CrowdFlex: Alpha

December 2022

D6.2 – Plan for incentives to trial across viable "trial-services" for target technologies and consumer segments

Strategic Innovation Fund

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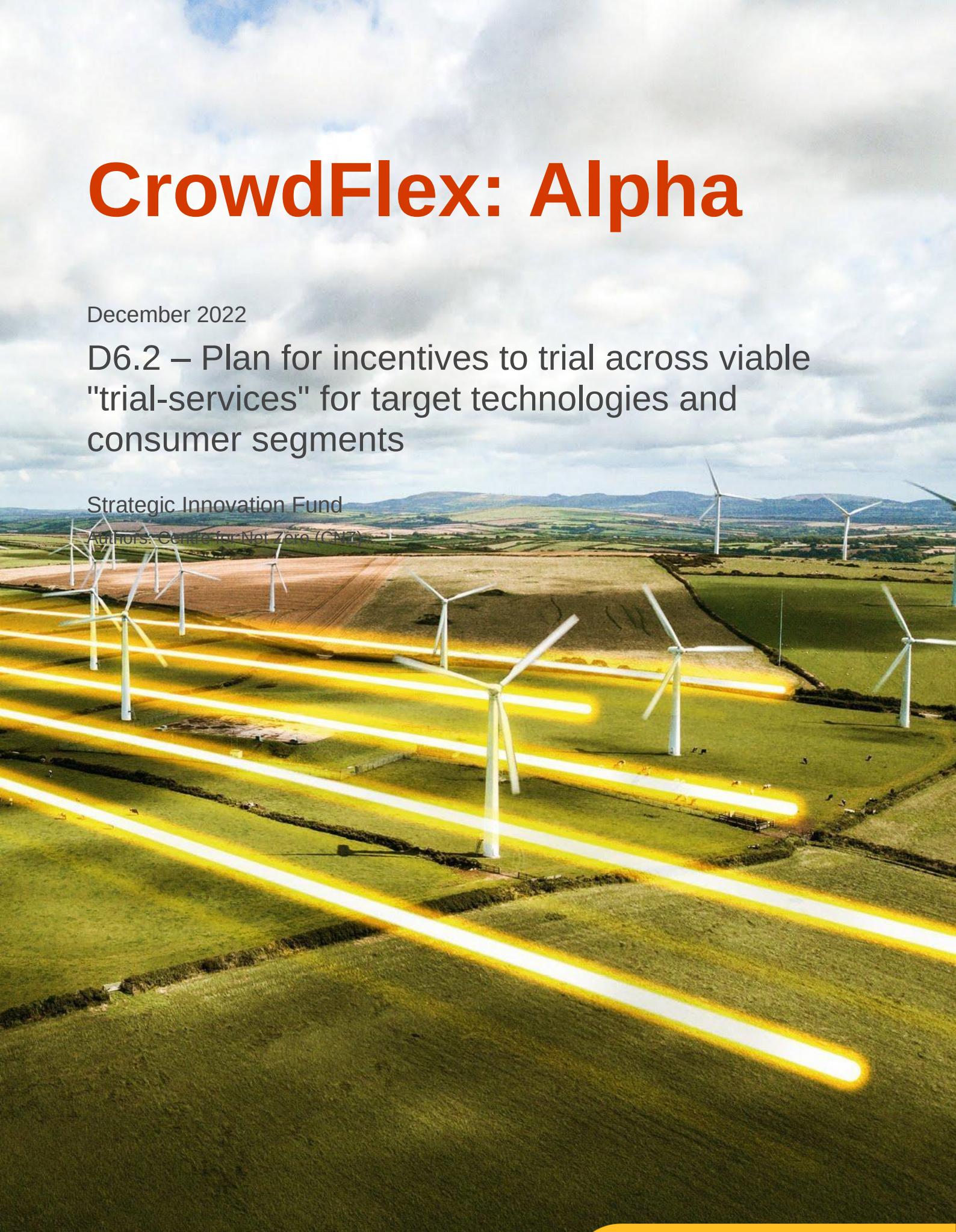

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1 Background

As discussed in the literature review in D2.1, several methods have been utilised to influence domestic demand flexibility. For example, Static Time of Use (ToU) tariffs - such as the long-standing Economy 7 tariff - have been used to change electricity demand profiles and shift consumption away from peak hours.[1] However, electricity demand is evolving, with significant increases in demand, and an increasing share of electricity being generated from renewable energy sources.

The domestic sector now accounts for over a third of electricity consumption in the UK, and the ESO's Future Energy Scenarios (FES) 2022 report highlights the importance of introducing consumer demand flexibility to enable the UK to achieve Net Zero by 2050.

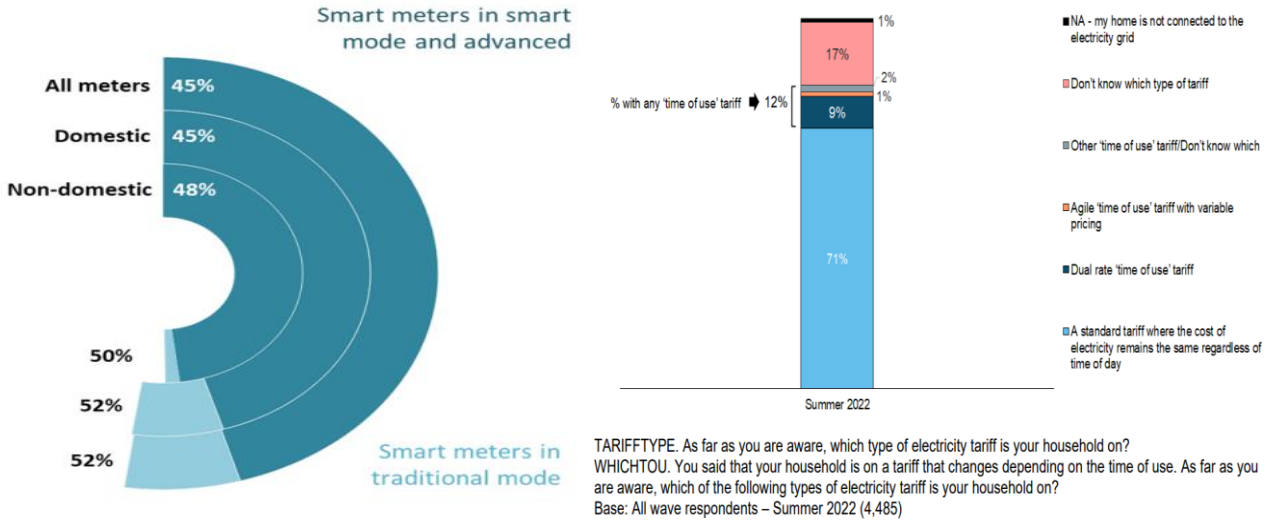
Increased availability and uptake of smart meters and Low Carbon Technologies (LCTs) like Electric Vehicles (EVs) and heat pumps increases the potential scale of demand side flexibility that consumers can provide, curtailing demand at peak times, or increasing demand where the share of renewables in electricity generation is higher (for example).

1.1 Role of smart meters and ToU tariffs in flexibility provision

In the UK, smart meters have been installed for more than half (52%) of domestic connections as of June 2022.[2] Static and Dynamic ToU tariffs can leverage the high temporal resolution of electricity consumption readings provided by smart meters to send price signals to incentivise consumers to change their energy consumption behaviour, i.e., by turning down energy use when it is relatively expensive and by turning up when it is relatively cheap.

However, ToU tariffs are not yet dominant in the UK domestic energy landscape. The BEIS Public Attitudes Tracker reports that while 75% of ~4,000 respondents had 'heard of' ToU tariffs, only 12% report being on a ToU tariff, with most respondents (71%) reporting being on a flat tariff where retail price of electricity does not vary by time of day.[3]

Figure 1: Extract from Smart Meter Statistics in GB and Public Attitudes Tracker (Summer 2022), BEIS Reports.



Therefore, to demonstrate results in the relatively short term (starting in Winter 2023/24), CrowdFlex: Beta should encourage consumers on non-ToU tariffs to switch as part of being included in providing demand flexibility. This can be done through notifications about rewards per kWh of demand turn up or turn down at certain times during CrowdFlex:Beta events.

[1] The Electricity Council, "Electricity Supply in the UK: A chronology". Fourth edition, London, UK, 1987.
[2] Smart Meter Statistics in Great Britain: Quarterly Report to end June 2022, BEIS. Available here.
[3] BEIS Public Attitudes Tracker: Energy Bills and Tariffs Summer 2022, UK. Available here.

A consumer does not necessarily have to be on a static or dynamic ToU tariff to be incentivised to provide flexibility. However, to receive rewards linked to the amount of demand turn down or turn up consumers provide, their energy consumption needs to be observable specifically for the period of the event.

Further, consumers who are already on static or dynamic ToU tariffs may face different prices per unit of energy consumption during event times compared to those on a flat tariff. ToU consumers may also be more familiar with changes in electricity prices by time-of-day, and hence respond more to demand turn up or turn down requests.

This has implications for analysis of the results of CrowdFlex: Beta, and it is recommended that statistical analyses account for differences in consumers' tariff types, as will be described in Work Package 7 (D7.1).

1.2 Role of technology (EVs and heat pumps)

As described in D6.1, electric vehicles and heat pumps play a major role in consumers being able to obtain benefits from the provision of flexibility, since these technologies (where they are available) account for large portions of household-level energy consumption. In D6.1, the benefits that flexibility can provide through EV and heat pump technologies are categorised into benefits from shifting consumption to times when electricity is cheaper (moving from a flat tariff to a ToU tariff), introducing household assets into the balancing mechanism (BM), savings from providing turn-down in DSO constraint management zones and thermal constraint cost reductions for ESO. The total potential savings on consumers' electricity bills are around 25-33% reduction on average, with a large share of benefits accruing from moving to a ToU tariff that rewards consumers for using more electricity at times of the day when electricity is cheaper.

2 Context

Previous and ongoing work, including the CrowdFlex NIA, the Domestic Scarcity Reserve Trial, and the Demand Flexibility Service have shown some evidence for the potential of domestic flexibility when utilised at scale, covering hundreds of thousands of consumers at the same time. Financial incentives, information provision, and technology development affect residential energy use patterns.

The CrowdFlex project utilises rigorous scientific methods applied at large scale to build confidence in the potential of domestic flexibility to be utilised to curtail electricity demand at times of system stress (turn down) or take advantage of high renewable energy generation (turn up) in order to reduce the need to invest in fossil fuel-based generation capacity and to facilitate the transition to a cleaner and more flexible energy system. However, a barrier to realising the full potential of demand flexibility is the high variability of domestic demand and the consequent effects on aggregate demand profiles.

Several factors, such as electricity tariffs, LCT penetration, and behavioural patterns, influence domestic energy consumption, and teasing apart the importance of factors that are often correlated is important for policymaking on the energy transition.

Therefore, CrowdFlex: Beta will prioritise and implement large scale trials to attribute patterns of domestic flexibility to specific factors that can be influenced through enabling policy and market mechanisms.

The trial services scoped in CrowdFlex: Alpha aim to generate value to the system through utilising domestic demand flexibility responses to improve system operation and reduce the impact of grid constraints. Work Packages 1 and 4 have identified five such 'trial services', summarised in the table below.

Table 1: Summary of "trial services" to be explored in CrowdFlex Trial from D4.1.

System Operator	Trial Service	Local / National Response	System Need	Dispatch Notice	Response Duration
ESO	Balancing Mechanism	National	ESO Frequency	<1-hour	~30 mins
ESO	Thermal Constraint Management	Local	ESO Thermal	Day Ahead	<4 hours
ESO	Demand Flexibility Service[4]	National	ESO Adequacy	Day-Ahead	1-2 hours
DSO	Sustain-H	Local	DSO Constraint Management	Contract Stage	4 hours
DSO	LMA Secure	Local	DSO Constraint Management	Day Ahead	24 hours

Consumers interface with these trial services through incentive mechanisms and information provision relating to their energy consumption. This may differ by trial service. For example, the balancing mechanism necessitates responses at very short time scales with dispatch notices given less than 1 hour ahead of the 'event' time, while thermal constraint management allows for dispatch notices to be provided 24 hours ahead. These factors can affect how consumers behave in terms of flexibility they provide to the system.

CrowdFlex has the potential to provide rigorous evidence on factors that affect consumers' flexibility provision. However, to generate confidence in the results of the trial and inform policy, it is important to prioritise the types of incentive and information mechanisms that should be tested.

[4] D4 proposed that CrowdFlex does not attempt to design a service that provides demand turn down during system stress events, as the Demand Flexibility Service does, but stack the other CrowdFlex "trial services" alongside the output of the DFS in Winter 23/24.

3 Aim and interlinkages

This document recommends the high-priority financial incentive mechanisms and information frames that should be tested as part of CrowdFlex: Beta. Specifically, for automated assets which are the focus of D5.1 and D6.1, modelled estimates suggest that EVs and heat pumps have the potential to provide significant domestic flexibility and if consumers sign their assets up to automated charging profiles, they can benefit by >£200 per EV and £250 per heat pump. However, this involves a trade-off in terms of 'handing over' the control of assets to the supplier. Therefore, realisation of these savings, and the resulting flexibility provision can be tested through CrowdFlex.

This work also links up to specifying research questions that inform the trial design in Work Package 7 (D7.1) and model specification in Work Package 8 (D8.1).

4 Consortium workshop

To scope ideas for factors that are critical to test in CrowdFlex, CNZ organised a workshop for all consortium members in December 2022. At the workshop, participants were reminded of the proposed design features of CrowdFlex (D2.2) and feedback was sought on key questions.

A part of this workshop was dedicated to 'thinkgroup' sessions, collecting, and providing feedback on ideas from consortium members on consumer-facing information and incentive mechanisms that would be relevant to test through CrowdFlex.

These mechanisms were separated into two categories - those that can be randomised between consumers in the same event (treatments) and factors that change across events but are the same for all consumers within the same event (event parameters). The distinction here is in terms of analytical strategies and interpretation of the effect of these parameters on domestic flexibility.

Feedback was received from the workshop participants on key treatment ideas. Thereafter, participants were encouraged to provide their thoughts on the 'feasibility of implementation' and 'value of insights' from each treatment idea. On event parameters, ideas were sought on boundary conditions that would determine the range of specific parameters to be tested. Results from these activities are recorded in the Appendix (Table 3 - Table 5).

Consolidating these initial ideas and findings from other deliverables, as well as several meetings with consortium partners, the following sections highlight the high priority consumer-facing mechanisms that should be included within CrowdFlex: Beta.

These recommendations are categorised into financial incentives for provision of flexibility and information provision.

While randomised treatment allocation can be used to causally attribute effects of treatment on consumer response, event parameter variations can be included as covariates in regression analyses to understand correlations between specific parameters and consumer response.

As the gold standard of empirical impact evaluation methods, randomised control trials (RCTs) should be implemented for the most important research questions to be answered through CrowdFlex: Beta.[5] The randomisation design and analytical strategy will be described further in D7.1 of CrowdFlex: Alpha.

[5] https://whatworksgrowth.org/resource-library/the-maryland-scientific-methods-scale-sms/

5 Financial incentives for trial

Investigating how domestic flexibility responds to financial incentives was emphasised during the workshop, as well as in conversations with consortium members, as a key research question that can be addressed in CrowdFlex: Beta. The importance of price incentives for domestic flexibility has been highlighted in previous deliverables of CrowdFlex: Alpha (for example, in Section 6 of D4). With this in mind, the effect of financial incentives should be investigated in two ways.

5.1 Utilisation payments

First, and of primary importance, in cases where consumers adjust their consumption behaviour themselves, CrowdFlex should vary the level of financial rewards (£ / kWh of turn down or turn up) between different consumers in the same event. This incentive variation would enable identification of the causal effect of price on demand response and enable estimation of price elasticity of demand for electricity. Randomised price incentives would also enable better forecasting of demand flexibility responses in a model (specification being developed in Work Package 8), where prices are used as an input parameter.

To reduce trial complexity and increase precision of estimated results, and as evidenced in the comments on this workshop idea (see Tables A1 and A2), three different levels of financial incentives should be used - **low (£1-2 / kWh), medium (£3-4 / kWh) and high (£5-6 / kWh)**.

The minimum level should be high enough to be beneficial to consumers (at or higher than unit rates), while the maximum level should be linked to the amount that ESO would have to pay to turn on excess generation capacity to meet system needs at times of peak demand. These levels can be calibrated further based on existing services like the Demand Flexibility Service that guarantees providers an acceptance price of £3 / kWh of response.[6]

This incentive structure links specifically to the ESO trial services 2 (thermal constraint management) and 3 (Demand Flexibility Service) as recommended in Table 1 from D4. Notice periods for both these services are day-ahead, and hence align with the framework of one-off events such as the Winter Savings Sessions being implemented by Octopus Energy.

Consumers are currently offered a range of tariff structures by their energy suppliers. These include flat tariffs, static time of use tariffs, dynamic tariffs, and asset-specific tariffs like Intelligent Octopus. Therefore, when investigating the effect of price incentives on domestic demand, randomisation should ensure an even split of treated and control consumers across tariff types (flat, static ToU and dynamic ToU) and technology ownership (EV and heat pump owners), allowing for robust subgroup analyses.

5.2 Availability payments

Second, in cases where consumers make their EVs or heat pumps available to be utilised automatically at times that are beneficial for the grid, CrowdFlex should test different levels of availability payments. Unlike a utilisation payment per kWh of flexibility described above, an availability payment rewards consumers in absolute terms.

Availability payments are practically more useful as a mechanism compared to utilisation payments for the balancing mechanism or local constraint management services since the demand response actions in these services need to occur at very fine time scales (down to seconds). It would be infeasible to request consumers to enter asset-based bid offers into these services at specific (unpredictable) times. Instead, availability payment can be used as a mechanism to compensate consumers for authorising their assets to be controlled by suppliers or aggregators, where the only decision from a consumers' standpoint is whether to accept the compensation offered to them.

Availability payments link with the ESO trial service 1 (domestic assets participating in the balancing mechanism), as well as more localised DSO constraint management services 4 and 5 (Sustain-H[7] and LMA Secure), since they require close to real-time deployment or deferral of asset utilisation.

[6] https://www.nationalgrideso.com/news/esos-demand-flexibility-service-launches
[7] https://www.nationalgrid.co.uk/downloads/145360

Availability payments should be used in conjunction with the utilisation payments suggested above, since the former rewards consumers for providing their assets to suppliers/aggregators, while the latter would reward consumers for actual flexibility provided during events.

To investigate how much households are willing to accept for giving up manual control of their assets, the availability payments could be linked to the potential value for the system. Similar to the design of utilisation payments recommended above, availability payments should be fixed at three different levels - **low (£30-50 / asset / year), medium (£75-100 / asset / year) and high (£150-175 / asset / year)**.[8] These incentive levels are scaled to match the potential value generated by household assets as estimated in D6.1, when considering the value of participation in the balancing mechanism and ESO thermal constraint reduction.

In the future, the incentive required for consumers to allow their assets to be controlled remotely may reduce if their preferences (for example, EVs charged to 80% by morning) are satisfied and they experience reductions in monthly electricity bills with automated response scheduling. To investigate such changes, CrowdFlex should repeat the offered availability payment every year over the course of the trial.

It is worth noting that availability payments will necessarily be limited in the number of eligible households when compared to utilisation payments. This is because utilisation payments can be offered to any consumer who has a smart meter, while availability payments can only be offered to consumers who own assets that can be controlled remotely (as shown in Table 2 below).

Three features for automated assets that should be allowed during implementation are:

1. Consumers should be able to opt out of automated control of assets ‘permanently’ over the period of CrowdFlex, even after they have initially opted in.
2. Consumers should be able to override automated control at specific times if they feel the need to do so.
3. Permanent opt outs (attrition) and event-specific overrides should be observable to the service provider so that any availability payments are adjusted accordingly.

In order to ensure financial incentives align with actual availability provided, the availability payment could be issued as a ‘balance’ to customers from which deductions are made on a pro-rata basis as and when attrition or overrides happen. The final balance is provided as a credit at the end of the period over which the availability payment is relevant.

[8] More sophisticated incentive-compatible willingness to accept elicitation methods are available but need to be weighed against simplicity of trial implementation and communications to consumers.

6 Information and messaging frames for trial

In addition to the importance of conducting trials to understand the effect on demand flexibility of the payments described above, the consortium has also considered several non-financial aspects of flexibility events that could be relevant to test through CrowdFlex.

6.1 Notice period

The 'notice period'[9] given to consumers is a critical part of flexibility trials. It is also identified in the consortium workshop as one of the factors that would be most valuable to test as a treatment (Table A3).

Especially for manual responses, consumers may want to schedule their energy consumption ahead of time. The effects of changing notice periods on domestic flexibility provision can be estimated in the same way as the effect of the payments described above. This would allow CrowdFlex to arrive at findings that would be relevant for system needs.

For example, the trial design would help to understand whether providing higher financial incentives per kWh of flexibility provision but with shorter notice periods generate a different flexibility response compared to providing lower financial incentives but with longer notice periods.

The notice period is also an input for the demand flexibility forecasting model being specified in Work Package 8 (D8.2), and rigorous causal evidence of the effect of changing notice period on flexibility response is critical for model validation.

We recommend three different levels of notice periods be tested through the randomization in CrowdFlex. These levels should be **long (24-36 hours), medium (12-16 hours) and short (1-3 hours)**. Ranges within each of these levels are provided so that suppliers are able to deliver communications within the time specified for each level and allows for consideration of events that may occur at different times of day.

Trials like the ESO's Demand Flexibility Service and Octopus Energy's Big Dirty Turn Down have all implemented similar notice periods to all consumers ahead of events. Therefore, randomising this factor would provide novel insights from CrowdFlex: Beta.

6.2 Messaging frames

Sustained engagement of domestic consumers determines the magnitude of flexibility that can be provided over time. Testing different messaging frames at scale is possible through CrowdFlex. Ideas on messaging frames that were discussed during the workshop are listed in the tables in the Appendix. These include:

- Carbon reduction framed communication.
- Streaks - cumulating financial rewards for flexibility provided in subsequent events.
- Personal targets - consumers pledge how much flexibility they can provide during an event.

However, some of these frames are already built into communications to consumers before and after flexibility events, such as the Winter Savings Sessions of Octopus Energy. These sorts of strategies are also numerous, and suppliers and service providers may prefer specific strategies over others. Further, there is evidence from previous small-scale RCTs suggesting that financial incentives may be more effective than softer interventions.[10]

Therefore, to keep the CrowdFlex trial supplier-agnostic, while leaving room for consideration of these strategies, it is worthwhile to consider messaging frames on a smaller scale and rely on focus groups or qualitative work leading up to CrowdFlex Beta to consider whether any particular 'softer' strategy should be taken up as part of the large-scale national trial.

[9] Defined as the difference (in hours) between the announcement of a demand flexibility event and the event start time.
[10] Ito, K., Ida, T., & Tanaka, M. (2018). Moral suasion and economic incentives: Field experimental evidence from energy demand. American Economic Journal: Economic Policy, 10(1), 240-67.

7 Discussion

There are several market and policy levers and communication strategies that potentially influence demand flexibility response. In order to have more robust evidence on specific factors, it is important to prioritise among them for testing within CrowdFlex. With randomisation being the preferred tool to investigate causal effects, the factors of the highest priority should be chosen as the ones to randomise between consumers in the same event.

In the feedback received from consortium members, it is clear that consumers' price sensitivity is the most important factor, and cuts across all the 'trial services' relevant to ESO (Table 1). The effect of fluctuation in retail price of electricity on demand response is of critical importance for predicting and reducing the uncertainty around domestic demand flexibility.

The utilisation and availability payment designs described above are the relevant financial mechanisms that can be tested through an RCT in CrowdFlex.

In terms of non-financial factors, the notice period is eminently within the control of suppliers and grid operators and is a relevant design feature of any flexibility event. It influences how consumers schedule their energy consumption and facilitates demand flexibility.

Although notice periods for day-ahead requests are limited to 24 hours ahead of an event by definition, CrowdFlex should test whether shorter notice periods would have differential effects on consumers' demand response.

This impact, while less important than the effects of changes in price, could still be relevant for DSO services that are more localised.

In addition, there are open questions about interaction between incentives levels and notice period, i.e., how much higher incentive levels must be to deliver the same total flexibility given a shorter notice period. This question is of particular importance given that flexibility generally becomes more valuable to ESO and DSOs as the notice period reduces.

The softer communication strategies and message frames discussed above and during the workshop could be utilised for some events in CrowdFlex. However, to have sufficient statistical power to generate robust causal evidence (see D7.1), our current thinking is that the CrowdFlex events should focus on randomising financial incentives and notice periods.

Message frames and 'softer' strategies like streaks and personal targets, while interesting in their own right, are not as high-priority for randomised evaluation. While they can be incorporated into some events, we suggest these need to be considered and prioritised separately, through focus groups or qualitative work leading up to CrowdFlex: Beta.

8 Summary of recommendations

Meetings with consortium members and the workshop have helped to refine our thinking on priority incentives and information mechanisms that should be trialled in CrowdFlex.

While there are several message frames that could be interesting to investigate, they are currently lower priority than the primary questions on price elasticity, price discovery and notice periods that will generate evidence on domestic flexibility and help build and validate a probabilistic model of the magnitude of flexibility response that can be available to meet system needs.

The following table summarises our thinking on factors that affect domestic flexibility that should be evaluated through a randomised control trial in CrowdFlex.

Table 2: Summary of recommendations

	Incentive and information factor	Relevant services	Rationale
Incentives	Utilisation payments - low (£1-2 / kWh), medium (£3-4 / kWh) and high (£5-6 / kWh) of flexibility	Thermal constraint management (one of the costliest ESO services) and demand flexibility service can benefit from understanding the potential of price signals to consumers to provide flexibility when needed.	Utilisation payments can be implemented easily and allows for a large customer base to be included in the trial, to facilitate precise estimation of price elasticity of consumer demand response.
	Availability payments - low (£30-50 / asset / year), medium (£75-100 / asset / year) and high (£150-175 / asset / year).	Balancing mechanism service as well as more localised DSO services (such as the LMA-Secure or Sustain-H) can benefit from investigating availability payments.	Availability payments are a way to encourage domestic assets to participate in the balancing mechanism (ESO service) or for more local constraint management (DSO services). Since consumers would need to 'hand over' their assets (like EVs and heat pumps) to be charged/controlled remotely, investigating their willingness to accept this will be crucial to understanding the financial case to motivate customers to participate in these services. However, the scale of the investigation would be somewhat limited by the customer base owning such assets and accessible to the consortium, and thus is likely to be smaller in scale in terms of number of participants in these services.
Information	Notice period - long (24-36 hours), medium (12-16 hours), and short (1-3 hours).	ESO thermal constraint management and demand flexibility services.	Notice periods are a part of any flexibility trial. It allows consumers to plan ahead and schedule their flexibility response. Investigating how notice periods affect flexibility is recommended through a randomised evaluation.

Appendices

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Appendix A: Workshop outputs

Table 3: Workshop ideas on treatments

Ideas	Comments
Please enter your ideas in brief (10-20 words).	***Comment on existing ideas.***
Carbon reduction framed communications (emphasising carbon savings through demand shifting)	This needs to be a secondary benefit rather than primary motivator?
Praise and opportunity to win a special prize if consumer is in the top X% (e.g. top 10%)	Are we varying the size of the prize and % by groups?
Financial incentives communicated in a 'loss' framing – e.g. consumers begin with £5 reward for the event; they run down that balance based on the difference between actual versus theoretical maximum turn-down.	Households with 'lower baseline' will naturally benefit more under this scheme. Would have to 'tailor' the £ reward to make this work.
Heavy emphasis on personal target in communications – e.g. emphasising 20% turn-down target even when turn-down payment is not tied to targets.	We should provide personalised 'dashboards' comparing ve previous behavior / peer groups
Consumers select personal targets (e.g. % reduction/increase from baseline) ahead of event (in a situation where payments are not tied to targets)	Assumption that another group would then have targets chosen for them, and we could compare performance of those two groups
Additional financial bonus if 'similar' consumers (e.g. same street or postcode) meet combined target	
Financial incentive matched £-£ by charitable contribution from the flex service provider	
Different treatment groups get different notice periods for the same event.	
Turning 'targets' into two-sided targets – where customers try to stay within a specified interval of turn-down	Phew. Not sure I understand this?? I think this is similar to "block-pricing" - where the incentive varies by the amount of turn down? I think the idea was to try to increase individual-level predictability of flexibility by making the incentive for a boundaried amount of flexibility rather than an unbounded amount. "No incentive if you turndown for more than X kwh"?
(Octo)Points-framed incentives for some but not all treatment groups.	Need to be supplier agnostic
Non-financial incentive – rewards like free coffees, vouchers etc	Could be a method of getting larger incentives by allowing brands to say they are rewarding "Green" customers.

Social framing: Households “like you” turn down by X%, turn down by more than this and get paid £/kWh for each unit you turn down	This (“social engineering”) I think only works if the numbers make sense. Deliveroo has prompts (8% of customers in your area tip their drivers) - which is really poor messaging – further encourages me not to tip. As opposed to “90% of people in your area tip” -> that will encourage me. But we also cannot fudge numbers to make it “encouraging” as that would be lying (think black friday sales). You could show the half-hourly curve of “households like you” (aggregated) vs your “curve”
Give customers the amount that they need to use and how much they’ll be paid, and get customers to pledge against it. E.g.: use only 10kw and be paid £3. Use only 20kw and be paid £1 etc. Households promise I’ll use only 10KW. So framing is around absolute usage rather than the opaqueness of turning down against an ‘arbitrary baseline’).	Will customers know what 10 kW means? Does this keep out less engaged energy users?
Absolute incentive, e.g £10, rather than £ / kWh. Easier to understand incentive for achieving target	I agree this would be easier to explain to customers. I think for automated customers an “availability payment” would be needed and communicated in the initial comms. Perhaps paid for each “month” of opt in, providing they don’t “opt-out” of X or more events. I think this could be good for “predictability” as well because it doesn’t vary by the amount of turn up / down
Cumulative rewards bonus - successfully participate in x events and receive an additional £y	
Co-operation framing: By collectively turning down and turning up at the same time, we will keep X <wind/solar> on and use Y less <gas>	
Asymmetry of response - different requests (turn up v’s turn down) in different locations	How could this be randomised by treatment group, though? Each treatment group presumably has an even smear of regions. - maybe, but we are going to have localised events – constraint management will require it. perhaps it is about varying the communication for the different groups in those regions?
Customers receive “bonus” for repeated participation to encourage continued engagement and reliability	Possibly needs a minimum level of participation? For DFS – Octopus reward customers for opting in but no need to participate.

Introduce a league table taking advantage of people's competitive nature.	May align with prize option/reward. Risk of losing those partaking for greater social purpose if it becomes about competing?
Communication method (text vs email vs in-app)	
Session opt outs vs. Session opt ins	Observability could be preserved for the opt out group by a quick yes/no survey immediately after the event.
Financial vs. Non-financial incentives	Would this be fair to test? Wouldn't the group with non-financial incentives be annoyed that others were receiving financial incentives? (you could test within the same groups?) How would you test 'within' a group – I don't think I understand. (one event has a financial incentive, the next a non-financial incentive etc). Ah, so varying it as an event parameter rather than as a treatment group, is that right? (yes)
Different notice periods ahead of delivery (24h, 8h, 1h)	Agree this is important This is currently an 'event parameter' - do think there's value in testing this in lower-settings though (group treatments instead of event parameter')
Payment per kWh vs. Everyone gets same participation payment (which could vary by grid value)	Note – average value of might be low, driven down by long tail
Streak bonuses for participating in multiple events vs. Flat incentives	
Focus on different devices for manual response in communications – suggest different actions or give different weight in communication for heating (thermostats) and white goods, etc.	
Provide actionable tips for customers	This should be the case for all groups e.g through FAQs or a dedicated CrowdFlex website link. To what degree would these tips be generalised or made specific to the turn up/down event? Perhaps the specific communication is shorter/more focussed?
Notification period (currently suggested as event parameter)	
Differing £/kWh for treatment groups rather than event would give clearer understanding of price sensitivity (varying by events will be subject to external factors)	This would be amazing to test via randomisation – would ESO / OE be willing to do so?
Vary the time customers would have to plan for an event – is it better to let people know week in advance/ day ahead/ hours ahead?	This can be difficult logistically, as we need to plan ahead a week ahead? How do you calculate a "baseline"?
Communication method? SMS/Text/Email/App	Might be easier if customers "choose the communications they want" at the start of the trial (by ticking boxes) rather than this being randomised

Tips on making the demand response requested (e.g. for an overnight event, turn your heating on an hour later, For a morning event: delay laundry)	Yes, and vary the type and nature of communication.
Testing a seasonal opt in/out. I.e. will only participate in events during the winter or summer	
Reminders of past behaviour (or something to that effect, but could be horrible to track). So you saved x last time, if you do y you could also save more. Between groups could test whether this works at all or how much history is provided?	+1 – e.g you have hit the target in X out of Y events Also you could "build streaks" like Duolingo.
Encouragement through app notifications – like rings on Apple watch for achieving targets	Some consumers not tech savvy – need to consider
Method of engagement (app vs. Text vs. Email)	Not sure if this is important enough for a nation-wide trial. Feels like something to optimise when CrowdFlex is already a thing and we're looking to 'maximise' participation.
Doesn't work with the current method of running events, but could we test the power of developing a habit? E.g Tuesdays are turn down days?	I think we may be possible to vary the "intensity" of the treatment e.g. one group gets invited every two/three event.
Testing an availability payment, e.g. £10 per day just for being available to turn down at very short notice, and £1 per kWh when you do v. no availability payment	+1 I think testing availability payments (e.g £/month) vs delivery payments (e.g £/kWh) would be important to test to understand continued customer participation and to measure "reliability" of response. Needs some level of structure to ensure that if response doesn't arrive then they don't get paid availability payment.

Note: These ideas and comments were generated during and leading up to the workshop. They were briefly discussed by the consortium members, and feedback was received from participants during and after the workshop.

Table 4: Workshop ideas on event parameters

Ideas	Comments
Please enter event parameters you think we've missed in the empty cells below.	***What are the 'boundary' (min / max) conditions that could be useful to test for each idea?***
Event window length (1 hour / 2 hours / 3 hours / 4 hours etc.)	For manual: 0.5 - 3 hours For automation: 0.5 - 4 hours
	Is there a "meta" question here - a constraint can last days, so if we want to test that are we taking them as separate events or a sequence of events? So, for example, how long can the "event" be on day 3 if all the Evs are charged? Aggregate event like this could be 12 hours?
	Manual vs automated will impact upon windows / notice periods
	Probably will also depend on days of week and other conditions that affect whether people can turn down. E.g. on weekend it might be more possible for longer windows as people could "go out" as opposed to weeknights.
Notice period (e.g. 24 hours vs 12 hours vs 1 hour)	For non-BM services, It should be 2 hours – 24 hours
	Probably need to take into account of inertia: how long does it take to send comms over which channel, how long does it take for people to then react. So I'd say probably 3 hours in advance.
	Manual vs automated will impact upon windows / notice periods
Incentive level (e.g. £1/kWh vs £2/kWh)	Good to test this, but will this obscure the effect of "Trial Fatigue", and not allow us to make inference for the long-term behaviour of customer flexiblity?
	Price elasticity is key, but need to be commercially realistic (I.e based on value of service for ESO)
	Could also test nudge? I.e. no incentive. Nudge versus no incentive?
	One potential variant of interest for framing: put everything in terms of unit rate So values are [0, 0.5, 1, 2] x £unit-rate/kWh (up to max of e.g £2/kWh ??)
	Think we should look at range of BM pricing £1-6/kWh - lower than this is challenging to make economics stack up
	How do these incentives compare with the existing benefits of a ToU tariff??
	Consumer don't understand p / kWh. Should test different framing.
Incentive structure (e.g. £1/kWh for any reduction vs £1/kWh for reduction up to 20% of baseline and £2/kWh for reduction above 20%) Like a "step" reward function	Phew! Not sure I understand?
	Related to personal targets
	What about participation incentive? (So an availability payment.) Could that be factored in - £1 just for being available but this reduces the payment for the amount saved?

	I think an “availability payment” (I.e £X per month, providing no more than Y opt outs) vs “utilisation payment” (I.e £Z/kWh delivered) is important to test. For automated customers, I think we just use the former, but for manual customers we can vary by event.
	Sure – just needs to fit in the overall payment band
	No minimum target to reach payment – customers hate it if unsuccessful and baseline introduces lot of variability
Incentive structure (e.g. earn more £/kWh based on performance in previous events)	I don’t know if we could make this ‘fair’. Those with higher volumes would be favoured.
	Feel like this could disincentivise “late” participants – people who weren’t able to take part as much during earlier events, but could now do so for reasons beyond their control.
	I think this would have to be a non-financial incentive. Granu
	Like the streaks
Different curve – test more value closer to real-time	Kieron / Freddie liked this approach of having different prices closer to real time depending on forecasts E.g - 24 hours before: 20p - 12 hours before: 50p - 6 hours before: 70p - 1 hour before: £1 Would have to: - Make sure customers are paid highest marginal price, and this is communicated to them - Be opt-in, and could test response of opt-in by each of the options above
Direction of flexibility (e.g. turn down vs turn up vs both)	Should test: {National – Turn Up, National – Turn Down, Regional – Turn Up, Regional – Turn Down, Regional – Turn Up & Turn Down} where the last one is across a "constraint” (which we might simulate as its an innovation trial, but should be as close to real grid conditions as possible)
	Definitely should test both
Days since previous event (e.g. 1 day gap vs 2 days gap vs 7 days gap)	This could be important for engagement.
	This is important
	Should be able to learn valuable lessons regarding fatigue.
	Agree – important one to test
	Anything from 1 day up to 2 weeks (?)
	Think one day minimum but for grid reasons shouldn’t constrain max number per week (within reason)
	For extreme cold (hot) weather probably not wise to have trials (despite grid probably being most constraint) - possibly attracting bad

Weather forecast for event days (e.g. having an event on one of the warmest / coldest days)	media headlines?. [I think we want to understand level of response on those types of days]
	Coldest days align closely to system peak and therefore will be very important to test (previous studies have suggested that domestic flex tends to zero as temps decrease). Messaging around this will have to be delicate to make sure that consumers do not suffer (as above point says)
	Potential political / media issues re: coverage
Location / region	This will have to vary based on the event for constraint management
	Can we trial areas with high population of low income/vulnerable customers (ideally in a turn up event)?
	Granularity is quite important here – house level? street level? Where does GDPR come in?
Interaction with DSO flexibility and the stacking of benefits	Not sure this is a consumer attribute to test
	We should recruit crowdflex participants and have a “dashboard” of participants by DSO region area. Only that way can we define which DSO regions it makes sense to test events in, and work with those area managers.
Notification time	Ideally customers get notified of results within one day (but some smart metering constraints on this) - could experiment varying this.

Note: These ideas and comments were generated during and leading up to the workshop. They were briefly discussed by the consortium members, and feedback was received from participants during and after the workshop.

Table 5: Workshop participants' scoring of treatment ideas on 'feasibility of implementation' and 'value of insights'

Name	Combined Score	Feasibility Score	Value Score
Different treatment groups get different notice periods for the same event.	2.7	1.3	1.3
Consumers select personal targets (e.g. % reduction/increase from baseline) ahead of event (in a situation where payments are not tied to targets)	2.3	1.3	1.0
Incentive per event (absolute) and not per kwh	2.3	1.3	1.0
Customer pledges amount of flexibility	2.3	1.3	1.0
Cumulative rewards across events (streaks)	2.3	1.3	1.0
Carbon reduction framed communications (emphasising carbon savings through demand shifting)	2.0	1.7	0.3
Praise and opportunity to win a special prize if consumer is in the top X% (e.g. top 10%)	2.0	1.3	0.7
Financial incentives communicated in a 'loss' framing – e.g. consumers begin with £5 reward for the event; they run down that balance based on the difference between actual versus theoretical maximum turn-down.	2.0	1.3	0.7
Heavy emphasis on personal target in communications – e.g. emphasising 20% turn-down target even when turn-down payment is not tied to targets.	2.0	1.3	0.7
Different incentives for different treatment groups	2.0	1.0	1.0
Cooperation framing (collective framing)	2.0	1.7	0.3
Additional financial bonus if 'similar' consumers (e.g. same street or postcode) meet combined target	1.7	1.0	0.7

Note: These scores are calculated based on workshop participants' 'rating' of each idea on a 3-point Likert scale (0/1/2) measure of (i) 'feasibility of implementation' and (ii) 'value of insights'. The combined score is a sum of the average feasibility and value of insights score and can take values between a minimum of 0 and a maximum of 4. The 12 ideas with the highest combined score are listed here.