nationalgrid

Report on the Demand Turndown Trials

23rd March 2006

1.0 Executive Summary

Discussions at the Ofgem led Demand Side Working Group (DSWG), highlighted a number of potential barriers to participation of the Demand Side in the provision of balancing services to the SO. In particular the short response times that are necessary for real time balancing of the electricity system was highlighted as a potential barrier. To explore this further, a trial was conducted which incorporated longer notice response times to facilitate Demand Side participation in the provision of contingency reserve.

This report provides an assessment of the services that were piloted, including the structure of the two pilot schemes, levels of participation, an assessment of the economics and the conclusions that can be drawn from the whole process.

During discussions at the DSWG and initial levels of interest in participation in the trials were cited as up to 450MW. The two pilots have not attracted as much interest (3 new providers in the first pilot and 7 in the second pilot) from new Demand Side service providers as was hoped. These new sites provided an aggregated maximum availability of 14MW and 58MW in each of the two trials respectively.

In order to have an appreciable gain in operating margin, the Demand Turndown service was designed with a minimum volume requirement of 100MW. To allow the first pilot to take place this requirement had to be relaxed. During the first pilot, on utilisation the average volume of Demand Turndown delivered was 46.5MW, and for the second pilot, 65.9MW, both significantly below the 100MW requirement.

During the two pilot schemes, National Grid instructed Demand Turndown on a number of days (the majority of which had declared availabilities below the 100MW threshold). As with any Balancing Service, National Grid require confidence that on despatch that the expected volume will be delivered. However throughout both trials, upon utilisation of the service, there has been consistent underdelivery of the volumes declared available. The actual volume of Demand Turndown delivered, compared to the declared availability has been in the range of 47 – 83%. Confidence in the ability of the service to fully deliver the declared availabilities has not been gained from the operation of the two pilots.

An economic assessment of the Demand Turndown services offered compared to the costs of other actions to create reserve in contingency timescales has been made. Demand Turndown has generally proved to be a more expensive option. Operation of the pilots has also highlighted that in contingency timescales[1] and assuming a 100MW Demand Turndown product, the size of the reserve requirement dictates that Demand Turndown is generally not sufficient in magnitude to be able to displace the larger alternative actions (even when these larger actions were more expensive on a £/MWh basis).

The operation of the trial has successfully demonstrated some generic processes. In particular the trial has proved that aggregators can provide a single point of despatch

[1] Contingency Reserve Timescales being down to 4 hours ahead of real time.

for disparate sites and that E-mail systems can be used to make availability declaration.

The Demand Turndown Trials have highlighted a number of issues relating to the demand side provision of reserve services to National Grid in contingency timescales, in terms of overall participation, size of service provision, reliability, and economic competitiveness. It is clear from the trial that it is difficult to match the contingency reserve requirements of the GB transmission system with the nature of services that have been provided by Demand Side participants. However the trial has proved that the concept of aggregation of small sites to provide a single despatchable volume is at least viable. We believe that this is an important concept and provides scope for the DSWG to consider further potential applications, including the Balancing Mechanism and as a balancing tool for Suppliers.

National Grid continues to offer opportunities to demand side participants to provide a range of Balancing Services depending on the nature of their capabilities. In addition, as a result of the trial, National Grid will continue to offer the flexible service of Demand Management. We look forward to continuing to work with DSWG to promote active demand side participation in the wholesale electricity market.

2.0 Table of Contents

3.0 Background

Ofgem established the Demand Side Working Group (DSWG) with the aim of encouraging greater Demand Side participation and to establish a forum for discussion by market participants. In 2001, National Grid were invited to the DSWG to consider how demand side participation in the provision of Balancing Services could be developed under NETA and how barriers to participation could be removed.

The main barrier identified through the DSWG discussions related to the response times associated with the existing Balancing Services[2]. The existing Balancing Services feature short response times, which are necessary for real-time balancing of the electricity system. This may limit participation by parties, who require longer lead times to reduce demand due to physical, commercial and operational drivers.

The DSWG identified the potential to develop a new service with longer response times, in which the demand side could compete against existing providers for provision of contingency reserve services. National Grid agreed to pilot such a service to investigate whether such a service was viable and could be developed into an enduring solution. This service was called "Demand Turndown".

The drivers for conducting a Demand Turndown pilot were tabled via presentations at the DSWG on 2nd July 2003 and 15th January 2004, and were based on opportunities to:

- gather empirical data within a set timeframe
- ascertain the viability of an additional reserve service
- potentially increase Demand Side participants beyond existing providers to achieve improved liquidity
- profile the nature of Demand Side load management
- prove the reliability of the service and establish confidence in the service
- pioneer an email system for availability declaration
- encourage Demand Side to develop aggregation as a potential service for the future that may be applicable in the Balancing Mechanism

This report covers two pilot schemes for this service, which were conducted independently. The first scheme investigated the provision of contingency reserve during critical periods in summer 2004. The second scheme investigated the provision of contingency reserve during critical periods in winter 2004/5.

[2] Standing Reserve, Fast Reserve, Frequency Control by Demand Management

4.0 Summer Pilot Scheme

The design of the scheme encouraged the concept of 'Aggregators', which provide a service by aggregating demand from disparate sites due to their ability to:

- market the service to a customer base
- use existing interface equipment to potentially derive real-time operational metering
- offset any potential imbalance exposure
- despatch disparate sites to deliver a significant aggregate volume following a single National Grid instruction
- function as a single contracting counter-party and single point of contact for despatch purposes

The summer scheme took place between 5th April and 30th July 2004. Summer was chosen for the first pilot to avoid any risks associated with managing peak demand during winter.

4.1 Summer Pilot Scheme - Structure

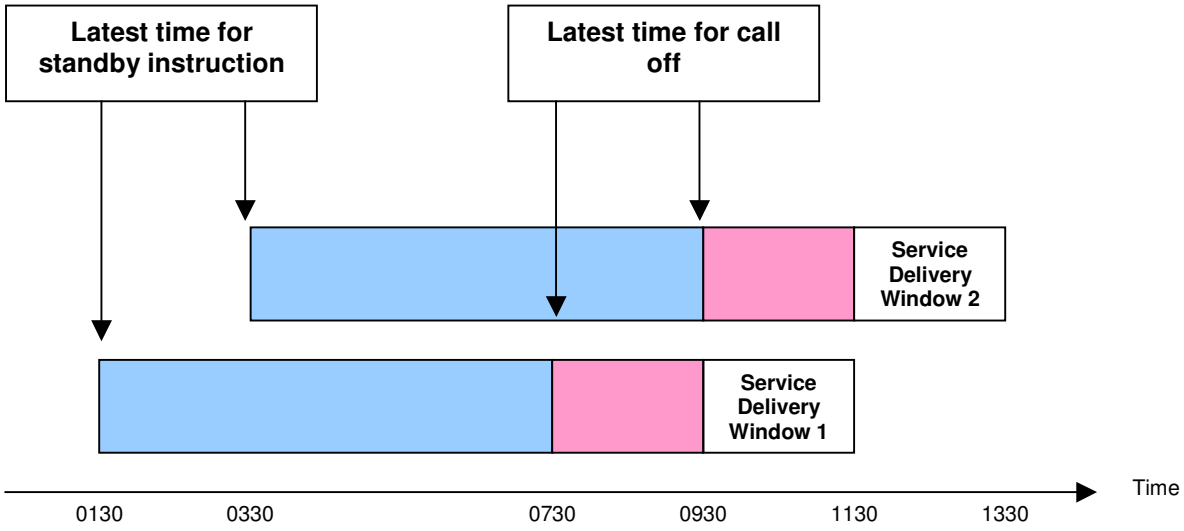
National Grid made initial proposals for the design of the Demand Turndown service to the DSWG. In response to feedback from the DSWG, amendments to the structure of the scheme were made prior to its commencement. The most significant change being that National Grid agreed to make availability payments in return for post event metering information from providers. Firm availability payments are normally only paid once a service has proved to be economic and reliable. For the Demand Turndown trial, availability payments were piloted to incentivise accurate availability declarations and to cover the administrative costs associated with providing the post event metering data.

The service required the firm provision of a minimum Turndown capability of 100MW[3] from an aggregator, across 2 fixed service periods for the trial, (Window 1 - 09:30 to 11:30 hrs and Window 2 11:30 to 13:30 hrs). These windows were chosen to allow the service to be evaluated across the summer morning demand peak. The trial operated on both weekdays and weekends.

The service was structured with a notice time to go on standby, with a further notice time to instruct the service (referred to as 'call off' in the contract). This is shown diagrammatically in the following chart.

[3] The 100MW limit was set as being the minimum level of Turndown that National Grid required in order to deliver an appreciable gain in operating margin

Example Standby and Call Off Periods for the Summer Trial



Participating demand side providers had to implement new processes and allocate resources to take part in the trial. The payment structure for the service considered these factors and was comprised of:

i. *Availability Payment [£/MW/h]* Payment during the service windows, dependent on whether declared availability was accurate to within 10% of the metered MW. The accuracy was assessed from the daily metered demand profiles submitted post event by the providers.

ii. *Standby Payment [£ per day on Standby]* - A fixed fee bilaterally negotiated with National Grid (maximum of one Standby Payment per day) paid when the service was selected to Standby by National Grid.

iii. *Utilisation Payment [£/MWh]* – Payment based on a bilaterally negotiated Utilisation Price (£/MWh) for energy delivered, when the service was utilised.

4.2 Summer Pilot Scheme - Participation

Prior to the launch of the scheme, six aggregators and a number of sites expressed an interest in participating in the scheme, with an early indication of up to 450MW of participation. There was however the possibility that this volume may have been overstated as some sites may have been negotiating with more than one aggregator to get the best deal. When the trial was taken forward none of the aggregators were able to meet the 100MW per aggregator requirement.

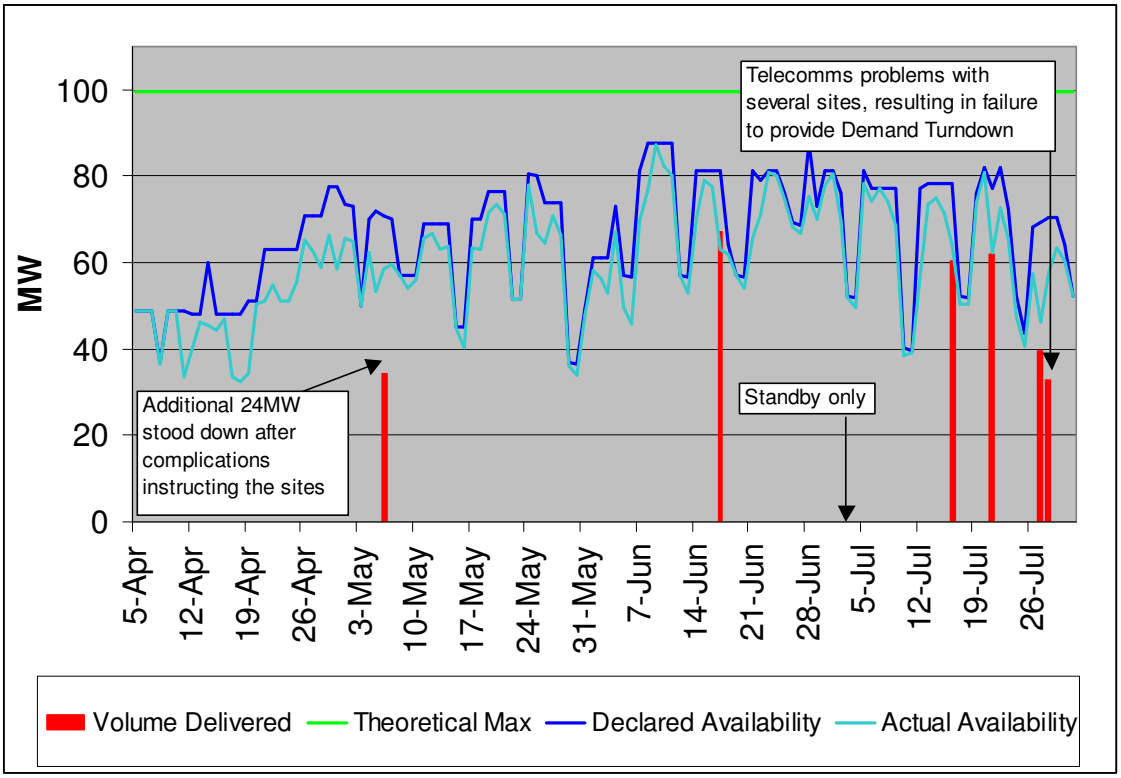
To allow a pilot to proceed, National Grid relaxed the 100 MW per aggregator requirement, with the hope that levels of participation would increase[4]. Ultimately two aggregators (Gaz de France and Npower) participated in the trial with a

4 During the summer pilot, no significant increases in participation were observed.

theoretical maximum aggregate volume of 99.6[5]MW between them. During the 118 days of the summer pilot scheme, National Grid instructed the service 8 times, (7 Utilisations[6] and 1 Standby).

The following two charts (one for each window) show the level of declared availability, the actual availability and the volume of Demand Turndown delivered when the service was utilised.

Summer Demand Turndown trial performance – Window 1

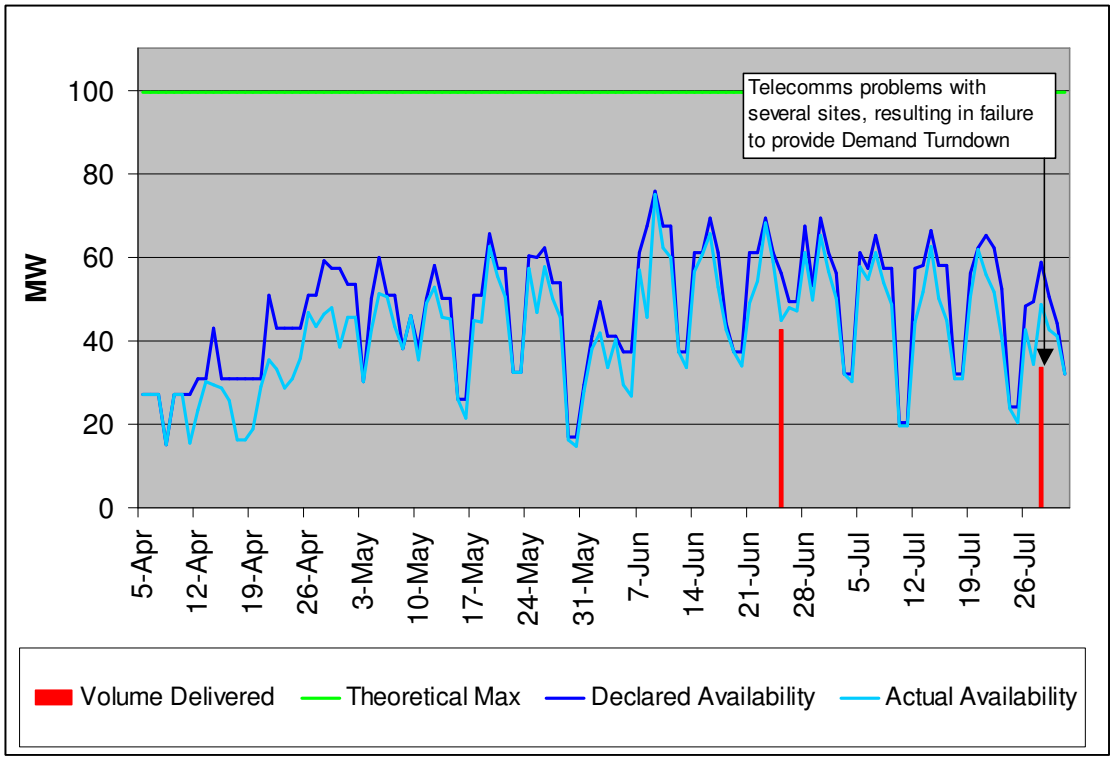


Note: All Values are the numerical average for each day

[5] This theoretical figure assumes all sites are co-incidentally taking their maximum demand and can make all of this volume available as Demand Turndown

[6] Note one of the utilisations extended across both of the windows

Summer Demand Turndown trial performance – Window 2



Note: All Values are the numerical average for each day

The two charts above show that on each of the days in the trial the level of declared availability was significantly below the theoretical maximum level available (99.6MW). This is to be expected, as all of the sites would need to be co-incidentally taking their maximum demand to be able to offer this theoretical level.

However, it should be noted that on many of the days the actual level of Demand Turndown availability (based on post event metering provided by the aggregators) was below the declared availability level. For an enduring service this would be an issue as at the time of despatch the level of Demand Turndown expected when the service was utilised would be the Declared Availability.

On the 7 utilisations of Demand Turndown, the levels of Demand Turndown declared available were not reached (as shown by the bars on the chart above and summarised in the table below). Based on the information available to National Grid, it is not clear whether this was due to over-forecasting of the declared availability or if the sites underdelivered on the days of utilisation. However in either case it is important for system security reasons that any Balancing Service is delivered as instructed.

Utilisation days during the Summer Demand Turndown trial

Date	Declared Availability (MW)	Volume Delivered (MW)	Underdelivery (MW)
6 May 04	58.6	34.4 (59%)	24.2
17 June 04	81.2	67.2 (83%)	14.0
25 June 04	56.2	42.5 (76%)	13.7
16 July 04	78.2	60.4 (77%)	17.9
21 July 04	77.2	61.8 (80%)	15.5
27 July 04	69.2	39.4 (57%)	29.8
28 July 04 – window 1	70.6	32.9 (47%)	37.7
28 July 04 – window 2	58.6	33.5 (57%)	25.1

On the 6th May and 28th July telecommunication problems were experienced when the Demand Turndown service was utilised leading to under delivery. These telecommunication problems were related to inability to contact the aggregator or site on the given number and in one case accidental transposition of some of the digits of a sites phone number in a provider's software system. Following these failures alternative back-up phone numbers were provided.

4.3 Summer Pilot Scheme – Assessment Against Drivers/Benefits

The Summer Pilot has provided data, which demonstrates that aggregators can provide a single point of despatch for provision of a Demand Turndown service from participating sites. This data is valuable in highlighting performance issues and for assessing the viability and reliability of the service.

Operation of the trial has proven that an E-mail availability declaration system can work. During the trial some communication issues such as correct use of the templates and file nomenclatures were identified and successfully resolved. In the contract for the Summer Pilot, utilisation of the service was named 'call off'. This proved to be a counter-intuitive phrase, which caused confusion as some providers interpreted this as an instruction to stand down. This highlights the importance of clear communication.

One of the trial aims was to improve increase the numbers of participants providing Demand Services. Operation of the Summer Trial did encourage participation from a small number of new sites. In total 13 sites participated in the trial, 10 of which were providers of other demand services (FCDM) to National Grid and 3 of which were new providers. However given the efforts involved by all parties to set up the trial, the level of participation was disappointing.

For any Balancing Service it is important that on despatch National Grid have confidence that the service will be fully delivered. For this reason one of the trial aims was to 'prove the reliability and establish confidence in the service'. Operation of the trial raised several issues, which has not established confidence in the service to fully deliver when requested. The first of these relates to the communications problems experienced during the trial, notably during utilisations on 6th May and 28th July, which lead to some of the volume declared available not being delivered. Reliability of the service and hence confidence in the service is also eroded by the

observation that during the trial the declared availabilities could not be fully delivered when utilised. This observation is based both upon the actual volumes delivered during the utilisations but also comparison of the declared availabilities with the post event actual availabilities provided by the aggregators.

The operation of the trial, presented an opportunity to assess the viability of using Demand Turndown to act as a service for creating additional reserve. In the original service design, National Grid set a threshold of 100MW per aggregator as being the minimum size for a service to deliver an appreciable gain in operating margin. This limit was ultimately relaxed to allow the trial to proceed, with the hope that participation would increase during the trial, which subsequently proved not to be the case. Even with two aggregators participating in the trial the aggregate average volume delivered when the service was utilised was only 46.5MW. In terms of the uncertainty, which exists in contingency timescales this volume is insignificant.

Another aspect of the viability of the service is the economic viability of the service compared to alternative options for creating contingency reserve, this analysis is contained in section 4.4.

4.4 Summer Pilot Scheme Economic Assessment

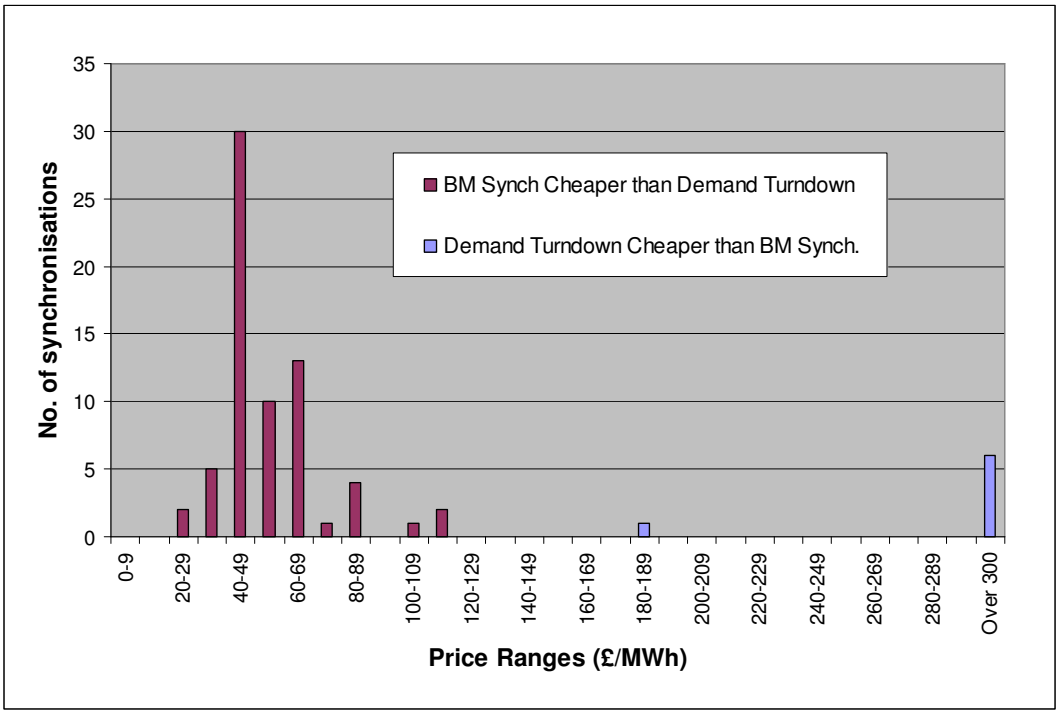
As Demand Turndown was a trial service it did not displace the utilisation of other Balancing Services, therefore the costs incurred were additional to normal Balancing Service costs. The overall cost of the summer trial was £148k, made from Availability £36k, Standby £29k and Utilisation of £83k.

An assessment of the relative economics of Demand Turndown has been made against the costs of creating 100MW of reserve by synchronising an additional generation unit via the BM during the operational windows of the summer trial. The purpose of this was to see on how many occasions a 100MW Demand Turndown service could have been cheaper, to give an indication as to the relative economics of Demand Side provision of contingency reserve. For the purposes of this evaluation the costs of the Demand Turndown service has been calculated at the average prices from the two providers.

The chart below shows the prices of creating 100MW of reserve through synchronisations via the BM during the summer trial windows. The bars on the chart are colour coded to show which actions were more or less expensive than the average utilisation price of Demand Turndown[7].

[7] Average is numerical average of the two service provider's utilisation prices. Analysis excludes the other costs of Demand Turndown (Availability and Standby).

Economic comparison of actual BM synchronisations and Demand Turndown Utilisation prices during the Summer Trial.



During the period of the Summer Trial and within the trial windows there were 75 occasions, where units were synchronised within the BM to create additional reserve. On 7 (9%) of these occasions the price of the BM synchronisations was more expensive than the numerical average utilisation price of Demand Turndown services available, which potentially makes Demand Turndown a more economic alternative on these occasions (excluding Availability and Standby payments).

However on all of these 7 occasions the reserve requirement that was being met by synchronising the most expensive BM unit was in excess of 100MW. On these occasions had a 100MW of Demand Turndown been instructed (and delivered) the costs of taking the BM actions would not have been avoided, as the BM action would still have needed to be taken. Therefore whilst there were a small number of occasions when the utilisation prices were potentially economic, the size of the service prevented the economic displacement of other services. If on any of the 7 occasions the reserve requirement that was being met by synchronising the most expensive BM unit had been less than 100MW then instruction of Demand Turndown would have avoided the costs associated with taking the competing BM action. However in contingency reserve timescales, the inherent uncertainty makes this highly unlikely.

4.5 Summer Pilot Scheme – Conclusions

The Demand Turndown Summer Pilot scheme was carried out to assess the ability of the Demand Side to deliver a service in contingency reserve timescales. Operation of the trial has indicated that aggregators can provide a single point of despatch of a Demand Turndown service. However the trial has highlighted a number of issues, which are summarised below.

- None of the providers were able to provide the original 100MW requirement during the Summer trial. Discussions were held at the DSWG to identify if there had been any potential barriers to participation in the Summer Trial. Reasons for the low level of participation included:
    - Timing of the scheme -coinciding with negotiation of supply contracts.
    - Operational difficulties for providers of having back to back 2 hour windows (easier to provide a service on a more flexible basis to fit around operational schedules)
    - Infancy of the scheme
    - Short contracting process
    - Lack of awareness of the scheme
    - Limited choice of aggregators
    - Adoption of a 'wait and see' approach and subsequently evaluating whether to participate in any future opportunities
    - A utilisation payment formula which potentially underestimated the volume of Demand Turndown that had been delivered[8]

- During the trial, Demand Turndown Utilisation prices could only economically compete against a small proportion of the BM synchronisation actions taken. Based on the Summer Pilot and factoring in Standby and Availability payments made, Demand Turndown did not appear to be an economic way of creating contingency reserve.

- During the trial actual availabilities and volumes delivered during utilisations were measured to be significantly lower than the declared availability. For system security reasons National Grid requires confidence that on instruction of any service the volume declared available can be relied on to be delivered.

- Post trial analysis has identified that the size of the reserve requirements in contingency timescales experienced during the trial, meant that a service of limited volume (even 100MW) would not have been sufficient to be able to displace larger, more expensive alternative BM actions. This suggests that in order to have any chance of being competitive in contingency reserve, much larger volumes are required.

[8] The volume of Demand Turndown delivered was made by comparison with the demand in the previous two settlement periods. This potentially penalised providers who gradually reduced their demand in advance of the service window.

5.0 Winter Pilot Scheme

Following the Summer Pilot and the feedback from the DSWG, it was decided to proceed with a second pilot scheme (the Winter Pilot Scheme) to provide an opportunity to address some of the issues raised by the Summer Pilot. To aid in this process, feedback from the Summer Pilot was used to make the services offered in the Winter Pilot scheme more flexible. The changes to the services are described further in section 5.1.

It was hoped that the Winter Trial would attract a higher level of participation due to the increased flexibility offered in the services, the better relative economics[9], increased industry awareness following the first pilot and participation from sites, which had adopted a 'wait and see' approach to the first pilot.

The Winter Pilot Scheme operated on weekdays for four months, from 29th November 2004 to 31st March 2005.

5.1 Winter Pilot Scheme – Structure

Following the feedback from the Summer Trial, a greater degree of flexibility was added to the Winter service structure by removing one of the fixed service periods from the Demand Turndown product and adding a new more flexible Demand Management product. A single fixed service period was maintained to meet National Grid's requirement for reserve across the morning peak.

Providers in the Winter Trial were presented with the option of participating in Demand Turndown and/or the more flexible Demand Management product. The table below summarises these services, which are explained in more detail in sections 5.2 and 5.3.

Winter Pilot Scheme Services
(summer products shown for comparison purposes only)

Service	Min Vol. (MW)	Service days	Window	Payments	Notes
Demand Turndown Summer Pilot	100	All days of the week	Two fixed windows (09:30-11:30 & 11:30- 13:30)	Availability, Standby and Utilisation	Minimum volume requirements subsequently relaxed
Demand Turndown Winter Pilot	100	Week days only	Single fixed window (09:00-11:00)	Availability, Standby and Utilisation	Could only be declared available when 100MW limit reached.
Demand Management Winter Pilot	25	Week days only	Any 2 consecutive settlement periods in an operational day	Utilisation only (no Standby or Availability payments)	

[9] It was expected that the higher winter costs associated with alternative sources of reserve could improve the relative economics of demand turndown.

5.2 Demand Turndown Winter Scheme

The single fixed window in winter Demand Turndown (09:00 to 11:00 hrs) was chosen to enable the service to compete for the provision of contingency reserve for the winter morning peak. Use of the morning peak avoided the risks associated with operating a trial service during the high winter evening demand.

A firm minimum criterion of 100MW per aggregator was required for participation in the scheme. Unlike the Summer Pilot, this was non relaxable for the Winter Pilot. If on any day during the trial, the declared availability was under 100MW, the service was considered to be unavailable for that day.

Under the Demand Turndown scheme payments were made for availability, standby and utilisation. Availability payments were:

- Subject to actual availability being at least 90% of the declared availability
- Based on the deemed availability (the lower of the actual and declared availabilities)
- Only made when deemed availability was greater than the 100MW threshold

5.2.1 Demand Turndown Winter Scheme - Participation

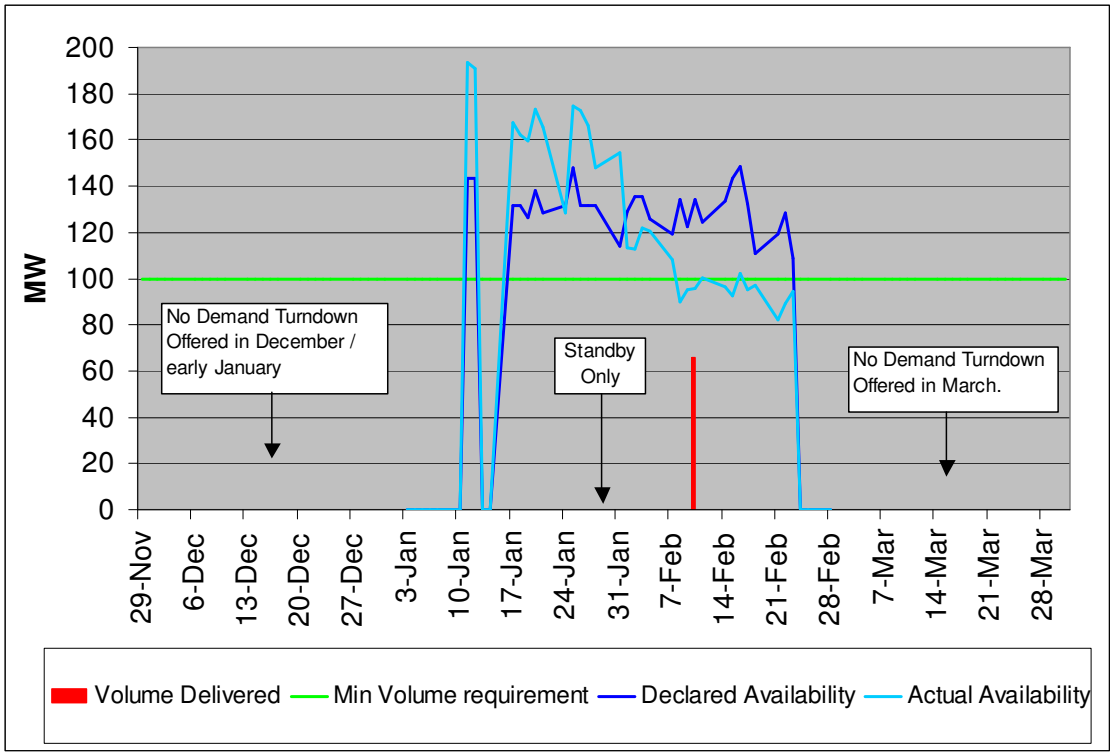
Participation in the Winter Demand Turndown trial was lower than initially indicated with providers explaining that organising resources across the festive season was difficult.

Ultimately only one aggregator participated in the Demand Turndown scheme with 15 participating sites (8 of which were already existing providers of other Demand Side services to National Grid), with the remaining 7 being new providers. This compares favourably to the Summer Trial where 3 sites that were not providers of other Demand Side Services to National Grid participated.

Of the 89 weekdays during the trial, there were only 30 days (all during January and February), where the availability was above the 100MW threshold and hence the service was available. During these 30 days the average declared availability was 131MW, with 148.5MW the highest declared availability in a single settlement period. The providers made no Demand Turndown services available in December 2004 or March 2005.

The Demand Turndown Service was instructed twice during the Winter Pilot, on the 27th of January 2005 to standby only and on the 10th February 2005 the service was utilised. On the 10th February the Declared Availability was 134.2MW, across the four settlement periods the average Volume Delivered was 65.9MW (49%) an average underdelivery of 68.3MW. The following chart shows the level of declared availability, the actual availability and the volume of demand Turndown delivered when the service was instructed across the trial period.

Winter Demand Turndown trial performance



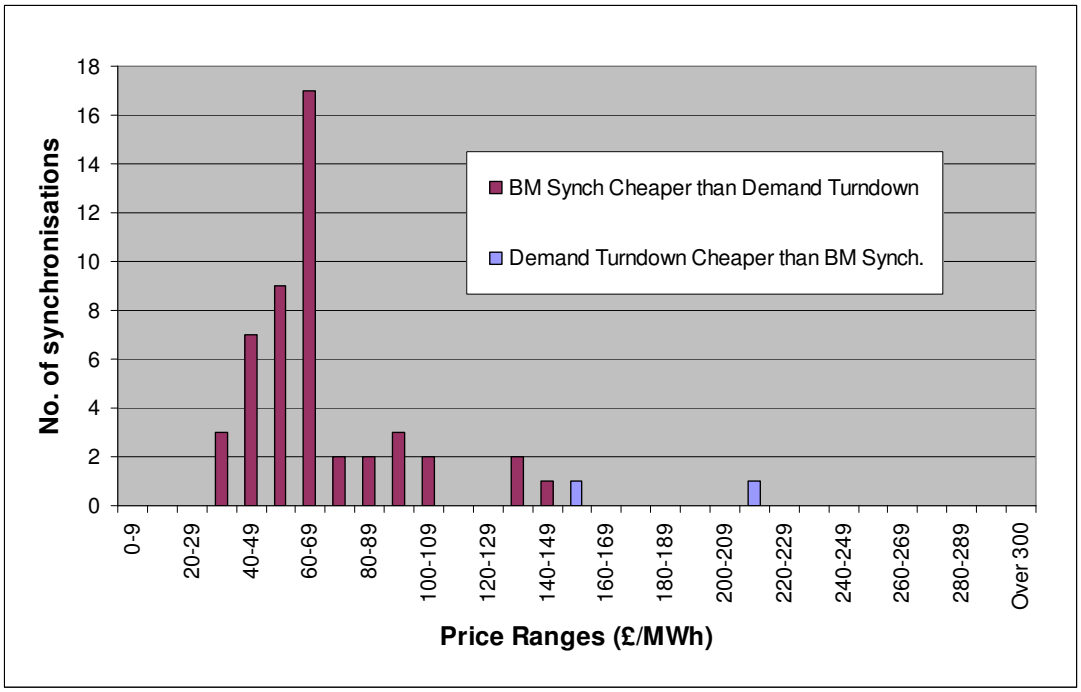
5.2.2 Demand Turndown Winter Scheme - Assessment

The issues and learning points that arose from the Winter Pilot were similar to those that arose from the Summer Pilot and are listed in Section 4.3.

As Demand Turndown was a trial service it did not displace the utilisation of other balancing services, therefore the costs incurred were additional to normal Balancing Service costs. The overall cost of the Winter Demand Turndown trial was £52.5k, comprising Availability of £26.7k, Standby of £6k and Utilisation of £19.8k

Similar to the analysis carried out in Section 4.4, the chart below shows the comparison between the costs of BM synchronisations and the utilisation price of Demand Turndown on the weekdays during the Winter Pilot.

Economic comparison of actual BM synchronisations and Demand Turndown Utilisation prices during the Summer Trial.



During the period of the Winter Trial there were 50 occasions, where units were synchronised within the BM to create additional reserve. On 2 (4%) of these occasions the cost of BM synchronisations was more expensive than the utilisation price of Demand Turndown, which potentially makes Demand Turndown (excluding Standby and Availability payments) a more economic alternative on these occasions.

Of these 2 days there was 1 occasion where the size of the reserve requirement was such that it could have been fully met by a 100MW of Demand Turndown thus avoiding the need for the alternative synchronisation via the BM. However if availability and standby payments are brought into consideration, the total cost of the service for a single day's utilisation would have been more expensive than the corresponding synchronisation cost via the BM.

Overall this suggests Demand Turndown struggled to be economically competitive in the provision of contingency reserve.

5.3 Demand Management Winter Scheme

The Demand Management trial service was introduced following feedback from the Summer Pilot, which requested greater flexibility in the service windows.

Demand Management is a highly flexible derivative of Demand Turndown and could be provided in all settlement periods outside the single Demand Turndown fixed service period in the Winter Trial. The service was entirely optional and availability was on a non firm basis. This service had a reduced minimum size of 25MW across consecutive settlement periods. The service included additional parameters such as,

minimum and maximum on times to allow providers to tailor the service to their operational requirements.

As Demand Management could be offered on an 'as and when' basis, and was not firm, remuneration was for utilisation only (£/MWh).

5.3.1 Demand Management Winter Scheme - Participation

Only one aggregator offered Demand Management services to National Grid. The table below summarises the declared availabilities from this provider. The key point being that out of 89 weekdays in the pilot the service was declared available on 40 days, interestingly 10 times on each day, Tuesday to Friday and never on a Monday.

Declared Availability of the Demand Management service

Declared Availability (MW)	No. of days	% of days	Notes
25-27	40	45%	16 days had inconsistent data[10]
0 declared	38	43%	
No declaration	11	12%	Availability defaults to zero.

Note: As the service was only available on weekdays, the table excludes weekends

During the pilot this service was not instructed due to the high utilisation costs.

5.4 Winter Pilot Scheme – Conclusions

Following the feedback from the DSWG and the introduction of the smaller volume and more flexible Demand Management product to the Winter Pilot Scheme, it was disappointing that only two aggregators participated in the Winter Pilot (one in each of the products offered). Again there is the possibility that prior to the pilot, some sites may have approached more than one aggregator to price explore, possibly leading to raised expectations of the likely levels of participation. However it was encouraging that the there was an increased number of sites that weren't already providers of other Demand Side services to National Grid that participated in the trial.

For the Demand Turndown service it had been hoped that the Winter Pilot would resolve some of the issues that had arisen from the Summer Pilot (as listed in Section 4.5). However despite the refinements to the design of the Demand Turndown service, the results from the Winter Pilot appears to have done more to reinforce these as issues rather than resolve them.

Following the Summer Pilot, one of the key issues for National Grid was to gain confidence that the volumes declared as available could actually be delivered. On the instruction on the 10th February only 49% of the actual volume that had been declared available was delivered, which did not promote confidence in service delivery.

[10] On these 16 days the total declared availability was zero, however valid data was submitted for the individual settlement periods. It has been assumed that the service **was** available for these settlement periods.

Another key issue following the Summer Pilot was ascertaining if the 100MW requirement (and hence appreciable benefit on operating margin) could be met. During the Winter Pilot declared availabilities were above this level on 30 out of the 89 days. Following the experience of the volume delivered when the service was instructed on the 10th February, it is uncertain if 100MW+ of Demand Turndown could actually have been delivered on all of these 30 days. During the first month (December) of the trial no providers offered availability of Demand Turndown or Demand Management services. Contact with the aggregators suggested that this might have been due to resource constraints as a result of heightened core business activity in winter and the holiday season in general. This is disappointing given that, in general peak demands occur in December.

As with the Summer Pilot, the utilisation price of Demand Turndown during the Winter Pilot were generally uncompetitive compared to the actual costs that were incurred during the period of the Pilot in creating reserve by synchronising a generating unit in the BM.

The Demand Management product had smaller volume requirements and offered increased flexibility to providers. As these changes were made following DSWG feedback it was hoped that this would encourage participation. However only one provider participated and the service was only made available on 40 out of the 89 days in the pilot, with all of the days being Tuesday to Friday. It is not clear why the service was not declared available on Mondays

6.0 Overall Conclusions

National Grid carried out two separate trials to establish the potential to develop a new Demand Side Balancing Service in contingency reserve timescales. One of the main aims of the trial was to increase the participation of the Demand Side in the provision of Balancing Services. The Demand Side Working Group provided input into the design of both trials and based on the feedback from the first trial, the services offered in the second trial were made more flexible for providers.

Two aggregators participated in the Summer Trial, with participation from 13 sites (3 of which were new providers). These 3 new sites provided in aggregate a maximum actual Demand Turndown availability of 14MW. Following the trial, feedback on why participation levels had been low included co-incident supply contract negotiations, infancy of the scheme and adoption of a wait and see approach. It was therefore hoped that higher levels of participation would be experienced in the Winter Trial.

In the Winter Trial one aggregator participated in each of the two services. 15 sites (7 new) participated in the Demand Turndown. These 7 new sites provided in aggregate a maximum actual Demand Turndown availability of 58MW. Feedback on the low level of participation in the trial, particularly in the first month (Dec) highlighted resource constraints over the holiday season.

In the lead up to both trials, much higher levels of potential participation were indicated than ultimately participated. This may have been due to sites negotiating with more than one aggregator to price explore. As one of the reasons for setting up the trials was to overcome the potential to barrier in participation in other Balancing Services with necessarily short lead times by the Demand Side, it is disappointing that higher levels of participation were not achieved.

Another aim of the trials was to gather data to prove the reliability of such a Demand Side service. The trial also offered opportunities to test more generic processes such as using e-mail systems to make availability declarations and using aggregators to provide a single point of despatch for Demand Side services.

For both of the trials the Demand Turndown product was designed with a minimum requirement of 100MW (subsequently relaxed for the Summer Trial to allow it to proceed). During the utilisations in the Summer Trial the average volume delivered was 46.5MW, on the individual days of the trial only 47-83% of the declared availability was actually delivered. For the single utilisation in the summer trial 65.9MW was delivered, which was only 49% of the declared availability. For any Balancing Service it is vitally important for system security reasons, that when the service is utilised that the service is fully delivered. Unfortunately the trial did not provide confidence in service delivery. In both of the trials the aggregators provided post event metering (proving what the actual availabilities had been) and in many cases these were below the declared availability, again eroding confidence in the service.

Operation of the two trials has allowed some other non-service specific aspects to be tested. Of particular note are the successes of using an E-mail system to make availability declarations and the ability of aggregators to provide a single point of despatch. In general the concept of establishing aggregators to provide a single point of despatch was a success.

On two occasions when the service was utilised telecommunication problems lead to some of the Demand Turndown volume not being delivered. These included problems with National Grid contacting aggregators and the aggregators contacting the sites. The learning point is to have more than one method of contact with aggregators and site (i.e. not solely relying on a single person or phone number) and the need for most robust testing of the communications prior to commencement of the full trial.

An economic assessment of the viability of Demand Turndown has been made by comparing the actual costs of reserve creation via the BM (using the most expensive 100MW) compared to 100MW of reserve via Demand Turndown (using the average prices from the two aggregators). The analysis highlighted that on small number of occasions Demand Turndown Utilisation (ignoring standby and availability costs) would have been cheaper than the BM action. However due to the reserve requirement being greater than 100MW, there was only one occasion where a 100MW Demand Turndown action would have displaced the more expensive BM action. Factoring in standby and availability payments further suggests that Demand Turndown is not an economic service for the provision of contingency reserve. If Demand Turndown were to be available in larger volumes (>100MW), it would be able to displace more of the reserve creation actions via the BM and its economic viability would marginally improve but is unlikely to be competitive.

Smaller volumes of any Balancing Services are more suited to real time balancing and there are a number of existing services that Demand Side providers can participate in. These services are summarised in Appendix 1 of this document.

Following completion of the two pilots, National Grid is not intending to run any further Demand Turndown trials. The Demand Management product has been made available following the second pilot but has not been taken up to date.

7.0 Way Forward

The Demand Turndown Trials have highlighted a number of issues relating to the demand side provision of reserve services to National Grid in contingency timescales, in terms of overall participation, size of service provision, reliability, and economic competitiveness. It is clear from the trial that it is difficult to match the contingency reserve requirements of the GB Transmission System with the nature of services that have been provided by Demand Side participants. However the trial has proved that the concept of aggregation of small sites to provide a single despatchable volume is at least viable. We believe that this is an important concept and provides scope for the DSWG to consider further potential applications, including the Balancing Mechanism and as a balancing tool for Suppliers.

National Grid continues to offer opportunities to Demand Side participants to provide a range of Balancing Services depending on the nature of their capabilities. In addition, as a result of the trial, National Grid will continue to offer the flexible service of Demand Management. We look forward to continuing to work with DSWG to promote active Demand Side participation in the wholesale electricity market.

7.1 Contact Details

For further information, please contact.

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Appendix 1: Demand Side Participation in Existing Services

Service	***Description***	***Procurement Mechanism***	***Indicative Demand Side Volume***	***Potential/Indicative Utilisation***
Demand Management	*Increase in active power generation or demand reduction by back-up generation and large electricity consumers respectively across a minimum of any 2 consecutive Settlement Periods*	*Bilateral agreement*	*0 MW*	*-*
Fast Reserve	*Increase in active power generation or demand reduction at a rate of at least 25MW/min within two minutes of a manual instruction by National Grid.*	*A combination of monthly tender and, in specific circumstances, bilateral agreements if this better suits the operation of the provider*	*760 MW*	*Daily, during rapid changes in demand (such as those that occur during TV 'pick-ups')*
Firm Frequency Response	*Firm availability of Dynamic and/or Non-Dynamic frequency response in nominated service periods*	*Monthly tender for single or multi-month contract*	*0 MW*	*Daily, for dynamic frequency response*
Frequency Control by Demand Management (FCDM)	*Low Frequency relay(s) at providers' sites automatically trip the contracted demand should the frequency fall below an agreed set point (normally 49.7Hz).*	*Procured bilaterally through FCDM 'agents', who act as consolidators*	*The potential total maximum volume available for the service is ~200MW*	*FCDM has been required to trip 13 times in the current financial year.*
Standing Reserve	*Increase in active power generation or demand reduction of at least 3MW, available within 20 minutes of instruction and sustainable for at least 2 hours*	*Annual tender process*	*~780MW from non-BM providers comprising demand side and small-embedded generation.*	*Contract-dependent (typically daily)*