sunshine Tariff will be easier and more efficient in future markets.

4.1 Potential changes in supplier charging methodologies

4.1.1 Settlement reform

Ofgem's ambition is for all consumers to be settled using HH consumption data.[15] The next steps for settlement reform will be set out in Ofgem's demand-side flexibility strategy, expected in late 2015, which will include the timescale for the transition to using HH data. The key stages are set out below.

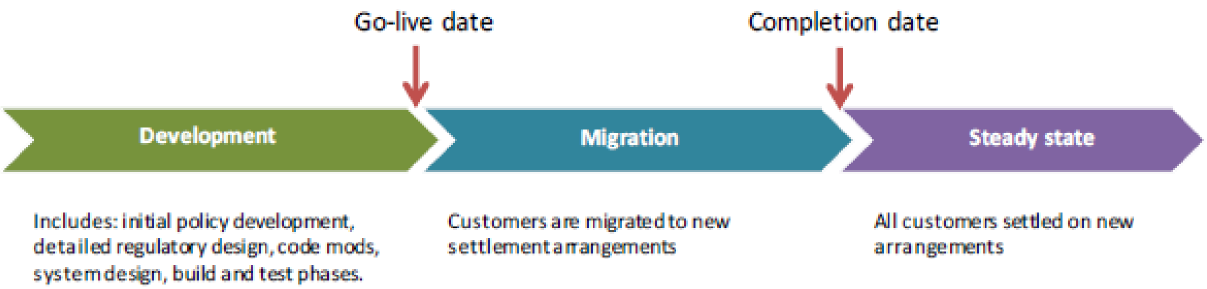

Figure 6: Ofgem's milestones for settlement reform

Under HH settlement, energy costs will become more cost-reflective for suppliers. These costs could then be passed onto customers in a way that reflects individual consumption patterns. Suppliers may choose to offer time of use tariffs to incentivise a shift to off-peak times and/or provide flexibility services to the network operator. Alternatively, suppliers could decide to spread costs over their portfolio of customers to mitigate the risk of vulnerable customers seeing an increase in their bills. But to remain competitive, it is likely that many suppliers will choose to offer a range of tariff options.

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.

4.1.2 Local supply models

As mentioned in section 5.1.2 above, we have seen a recent wave of new independent suppliers into the market and Ofgem has stated that it will remove regulatory barriers to

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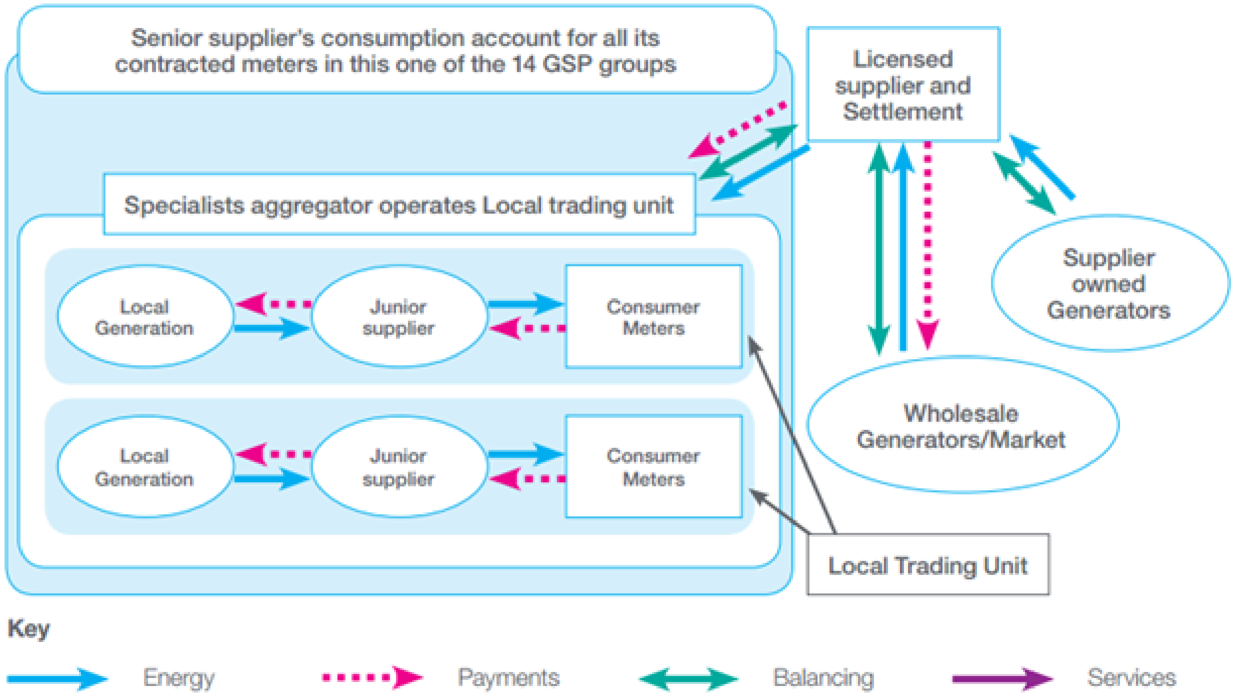
[15] Ofgem's Update on electricity settlement project (January 2015) https://www.ofgem.gov.uk/publications-and-updates/update-electricity-settlement-project

growth where non-traditional business models (NTBMs) can help drive down costs and deliver better environmental and social outcomes.

There are already numerous partnerships between licensed suppliers and community interest organisations, such as local authorities, social landlords and community energy groups, which use alternative charging methodologies to reduce the supplier (and in some cases generator) profit margin to reduce the local tariff. Some local authorities have also become fully licensed suppliers, giving them full control over setting the price they pay for local generation as well as the tariff prices for their customers.

There are further models currently being explored that enable local generation to be taken into account in a local market. These include netting-off generation from an aggregated demand curve for domestic customers (for example, the Energy Local trial[16]). This model fits well with Elexon's proposal for a Local Balancing Unit (LBU) – a new definition of a balancing mechanism unit (BMU), which is the unit of trade under the Balancing and Settlement Code. This would enable a junior supplier to net local generation and consumption before it is added to a senior supplier's position in the balancing settlement. This could reduce balancing charges for the junior supplier and enable them to claim the value of embedded benefits from the senior supplier, and therefore reduce tariffs.[17]



[16] http://www.energylocal.co.uk

[17] https://www.elexon.co.uk/wp-content/uploads/2015/03/Encouraging-local-energy-supply-through-a-local-balancing-unit_March2015.pdf

Figure 7: Model of settlement using a local balancing unit[18]

New local supply models could 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 potential for a LBU or similar model that enabled local generation to be netted off local consumption could help bring down the cost of a Sunshine Tariff, as it would reduce balancing and use of system charges.

4.2 Potential changes to the DNO model

The DECC/Ofgem Smart Grid Forum has explored how the DNO model will need to change to facilitate a smarter and more efficient network. This section covers how the overall model, the charging systems and connection process may evolve.

4.2.1 Move to a Distribution System Operator (DSO)

The Smart Grid Forum has looked at the potential new role of the Distribution System Operator (DSO) and the transition from a DNO. It has outlined potential evolutionary stages that would characterise a move to a DSO role as follows:

- Enhanced network monitoring and planning
- Real time reconfiguration of the network
- Commercial arrangements to manage the network under fault conditions
- Active network management to manage voltage or thermal constraints
- Distribution system balancing. [19]

In the transition period to a DSO, it is likely that we will see the use of bilateral contracts between DNOs and service providers, first in trials and then as business as usual. The commercial arrangements of this new market have not yet been developed in the UK. But it is worth noting that EU codes will soon require all renewable generators, above a certain size, to provide balancing and ancillary services,[20] which may further drive the need for local markets.

The move to a DSO would provide a means for the DNO to pay the supplier of a Sunshine Tariff for distribution system balancing, justified by the avoidance of reinforcement costs. This would provide another value stream for the tariff.

[18] University of Leeds (March 2015) Local Electricity Supply: Opportunities, archetypes and outcomes

[19] The GB customer focussed smart grid: Next steps for regulatory policy and commercial issues. Report of workstream 6 of the Smart Grid Forum 2015

[20] https://ec.europa.eu/energy/sites/ener/files/documents/RfG_100615.pdf

4.2.2 Restructuring DUoS charges

The Smart Grid Forum identified restructuring DUoS charging as a key option for enabling domestic consumers to engage with smart grids.[21] Changes to DUoS will make it possible to send time of use or locational signals, either directly to consumers or via suppliers. Therefore, it was recommended in the Smart Grid Forum Workstream 6 report that Ofgem trial alternative DUoS charging methodologies for networks where there is a high percentage of local generation and local use to better understand the potential and practicalities.

The Sunshine Tariff trial will test how much local generation can be matched with local demand. If the trial demonstrates that there is no need to export power from the solar farm into the wider network, there is an argument that lower DUoS charges could apply. A time of use signal may also be relevant if the shift in use relieves pressure on the network.

It is unlikely that a DSO would have a bilateral contract with the generator/supplier for system balancing services as well as restructuring DUoS charges, as this would be double counting. Instead, one or the other could apply.

Lower DUoS charges could apply to a Sunshine Tariff where it can be demonstrated that it reduces pressure on the distribution network through local balancing and/or use at times that supports load flattening.

4.2.3 Restructuring Line Loss Factors (LLFs)

As energy is transported from the point of production to the end user, some of it is 'lost'. Losses on the distribution networks are allocated through the use of Line Loss Factors (LLFs), which are calculated by the DNOs and passed onto Elexon to adjust metering system volumes in settlement.

The off peak LLF for the south west is 1.073, or a 7.3% addition to the energy consumed by the end customer to account for losses. It is estimated that 72% of losses occur after transformation down to the 11 kV network,[22] with 28% of losses occurring on the higher voltage networks. The distribution of electricity from the solar farm to the Sunshine Tariff customers does not require use the extra high voltage network and so could reduce losses by approximately 28%, which could reduce the LLF by 2% to 1.053. However, this quick analysis makes some crude assumptions and does not take into account standard losses nor the local network configuration. More detailed analysis is required.

Where generation and demand are balanced locally, such as with a Sunshine Tariff, there is an argument that a reduced LLF should apply as losses will be lower. This would reduce the total amount of energy paid for at settlement.

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[21] As above

[22] Imperial College and Sohn Associates (2014) Innovation Funding Incentive: Management of electricity distribution network losses

4.2.4 Flexible connections

The risk of curtailment under flexible connections makes the investment decision for developers difficult. The Smart Grid Forum highlighted the need for consideration of how and when to trigger and recover the costs of reinforcement after a flexible connection.[23] Specifically, it raised the issue of how to determine when the network has reached a certain level of curtailment that makes it optimal to reinforce instead of continuing to curtail generation. It proposed that Ofgem values constrained energy under flexible connections as an investment signal.

The consequence of this would be that flexible connections would become firm connections over time. Therefore, in the case of an offset connection agreement, the offset and associated tariff would not be required for the lifetime of the generation project. The exact timescale would depend on demand for DG connections in the local area, which is possible to forecast for each specific case, but not with a high degree of certainty.

The potential to move from an offset connection to a firm connection could provide the generator with a mitigation strategy for the risk of a Sunshine Tariff failing to shift demand over time.

4.3 Future tariff funding sources

This section has set out four potential sources of funding in a future smarter market:

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

Further analysis and modelling would be required to assess which approach would provide the best value for money, which would be most effective and what combination of approaches could be used without double-counting.

4.4 Future tariff viability

We concluded in section 4.5 that the Sunshine Tariff is viable in current markets, but future markets could provide additional funding streams to further reduce the tariff to make it more attractive to consumers and more sustainable over a longer period.

In addition to the future tariff funding sources set out above, the move to HH settlement will make time of use tariffs easier to set up and more widespread. If time of use tariffs become a standard offer, customers are likely to become more aware of how to optimise them and technology providers will see a market to support that optimisation, for example, through home energy management systems and smart appliances.

[23] As above

Furthermore, the potential for DNOs to use constrained energy under flexible connections as an investment signal could reduce the duration of an offset connection by many years, therefore, reducing the uncertainty of sustaining a Sunshine Tariff for 20 years.

The figure below sets out the Smart Grid Forum's implementation framework and next steps for the actions relevant to the Sunshine Tariff to give an indication of timescale.

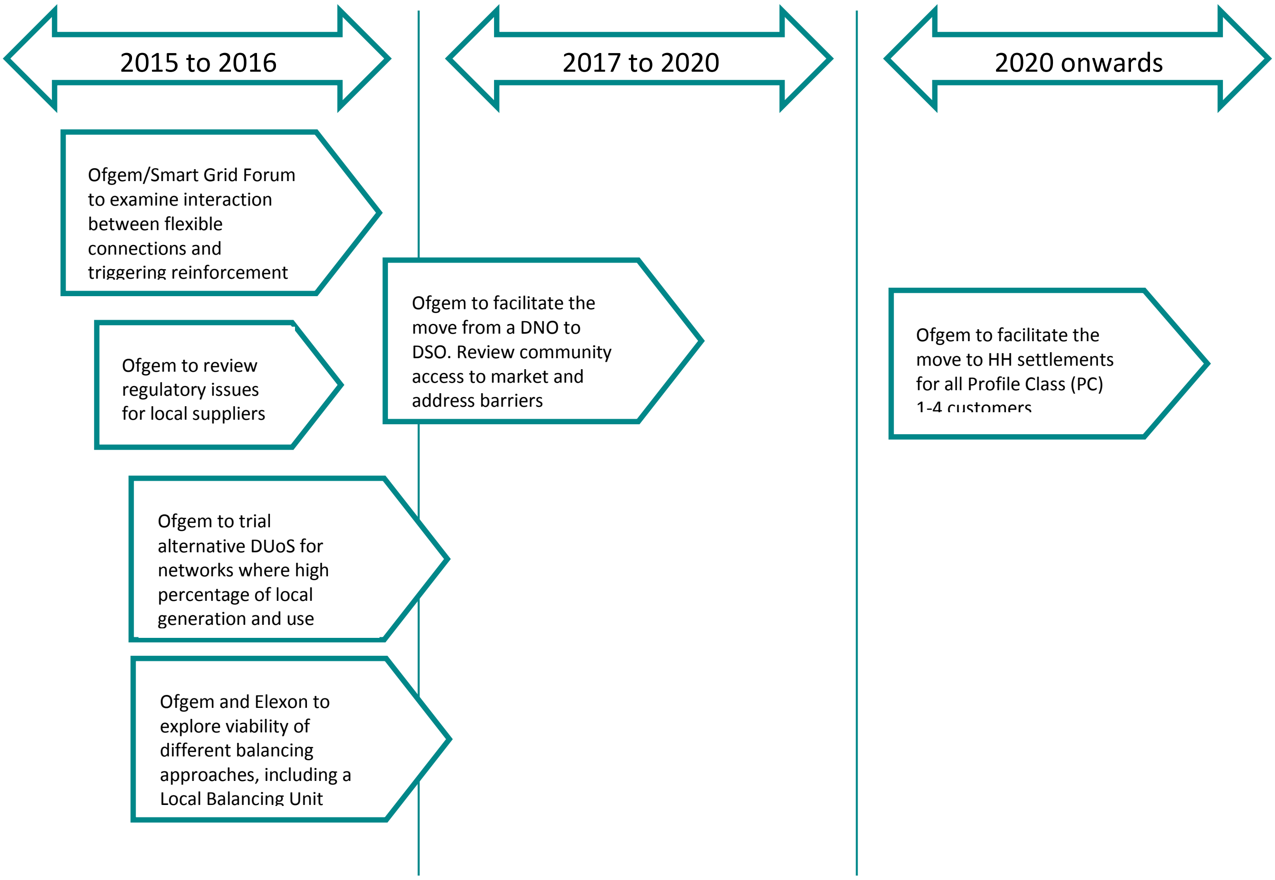

Figure 8: Smart Grid Forum implementation framework and next steps for relevant actions[24]

In summary, future markets could enable further funding streams to support the reliability and sustainability of a Sunshine Tariff and make time of use tariffs more widespread and therefore, easier to maximise the benefits from.

[24] The GB customer focussed smart grid: Next steps for regulatory policy and commercial issues. Report of workstream 6 of the Smart Grid Forum 2015

5 Permutations of offset agreement

The offset agreement will be based on the standard timed agreement, which specifies that the maximum export capacity is subject to constraint at certain times of the year:

- October to March = no constraint
- Apr and Sept = constrained to 30% of output 10am to 4pm (no constraint outside of these hours)
- May to Aug = constrained to 0% 10am to 4pm (no constraint outside of these hours).

In order to give WPD confidence that these constraints are being met, the timed agreement specifies that the customer must:

- install an automated system (independent from WPD) that limits the export capacity at the times specified
- run reports to ensure that the automated system is running correctly
- make said reports available to WPD at WPD's request
- use half hourly metering data to check compliance
- make more granular export data (instantaneous, 1 minute or 10 minute) available at WPD's request.

The offset connection agreement will differ in several ways. Firstly, the maximum export capacity will not be constrained if an equal or higher 'offset' (increase in demand) is achieved. And secondly, the automated system will need to be more sophisticated to take account of both generation and changes in demand.

5.1 Creating a successful offset agreement

There are two key challenges for creating a successful offset agreement: ensuring that the Sunshine Tariff incentivises a consistent and sustainable shift in demand; and identifying a reliable system for measuring the offset and controlling curtailment. These challenges will be addressed below.

5.1.1 A reliable and sustainable shift in demand

The generator will need a high degree of confidence that the Sunshine Tariff will deliver the required level of offset for the lifetime of the project (20 years, unless reinforcement takes place). There are a number of factors that will increase confidence, which are set out in the figure below.

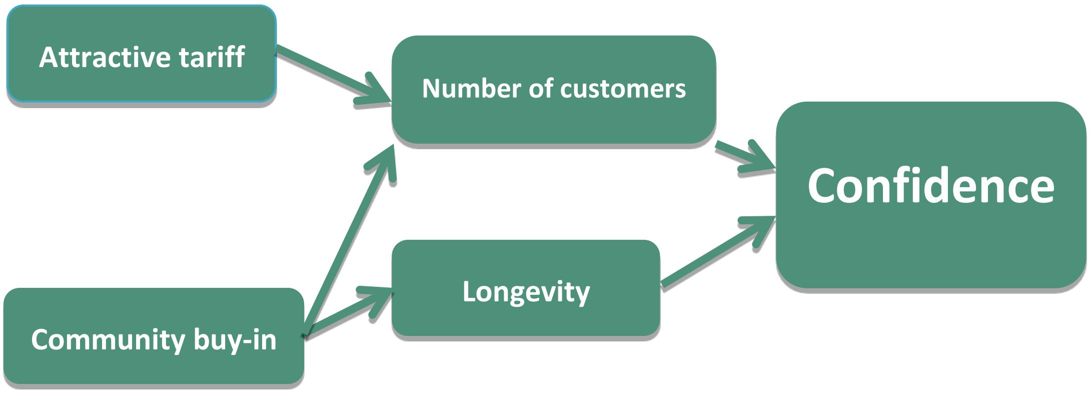

Figure 9: Factors affecting generator confidence in offset

The tariff needs to be low enough to attract large numbers of demand customers to first, sign up to the tariff, and secondly, to shift demand. The demand customer is not guaranteeing to shift demand every day through the summer months, and therefore, it is important to have a large number of customers to spread this risk.

If the community has reasons beyond a cheaper tariff to support the project, such as community ownership of the generation, they are more likely to both attract large numbers of demand customers and for these customers to support the project over the longer term.

5.1.2 Options for an offset connection control system

There are a number of options for setting up a control system for the offset connection agreement. Key considerations for choosing a control system are that it provides confidence to the DNO that the network will remain within safe parameters at all times and confidence to the generator that it will not be curtailed unnecessarily. The options include, but are not limited to:

1. A model that uses evidence from trials to calculate the average number of customers required per MWh of offset. The generator would then provide regular updates to the DNO on the number of customers signed up to the Sunshine Tariff and if numbers drop below those required, the generation would get curtailed accordingly.

   The output from a solar farm fluctuates on a day-to-day, and even minute-by-minute, basis. Solar PV generation can be very peaky, as illustrated in the figure below, which shows typical array output at 10 minute intervals at a site in Devon in August 2014.

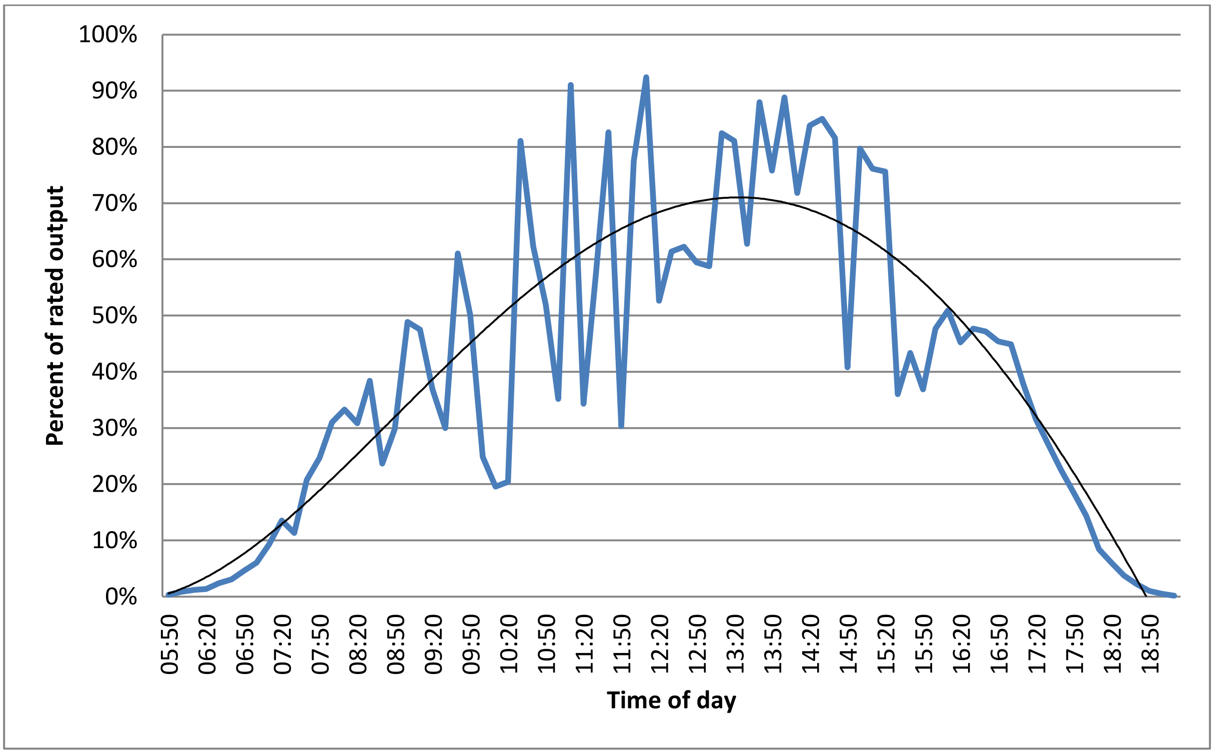

Figure 10: Typical solar PV generation for a day in August

This means that it is difficult to closely match generation with demand. Instead, we suggest using the lowest level of demand shift witnessed in the trial to calculate the number of customers required to offset the highest rated output from the generation. This could give the DNO confidence that safety limits would not be exceeded on the network. However, without real-time monitoring, the DNO will not know for certain that the offset is working. Furthermore, this method may require significantly more Sunshine Tariff customers than other models.

2. Monitoring system provided by DNO on the local network, which curtails generation when it is in excess of local demand. This is essentially a form of Active Network Management (ANM) for one generator.

   A monitoring system would be installed on the network that would monitor local constraints. If the network was to getting close to breaching thermal or voltage limits during the Sunshine hours (10:00-16:00 April to September), the generator would be curtailed accordingly. The cost of the monitoring system would be covered by the generator and would become more cost efficient as the scale of the solar farm increases.

   This system would give the DNO confidence that safety limits would not be exceeded on the network. However, it would not directly link generation with the shift in local demand. Therefore, 'noise' on the network (i.e. other demand customers and generators) may distort the impact of the offset and the generator may get curtailed when the demand shift is sufficient to cover its generation.

3. A platform that manages a virtual network of the generator and Sunshine Tariff demand customers in real-time and curtails generation when the demand does not match generation, as illustrated in the figure below.

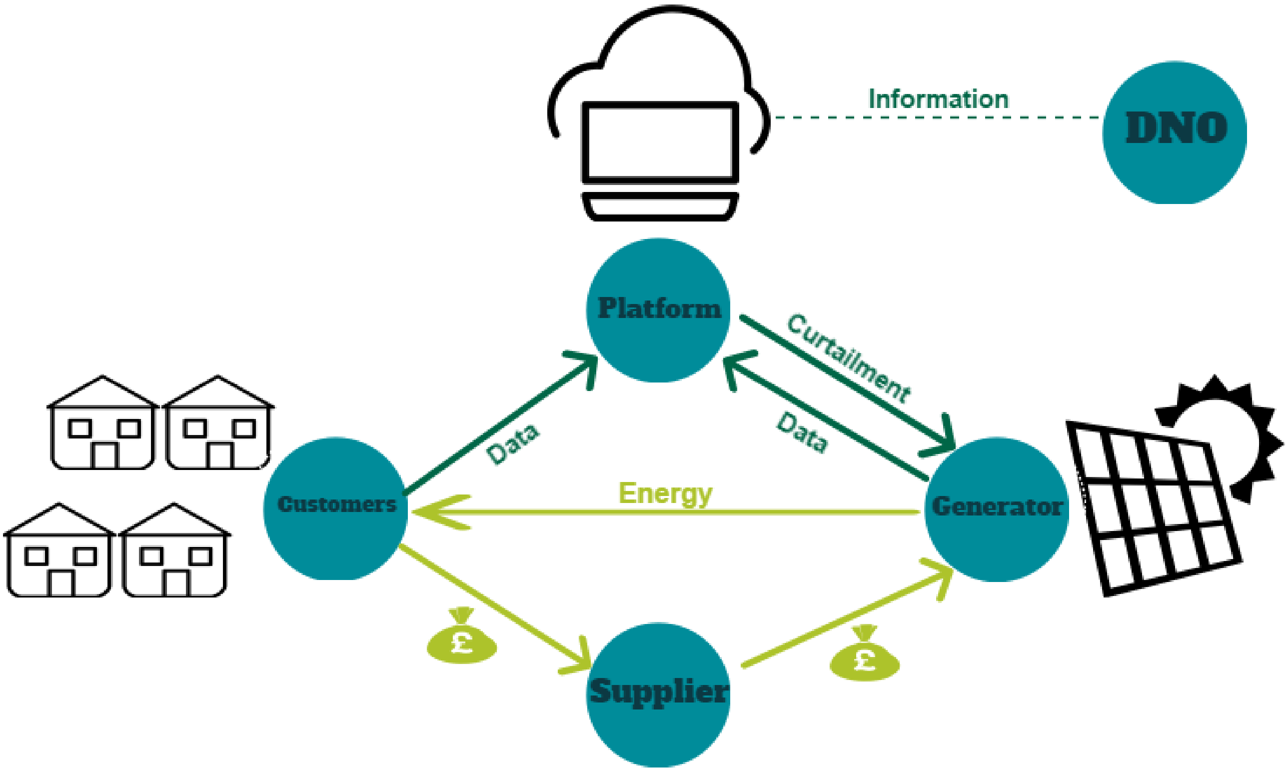

Figure 11: Sunshine Tariff control system

The platform could be run by the supplier, the generator or a third party. It would manage a virtual network of the generator and Sunshine Tariff demand customers and would calculate the demand shift or 'offset' by comparing a real-time aggregated demand curve for all customers with a local demand profile (or Elexon profile if not available). The platform would also receive real-time generation data from the solar farm. It would then compare the offset data with the generation data to calculate whether the generator needs to be curtailed or not.

The DNO and community could be regularly updated on how effective the offset has been and how often the generator has been curtailed.

There would be a cost to the generator to set up and maintain the platform, but it is the most accurate way to measure if the demand shift if delivering the required offset.

The options for an offset connection agreement control system will be explored further during the trial period and recommendations made in the final report.

5.2 Timescale for agreement

The offset connection agreement would have the standard National Terms of Connection,[25] which state that the terms apply from the time that the contract with the electricity supplier takes effect until either:

- another connection agreement takes effect
- the application of the National Terms of Connection is terminated.

This means that the offset connection agreement would remain in place until either the alternative connection becomes a full connection or the site is de-energised.

One of the barriers to roll-out of an offset connection agreement identified in section 5.4 is the timescale for the agreement. The tariff will need to remain attractive to customers over the lifetime of the generation project (up to 20 years) to avoid curtailment. This is a long period of time for:

- the customers to commit to staying on the Sunshine Tariff, as customers switch, move etc.
- the supplier (or a number of suppliers) to commit to providing the Sunshine Tariff
- ensuring that the Sunshine Tariff remains competitive in a changing market
- the generator to continue to support the Tariff for the lifetime of the project, especially if ownership changes.

These problems would, however, be overcome if the network is reinforced after the project has been connected and the offset connection agreement is transferred to a full connection agreement. Section 6.2.3 above raised the issue of how constrained energy under flexible connections can be viewed as an investment signal for the DNO so that all flexible connections would become firm connections over time.

This would overcome the reinforcement cost barrier. When the reinforcement costs can be shared amongst a number of distributed generators, the cost per MW can be significantly reduced. A consortium approach to sharing the cost of reinforcement was trialled by WPD and Regen SW, but failed because it was very difficult for a number of developers to come together on the same development timescale.[26] However, if generators are already connected under flexible connection agreements, the timescale is no longer an issue.

But if the generator has already paid to subsidise the Sunshine Tariff (as discussed in section 5.3.2) and covered the cost of setting up a monitoring system, it may not be financially viable to then pay a share towards network reinforcement at a later date. The case for reinforcement would depend on each individual site. The considerations would include: the cost of reinforcement; the frequency of curtailment; the contribution already made to subsidising the tariff; and the life left in the project.

[25] http://www.connectionterms.org.uk/

[26] http://www.regensw.co.uk/wp-content/uploads/2015/04/Bridgwater-consortium-trial-interim-report.pdf

6 Conclusions and recommendations

The purpose of this feasibility study is to explore the viability of a Sunshine Tariff in both current and future markets to determine whether phase two of the trial is worthwhile.

The paper concludes that the Sunshine Tariff is viable in current markets, which is 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 are:

- 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.

Future markets could enable further funding streams to support the reliability and sustainability of a Sunshine Tariff. These future funding streams include:

- 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.

Recommendations for research questions in phase two of the trial:

- Does the Sunshine Tariff reduce the supplier's profit margin when it is only able to utilise the difference in wholesale prices and a slightly higher peak tariff? Is the tariff viable without a subsidy?
- Are the customers better or worse off? And is the tariff low enough to incentivise a shift in demand?

- What difference would future markets make on the tariff and the consequent shift in demand? What combination of future models would be most effective? And which are most realistic?
- Which offset connection agreement control system would:
    - Provide the most confidence to DNO and generator?
    - Be most cost effective?
- What is a realistic timescale for an offset connection agreement? And what would give developers and their financier's confidence in its longevity?