

Non-BM Balancing Services Volumes and Expenditure

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Background

National Grid procures a range of Balancing Services ([Balancing Services on website](#)) from both Balancing Mechanism (BM) and Non-Balancing Mechanism (Non-BM) Providers. This report provides details of volumes and expenditure on the services provided by BM and Non-BM providers.

As part of our continuing work with our stakeholders we are adding to our suite of Market Information reports to give visibility to the Non-BM & wider community of the volumes and cost of contracted DSR in comparison to the wider market and our future requirements. Future Requirements information can be found here [Requirements Report](#)

Key points:

- This report is the fourth edition of the Non BM balancing services report. This contains data for the full financial year from 1st April 2016 to 31st March 2017
- The report focusses on the services where there is some existing level of Non-BM participation; this is not an exhaustive report of all balancing service expenditure and volumes
- In this edition we have added two new classifications (Non-BM Energy Storage) although they are not displayed in the report due to not having any cost or volume during this period:
 - BM Generation Balancing Support
 - Non-BM Generation Balancing Support
 - Non-BM CHP
 - Non-BM Generation Standby / Backup
 - Non-BM Load Response (load shifting and temporary demand reduction)
 - Non-BM Other (includes the Aggregator loads where no detailed asset data has been returned)

Note for this period there are no Providers that fall under the following categories (hence the reason that no data is shown for these):

- *Non-BM Energy Storage Balancing Support*
- *Non-BM Energy Storage Standby / Backup*

Summary of Total Non-BM Service Provision

Total Capacity by Service

The following table gives the maximum DSR capacity participating in each service during the period 1st April to 31st March 2017. Please note that this capacity may not all be available at the same time.

Product	DSR Volume
Frequency Response	707MW
STOR	1821MW
DSBR	0MW
Fast Reserve	180MW
Total	2708MW

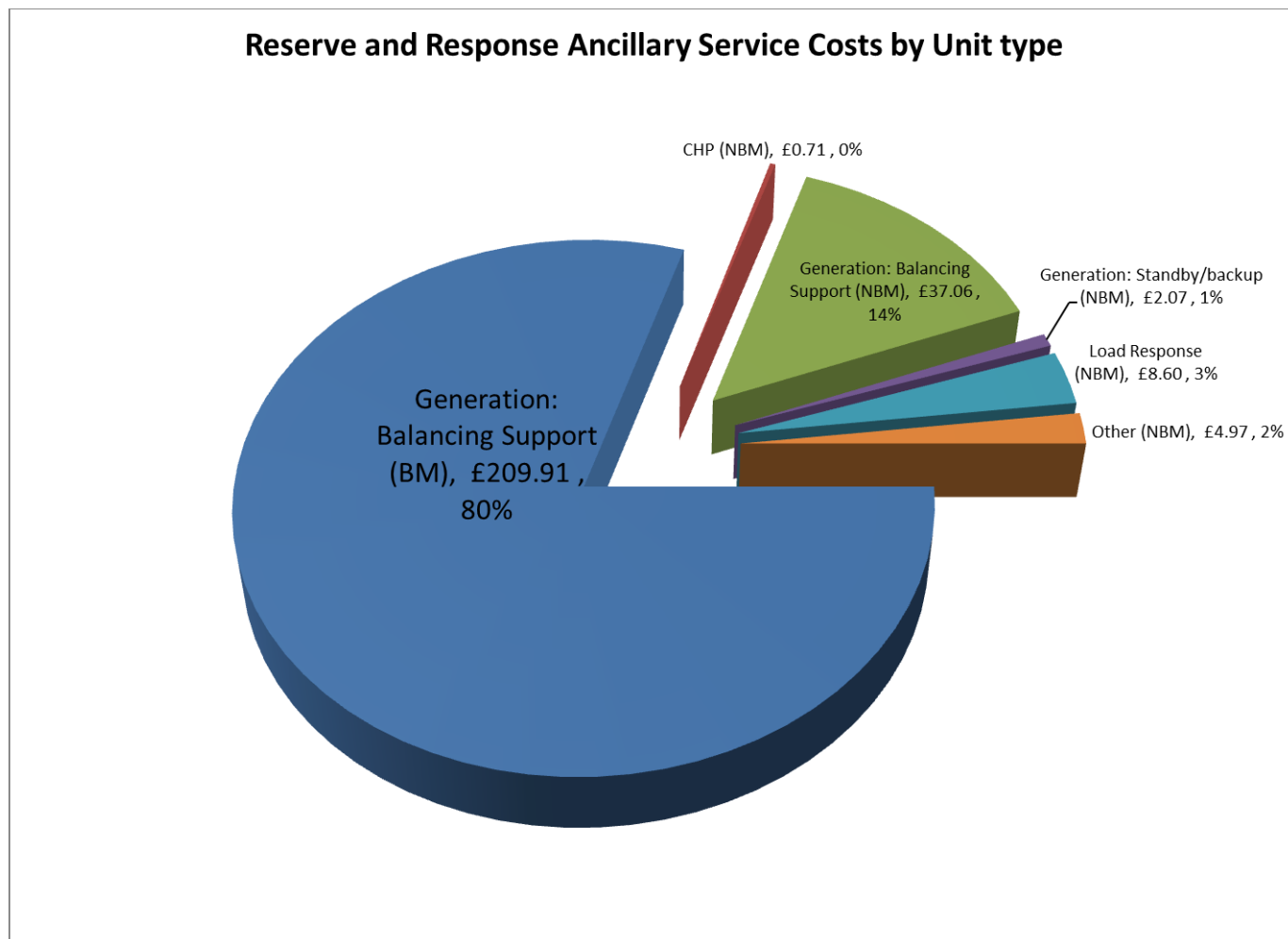
Total Ancillary Services Expenditure

The following table displays the total ancillary services expenditure from 1st April 2016 to 31st March 2017 split by provider type.

Please note at this current time the range of services available to Non-BM participants is smaller in number and monetary value than those open to Balancing Mechanism units. The table above only contains expenditure that are considered Ancillary Service expenditure and settled by National Grid. Actions taken on BM units for balancing are settled by Elexon and are not included in this table. The total expenditure on system balancing including all BM expenditure for the same time period is £958.8m, this includes the £522.4m of ancillary service costs shown in the table above.

Cost £m	Generation: Balancing Support (BM)	Load Response (NBM)	CHP (NBM)	Generation: Balancing Support (NBM)	Generation: Standby/Backup](NBM)	Other (NBM)	Total
Response and Reserve	£ 209.91	£ 8.60	£ 0.71	£ 37.06	£ 2.07	£ 4.97	£ 263.32
Black Start	£ 119.80	£ -	£ -	£ -	£ -	£ -	£ 119.80
Reactive	£ 86.18	£ -	£ -	£ -	£ -	£ -	£ 86.18
Constraints and Intertrip	£ 34.16	£ -	£ -	£ -	£ -	£ -	£ 34.16
BM Start Up	£ 6.85	£ -	£ -	£ -	£ -	£ -	£ 6.85
SO-SO trading	£ 2.84	£ -	£ -	£ -	£ -	£ -	£ 2.84
Interconnector Capability	£ 5.96	£ -	£ -	£ -	£ -	£ -	£ 5.96
DEMAND Turnup/Gen Turndown	£ 0.87	£ -	£ -	£ -	£ -	£ -	£ 0.87
Forecast of future liabilities	£ 2.36	£ -	£ -	£ -	£ -	£ -	£ 2.36
SBR	£ 118.34	£ -	£ -	£ -	£ -	£ -	£ 118.34
Total	£ 587.28	£ 8.60	£ 0.71	£ 37.06	£ 2.07	£ 4.97	£ 640.70

At the current time, ancillary reserve and response services are the main markets that are available to DSR. The pie chart below summarises the split of expenditure on these ancillary services between the six main provider types as outlined in the background section.



As demonstrated in the pie chart above, in the service areas where DSR currently participates they account for 20% of the expenditure in this period. The following sections of this report will breakdown Frequency Response, STOR and Fast Reserve by monthly cost and volumes.

Frequency Response

The National Electricity Transmission System is designed to operate at 50Hz. In practice, the system frequency varies second by second as the balance between system demand and total generation changes. If demand is greater than generation, the frequency falls – if generation is greater than demand, the frequency rises.

After a demand or generation fault there is a significant difference between generation and demand, and therefore system frequency changes. National Grid runs the system to ensure that:

- The maximum deviation of frequency after a normal loss is no greater than 0.5Hz.
- The maximum deviation of frequency after an infrequent loss is no greater than 0.8Hz.
- Any deviations outside 49.5Hz and 50.5Hz do not exceed 60 seconds.

National Grid achieves this by using various response services, which are defined below. The requirement for these frequency response services is set to the lowest amount that is required in order to meet the obligations outlined above.

Primary and secondary response are an automatic increase in generation (or reduction of demand) when the frequency is below 50Hz. Primary response is delivered within 10 seconds, while secondary response is delivered within 30 seconds.

High response is an automatic reduction in generation (or increase in demand) when frequency is above 50Hz. High response, like primary, is delivered within 10 seconds.

Enhanced response is a dynamic service currently under development that delivers automatic changes in power (both increase and decrease) as frequency deviates from 50Hz, delivered within 1 second.

[Dynamic / Static Response](#)

Primary, secondary, and high response can all be provided by either dynamic or static services. Dynamic response is characterised as a proportional change in power as frequency changes. Static response is characterised as a fixed change in power after frequency moves beyond a specified limit.

When referring to frequency response capability it is the MW of capability delivered at a 0.5 Hz deviation that is used.

National Grid procures Frequency Response services from a variety of sources; a general description of these services is presented below. For further details on each service please refer to the website.

<http://www2.nationalgrid.com/uk/services/balancing-services/frequency-response/>

[Firm Frequency Response \(FFR\)](#)

The FFR service is procured via a monthly tender round, with a minimum volume requirement of 10MW by provider. Participants can tender for contracts beginning the month ahead up to 2 years ahead. An FFR tender can be for any combination of capabilities of Primary, Secondary and High and can also be for a static or dynamic service. Full details of all tenders and the outcome of the assessment can be found on the FFR webpage ([FFR on website](#)) along with the latest market report detailing the current requirements.

[FFR Bridging](#)

FFR Bridging was designed to enable demand side response providers to secure a contract within which to develop a portfolio of new FFR volume, starting with a minimum of 1MW whilst volume is grown to 10MW. Once the 10MW is reached Providers move into the tendered FFR market.

Note – with the reduction in MW volume (down to 1MW) to participate in the tendered market, we are no longer procuring FFR Bridging.

The FFR Bridging contract is for a set term of one or two years, with a mandated £/MW/h of response per hour. The price is dependent upon the combination of response types being provided (e.g. Secondary, Primary + High, etc.) and the price increases as more MWs are aggregated. At the present time FFR bridging is only for Static service providers, please see ([FFR Bridging](#)).

[Frequency Control Demand Management \(FCDM\)](#)

Frequency Control Demand Management (FCDM) provides frequency response through the interruption of demand side response providers. The electricity demand is automatically interrupted when the system frequency transgresses the low frequency relay setting on site.

The demand side response providers who participate in FCDM service are prepared for their load response demands to be interrupted when the frequency drops to 49.7Hz, respond within 2 seconds (full output) and deliver the service for a period of 30 minutes. There is a minimum volume requirement of 3MW. This service is procured on a bilateral contract basis and is only open to Non-BM demand reduction.

Further details on FCDM can be found here ([FCDM](#)).

[Mandatory Frequency Response](#)

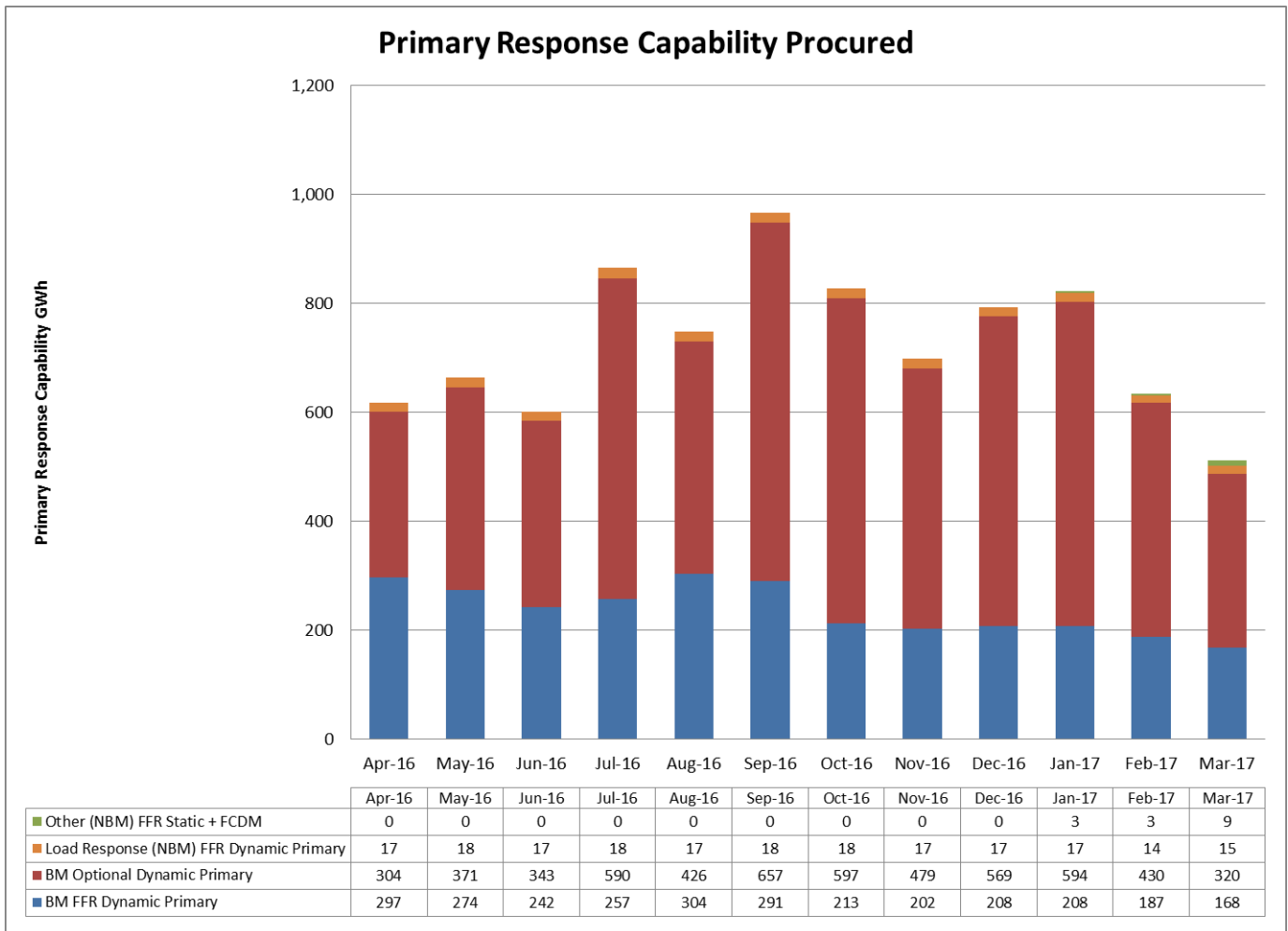
All generators caught by the requirements of the Grid Code are required to have the capability to provide Mandatory Frequency Response. The capability to provide this Service is a condition of connection for generators connecting to the GB Transmission System. Mandatory Frequency Response is an automatic change in active power output in response to a frequency change. It is a dynamic service with all generators offering some level of Primary Secondary and High. The level of each service will change depending on the load point of the generator.

Bilateral Frequency Control contracts and optional services

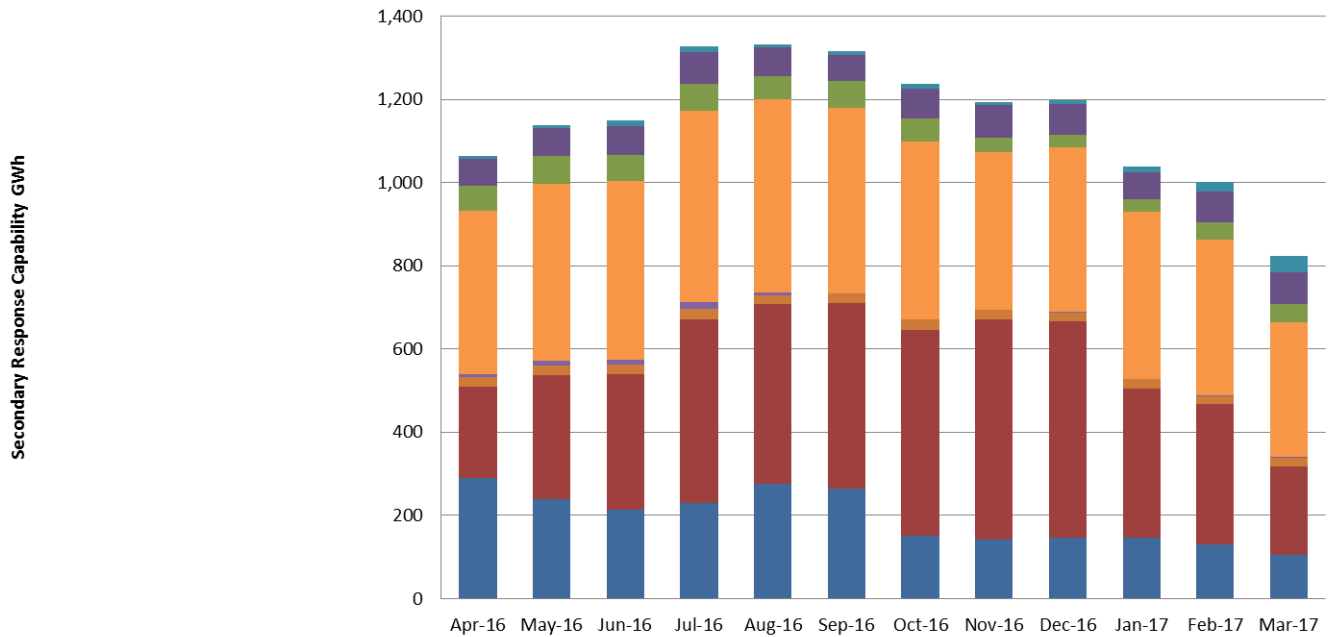
In the past, where a provider offered a service that does not fit into the existing service terms a bilateral contract would have been considered. This is no longer the case and we are not proactively procuring optional services or bilateral contracts, as the changes to the tendered markets have enabled participation in competitive markets.

The legacy contracts can be for BM and Non-BM providers and for static or dynamic services, they may also be a firm contract or an optional contract with fees only paid if nominated/armed. As part of the Fast Reserve service framework participants can make optional response services available such as Low Frequency triggered generation (typically 49.7 or 49.6Hz).

The following series of charts display the total monthly volume of response capability procured via all Frequency Response services. The volumes have been split by Primary Secondary and High. For the capability charts, categories are only shown if there is some volume to display. BM Optional Dynamic services include Mandatory response and any dynamic bilateral contracts or enhanced mandatory services. BM Optional Static services include services made available via the Fast Reserve framework and other bilateral contracts.

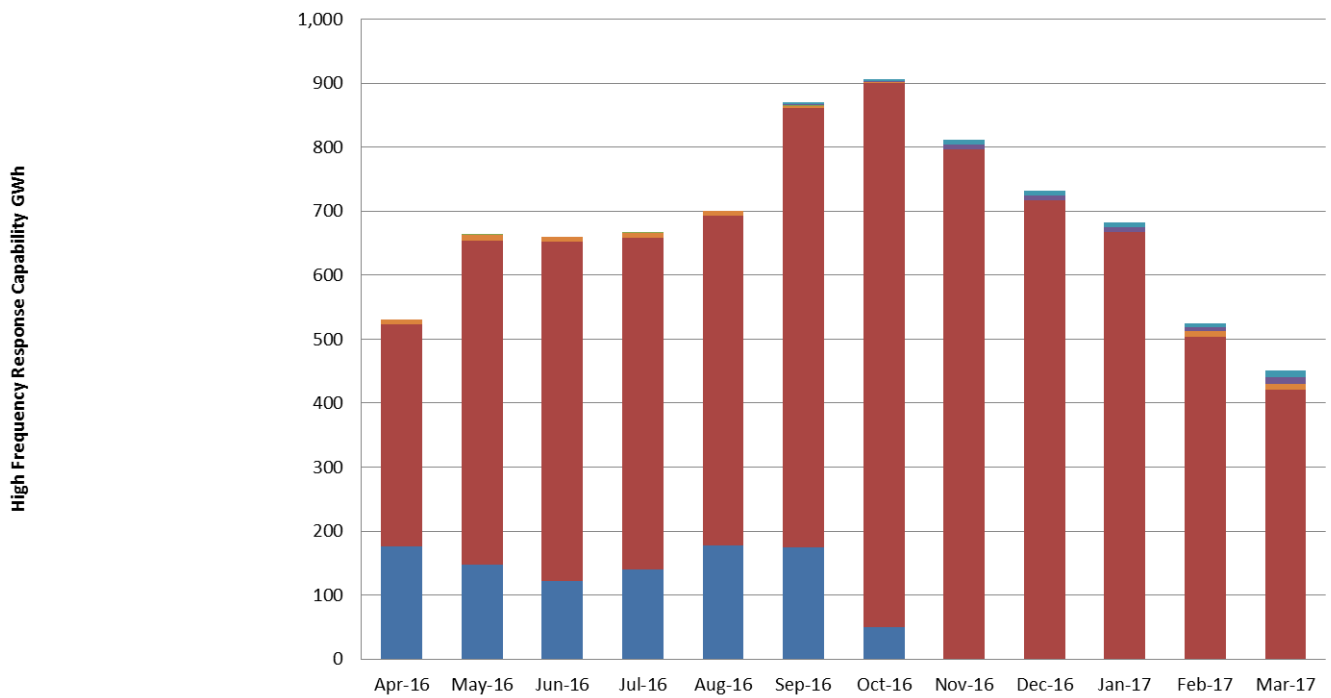


Secondary Response Capability Procured



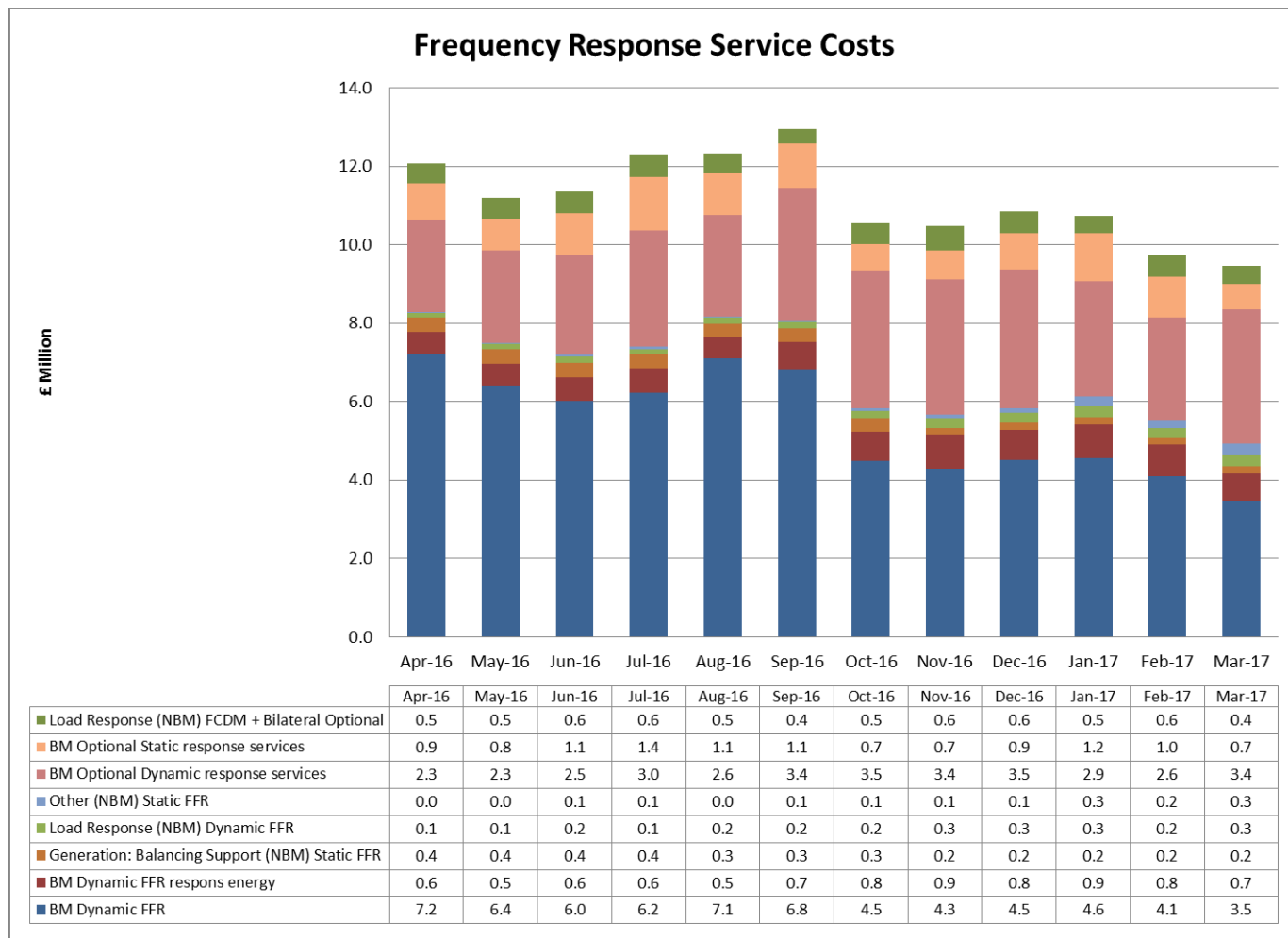
	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM) FFR Static + FCDM	8	7	13	14	7	10	13	6	10	14	24	40
Load Response (NBM) FFR Static + FCDM	66	65	68	75	68	63	70	79	73	63	72	77
Generation: Balancing Support (NBM) FFR Static + FCDM	59	67	62	65	57	64	56	35	31	30	43	43
BM Optional Static Secondary	393	425	432	462	463	446	427	378	395	404	373	323
Load Response (NBM) Optional Dynamic Secondary	7	12	11	16	7	0	1	1	1	1	2	3
Load Response (NBM) FFR Dynamic Secondary	23	25	23	25	23	24	25	23	22	22	19	20
BM Optional Dynamic Secondary	219	296	325	440	431	446	495	529	520	359	337	212
BM FFR Dynamic Secondary	289	240	213	231	276	264	151	142	146	146	131	106

High Frequency Response Capability Procured



	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM) FFR Static + FCDM	0	0	0	0	0	2	2	7	7	7	6	11
Other (NBM) FFR Static + FCDM	0	0	0	0	0	2	2	7	7	7	6	11
BM Optional Static High	0	2	0	1	0	1	0	0	0	0	0	0
Load Response (NBM) Optional Dynamic High	8	8	8	8	8	3	0	1	1	0	8	9
BM Optional Dynamic High	347	507	530	519	515	687	851	796	716	667	504	420
BM FFR Dynamic High	176	148	122	140	177	174	49	0	0	0	0	0

The Frequency Response Service Expenditure chart cannot be split by response type due to bundled services such as FFR where there is a single payment for any primary secondary or high response provided. The chart also includes the expenditure on response energy which is not displayed on the capability charts. For BM FFR contracts the response energy is displayed as a separate category but for Mandatory response services the response energy expenditure is relatively small and is included in the BM optional dynamic services category.



Short Term Operating Reserve (STOR)

Short Term Operating Reserve (STOR) is a service for the provision of additional active power from generation and/or demand side response. STOR is needed because at certain times of the day National Grid needs reserve power in the form of either generation and / or demand reduction in order to be able to deal with actual demand being greater than forecast demand and/or plant failure.

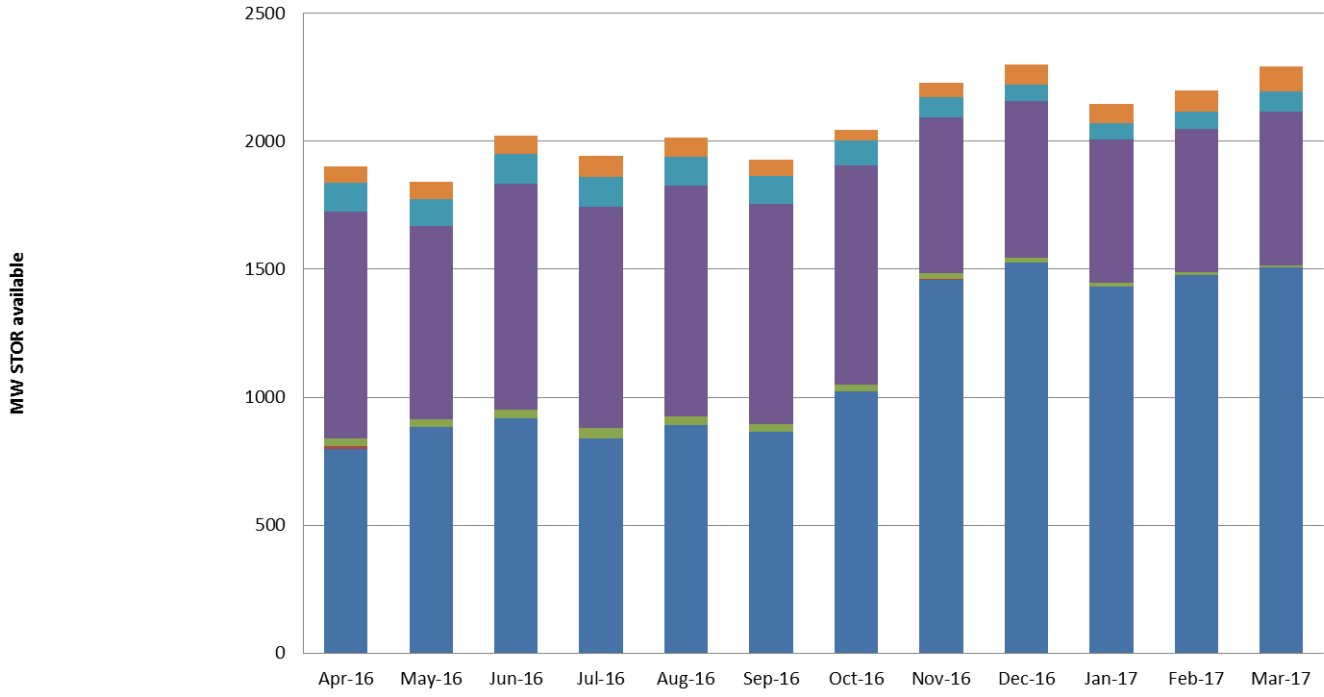
This service is procured on a tendered basis with three tender rounds per year. Providers have the opportunity to tender for up to two years ahead. Please see our website for further information here ([STOR](#)).

To date STOR has been the most successful service for accessibility to DSR providers. The charts below demonstrate the expenditure and volumes associated with the accepted tenders in the STOR market split by BM provider, Non-BM Generation and Non-BM Other.

Under the STOR service providers are paid an availability fee for making their capacity available to National Grid during the defined STOR windows. If a unit is instructed to deliver power then they are also paid a utilisation fee for the energy delivered.

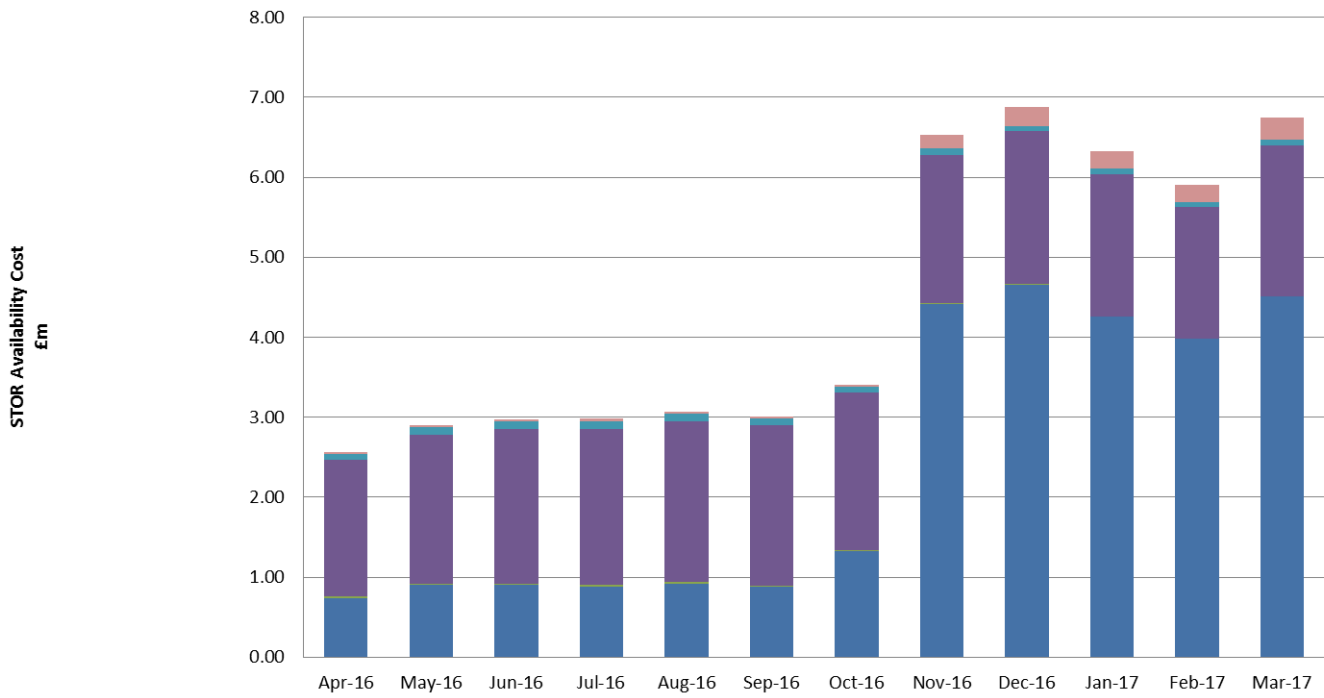
The following charts display the average available capacity during the STOR windows for each month and the associated expenditure. The volume of utilisation and cost of utilisation is also displayed along with a year to date total cost breakdown.

Average STOR capacity available



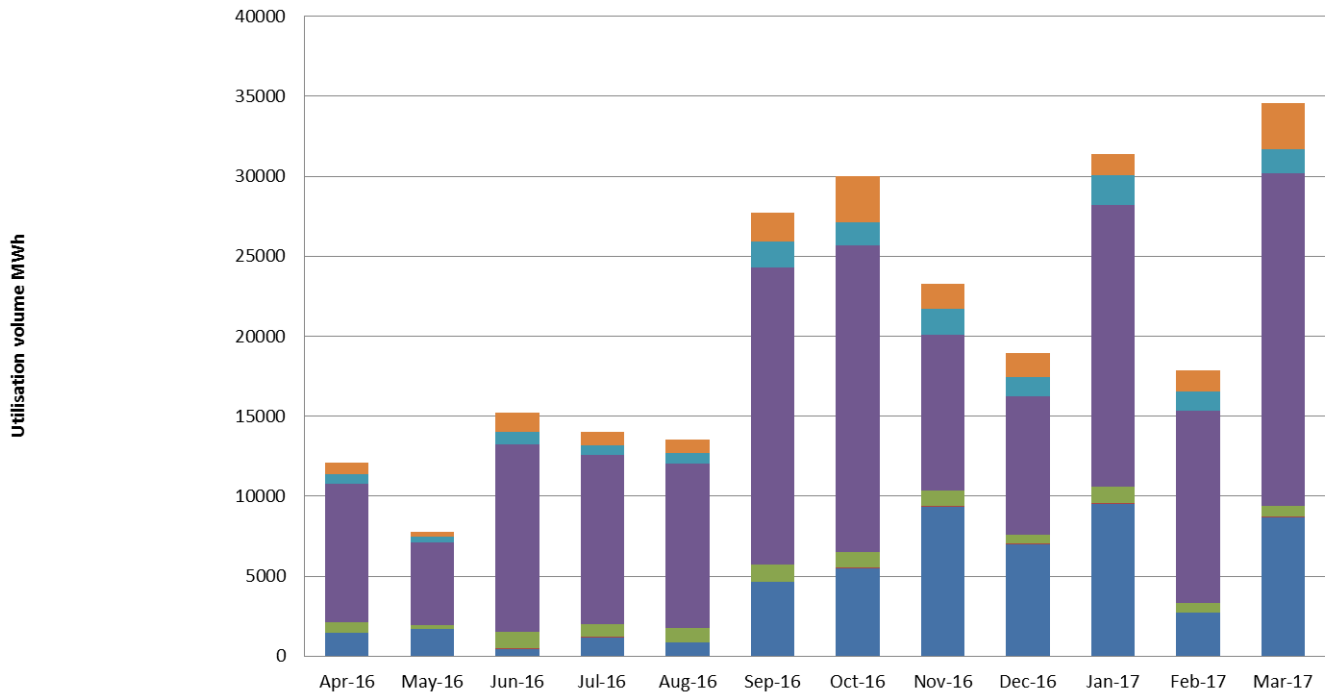
	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	65	67	70	83	75	64	44	58	78	74	83	100
Generation: Standby/Backup (NBM)	112	105	115	116	113	108	95	77	65	64	64	77
Generation: Balancing Support (NBM)	889	755	882	863	901	862	856	609	613	561	560	603
CHP (NBM)	30	30	34	40	35	29	27	23	15	13	12	8
Load Response (NBM)	9	0	0	0	0	0	0	1	0	0	0	0
Generation: Balancing Support (BM)	799	885	918	839	892	864	1023	1459	1527	1434	1477	1506

STOR Availability Cost



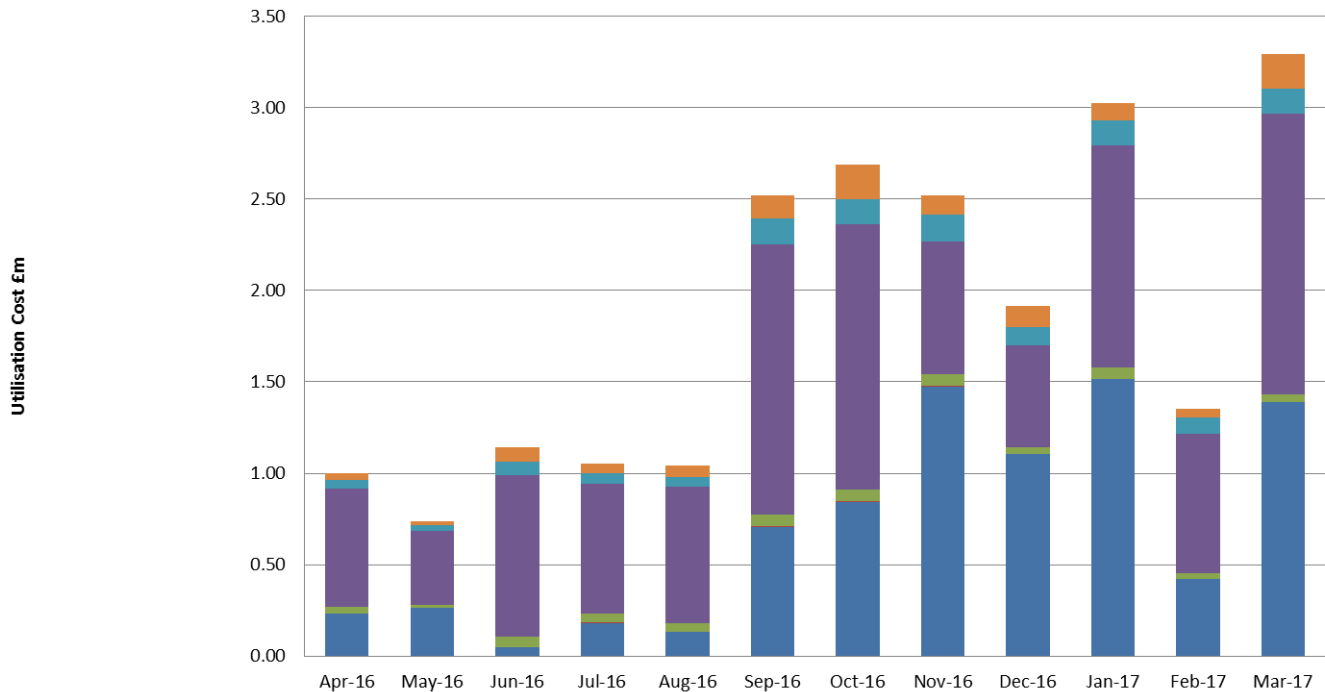
	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	0.02	0.03	0.03	0.04	0.03	0.03	0.02	0.17	0.24	0.21	0.21	0.29
Generation: Standby/Backup (NBM)	0.07	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.06	0.06	0.06	0.07
Generation: Balancing Support (NBM)	1.71	1.87	1.94	1.95	2.01	2.01	1.97	1.85	1.91	1.78	1.65	1.89
CHP (NBM)	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Load Response (NBM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generation: Balancing Support (BM)	0.74	0.90	0.90	0.88	0.92	0.88	1.32	4.42	4.66	4.25	3.98	4.51

STOR utilisation volume

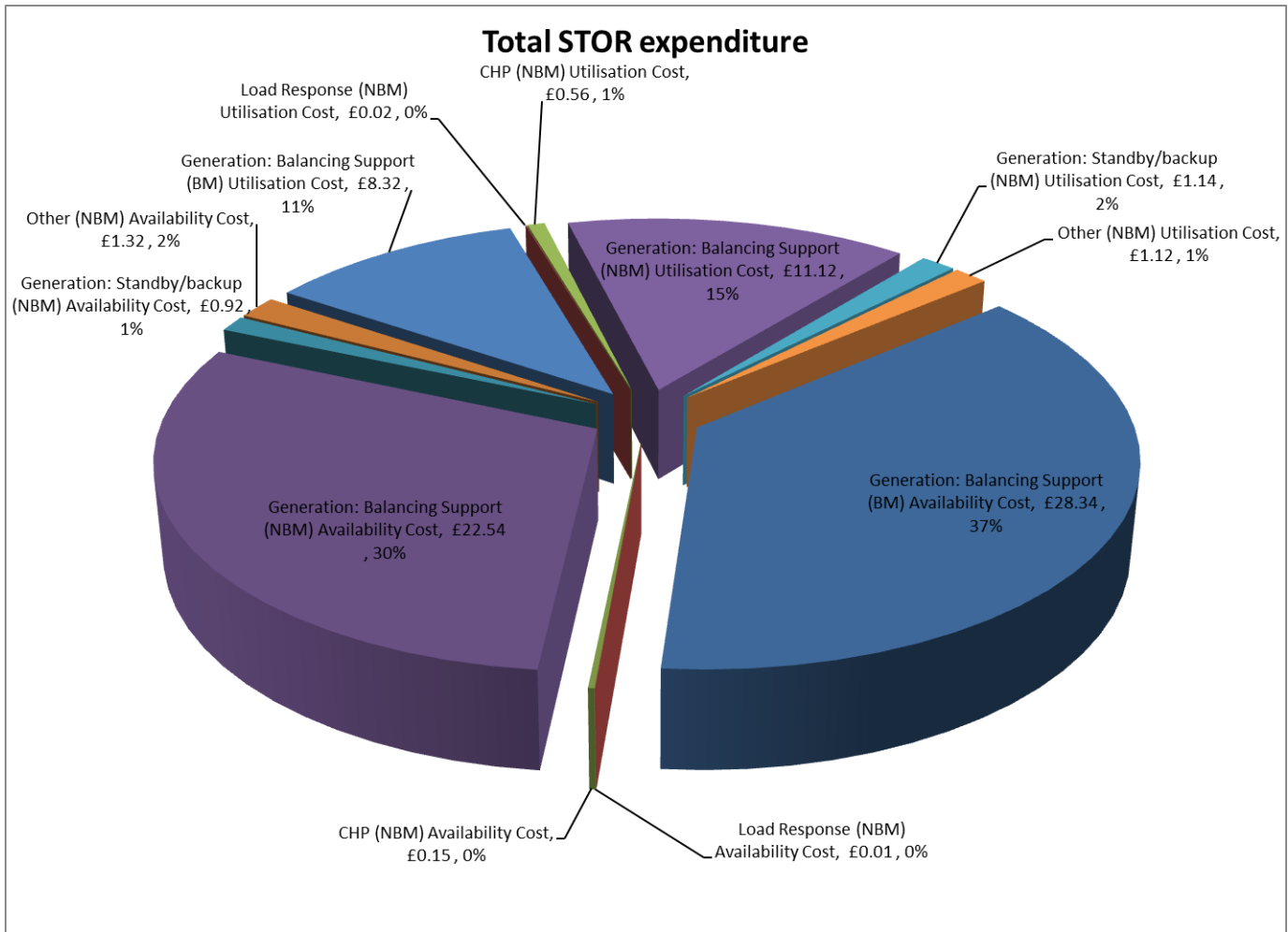


	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	704	340	1218	788	830	1792	2866	1573	1527	1345	1342	2857
Generation: Standby/Backup (NBM)	579	322	781	660	653	1646	1466	1597	1212	1825	1178	1526
Generation: Balancing Support (NBM)	8658	5180	11669	10536	10292	18562	19184	9726	8620	17614	12036	20805
CHP (NBM)	657	276	1060	801	900	1070	912	974	553	1051	597	673
Load Response (NBM)	17	4	37	74	14	34	69	72	43	51	7	16
Generation: Balancing Support (BM)	1461	1665	441	1133	835	4629	5496	9333	7003	9498	2718	8690

STOR Utilisation Costs



	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	0.04	0.02	0.08	0.05	0.06	0.13	0.19	0.10	0.12	0.09	0.05	0.19
Generation: Standby/Backup (NBM)	0.05	0.03	0.07	0.06	0.05	0.14	0.14	0.15	0.10	0.14	0.09	0.14
Generation: Balancing Support (NBM)	0.65	0.40	0.88	0.71	0.75	1.48	1.45	0.73	0.56	1.21	0.76	1.53
CHP (NBM)	0.03	0.02	0.06	0.05	0.05	0.06	0.06	0.06	0.04	0.06	0.03	0.04
Load Response (NBM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generation: Balancing Support (BM)	0.23	0.26	0.05	0.18	0.13	0.71	0.84	1.48	1.11	1.51	0.42	1.39



Fast Reserve (FR)

Fast Reserve provides the rapid and reliable delivery of active power through an increased output from generation or a reduction in consumption from demand side response providers, following receipt of an electronic despatch instruction from National Grid.

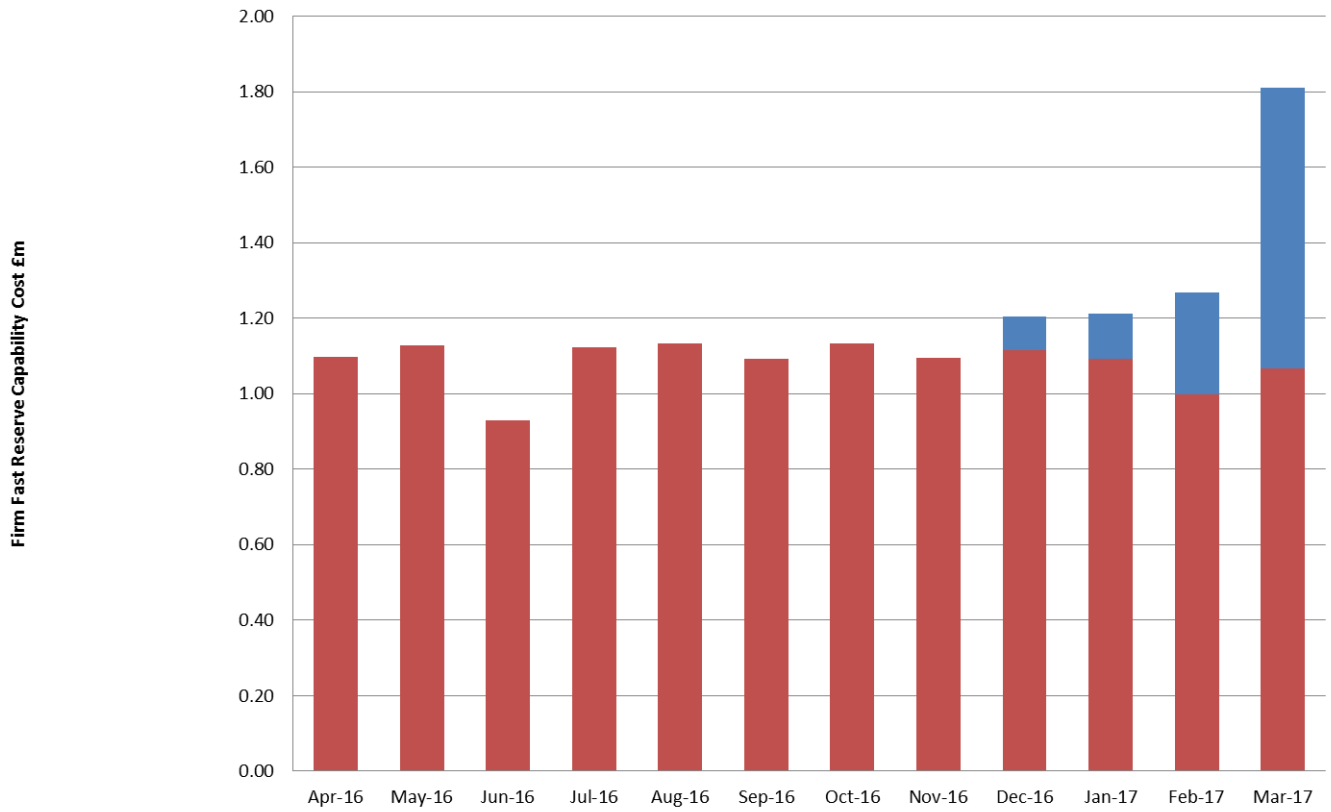
Fast Reserve is used, in addition to other energy balancing services, to control frequency changes that might arise from sudden, and sometimes unpredictable, changes in generation or demand.

Active power delivery must start within 2 minutes of the despatch instruction at a delivery rate in excess of 25MW/minute, and the reserve energy should be sustainable for a minimum of 15 minutes. There is a minimum volume requirement of 50MW. More details on the service can be found here ([Fast Reserve](#)).

There is no data included for Non-BM Fast Reserve Providers for the period concerned, although 120MW has been contracted to start between Nov 2016 and Mar 2017 and the data will be contained in the full year report.

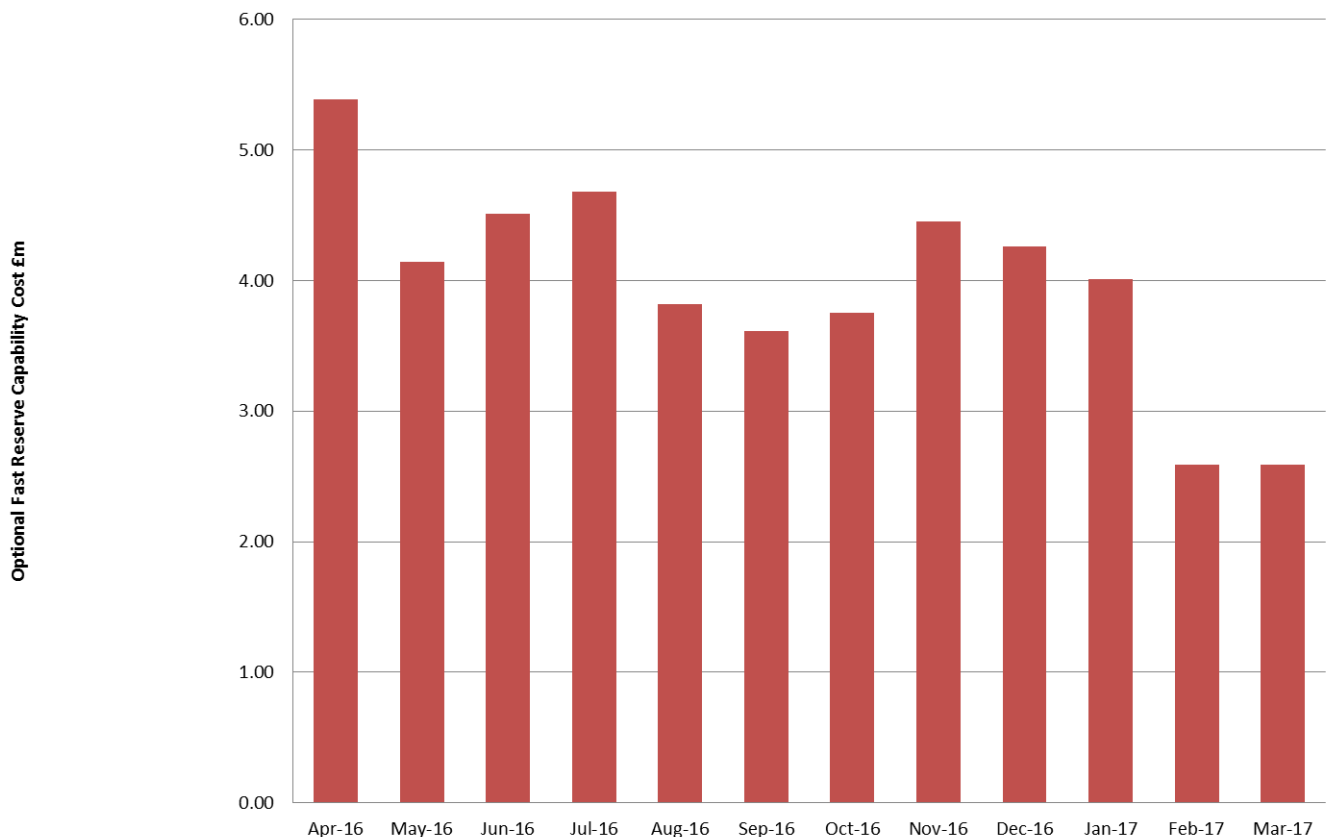
The following charts display the monthly expenditure of the contracted Firm Fast Reserve service and those for the optional Non-Firm Fast Reserve service.

Firm Fast Reserve Capability Costs



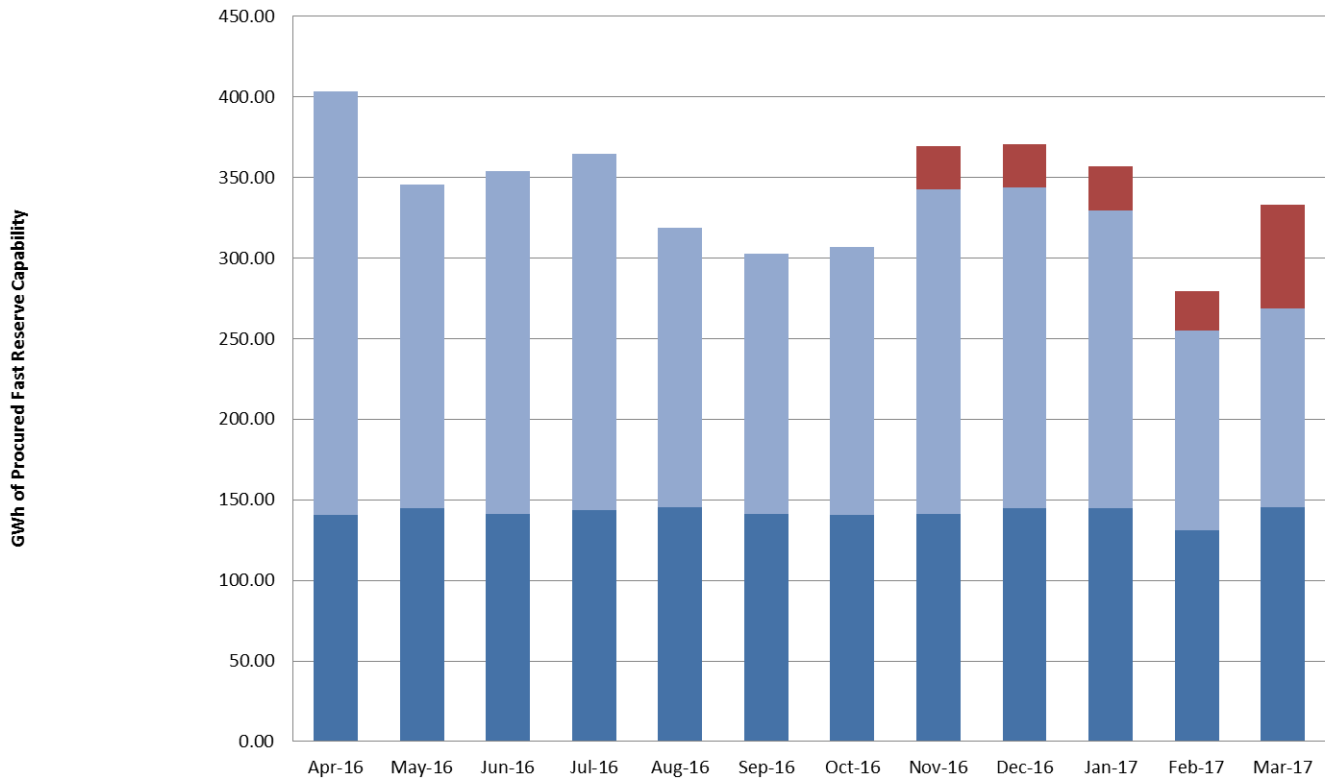
	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	0	0	0	0	0	0	0	0	0.089946	0.1205855	0.2707478	0.74366225
Generation: Balancing Support (BM)	1.10	1.13	0.93	1.12	1.13	1.09	1.13	1.09	1.11	1.09	1.00	1.07

Optional Fast Reserve Capability Costs



	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Generation: Balancing Support (BM)	5.38	4.14	4.51	4.68	3.82	3.61	3.75	4.45	4.26	4.01	2.59	2.59

Optional and Firm Fast Reserve Procured Capability



	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Other (NBM)	0	0	0	0	0	0	0	26.58	26.82	27.21	24.78	64.17
Generation: Balancing Support (BM)	262.39	200.90	212.91	220.79	173.35	161.75	166.59	201.68	198.85	184.67	123.57	123.02
Generation: Balancing Support (BM)	140.78	144.50	140.88	143.63	145.26	140.88	140.50	140.88	144.78	144.88	131.27	145.64

Supplemental Balancing Reserve

Supplemental Balancing Reserve (SBR) is designed to support National Grid in balancing the system in the unlikely event that there is insufficient capacity in the market to meet demand. The service is targeted at generators who would otherwise be closed, mothballed or generally unavailable to the market, and would only be used as a last resort by the system operator after all commercial balancing actions have been taken.

More details can be found here [\(SBR\)](#).

Appendix 1: Non Balancing Mechanism (NBM) Balancing Service Provision breakdown

The classifications for the breakdown have been developed through closely working with the DSR Provider Group to reach a general consensus to enable reporting.

The Purpose of the breakdown is to:

- a) Understand what makes up the aggregator assets.
- b) Measure progress of DSR in the provision of Balancing Services.
- c) Allow 3rd parties to assess the use of NBM assets and how they can participate in the overall energy market and provision of Balancing Services.
- d) Better identify the carbon impact of various forms of NBM service provision.

Non Balancing Mechanism provision will be classified in the following way:

1. **Load Response:** Reducing end consumer's load by turning down /off
2. **NBM Generation: Standby / Backup** - or other distributed and dispatchable generation including CHP – with a primary purpose to support a source of local demand
3. **NBM Generation: Balancing Support** - Distributed and dispatchable generation / CHP – not aligned with a source of demand
4. **NBM CHP**
5. **NBM Other** - includes the Aggregator loads where no detailed asset data has been returned
6. **Energy Storage** – with a primary purpose to support a source of local demand
7. **Energy Storage** – not aligned with a source of local demand

1. **Load Response** - This is an action to reduce an end consumer's load by turning down or turning off electrical consuming equipment behind the meter. There are two types:

Load Shifting - The postponement of electricity consumption

Shifting consumption from one time period to another, this may be both ramp-down (reduction) or ramp-up (increase of load).

For example, ramp-down load shifting may include:

- A temporary reduction in HVAC load.
- Smart appliance automated response to an instruction to reduce its load at a given time. The assumption being that the appliance will have to use that 'given up' energy at another time to function effectively e.g. where a smart refrigerator is programmed to switch off for half an hour during a peak time.

Ramp-down or ramp-up includes frequency response measures undertaken by end users, e.g. short-term turning off and on of high energy processes such that the action will not affect the effectiveness of the process, e.g. the intermittent turning on and off of a heating process.

Temporary Demand Reduction - Reduction of electricity consumption

As opposed to a permanent demand reduction (i.e. energy efficiency measures) this reduction is a single instance within a given timeframe. This behaviour would revert to normal if the constraint were removed e.g. reduction in factory production at the given time.

2. **Generation Standby/Backup** - Back-up / Standby generation may sometimes be referred to as behind the meter' generation. The amount of electricity consumed by the end user may not change but what is drawn off the network is reduced; e.g. an industrial consumer using a diesel generator at times of peak tariff rates thereby avoiding payment of more expensive network electricity. Includes generating assets (either offsetting demand or exporting to the network) where the primary purpose of the asset is in the support of a source of demand.
3. **Generation Balancing Support** – Use of distributed generation which is other generating assets that only export to the network and that are not aligned to an associated source of demand. This type of generation exclusively exports and is therefore offsetting Transmission System demand, either continually or periodically.
4. **Non-BM CHP** – Cogeneration or Combined Heat and Power. Simultaneous generation of electricity and useful heating and cooling from the combustion of a fuel or solar heat collector.
5. **Non-BM Other** - includes the Aggregator loads where no detailed asset data has been returned
6. **Energy Storage to support source of local demand** (Reduction / shifting of load or generation from when it is cheap to provide and saving it for when its consumption is valuable).
Use of energy storage assets (either offsetting demand or exporting to the network) where the primary purpose of the asset is in the support of a source of demand.
7. **Energy Storage not aligned with source of local demand**
Use of energy storage assets that only export to the network and that are not aligned to an associated source of demand.