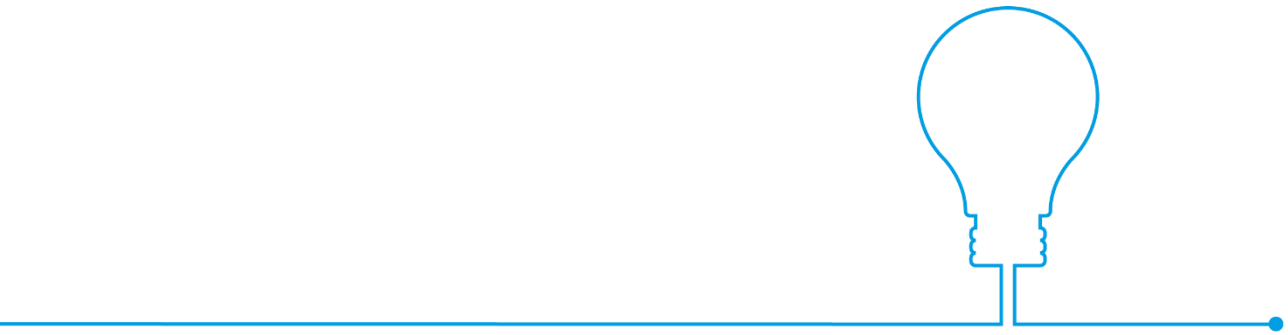
Department for
Business, Energy
& Industrial Strategy

EVALUATION OF THE TRANSITIONAL ARRANGEMENTS

Phase 1 - Executive Summary



February 2017

Executive Summary

Introduction

This report presents the findings from Phase 1 of the evaluation of the Transitional Arrangements (TA) for Demand-Side Response (DSR) and small-scale distribution-connected generation. This evaluation was commissioned by the then Department of Energy and Climate Change (DECC), now the Department of Business, Energy and Industrial Strategy (BEIS). The evaluation is being led by CAG Consultants, and delivered in partnership with Databuild, Verco and NERA Economic Consulting.

Phase 1 of the evaluation ran from late January to July 2016 and examined the outcomes and early impacts of the first TA auction. Phase 2 of the evaluation, which runs for one year from July 2016, will examine the delivery of obligations arising from the first TA auction and refine estimates of impact. Later phases of the evaluation will examine the outcomes, delivery and impacts of the second TA auction, planned for March 2017.

The TA is a pilot and forms part of the Capacity Market (CM) for security of electricity supply, within the government's Electricity Market Reform (EMR) programme. The TA aims to encourage development of DSR[1] and small-scale distribution-connected generation that can respond when needed to help balance supply and demand in the electricity grid. The TA scheme involves two auctions for capacity in the delivery years[2] 2016/17 and 2017/18 respectively. The TA had three main objectives:

1. To develop a stock of flexible capacity that can be available for the one year ahead (T-1) auction in 2017 for delivery in 2018/19, thereby contributing to liquidity in this and subsequent year-ahead auctions.

2. To contribute to security of electricity supply to help with short-term forecasted system tightness (winter 2016/17 and winter 2017/18).

3. To encourage enterprise and develop experience, confidence and understanding so that DSR and embedded generation will be able to realise their potential and ultimately compete with larger generation assets in the CM.

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[1] In this report we have used the CM definition of DSR: the activity of reducing the metered volume of imported electricity of one or more customers below an established baseline, by means other than a permanent reduction in electricity use. DSR may be achieved through any combination of onsite generation, temporary demand reduction or load-shifting.

[2] The delivery year runs from 1st October of one year through to 30th September of the following year.

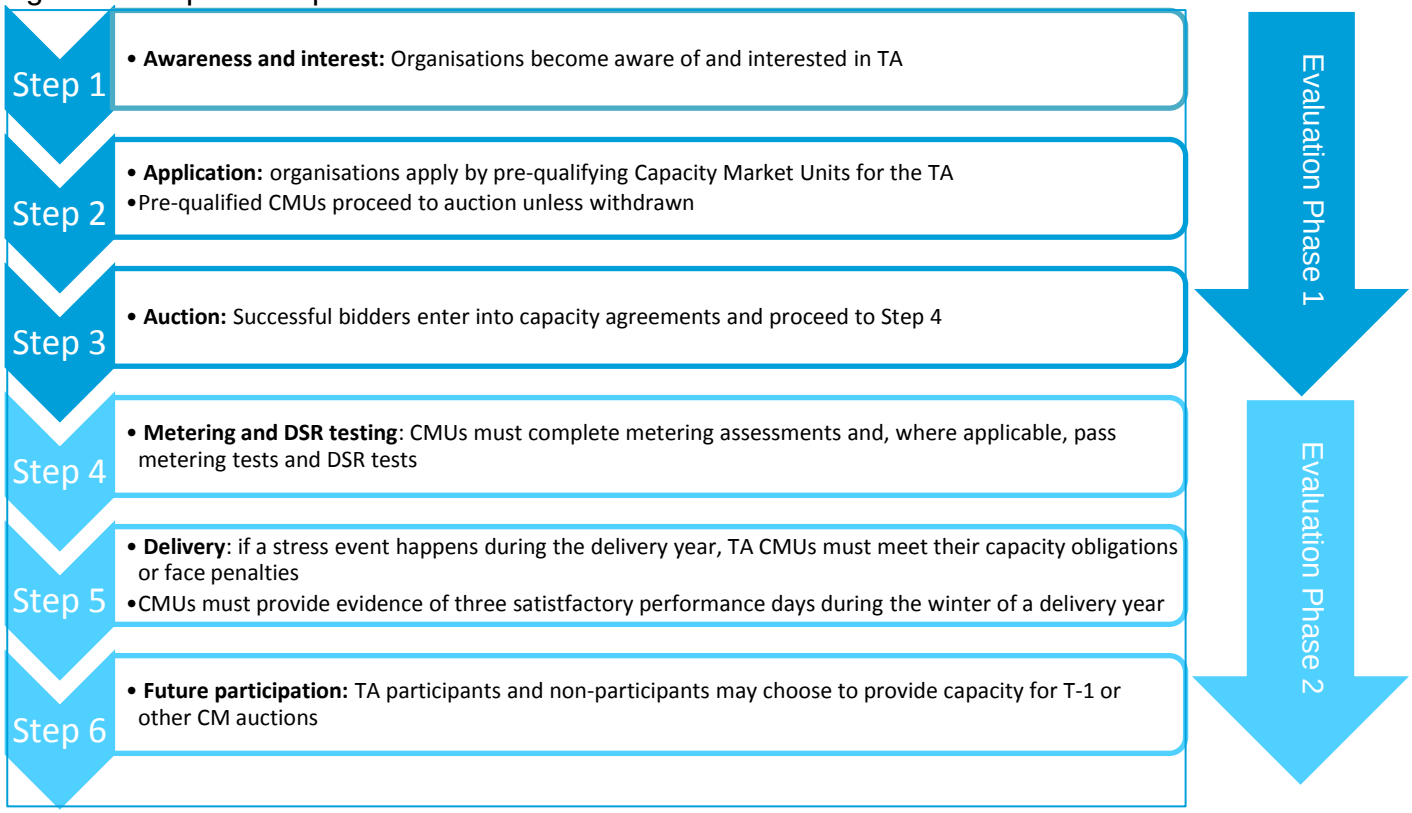
The TA is designed to be a stepping stone to the main CM for flexible capacity[3] that might have difficulty in competing in the main CM. The TA is open to both direct participants, putting forward their own capacity, and aggregators, putting forward capacity on behalf of clients. For the TA, Capacity Market Units (CMUs) must be between 2 MW and 50 MW in size, but may comprise multiple components across different sites and organisations. As in the main CM, TA participants are required to prequalify and, if successful, will bid in the TA auction to indicate the price at which they would be willing to make this capacity available when required by the System Operator. This is a 'pay as clear' auction, in which all participants who are successful receive the auction clearing price[4]. Unproven DSR and New Build CMUs must submit credit cover. The first TA auction was open to small-scale distribution-connected generation and to DSR provided by back-up generation and demand turn-down. In contrast, the second TA auction will be open only to turn-down DSR. The other types of capacity will be able to participate in the Early Auction.

Participants successful in the auction are awarded capacity agreement(s) for their CMU(s) which set out their obligations to deliver capacity if there is a CM stress event[5]. In such an event, participants are required to either provide generation capacity or reduce demand below their baseline, with a failure to do so resulting in financial penalties. Prior to the delivery year, they have to meet CM requirements for metering and DSR testing, and risk their agreement(s) being terminated if they fail. Conditions in the TA are softer than the main CM, to encourage new entrants: the level of credit-cover collateral is set at £500/MW, which is 90% lower than the main CM, and there an option to only respond to stress events occurring between 9-11am and 4-8pm on winter week days.

While the TA does not automatically lead on to future CM participation, it aims to build capacity and confidence so that providers of DSR and small-scale generation are better placed to compete in future CM auctions. A schematic representation of the different steps in the TA is shown in Figure A.

[3] Ofgem defines flexibility as 'modifying generation and/or consumption patterns in reaction to an external signal (such as a change in price) to provide a service within the energy system'.
[4] Bidding strategies are likely to differ between 'pay as clear' auctions (where participants tend to bid their own supply costs, knowing that they will receive the clearing price if successful) and 'pay as bid' auctions (where participant bids are swayed by their estimate of the bid price for the last unit to clear the auction).
[5] A stress event is a period in which the electricity supply/demand balance is too tight (as determined by National Grid algorithms).

Figure A: Steps in TA process



Methodology and approach

This evaluation aims to respond to five high level evaluation questions (HLQs) about the TA and its outcomes, as specified by BEIS, which are shown in Figure B.

Figure B: High-level questions for this evaluation

High level evaluation question
1. What outcomes can be attributed to the TA and were they as intended by BEIS? What outcomes occurred for whom and under what circumstances?
2. Through what levers and causal mechanisms have the TA contributed to these outcomes and the variation by group and circumstance?
3. Did the TA present good value for money to both scheme participants and the consumer?
4. Which aspects of the TA's design and implementation account for the findings of HLQ 2 and 3?
5. What are the implications of the findings for the future contribution of DSR and small-scale generation to the CM?

Our approach to this evaluation is realist and theory-based. A realist approach[6] emphasises the importance of understanding not only *whether* a policy contributes to outcomes (which may be intended or unintended) but *how*, for *whom* and in *what* circumstances. We developed a theoretical framework for the evaluation, involving the framing of realist hypotheses that set out for whom, and in what contexts, the policy is expected to lead to particular reasoning and choices being made (i.e. causal 'mechanisms' being activated[7]), leading to desired or undesired policy outcomes. These realist hypotheses are generally known as context-mechanism-outcome combinations, or CMOs[8], and the originals can be found in Appendix 1.

We used generative causation assessment methods to test the CMOs against research evidence. These involve examining causality through strategic data collection and logic, rather than measuring correlations between the intervention and outcomes[9]. The three main generative causation methods that informed our approach were contribution analysis, contribution tracing and participatory analysis. Contribution tracing involved the rigorous testing of the project and alternative hypotheses against relevant evidence for each participant, to assess the likelihood of each case supporting the hypotheses. Contribution analysis involved a broader, structured process to set out, test and refine our understanding of the TA's contribution, drawing on evidence from all sources. Participatory analysis involved testing the emerging 'contribution story' with external stakeholders.

Research undertaken in Phase 1 of the evaluation involved: a literature review to test the theoretical framework, analysis of EMR Delivery Body[10] data, modelling of participant costs and revenues, 64 in-depth interviews with all TA participants and a sample of non-participants, and a quantitative survey with 169 non-participating organisations. The quantitative survey sample was drawn from a list of organisations with high to medium electricity consumption (over 6,000 MWh per year) that could have the potential to participate in the TA. The sample was small because this survey was primarily designed to identify potential non-participants for in-depth interviews, but it was sufficient to generate wider findings about awareness of and suitability for the TA. Further details of sampling and methodology are given in the appendices. Preliminary findings, including the 'contribution story', were tested with external stakeholders at a participatory analysis workshop in May 2016.

[6] R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.
[7] In realist terminology, the activation of a causal mechanism is referred to as the mechanism 'firing'.
[8] Definitions for contexts, mechanisms and outcomes are provided in the glossary. Further detail can be found in Pawson and Tilley (1997) (op cit).
[9] Because of the small sample sizes, we did not just look for statistical correlations in the evaluation evidence but aimed to understand how and why each and every organisation made the choices they did.
[10] The EMR Delivery Body is currently National Grid.

Findings about outcomes of the first auction are tentative as some outcomes will not be known until Phase 2 of the evaluation. In particular, there were uncertainties about the type and related cost of capacity put forward by aggregators, as many were still in the process of securing clients to fill their CMUs during Phase 1. Another limitation of the Phase 1 research was the low number of in-depth interviews with non-participants and aggregator clients. This was partly due to time and resource constraints and partly to difficulties in identifying aggregator clients, which will be addressed in later evaluation phases. Steps were taken to guard against lobbying bias by triangulating interview data with other sources of evidence, both within specific contribution tracing tests and within the overall contribution analysis. A further consideration was that BEIS undertook a consultation on the future of the CM, including the second TA auction, during the research period, which may have negatively influenced their views of the TA.

Following our realist approach, the sections below present evidence about whether the TA contributed to each of its three objectives as well as the contexts and mechanisms through which these contributions were observed.

Findings on contribution to capacity for future T-1 auctions

Contribution tracing using Phase 1 evidence strongly suggested that the TA will contribute to increased volumes and more competitive capacity being made available to the CM beyond 2016/17. TA participants and non-participants commented in the interviews that the TA would help to develop higher volumes for future T-1 auctions, including the Early Auction in 2017. Interview evidence indicated that the TA was enabling inexperienced players to develop their customer base, their knowledge of the CM and their confidence about DSR and flexibility services, in a relatively low risk environment.

In particular, interview evidence indicated that the low credit cover, early revenue and one-year ahead agreements had attracted new entrants into the aggregation market. Around half of the TA aggregators, six in total, were new entrants, comprising aggregators with international experience and energy suppliers that saw flexibility services as an additional service that they could offer. They saw the TA as a lower risk environment than the main CM for them to try out a new business area and build a portfolio. It is not yet clear how aggregators will contribute to overall growth in flexible capacity nor how new entrants will increase competition. During Phase 1, it was too early to assess whether TA participants would in fact choose to participate in future T-1 and other CM auctions.

For TA aggregators and direct participants already experienced in flexibility services and confident in participating in the CM, the TA did not necessarily influence the capacity they will provide to future T-1 or other CM auctions, as some had already demonstrated their capability by participating in the T-4 auctions. However, even these participants predicted that the TA would increase capacity in the market generally. These findings are preliminary and will be refined in Phase 2 of the evaluation.

Findings on contribution to security of supply in 2016/17

The first TA auction resulted in capacity agreements being signed for 803 MW for the 2016/17 delivery year. But Phase 1 evidence suggests that the TA will make only a limited contribution to security of supply in 2016/17 because auction results, combined with interview evidence, indicate that much of the capacity covered by TA capacity agreements was already available to the grid through National Grid balancing services[11]. This was the case for most direct participants, but was also the case for well-established aggregators.

However, the contribution tracing and wider interview evidence from Phase 1 suggest that the TA will make a limited contribution to short-term security of supply through:

- Encouraging some new aggregators to enter the UK DSR market, and encouraging existing aggregators to sign up new DSR clients (primarily clients offering back-up generation). It is not clear what proportion of TA capacity was already available through balancing services, and what proportion of 'new' aggregator clients were just switching between aggregators. However, evidence from aggregator and client interviews suggests that aggregator activity is bringing some capacity into the TA and wider CM that had only been made available through Triad management[12].
- Supporting a few generators (direct participants) that had marginal economic capacity and could not commit far enough ahead to enter T-4.

Further research will be needed during Phase 2 of the evaluation to refine estimates of the capacity made available in 2016/17, including the proportion of aggregators' DSR capacity that is new to the market, and to assess how TA participants respond to a stress event.

Findings on contribution to encouragement of turn-down DSR

Our analysis of EMR Delivery Body data, combined with interview evidence about CMU composition, indicated that an estimated 55% of the capacity contracted in the first TA auction was expected to be diesel generation, whereas turn-down DSR was estimated at 19%. These figures are tentative as aggregators did not yet know the final breakdown of their capacity as they were still contracting clients at the time of research. However, there was consensus that the proportion of turn-down DSR was likely to be low.

Contribution tracing indicated that the first TA auction would make a limited contribution to the encouragement of turn-down DSR. Evidence from interviews and stakeholder

[11] System services contracted by National Grid.
[12] Organisations trying to reduce their electricity demand or boost their generation during three peak demand periods (or 'Triads'), in order to reduce their transmission charges or boost their revenues.

workshop suggests that up-take of turn-down DSR requires a greater attitude change within organisations due to concerns about potential business disruption. Our overall analysis of the TA's contribution to turn-down is supported by the following evidence:

- Interview evidence indicated that the first TA primarily encouraged turn-down DSR through DSR aggregators seeking turn-down DSR as one element of the capacity they contract from clients, but that they found it challenging to bring forward new turn-down DSR between the auction (in January 2016) and the completion of CM tests (by end August). At the time of the interviews, DSR aggregators typically reported that 10-20% of their CMUs were likely to be turn-down DSR.

- A number of organisations offering DSR, including direct participants and aggregators, participating and non-participating organisations, stated in interview that they had a pre-existing commitment to provide turn-down DSR which was not influenced by the TA.

- Some non-participant aggregators with access to technologies capable of offering frequency-related services (using automatically controlled turn-down over very short time windows) reported choosing them over the TA and wider CM because of their financial attraction and more manageable operational consequences for clients. For similar reasons, stakeholders at the participatory workshop reported that some potential direct participants opted to offer DSR via frequency-related services rather than the CM.

- A number of organisations offering generation, both participants and non-participants, were not interested in or had no capacity for turn-down DSR. They perceived a conflict between turn-down DSR and other business objectives.

- However, the TA was reported by some aggregators to be contributing to an attitude change in potential DSR participants by making DSR more financially attractive. Stakeholders at the participatory workshop also reported that this attitude change was aided by National Grid's 'Power Responsive' campaign, which was beginning to raise awareness of DSR opportunities across a range of organisations.

As the second TA will be restricted to turn-down DSR, later phases of the evaluation will provide more evidence on the TA's overall contribution to this objective.

Findings on value for money

Overall assessment of the contribution of the first TA auction to its three objectives will depend on the findings of Phase 2 of the evaluation, relating to the testing and delivery of TA obligations. Given the inter-relationships between the TA, the wider CM, balancing services and embedded benefits (such as Triad revenues), the longer term outcomes of the TA, and hence its value for money, will depend on changes in these other markets.

As mentioned above, the first TA auction has made some contribution to security of supply in 2016/17 and appears likely to bring forward some capacity for future CM auctions. However, the clearing price of £27.50/kW was high relative to our estimates of underlying supply costs. This is relevant when considering the cost effectiveness of the auction, but a full value for money assessment is beyond the scope of this evaluation and would need to compare the cost of the TA with the cost of achieving the TA objectives by other means.

We modelled costs and revenues for different types of TA capacity, using industry data supplemented by cost information gathered through interviews. These costs and revenues were used to compile a supply curve for the first TA auction, which was compared to the auction demand curve to generate a theoretical 'supply curve clearing price'. The observed clearing price was significantly above the theoretical supply curve clearing price, owing to the low costs of capacity that was already available to the market by other routes and was not dependent on the TA. But the cost estimates underlying the modelled supply curve may be too low, as they do not include the opportunity costs of DSR. This will be addressed in Phase 2.

Our analysis of the auction results indicated that the relatively low volume of capacity brought forward to the TA contributed to its high clearing price. Research evidence suggested that the low volume was influenced by a number of factors including limited awareness of the first TA auction and the time required to understand complex CM rules and guidance, which was particularly challenging for potential direct participants.

While a full value for money assessment, including the alternative means of achieving these objectives, is beyond this evaluation due to the complexity of the system, data collected during Phase 2 will enable some refinement of our assessment.

Findings on the factors contributing to these outcomes

The findings were used to refine the 'context-mechanism-outcome' (CMO) combinations for steps 1-3 in the TA process, and are presented in a revised theoretical framework for steps 1-3 (see Appendix 2). The revised theoretical framework is more specific than the initial framework about which organisations participated in the TA and why. All of the CMO descriptions below apply to potential participants that heard about the TA, and had/or could access or develop the capacity to participate:

- For direct participants offering capacity to National Grid via other services that are compatible with the TA (e.g. STOR), the TA offered another source of revenue.
- In a few organisations, with marginal generating capacity, TA revenues supported new capacity or retained capacity at risk of closure as they could not plan far enough ahead to participate in the T-4 auction.

- For a few experienced aggregators that submitted unproven DSR CMUs to the T-4 auction but failed to acquire higher prices, the TA offered higher prices enabling them to contract for this capacity.
- For aggregators already experienced in the DSR aggregation market in Great Britain, the TA provided an extra source of revenue to attract new clients.
- For organisations interested in entering the DSR aggregation market in GB, the TA provided a low-risk setting to test the market and develop their DSR client base.
- Organisations that had suitable load or generation and perceived an opportunity, but were risk averse or lacked sufficient confidence, management time or experience to directly participate in the TA, did so via an aggregator.

The revised framework also highlights contexts that resulted in non-participation in the TA, even amongst those organisations that were aware of the scheme and appeared to have the capacity to participate (either directly or via clients):

- Potential direct participants or aggregator clients uncertain about future TA prices, or the potential number and length of stress events under the TA, felt that the risks of entering the TA outweighed the potential benefits so they did not participate.
- Aggregators or organisations participating in other schemes incompatible with, but perceived to be more lucrative or more stable than the TA, did not to participate (e.g. frequency-related services, Long-term STOR, T-4, DSBR, and Triad management).
- For organisations with limited management time, complex technology (e.g. CHP) and/or a complex institutional setup, the TA was perceived as too time-consuming, too complex or too difficult to engage with so they did not participate.
- Organisations at the early stages of developing their aggregation business, or still deciding on their business strategy, were not ready to participate in the TA.

The contexts and mechanisms by which the TA made additional contributions to its three objectives have already been summarised in the ‘contribution’ sections above. Further review of additionality CMOs will be undertaken during Phase 2 of the evaluation, when fuller evidence is available.

Learning points for the future

The research findings highlight some key learning points for future CM auctions.

- Interview evidence suggests that participation of DSR in future CM auctions may be limited by low awareness of the TA and CM, and by the complexity of guidance and rules, especially for direct participants.
- Interview evidence suggests that the second TA auction, which is restricted to turn-down DSR only, may have limited liquidity as some DSR providers reported that they would choose to contract mixed DSR portfolios (including back-up generation) in the Early Auction instead of the TA. While a few TA aggregators welcomed the reduction in minimum CMU size to 500 kW, some were concerned about the shortened time between auction and delivery compared to the first TA.
- Many TA participants reported that they sought to 'stack' TA revenue with revenue from at least one other source (e.g. Triad, balancing services), but some were concerned about the future of Triad revenues, given Ofgem's review of embedded benefits..
- Some TA aggregators reported that they would like to see greater certainty about the future policy environment for the DSR sector. They cited examples of policy uncertainty, like the last-minute reduction in volume of the first TA auction, and the recently announced changes to the CM rules (e.g. removal of guaranteed volumes in some future T-1 auctions[13] and eligibility criteria changes for the second TA auction.).

Conclusions

While a full value for money assessment is not within the scope of this study, early evidence from Phase 1 of this evaluation strongly suggests that the first TA auction will increase the flexible capacity coming forward to the CM beyond 2016/17, in line with one of its objectives. However, it will make only a limited contribution to its objectives of increasing security of supply in 2016/17 and encouraging turn-down DSR. The clearing price of £27.50/kW was high relative to our estimates of underlying supply costs, based on cost data from interviews and industry sources. The contexts and mechanisms leading to these outcomes are included in the revised theoretical framework, as presented in the appendices. Further research will be undertaken during the TA delivery phase with participants, and any organisations dropping out from the scheme, to gather further evidence on outcomes, why they occur, for which organisations and in what circumstances.

[13] Changes introduced by BEIS during 2016 mean that a higher volume of capacity is procured at the T-4 auction, resulting in less capacity being set aside for the corresponding T-1 auction. To support smaller providers in the CM's introductory years, there is a volume reserved for the T-1 auction for delivery years 2018/19 and 2019/20, but not for delivery years from 2020/21 onwards.