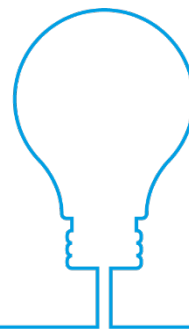




Department for
Business, Energy
& Industrial Strategy

EVALUATION OF THE TRANSITIONAL ARRANGEMENTS FOR DEMAND SIDE RESPONSE

Phase 2 – Executive Summary



December 2017

Executive Summary

This report presents findings from the evaluation of the first auction of the Transitional Arrangements for Demand Side Response (DSR) and small-scale distribution-connected generation (referred to simply as 'the TA'). This realist, theory-based evaluation was undertaken for the Department for Business, Energy and Industrial Strategy (BEIS) by CAG Consultants, in partnership with Databuild, Verco and NERA Economic Consulting.

The earlier Phase 1 evaluation report¹ presented findings on the first TA auction, including awareness of the auction and pre-qualification, while this Phase 2 report focuses on participant experiences and impacts of the first TA after the auction. Later phases will evaluate the second TA, the auction for which took place in March 2017.

The TA is a pilot and forms part of the Capacity Market (CM) for security of electricity supply. The TA aims to incentivise and encourage the development of DSR² and small-scale distribution-connected generation so that it can participate in the CM both in the short and the longer-term. The three main objectives for the first TA are set out in Figure A below.

Figure A: Objectives of the first TA

- 1. To contribute to security of electricity supply to help with short-term forecasted system tightness (winter 2016/17 and winter 2017/18).**
- 2. To develop a stock of flexible capacity³ 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.**
- 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.**

¹ <https://www.gov.uk/government/publications/evaluation-of-the-transitional-arrangements-phase-1>

² The CM definition of DSR is 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 onsite generation, temporary demand reduction or load-shifting.

³ Flexible capacity means electricity generating capacity and demand that can increase or decrease in response to signals, to help balance supply and demand of electricity across the GB grid.

The TA involves two auctions for flexible capacity within the CM, the first for delivery of capacity in the 2016/17 delivery year and the second for delivery of capacity in 2017/18.

Methodology and approach

Our approach to this evaluation is realist and theory-based. A realist approach⁴ 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 hypotheses⁵. We used generative causation assessment methods to test these realist hypotheses against research evidence. Realist contribution analysis was the main generative causation method used, supported by contribution tracing with Bayesian updating. During Phase 2 of the evaluation, we collected and analysed evidence through:

- Analysis of the Capacity Market register for the first TA, and for the other CM auctions that had taken place as of June 2017.
- Analysis of testing information provided by BEIS, National Grid and EMR Settlements (EMRS).
- An email survey with TA participants (to which 17 TA participants responded). Participants were made up of direct participants and aggregators⁶.
- In-depth interviews with 19 TA participants, supplemented by email evidence from a further four participants, bringing the total to 23 out of 24 TA participants.
- In-depth interviews with seven organisations who were the clients of aggregators (i.e. they put forward capacity into the TA through an aggregator⁷).
- Four participant case studies focused on DSR tests and Satisfactory Performance Days (SPDs).

The findings presented in this report are based on these evidence sources, as well as drawing and building on evidence collected during Phase 1, where appropriate.

Findings on testing and participation

Following success in the first TA auction and the awarding of capacity agreements, participant Capacity Market Units⁸ (CMUs) were required to pass standard CM tests to

⁴ R Pawson, R, and Tilley, N. (1997) *Realistic Evaluation*. London: SAGE Publications Ltd; and Pawson, R. (2006) *Evidence-Based Policy*. London: SAGE Publications Ltd.

⁵ Definitions of these evaluation terms can be found in the glossary in Chapter 9 of the Main Report.

⁶ There were 24 TA participants (i.e. organisations with CMUs that had obtained capacity agreements after the first TA auction) at the beginning of Phase 2. These included 13 aggregators and 11 direct participants.

⁷ An aggregator is an intermediary organisation that provides a service of collating capacity for flexibility services from a range of other organisations, in return for a share in the revenues generated.

confirm their capacity. Nearly a quarter (182.4 MW) of the 802.7 MW of capacity that was successful in the first TA auction dropped out of the TA through the testing process, leaving 620.3 MW of capacity contracted for the TA's first delivery year, of which 307.9 MW was unproven DSR. While the stringency of the testing process was the primary reason behind loss of capacity, the testing process also revealed some loss of capacity caused by aggregators having problems signing up clients that could meet TA requirements.

Almost all of the lost capacity (167 MW) was classified as 'unproven DSR', representing a reduction of around 35% in unproven DSR capacity from the 475 MW that was successful in the first TA auction. DSR capacity was lost due to some aggregators achieving lower than expected sign-up of DSR and most encountering challenges in complying with both metering and DSR testing requirements within a tight timeframe while subject to external constraints. Metering accuracy requirements were particularly problematic for those not using supplier settlement meters because they had either to document the accuracy of their existing meters or install new meters. A further challenge was that any onsite renewable generation assets that were receiving Feed-In Tariff had to be separately metered, to the same level of accuracy, to avoid double-subsidy. DSR testing and Satisfactory Performance Day (SPD) requirements were also challenging for those aggregators with large numbers of components in their CMUs. Despite all unproven DSR being able to appeal if they failed the DSR or metering test, only 10 MW successfully appealed having initially failed testing, as most DSR providers simply chose to exclude problematic sites rather than invest management time in appeals.

Participants with existing generation CMUs were not subject to DSR tests but were subject to metering assessment and in some cases metering tests, which some CMUs, particularly those involving multiple or complex sites, had problems complying with. Unlike DSR CMUs, they were not able to leave out problematic sites and continue with reduced capacity because their capacity was already 'proven'. However, only 15 MW of existing generation dropped out after the auction, representing about 5% of existing generation capacity. Other CMUs made significant investments in metering or appeal processes to pass testing requirements: 99 MW of the 300 MW of existing generation capacity remaining in the TA initially failed the tests but passed on appeal. There was a small proportion of new build capacity (13 MW) which met testing requirements without loss of capacity.

Three organisations (two aggregators and one direct participant) lost or withdrew all the capacity they had won in the first TA auction because of testing and sign-up issues. All

⁸ Capacity Market Unit is a unit of electricity generation capacity or electricity demand reduction that participates in GB's CM. To pre-qualify for the first TA, a CMU had to be between 2 MW and 50 MW. A CMU may consist of a number of sites or components.

but one of the 21 participants remaining in the first TA reported that participation in the TA was still worthwhile, in spite of unanticipated expenditure on testing and metering, because they retained TA revenues and positioned themselves for future CM auctions.

Findings on fulfilment of obligations

Participants with CMUs in the TA must deliver against their capacity obligation if a stress event occurs during the Delivery Year⁹, or face a financial penalty. At the time of this research, two Capacity Market Notices (CMNs) had been issued but neither led to a stress event meaning that CMUs were not called upon to deliver their capacity obligations¹⁰. Our understanding of CMN reactions is self-reported by TA participants, because meter data is only made available to National Grid if there is a stress event. Seven participants who offered baseload generation¹¹ (nearly 240 MW, across 13 CMUs) delivered capacity at the time of both CMNs because their generation plant was running anyway.¹² A further tranche of TA capacity was made available at these times because it was delivering for other purposes. We estimate that this applied to six participants (13 CMUs, 95 MW) for the first CMN and seven participants (16 CMUs, 175 MW) for the second. TA capacity was specifically delivered in response to the CMNs, by participants who were not confident in their understanding of the electricity system and delivered 'just in case' the CMNs developed into stress events. We estimate that there were 5 such participants (14 CMUs, 173 MW) for the first CMN, and 4 such participants (12 CMUs, 153 MW) for the second. The remaining capacity, an estimated 114 MW (6 CMUs) for the first CMN and 53 MW (5 CMUs) for the second, was not delivered because participants were confident in their understanding of the electricity system, thought a stress event unlikely and could respond quickly if needed. There is some uncertainty in these estimates because a few respondents had limited recall of their CMN responses and because interview data for aggregated CMUs was provided by aggregators rather than clients. Findings from client interviews suggest that clients generally followed aggregator instructions for these CMNs.

Findings on TA contribution to security of supply in 2016/17

An estimated 20-30% of the capacity available to National Grid in the delivery year following the first TA auction, and then remaining in the first TA, would not have been made available to National Grid in 2016/17 without the TA. This estimate, which is based on interview evidence cross-checked with contribution tracing analysis, is consistent with

⁹ The delivery year runs from October 1st 2016 to September 30th 2017.

¹⁰ The first CMN was issued on 31st October at 12.06pm, and was live from 4.30pm to 7.00pm. The cancellation notice was issued at 6.53pm. The second CMN was issued on 7th November at 12.06pm. This was due to go live at 4.30pm but was cancelled at 3.07pm.

¹¹ Baseload generation was almost entirely provided by combined heat and power (CHP) plants, together with some coal-mine methane plants.

¹² These estimates are based on responses reported by participants during Phase 2 interviews. In a few cases, where Phase 2 responses were unavailable, we used Phase 1 information to identify baseload generating plant.

the provisional estimate of 29% additional capacity in Phase 1 of the evaluation. TA revenue and conditions helped to incentivise a few participants to retain marginally economic plant, encouraged new and existing aggregators to market TA opportunities to new clients and encouraged existing aggregator clients and direct participants to make new sites available to the flexibility market. But there was strong evidence that TA revenues were being stacked with other sources of revenue (e.g. Triad, STOR, FFR¹³ and/or sales to the electricity market), and that decisions to invest in new capacity, controls or equipment were premised on revenue streams over several years, not just one year of TA revenues.

Findings on TA contribution to capacity for future T-1 auctions

There is consistent evidence that the TA acted as a 'pilot' for the main CM, not just for TA participants but also for National Grid, EMRS and for BEIS. It generated significant learning about how CM testing and delivery work in practice. Three participants that were new to the CM gained learning and confidence from the first TA that made them more likely to participate in the main CM. Seven further participants, with successful but challenging experiences, invested in metering equipment, their client base or strategic learning for the TA that put them in a better position to participate in the main CM. Seven other participants that were already confident in the CM, and already had a well-established client base for flexibility services, reported that their TA experience made them feel more prepared for the main CM but that this would not affect the scale and competitiveness of their offer to the main CM. Four participants who had problems in the TA reported that they had gained a better understanding of CM rules but this had made them more cautious about participating directly in the main CM with DSR capacity in future. Their reasons included the high cost of metering for sites with renewable components, difficulties in signing up DSR clients and/or the challenge of developing a viable aggregation business for DSR in the main CM. Finally, three direct participants that offered turn-down DSR, or other capacity with a higher cost base, were cautious about participating in the main CM owing to higher credit cover and the expectation of lower clearing prices, despite successful TA participation.

Findings on TA contribution to encouragement of turn-down DSR

An estimated 10-15% of capacity delivered for the first TA was turn-down DSR. This estimate is based on interview statements, cross-checked with contribution tracing analysis. This capacity comprised just under 30 MW of well-established turn-down DSR from direct participants, and a further 30-60 MW¹⁴ of turn-down DSR across 16 DSR CMUs put forward by aggregators. The first TA encouraged new turn-down DSR to a small extent by providing an extra incentive for aggregators to market turn-down to both existing

¹³ National Grid buys a number of flexibility services from electricity consumers and generators, including the Short Term Operating Reserve (STOR) and Fast Frequency Response (FFR).

¹⁴ This is a rough estimate based on interview statements, not direct data.

and new clients: some aggregator clients offered turn-down DSR for the first time in response to TA deals offered by aggregators, where they had suitable loads and judged the risks to their main business to be acceptable. There was unanimous agreement amongst aggregators that it was more challenging to recruit clients offering turn-down rather than back-up DSR, because turn-down was perceived as potentially conflicting with an organisation's main business activity. Recruitment of turn-down DSR was hindered by the tight timeframe between the auction and start of the delivery year, by uncertainty about the number and length of stress events, and by concern about the impact on DSR baselines of delivery for other flexibility services (e.g. Triad, STOR, FFR). The aggregators recruiting the highest proportion of turn-down in their portfolios were those who had most experience of turn-down, in GB or overseas, and who prioritised CM rather than frequency services opportunities for turn-down.

Value-for-money

Our findings from Phase 1 were that the first TA auction had made some contribution to security of supply in 2016/17, and appeared 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 costs¹⁵. 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 TA objectives by other means. For this reason, additional supply curve analysis was not conducted in Phase 2. Nonetheless, new cost evidence from Phase 2 was broadly consistent with the supply curve modelling undertaken during Phase 1, and our Phase 2 findings do not significantly change our Phase 1 assessment of value-for-money of the first TA auction.

Key learning points: implications for the future of DSR in the CM

- TA impacts were constrained by the short timescale between the auction and start of the delivery year, by CM metering accuracy and by the complexity of CM rules.
- CM metering accuracy requirements made it difficult for complex sites with renewable energy generation to participate in the CM. The metering accuracy required by the CM is more demanding than the accuracy required for other flexibility services or for Feed-in-Tariff or Renewable Heat Incentive projects. This was a source of frustration for industry and acted as a barrier to participation of DSR in the CM.
- Aggregators reported that it was more challenging to recruit turn-down rather than back-up DSR capacity, because turn-down was perceived as potentially conflicting

¹⁵ The supply costs that were included in the earlier analysis are detailed in section 3 of the Phase 1 report: <https://www.gov.uk/government/publications/evaluation-of-the-transitional-arrangements-phase-1>

with an organisation's main business activity. Aggregators suggested that turn-down assets suitable for the CM, rather than frequency services, need to tolerate longer turn-down but need not be capable of fast, automatic dispatch.

- The scope for, and implications of, turn-down DSR participating directly or via an aggregator will be explored further in future phases of the evaluation.