

STOR Market Information Report TR32

Published 28th July 2017

Foreword

Welcome to the TR32 Market Information Report and the second tender opportunity for STOR Year 12. We continue to show tendered MW for each bid which we hope provides a greater degree of understanding of the STOR market.

We see lower availability from Flexible and Premium Flexible units which in turns lowers our forecast when we asses new tenders. Committed units offer a higher availability thus we aim to procure a significant proportion of our requirement with these units.

In June, we published our System Needs and Product Strategy document which is intended to give more information on our future service requirements. We have consulted with industry on possible new reserve services that ensure that there is sufficient flexibility closer to real time, provides access to both BM and NBM parties and is in line with European guidelines. More information on the consultation and our thoughts can be found on our Future of Balancing Services [page](#).

Operationally, on 17th May, there was a confluence of events where 1800MW of generation tripped close to one another. A large volume of STOR was utilised to cover these losses and later that evening, system prices increased to £1500/MWh over concerns of a tight system. Aside from this, while there have been challenges, we have been able to use the tools at our disposal to manage the system.

We are keen to hear your thoughts on how we can improve the STOR service or this report, so if you do have any comments, please do get in touch.

Thanks,

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Introduction

This market report is produced after each tender round and is designed to give existing and potential STOR participants an overall view of the tenders received in tender round 32 (TR32). The report provides details of tendered utilisation and availability prices and National Grid's consequent forward contracted position; together with further details on the type and dynamics of the tendered plant. For further information regarding this product, Frequently Asked Questions, or how and when to tender please consult the STOR section found on the National Grid Balancing Services information website:

<http://www2.nationalgrid.com/uk/services/balancing-services/reserve-services/short-term-operating-reserve/>

This report is under continuous review and development, if you have any comments or suggestions of information you would like to see in future issues of this report, please contact your account manager.

Data and charts that were previously found in this report can still be found in the associated Excel file available on the website.

Operating Reserve Requirement and STOR requirement and de-rating factors

As National Electricity Transmission System Operator (NETSO), National Grid holds an Operating Reserve Requirement (ORR) from 4 hours ahead of time to real time, to take account of demand forecast errors, plant losses and market imbalance. The ORR is met by headroom on market synchronised machines, additional actions taken by National Grid via the Balancing Mechanism (BM) and contracted reserve products. STOR is a contracted reserve product and as such STOR tenders can make up a finite proportion of the ORR. The amount of contracted STOR required is determined by the size of the ORR which changes due to forecast market length, market provided headroom, volume of intermittent generation and demand forecast errors. The proportion of the ORR met by STOR is determined by considering the technical system requirements and also the forecast cost of alternatives versus the cost of the tendered STOR units.

National Grid aims to procure STOR tenders such that a minimum of 1800MW of contracted STOR is made available throughout the STOR seasons. The daily and seasonal optimal STOR MW level varies due to real-time and seasonal pressures on the system, but National Grid typically aims to achieve approximately 2300MW of STOR available where economic to do so.

National Grid manages the optimal STOR MW level at a daily resolution through the week-ahead Flexible STOR assessment, refining the available portfolio in response to the forecast conditions for the week-ahead.

In order to achieve the optimal level at the week-ahead stage, National Grid examines historic availability profiles from Committed and Flexible providers to help determine the volume of STOR tenders to procure at the tri-annual tender round. During the assessment National Grid uses specific unit forecasts based on history where available and also based on any other information available, however as a general rule the following de-rated percentages can be applied to the data to develop a clearer understanding of the actual volume available. BM-C 90%, NBM-C 85%, NBM-F non winter 50% NBM-F winter 25%. These figures represent average outturn availability over the various seasons, the actual availability over the peak winter evenings has been as low as zero. When considering the capacity accepted and tendered it is important to think of it not in absolute volumes but instead the de-rated volume. Whilst there is currently no fixed limit to the amount of Committed, Flexible, or Premium Flexible we are willing to accept, committed units are key in meeting the requirement during those periods of low non-committed availability and as such National Grid values committed units particularly in the winter seasons.

The two versions of the chart below demonstrate this concept and also highlight the recent change in the market "available capacity" over the winter months in particular.

Figure 1 gives a breakdown of the accepted Flexible and Committed MW per season since the start of the STOR service. Premium Flexible tenders are included in the Flexible category for the purpose of this chart. The blue line represents the sum of the maximum tendered MW from unique units from any tender round for each season. Capacity is as tendered, in a change to previous charts unsuccessful tenders from 2010 long term tenders have been removed from the maximum MW tendered. For seasons with tender rounds still to come, this figure will increase if units that thus far have not tendered for that season, tender in. The black line on the chart represents the outturn average availability for each season (where available).

Figure 2 gives exactly the same data as figure 1 but using the general de-rating figures shown above. This demonstrates a much closer match between total de-rated MW and the actual outturn available MW. It also

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demonstrates how the excess capacity has decreased from ~2000MW in year 7 and 8 to ~1300MW for winter year 10.

It should also be noted that the Maximum tendered capacity is greater than (or equal to) the actual current capacity as some units have left the market or reduced their capacity.

Figure 1

Breakdown of Accepted Flexible and Committed MW per season

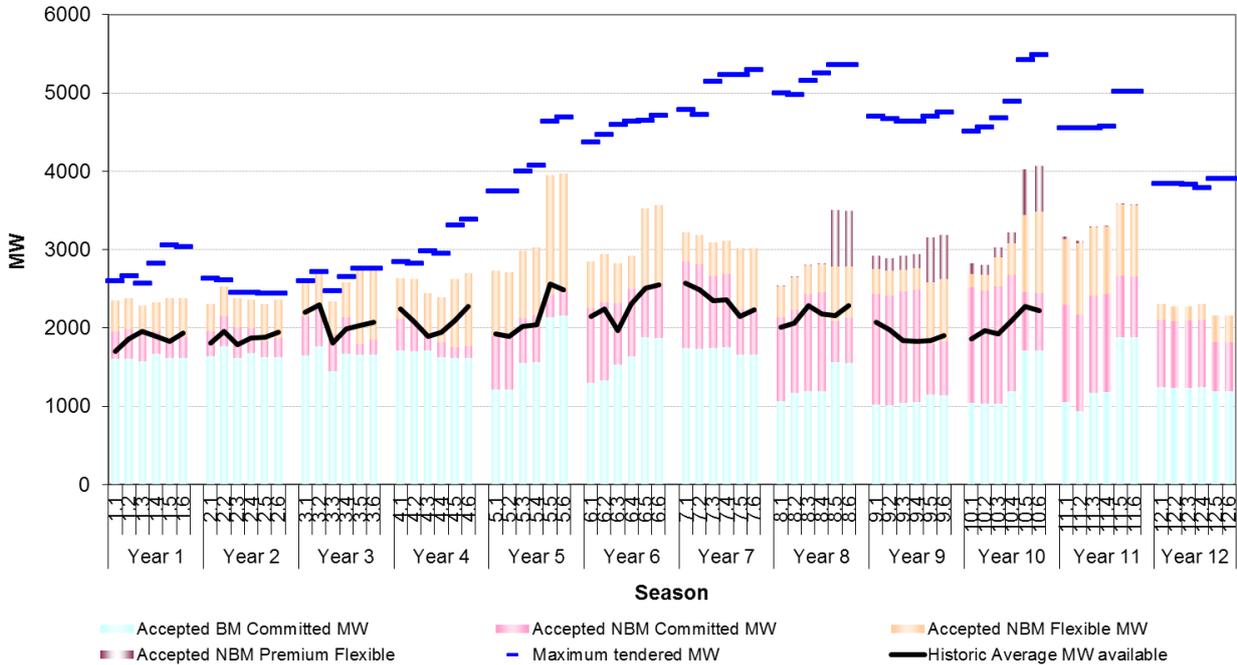
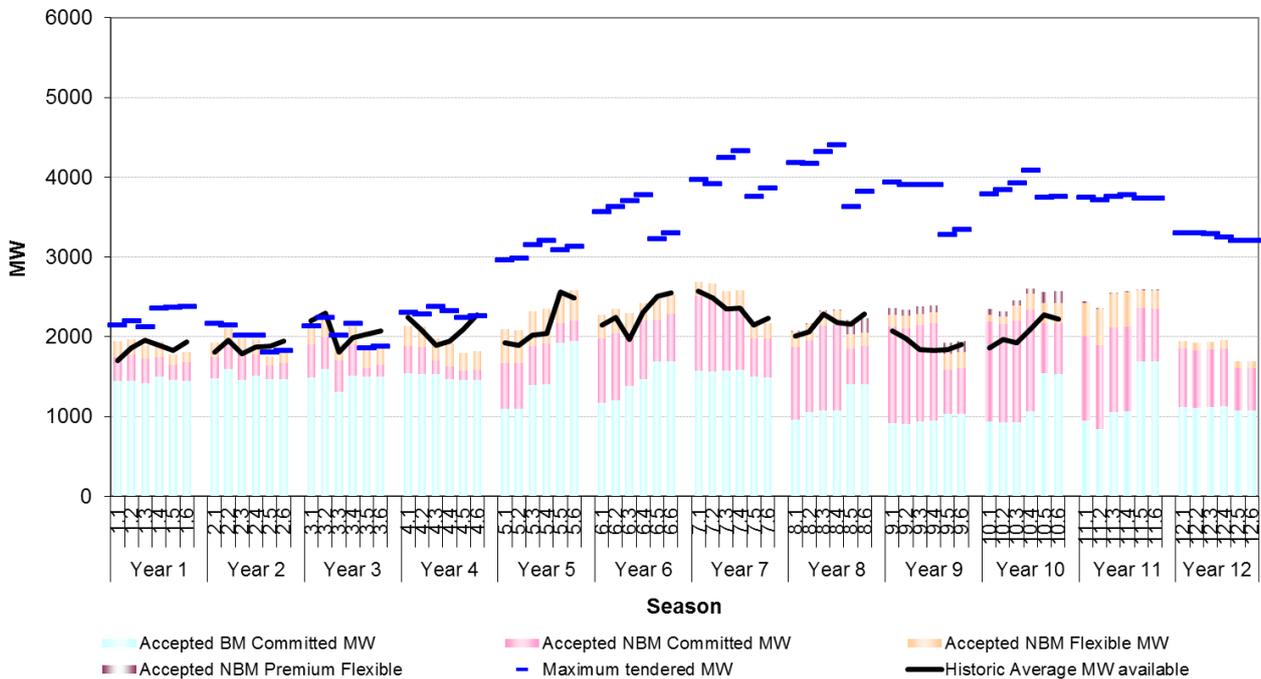


Figure 2

Breakdown of Accepted Flexible and Committed De-rated MW per season



Tenders received and assessment results

Table 1 below summarises the tenders received including STOR Runway it also summarises the total contracted and de-rated. A full breakdown of contracted and tendered data can be found in the Excel file.

Season Number	TR 32 Tenders						STOR Runway TR32 tenders						Already contracted capacity	
	BM-C	NBM-C	NBM-F	NBM-PF	Total	De-rated Total	RW-C	RW-F	RW-PF	Total	De-rated Total	Total	De-rated Total	
11.1	0	0	0	0	0	0	0	0	0	0	0	3120	2408	
11.2	0	0	0	0	0	0	0	0	0	0	0	3069	2331	
11.3	549	28	483	52	1112	785	45	0	0	45	38	2564	2124	
11.4	551	28	483	52	1114	787	45	0	0	45	38	2580	2137	
11.5	646	28	20	0	694	610	0	58	2	60	15	3480	2526	
11.6	646	28	20	0	694	610	0	66	6	72	18	3474	2521	
12.1	1063	671	25	71	1830	1575	60	6	6	72	57	1354	1156	
12.2	1086	669	25	71	1851	1594	60	6	6	72	57	1326	1136	
12.3	1086	669	25	71	1851	1594	60	6	6	72	57	1334	1143	
12.4	1024	671	25	71	1791	1540	60	6	6	72	57	1355	1158	
12.5	1312	372	119	3	1806	1528	0	66	6	72	18	1567	1245	
12.6	1312	372	119	3	1806	1528	0	66	6	72	18	1561	1239	

Table 2 below summarises the accepted units and the approximate requirement remaining for the next tender rounds.

Season Number	TR 32 Tenders Accepted						STOR Runway TR32 tenders Accepted						Remaining
	BM-C	NBM-C	NBM-F	NBM-PF	Total	De-rated Total	RW-C	RW-F	RW-PF	Total	De-rated Total	Total	
11.1	0	0	0	0	0	0	0	0	0	0	0	-	
11.2	0	0	0	0	0	0	0	0	0	0	0	-	
11.3	123	15	535	0	673	391	0	0	0	0	0	-	
11.4	125	15	535	0	675	393	0	0	0	0	0	-	
11.5	0	0	20	0	20	5	0	5	0	5	1	-	
11.6	0	0	20	0	20	5	0	12	0	12	3	-	
12.1	429	423	96	0	948	794	0	12	0	12	6	350	
12.2	427	421	96	0	944	790	0	12	0	12	6	350	
12.3	427	421	96	0	944	790	0	12	0	12	6	350	
12.4	429	423	96	0	948	794	0	12	0	12	6	350	
12.5	300	174	119	0	593	448	0	12	0	12	3	650	
12.6	300	174	119	0	593	448	0	12	0	12	3	650	

Successful Tenders in TR32

Year 11 (2017/18)

This tender round was the final opportunity to tender for seasons 11.3 and 11.4, as such the most economic tenders were accepted to provide sufficient volume to meet the optimal level. The requirement for the winter seasons (11.5 & 11.6) has already been satisfied; as such no additional tenders were accepted. We have continued to de-value PF tenders based on the forecast of their availability profile during the premium windows; as such no PF tenders have been accepted for the winter seasons.

Year 12 (2017/18)

As with the previous tender round (TR31) significant volume of tenders had all or nothing restrictions across the whole of year 12, many of these were considered beneficial and were accepted. Further, a number of committed tenders for part of the year (e.g. season 12.1 -12.4) were considered to be beneficial against the cost of alternative actions and were accepted.

Tables demonstrating the breakdown of accepted and rejected tenders and average prices have been moved to the MIR Excel file.

Expectations for TR33

This section is designed to clarify our views for the next tender round, including remaining requirement and likely intentions.

- **Seasons 11.5 & 11.6:** we will continue to review the winter capacity and monitor our requirement. The current requirement for seasons 11.5-11.6 has been satisfied, however, any terminations may be replaced if considered to be economic against alternative actions. PF units will continue to be assessed at 0% availability during peak periods. Flexible units will be accepted in line with committed prices; high

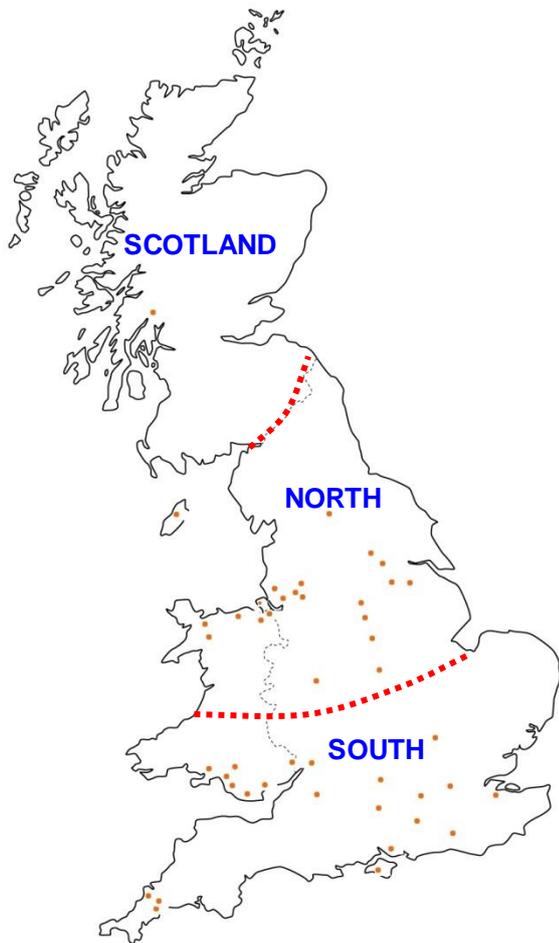
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priced units are likely to be rejected at the week ahead assessment stage if there is a surplus of capacity.

- **Year 12:** we have procured a significant proportion of our requirement for seasons across year 12. Our remaining requirement is ~350MW de-rated for seasons 12.1-12.4 and ~650MW de-rated for seasons 12.5-12.6. We will continue to accept the most cost effective tenders to satisfy our requirements.

Figure 3 presents the number of units and the total MW tendered and accepted for each season and each location. The orange dots on the map indicate the approximate location of the units tendered in any season (not including sites located in more than one region).

Figure 3 Map of Great Britain



	Units tendered	Units Accepted	MW tendered	MW Accepted
SCOTLAND				
11.1	-	-	-	-
11.2	-	-	-	-
11.3	-	-	-	-
11.4	-	-	-	-
11.5	-	-	-	-
11.6	-	-	-	-
12.1	2	1	44	4
12.2	3	1	69	4
12.3	3	1	69	4
12.4	3	1	69	4
12.5	2	-	65	-
12.6	2	-	65	-
NORTH				
11.1	-	-	-	-
11.2	-	-	-	-
11.3	43	41	324	294
11.4	43	41	324	294
11.5	6	1	466	20
11.6	6	1	466	20
12.1	35	20	773	477
12.2	35	20	772	476
12.3	36	21	778	482
12.4	34	21	715	483
12.5	31	18	976	430
12.6	31	18	976	430
SOUTH				
11.1	-	-	-	-
11.2	-	-	-	-
11.3	65	50	745	336
11.4	65	50	747	338
11.5	10	-	228	-
11.6	10	-	228	-
12.1	36	20	693	254
12.2	36	20	690	251
12.3	36	20	697	258
12.4	36	20	700	261
12.5	26	9	565	73
12.6	26	9	565	73

MULTIPLE LOCATIONS (Aggregated sites)

MULTIPLE	Units tendered	Units Accepted	MW tendered	MW Accepted	MULTIPLE	Units tendered	Units Accepted	MW tendered	MW Accepted
11.1	-	-	-	-	12.1	49	34	320	213
11.2	-	-	-	-	12.2	49	34	320	213
11.3	8	8	43	43	12.3	48	33	307	200
11.4	8	8	43	43	12.4	48	33	307	200
11.5	-	-	-	-	12.5	29	13	200	90
11.6	-	-	-	-	12.6	29	13	200	90

Prices

Figures 4 and 5 below show scatter plots of availability and utilisation price for each tender and for each season. The data is broken down into response time groups of >20 mins or <=20 mins, Flexible or Committed service and accepted or rejected tenders. These charts also display any units accepted as Premium Flexible, or rejected as Premium Flexible if they were not then assessed as Flexible. If a unit was rejected as Premium Flexible and then assessed as Flexible, they are represented on the chart as normal Flexible tenders. These charts also depict the accepted and rejected tenders from previous tender rounds. To keep this report short only seasons 2, 4 and 5 are displayed (these are the longest of each of the season pairs). The full data for all seasons is available in the MIR Excel file including the details of PF units and secondary assessment.

Figure 4 Year 11 Availability and Utilisation price charts

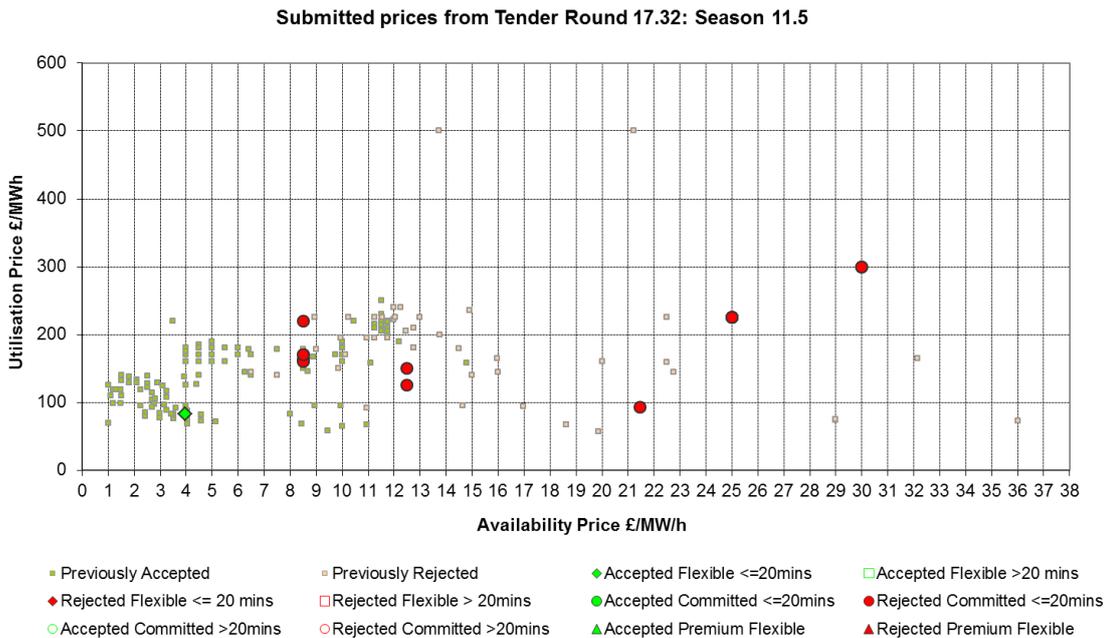
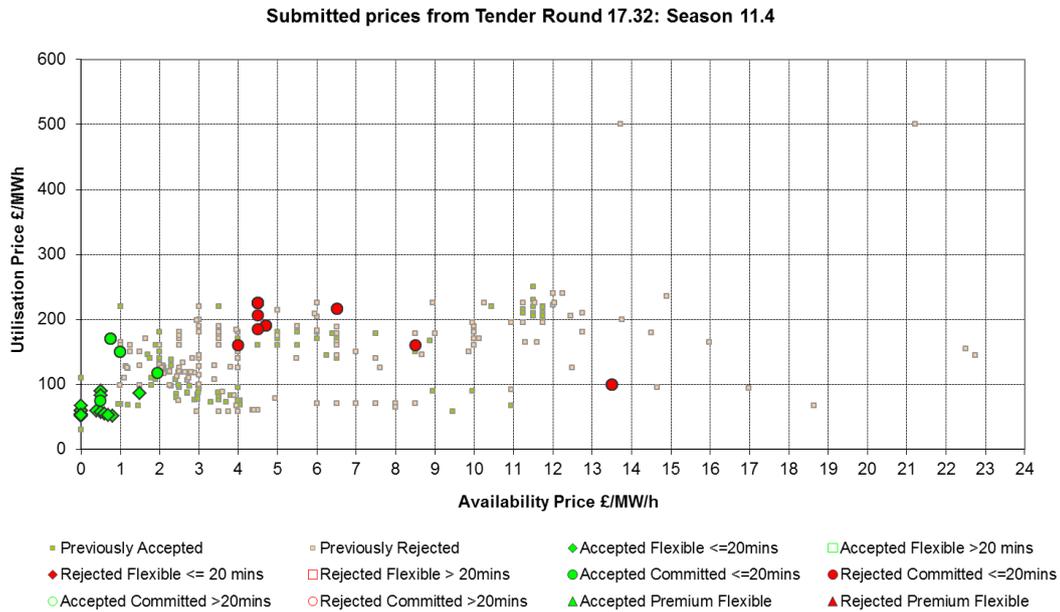
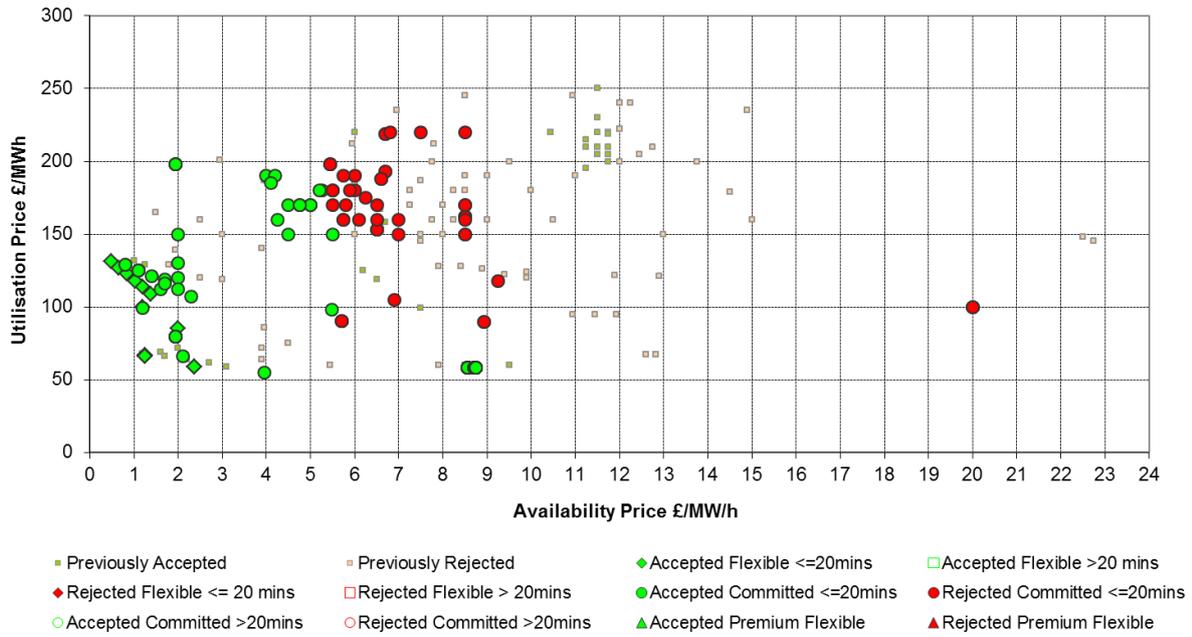
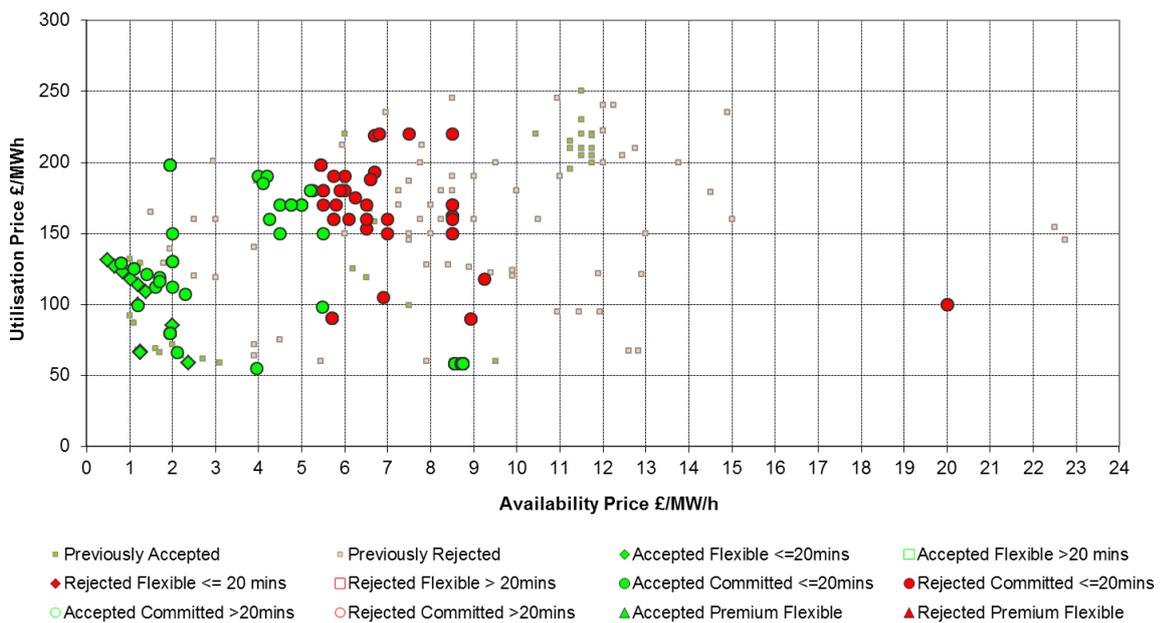


Figure 5 Year 12 Availability and Utilisation price charts

Submitted prices from Tender Round 17.32: Season 12.2



Submitted prices from Tender Round 17.32: Season 12.4



Submitted prices from Tender Round 17.32: Season 12.5

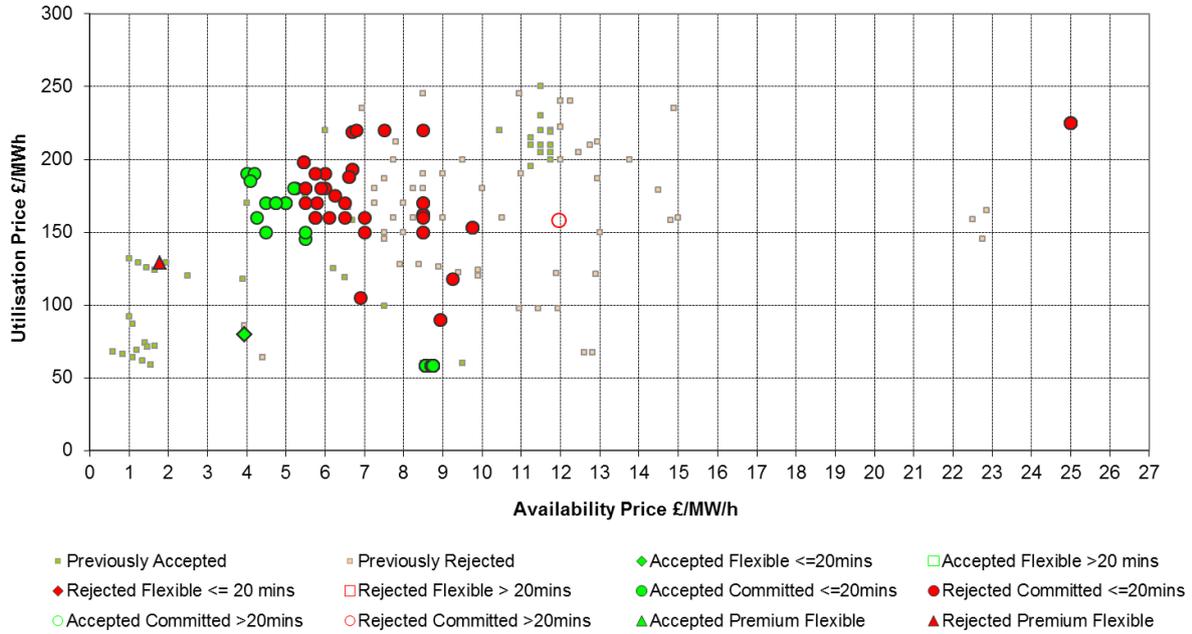


Table 3 below presents a summary of the highest accepted availability price for Committed and Flexible units with Premium Flexible tenders listed separately. The table also presents the highest and lowest Utilisation price accepted for each season as a guide. This is intended to display the difference in value between Premium Flexible and normal tenders, although it should be noted that it is the combination of utilisation and availability price that is key. This information can be seen on the scatter plots above. For this report we have added an extra column which is the highest availability price accepted that is not from an “all or nothing” tender. This change is to help distinguish between “all or nothing” prices that were accepted due to their benefits in other seasons to those accepted for their benefit in the current season.

Table 3 Summary of accepted Prices

Season Number	Marginal Availability price accepted £/MW/h	Marginal Availability price accepted non all or nothing	Marginal PF availability price accepted £/MW/h	Highest Utilisation Price accepted £/MWh	Lowest Utilisation Price accepted £/MWh
11.3	1.94	1.94	-	170	51
11.4	1.94	1.94	-	170	51
11.5	3.95	3.95	-	82.90	82.90
11.6	3.95	3.95	-	82.90	82.90
12.1	8.75	3.96	-	198.00	55.00
12.2	8.75	3.96	-	198.00	55.00
12.3	8.75	3.96	-	198.00	55.00
12.4	8.75	3.96	-	198.00	55.00
12.5	8.75	3.96	-	190.00	58.10
12.6	8.75	3.96	-	190.00	58.10

Figure 6 below shows the detail of all or nothing tenders. For simplicity multiple tenders of the same price are removed from the following charts. Also tenders which included PF as part of the all or nothing offer for winter are not displayed. Tenders that were accepted are coloured green and rejected tenders coloured red.

Figure 6 All or nothing tenders.

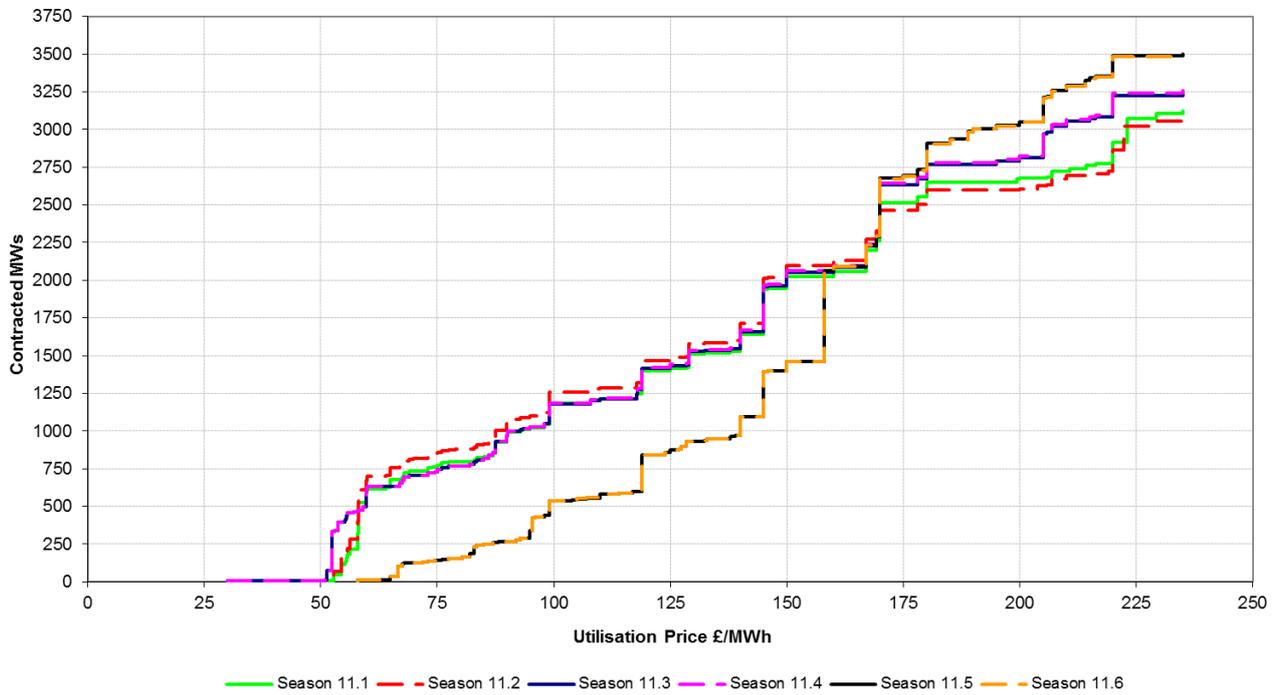


Utilisation price and response time stacks

Figures 7 and 8 exhibit cumulative graphs. In these graphs the total accepted MW from previous tender rounds, up to and including the results from TR32, have been stacked according to two categories: **Figure 7a & 7b** is ranked according to utilisation price and **Figures 8a & 8b** according to the response time of the unit. The utilisation prices have had indexation applied (seasonal and annual).

Figure 7a illustrates that for seasons 11.3 and 11.4 approximately 2000MW of STOR is contracted with a utilisation prices of £150/MWh or less.

Cumulative MW by Utilisation Price for Year 11



Cumulative MW by Utilisation Price for Year 12

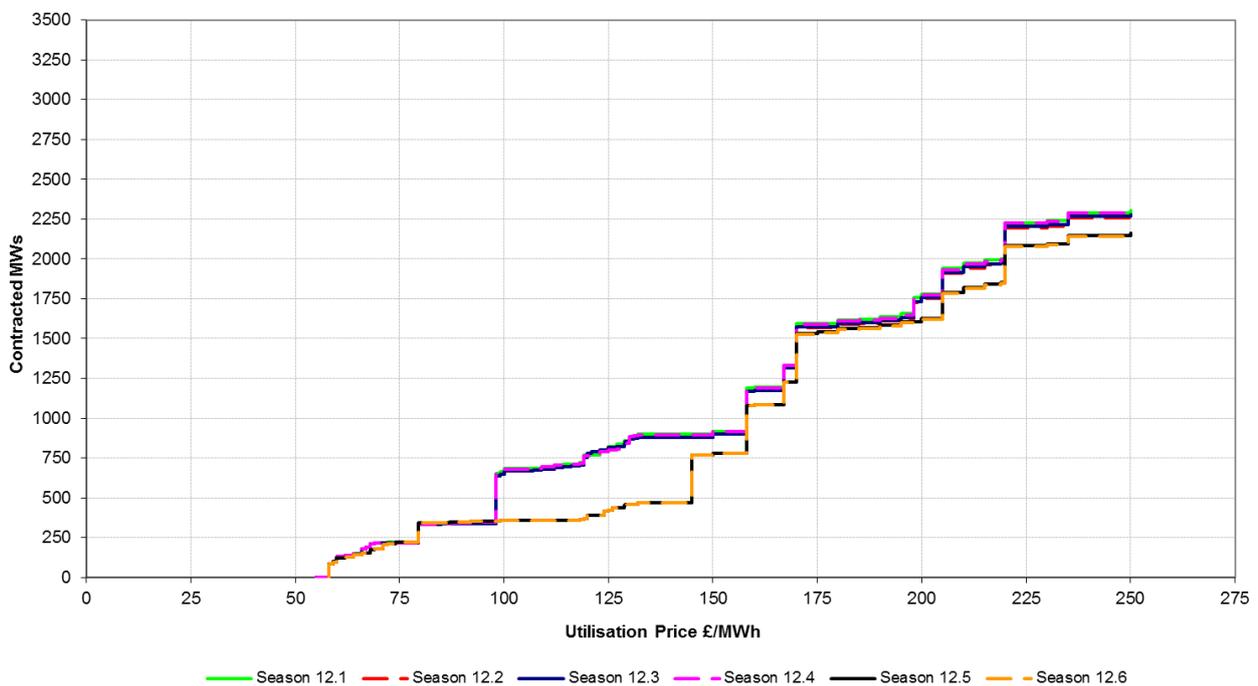
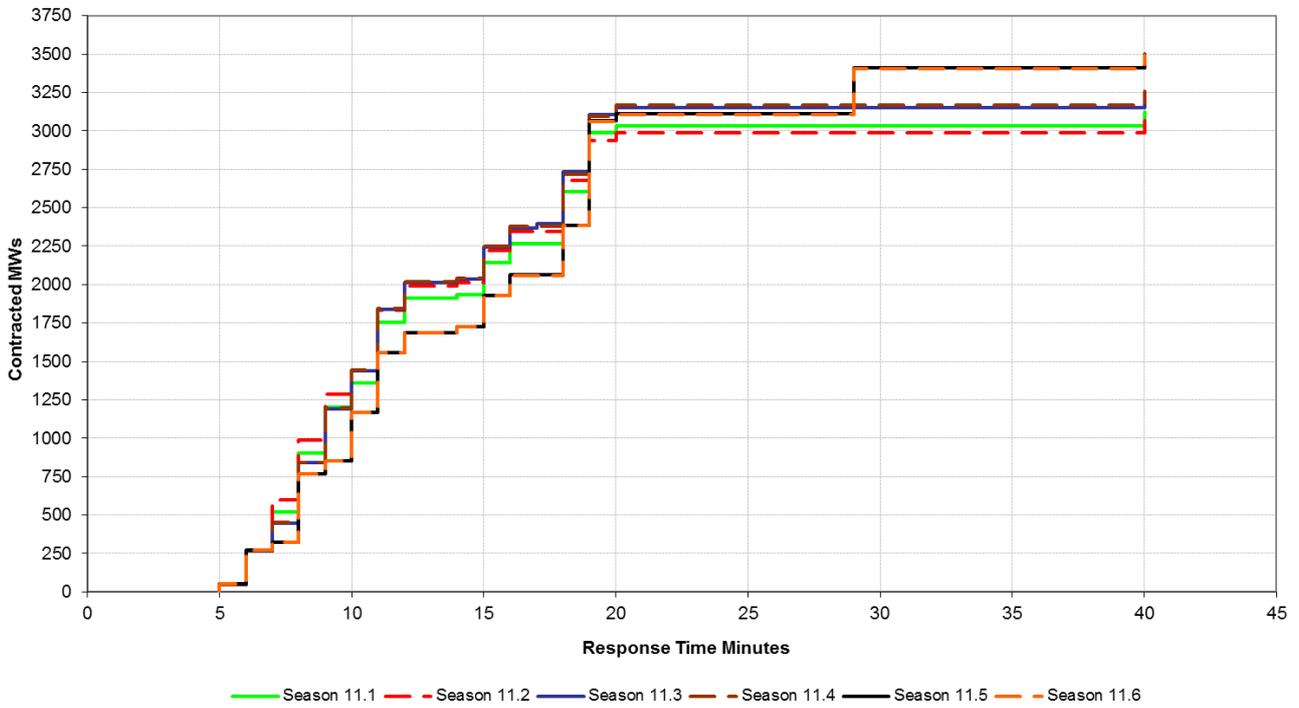
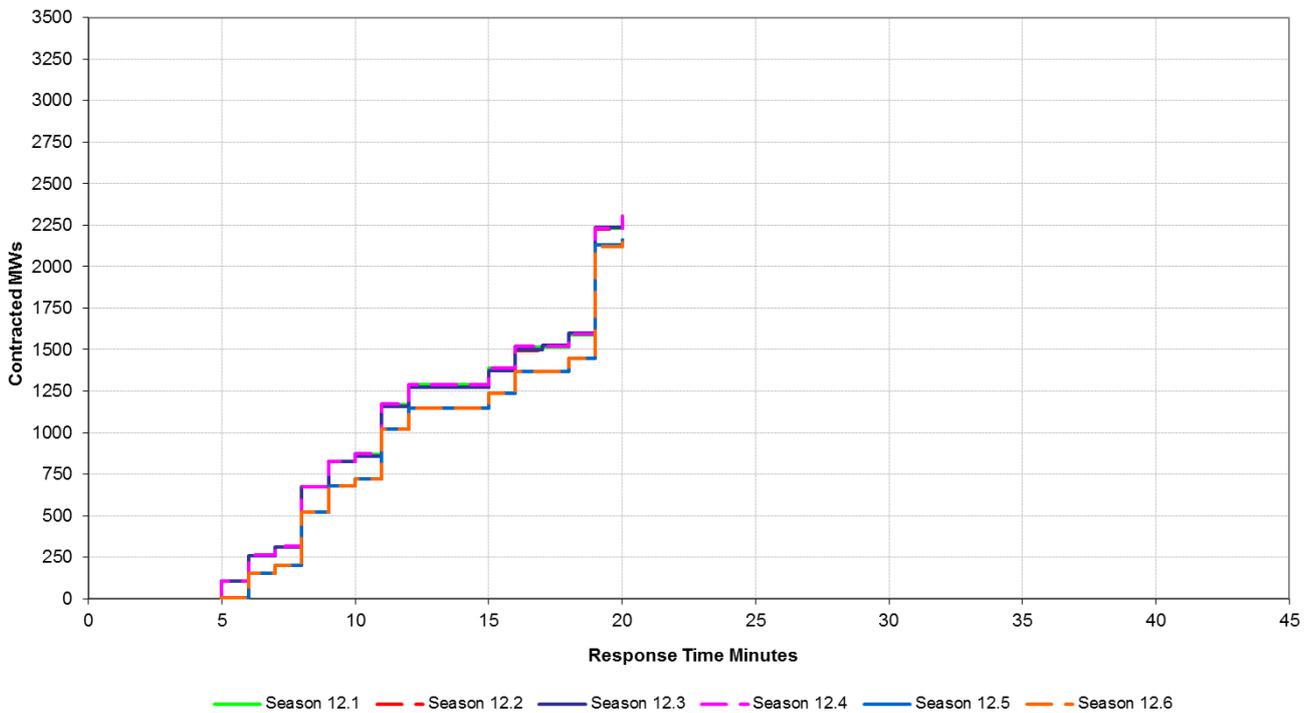


Figure 8a illustrates that for seasons 11.1 and 11.2 approximately 1300MW of STOR is contracted with a response time of 10 minutes or less.

Cumulative MW by Response Time for Year 11



Cumulative MW by Response Time for Year 12

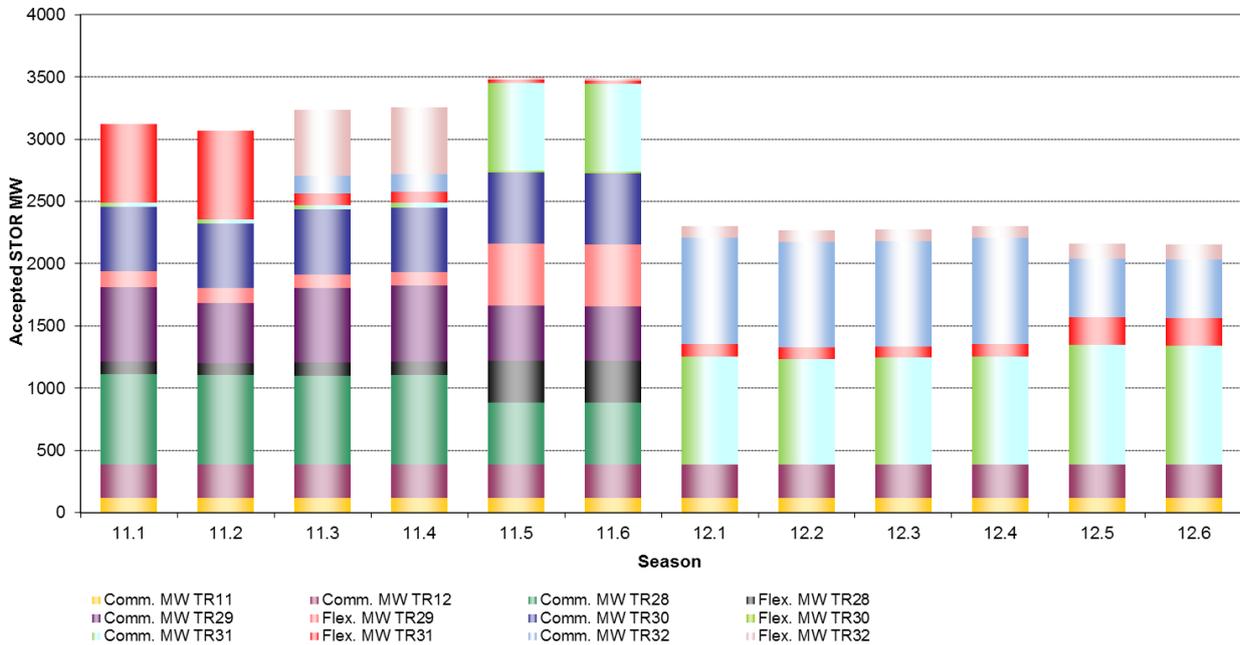


Total Contracted Position

Figure 9 shows the breakdown of accepted volumes from all previous tender rounds across the seasons of Years 11 and 12. The table accompanying Figure 9 below displays the same data in table format split by Committed or Flexible. For the purpose of this chart and table Premium Flexible units are classed as Flexible units.

Figure 9 Year 11 and 12 summaries by tender round

Overview of Accepted STOR Tenders for Seasons 11.1 - 12.6



Accepted MW	Season	11.1		11.2		11.3		11.4		11.5		11.6	
	Service Type	C	F	C	F	C	F	C	F	C	F	C	F
	TR11 (LT)	116		116		116		116		116		116	
TR12 (LT)	273		271		272		273		274		274		274
TR28	727	95	722	92	714	107	718	110	493	340	493	340	340
TR29	604	124	480	125	597	109	605	109	443	497	437	497	497
TR30	519		519		519		519		571	10	571	10	10
TR31	34	628	34	710	37	93	37	93	706	30	706	30	30
TR32					138	535	140	535		20		20	20
Total	2273	847	2142	927	2393	844	2408	847	2603	897	2597	897	897

Accepted MW	Season	12.1		12.2		12.3		12.4		12.5		12.6	
	Service Type	C	F	C	F	C	F	C	F	C	F	C	F
	TR11 (LT)	116		116		116		116		116		116	
TR12 (LT)	273		271		272		273		274		274		274
TR31	862	103	850	89	857	89	866	100	957	220	951	220	220
TR32	852	96	848	96	848	96	852	96	474	119	474	119	119
Total	2103	199	2085	185	2093	185	2107	196	1821	339	1815	339	339

STOR Runway Tender details

In TR32 there were four tenders received, three of which were accepted as being economic when compared to tenders received in the main tender. A total of 72MW was received. A breakdown of the tenders is included in the supporting data file.

Appendix 1: Terminology and Definitions

High level description of STOR:

STOR is designed to give National Grid sufficient Operating Reserve to replace sudden generation losses, or unpredictable changes in demand between four hours ahead of real time and real time and requires a large proportion of units to be available within 20 minutes. STOR also recognises that other potential reserve providers who cannot meet the 20 minute response time criteria can still be of value in meeting our reserve requirement. Hence a key aspect of the definition of the STOR product is that it extends the maximum response time to 240 minutes to allow alternative providers to participate. How value is placed on these units by National Grid is different to the sub 20 minute notice units as the longer notice units compete mainly with alternative options available in the Balancing Mechanism with equivalent response times. Location, reliability and utilisation parameters are also important elements of the STOR assessment.

The Committed service applies to all providers who wish to make themselves available for all required windows nominated by National Grid. Both BM and NBM providers can tender for this service. The Flexible service applies only to NBM providers and allows the provider to make the unit available or unavailable for particular windows. This availability is assessed on a week-ahead basis and providers are notified if their service is required or not. It is at the discretion of National Grid whether a unit is accepted or rejected at the week-ahead stage and this decision will be based on the same assessment principles as the main tender assessment. The increased accuracy of the week-ahead forecast means that some factors may have more importance such as location if specific constraint issues are forecast. Both Services attract an availability payment paid on a £/MW/h basis when available within defined windows and a utilisation payment on delivery of STOR MW when instructed by National Grid paid on a £/MWh basis.

A summary of the STOR service can be found on our website at the following link:

<http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=8589934872>

Appendix 2:

Accepted and Rejected Tenders TR32: A list of information containing prices, response time, location and unit type of all accepted and rejected tenders from this tender round, previously found in the appendix to the market information reports, can now be downloaded, in spreadsheet format, from the Market Information section of the STOR website:

<http://www2.nationalgrid.com/UK/Services/Balancing-services/Reserve-services/Short-Term-Operating-Reserve/Short-Term-Operating-Reserve-Information/>

Appendix 3: Season Reference

The following tables summarise the season information for the current year (Year 11) and the following year (Year 12).

Year 11 Seasons - 2017/18							
Season	Dates	WD		NWD		Indicative Hours	
		Start Time	End Time	Start Time	End Time	WD	NWD
1	05:00 on Saturday 1st April 2017 - 05:00 on Monday 24th April 2017	06:00	13:00	10:00	14:00	126.00	20.00
		19:00	21:30	19:30	21:30	45.00	10.00
2	05:00 on Monday 24th April 2017 - 05:00 on Monday 21st August 2017	06:30	14:00	10:30	13:30	750.00	57.00
		16:00	18:00	19:30	22:00	200.00	47.50
		19:30	22:00			250.00	0.00
3	05:00 on Monday 21st August 2017 - 05:00 on Monday 25th September	06:30	13:00	10:30	12:30	188.50	12.00
		16:00	21:00	19:30	21:30	145.00	12.00
4	05:00 on Monday 25th September 2017 - 05:00 on Monday 30th October	06:00	13:00	10:30	13:00	210.00	12.50
		17:00	20:30	17:30	20:00	105.00	12.50
5	05:00 on Monday 30th October 2017 - 05:00 on Monday 29th January 2018	06:00	13:00	10:30	13:30	525.00	48.00
		16:00	20:30	16:00	19:30	337.50	56.00
6	05:00 on Monday 29th January 2018 - 05:00 on Sunday 1st April 2018	06:00	13:00	10:30	13:00	378.00	20.00
		16:30	20:30	16:30	20:00	216.00	28.00
						3,476.0	335.5

Season	WD	NWD
1	18	5
2	100	19
3	29	6
4	30	5
5	75	16
6	54	8

Year 12 Seasons - 2018/19							
Season	Dates	WD		NWD		Indicative Hours	
		Start Time	End Time	Start Time	End Time	WD	NWD
1	05:00 on Sunday 1st April 2018 - 05:00 on Monday 30th April 2018	06:00	13:00	10:00	14:00	161.00	24.00
		19:00	21:30	19:30	21:30	57.50	12.00
2	05:00 on Monday 30th April 2018 - 05:00 on Monday 20th August 2018	06:30	14:00	10:30	13:30	705.00	54.00
		16:00	18:00	19:30	22:00	188.00	45.00
		19:30	22:00			235.00	
3	05:00 on Monday 20th August 2018 - 05:00 on Monday 20th September	06:30	13:00	10:30	12:30	188.50	12.00
		16:00	21:00	19:30	21:30	145.00	12.00
4	05:00 on Monday 20th September 2018 - 05:00 on Monday 29th October	06:00	13:00	10:30	13:00	210.00	12.50
		17:00	20:30	17:30	20:00	105.00	12.50
5	05:00 on Monday 29th October 2018 - 05:00 on Monday 28th January 2019	06:00	13:00	10:30	13:30	525.00	48.00
		16:00	20:30	16:00	19:30	337.50	56.00
6	05:00 on Monday 28th January 2019 - 05:00 on Monday 1st April 2019	06:00	13:00	10:30	13:00	378.00	22.50
		16:30	20:30	16:30	20:00	216.00	31.50
						3,451.5	342.0

Season	WD	NWD
1	23	6
2	94	18
3	29	6
4	30	5
5	75	16
6	54	9