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 second edition of the Non BM balancing services report. This now contains the full years data from 1st April 2015 to 31st March 2016
- This 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 second edition the data has been classified into the following six categories:
    - 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)

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 financial year to 31st March 2016. Please note that this capacity may not all be available at the same time.

Product	DSR Volume
Frequency Response	374MW
STOR	1745MW
DSBR	515MW
Total	**2634MW**

Total Ancillary Services Expenditure

The following table displays the total ancillary services expenditure from 1st April 2015 to 31st March 2016 split by provider type.

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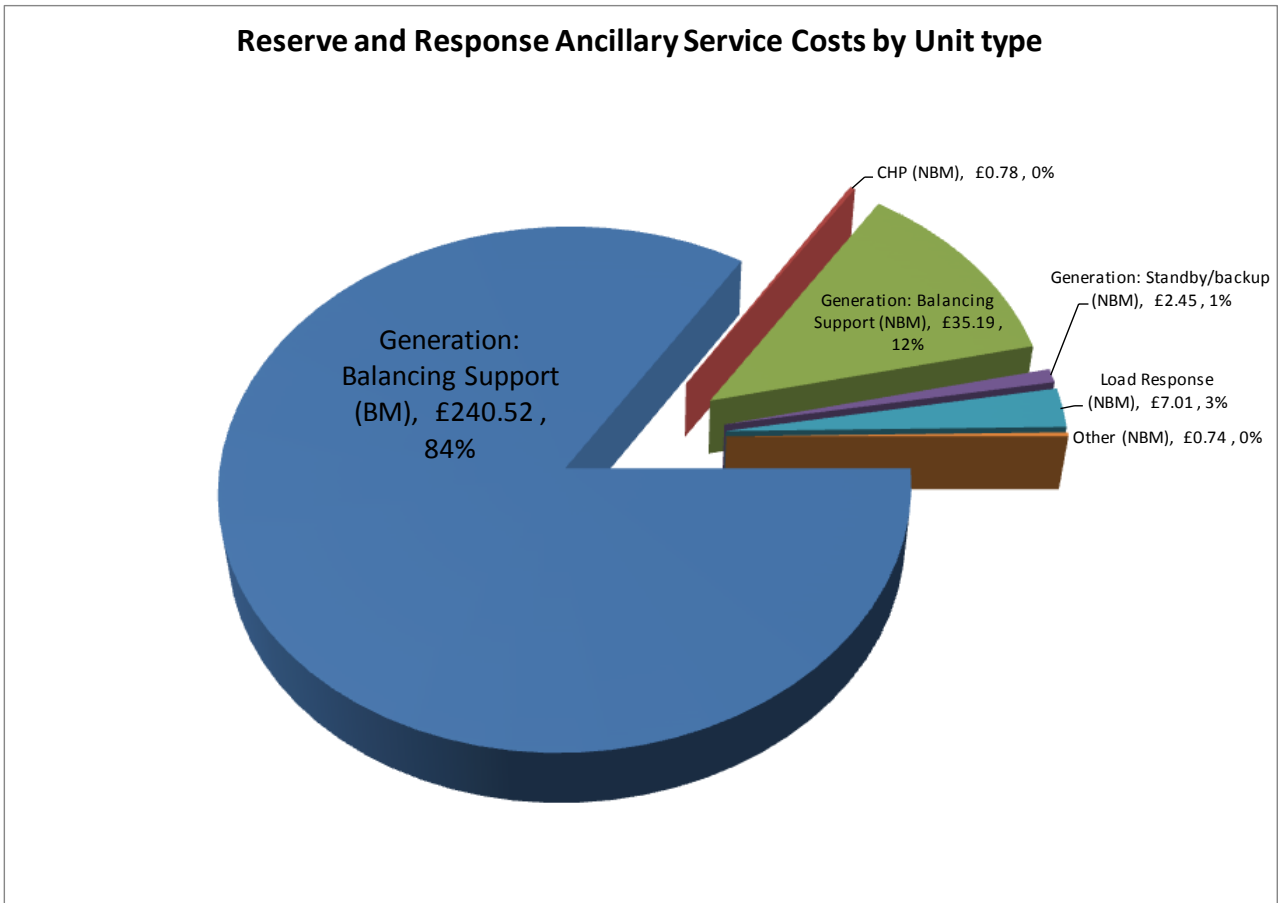
Please note at this current time the range of services available to Non-BM participants is smaller in number and monetary value than those open to Balancing Mechanism units. The table above only contains expenditure that are considered Ancillary Service expenditure and settled by National Grid. Actions taken on BM units for balancing are settled by Elexon and are not included in this table. The total expenditure on system balancing including the BM expenditure for the same time period is £868.5m, this includes the £399.7m shown in the table above.

Total	Generation: Balancing Support (BM)	CHP (NBM)	Generation: Balancing Support (NBM)	Generation: Standby/backup (NBM)	Load Response (NBM)	Other (NBM)	Total
Response and Reserve*	240.52	0.78	35.19	2.45	7.01	0.74	286.68
Black Start	19.22	0.00	0.00	0.00	0.00	0.00	19.22
Reactive	75.47	0.00	0.00	0.00	0.00	0.00	75.47
Constraints and Intertrip	35.07	0.00	0.00	0.00	0.00	0.00	35.07
BM Start Up	0.87	0.00	0.00	0.00	0.00	0.00	0.87
SO-SO trading	-0.61	0.00	0.00	0.00	0.00	0.00	-0.61
Trial service/Wind Curtailment	0.72	0.00	0.24	0.00	0.00	0.00	0.96
SBR	28.41	0.00	0.00	0.00	0.00	0.00	28.41
DSBR	0.00	0.00	0.00	0.00	0.00	2.31	2.31
Total	**399.67**	**0.78**	**35.43**	**2.45**	**7.01**	**3.05**	**448.38**
**STOR clawback*							*-0.56*

At the current time, ancillary reserve and response services are the main markets that are available to the 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 16% of the expenditure. 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 has been 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 will move into the tendered FFR market.

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

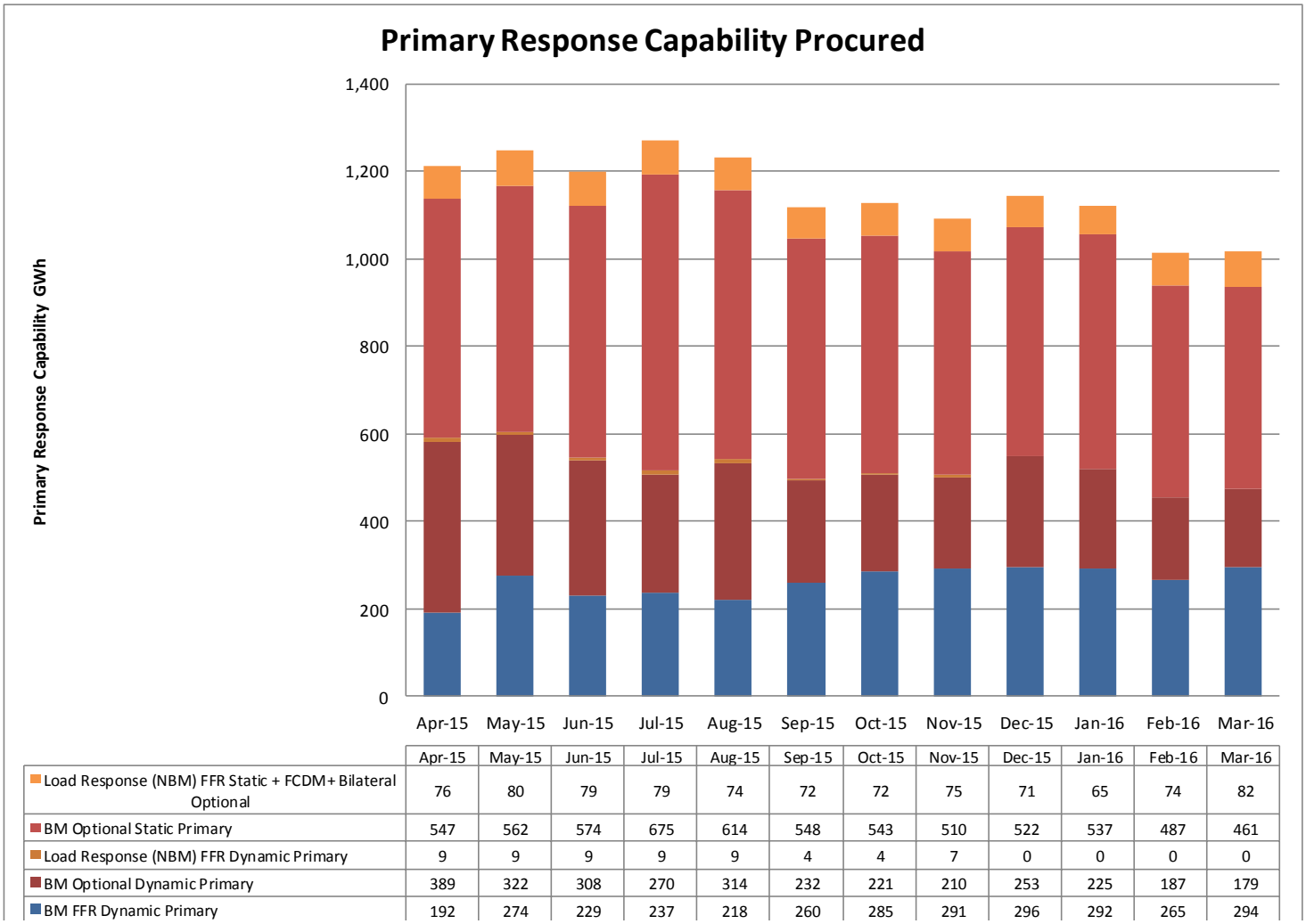
All generators caught by the requirements of the Grid Code are required to have the capability to provide Mandatory Frequency Response. The capability to provide this Service is a condition of connection for generators connecting to the GB Transmission System. Mandatory Frequency Response is an automatic 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

Where a provider can offer a service that does not fit into the existing service terms a bilateral contract may be considered. Note that some of the bilateral contracts are legacy; we are not proactively procuring more optional services.

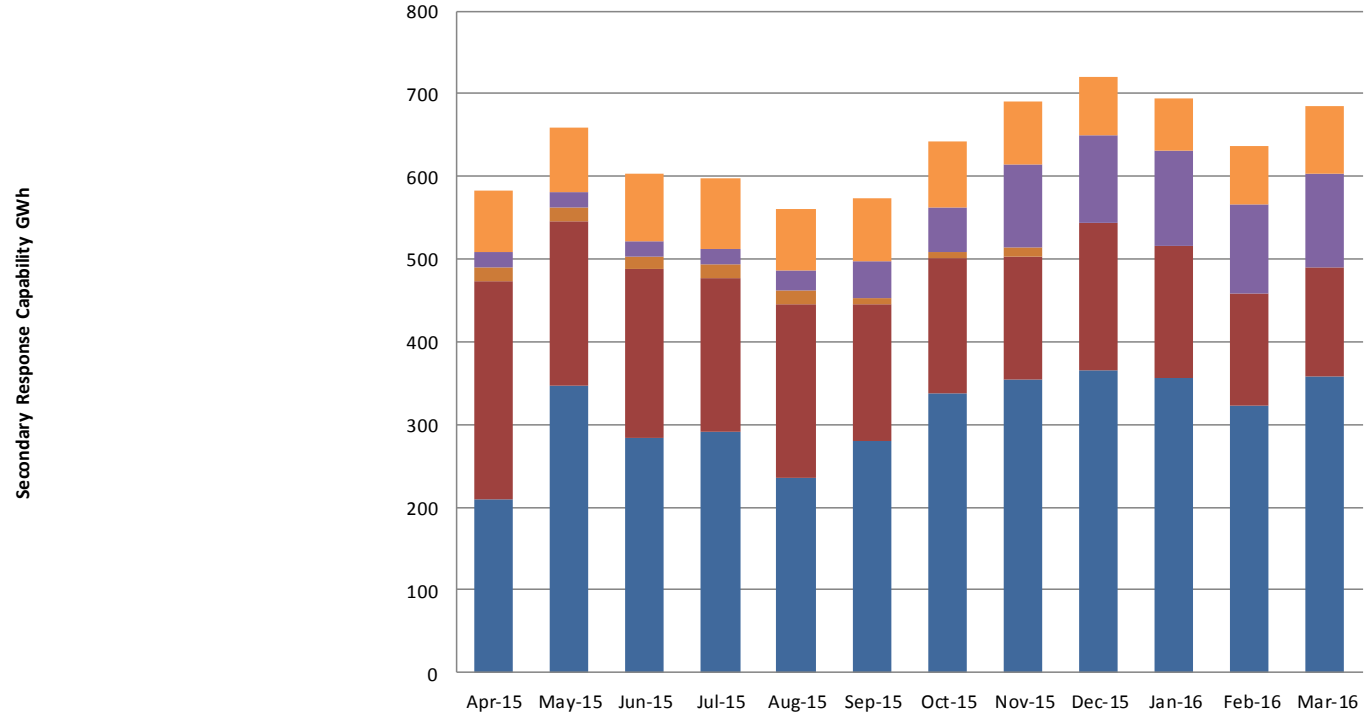
These contracts can be for BM and Non-BM providers and for static or dynamic services, they may also be a firm contract or an option contract with fees only paid if nominated/armed. As part of the Fast Reserve service framework participants can make optional response services available such as Low Frequency 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.



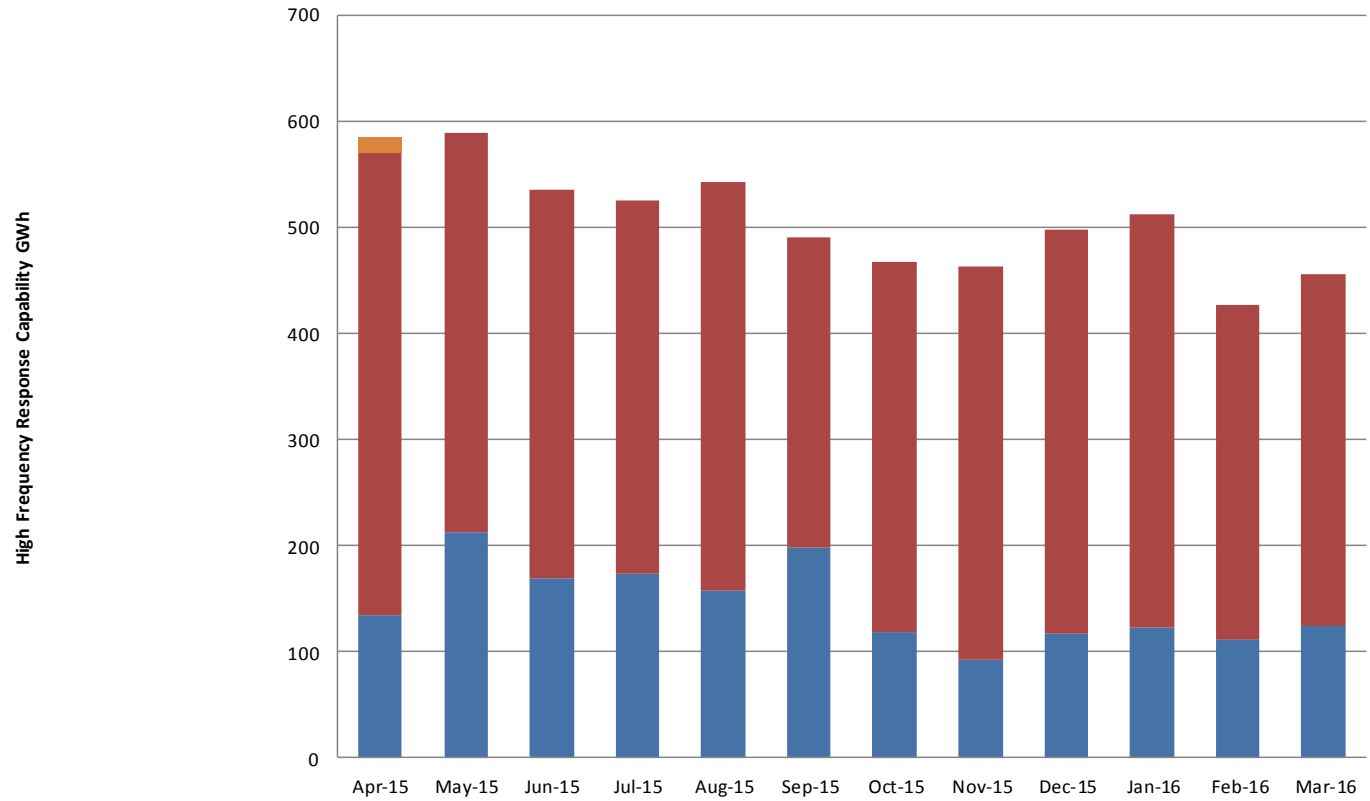
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Load Response (NBM) FFR Static + FCDM+ Bilateral Optional	76	80	79	79	74	72	72	75	71	65	74	82
BM Optional Static Primary	547	562	574	675	614	548	543	510	522	537	487	461
Load Response (NBM) FFR Dynamic Primary	9	9	9	9	9	4	4	7	0	0	0	0
BM Optional Dynamic Primary	389	322	308	270	314	232	221	210	253	225	187	179
BM FFR Dynamic Primary	192	274	229	237	218	260	285	291	296	292	265	294

Secondary Response Capability Procured



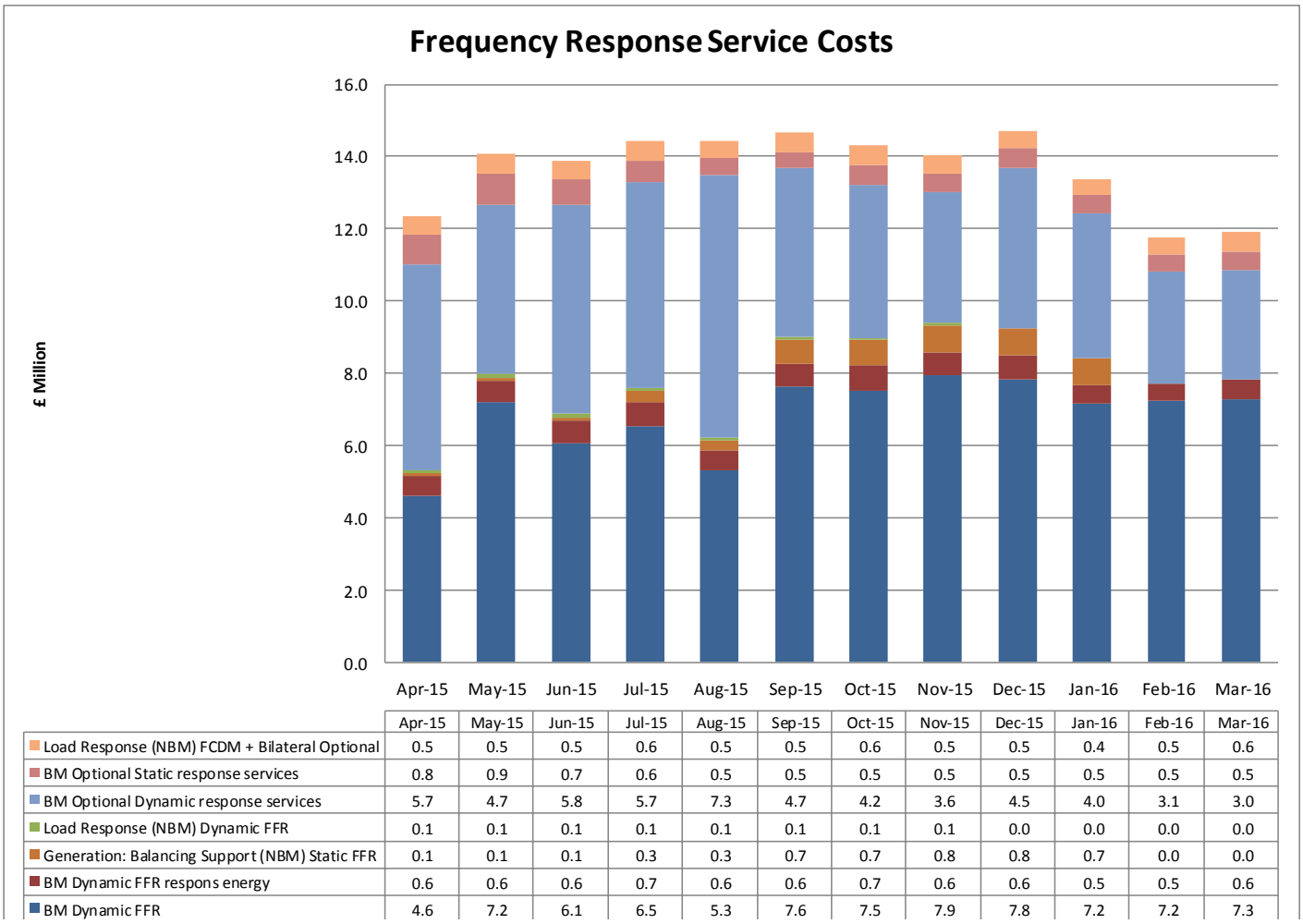
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Load Response (NBM) FFR Static + FCDM+ Bilateral Optional	76	80	82	86	76	75	80	75	70	62	70	81
Generation: Balancing Support (NBM) FFR Static + FCDM	18	19	18	18	23	46	53	102	106	116	109	114
Load Response (NBM) FFR Dynamic Secondary	16	16	16	16	16	7	7	10	0	0	0	0
BM Optional Dynamic Secondary	265	198	204	186	210	166	164	149	178	160	136	133
BM FFR Dynamic Secondary	209	348	283	291	236	280	337	354	366	356	322	357

High Frequency Response Capability Procured



	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Load Response (NBM) FFR Dynamic High	14	0	0	0	0	0	0	0	0	0	0	0
BM Optional Dynamic High	436	376	367	352	386	294	348	370	382	389	316	331
BM FFR Dynamic High	135	212	169	174	157	197	118	92	116	122	110	124

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.



	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Load Response (NBM) FCDM + Bilateral Optional	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.5	0.5	0.4	0.5	0.6
BM Optional Static response services	0.8	0.9	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
BM Optional Dynamic response services	5.7	4.7	5.8	5.7	7.3	4.7	4.2	3.6	4.5	4.0	3.1	3.0
Load Response (NBM) Dynamic FFR	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Generation: Balancing Support (NBM) Static FFR	0.1	0.1	0.1	0.3	0.3	0.7	0.7	0.8	0.8	0.7	0.0	0.0
BM Dynamic FFR respons energy	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.5	0.5	0.6
BM Dynamic FFR	4.6	7.2	6.1	6.5	5.3	7.6	7.5	7.9	7.8	7.2	7.2	7.3

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.

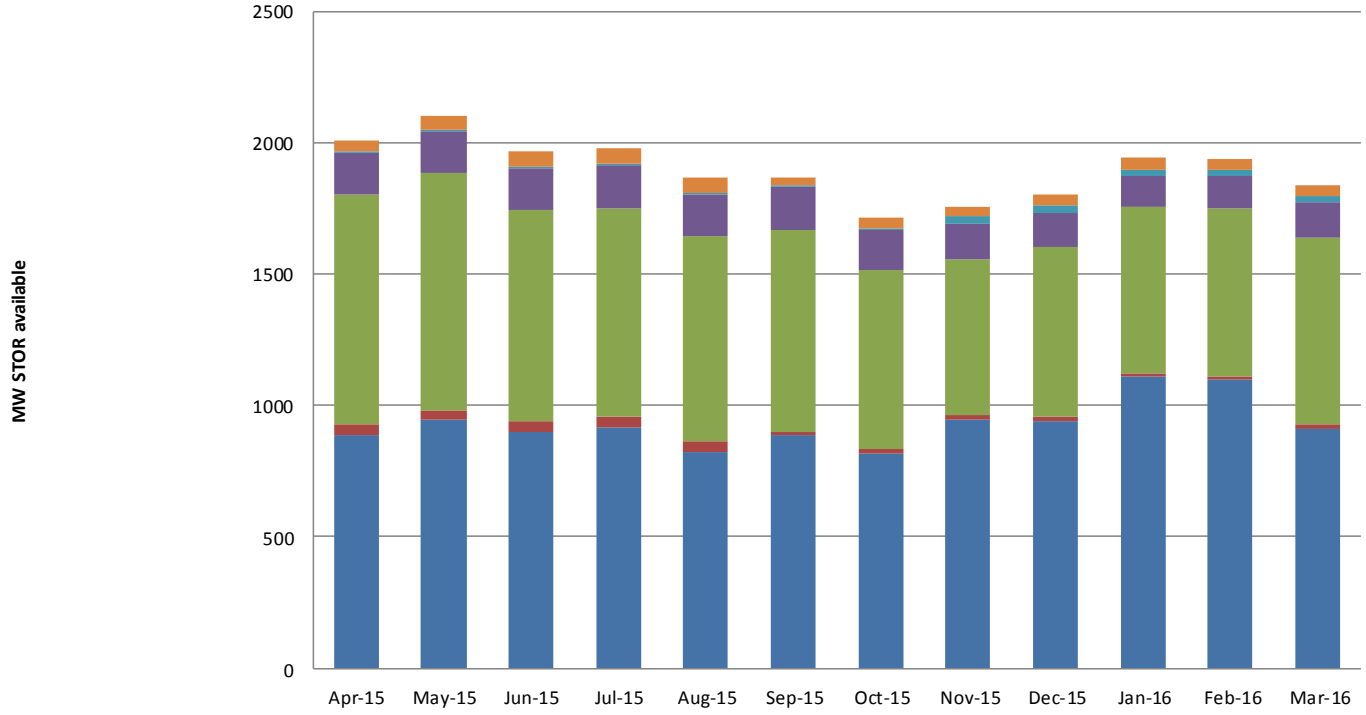
This service is procured on a tendered basis with three tender rounds per year. Providers have the opportunity to tender for up to two years ahead. Please see our website for further information here (STOR).

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.

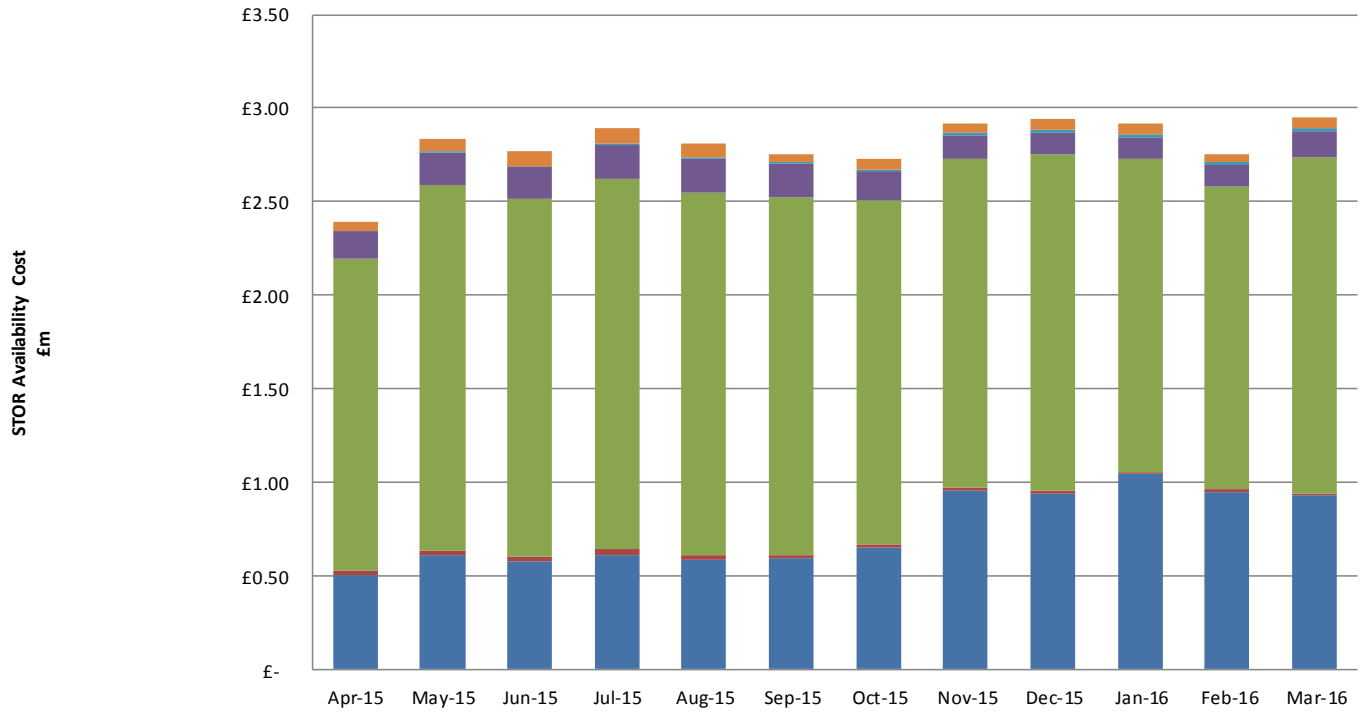
The following charts display the average available capacity during the STOR windows for each month and the associated expenditure. The volume of utilisation and cost of utilisation is also displayed along with a year to date total cost breakdown.

Average STOR capacity available



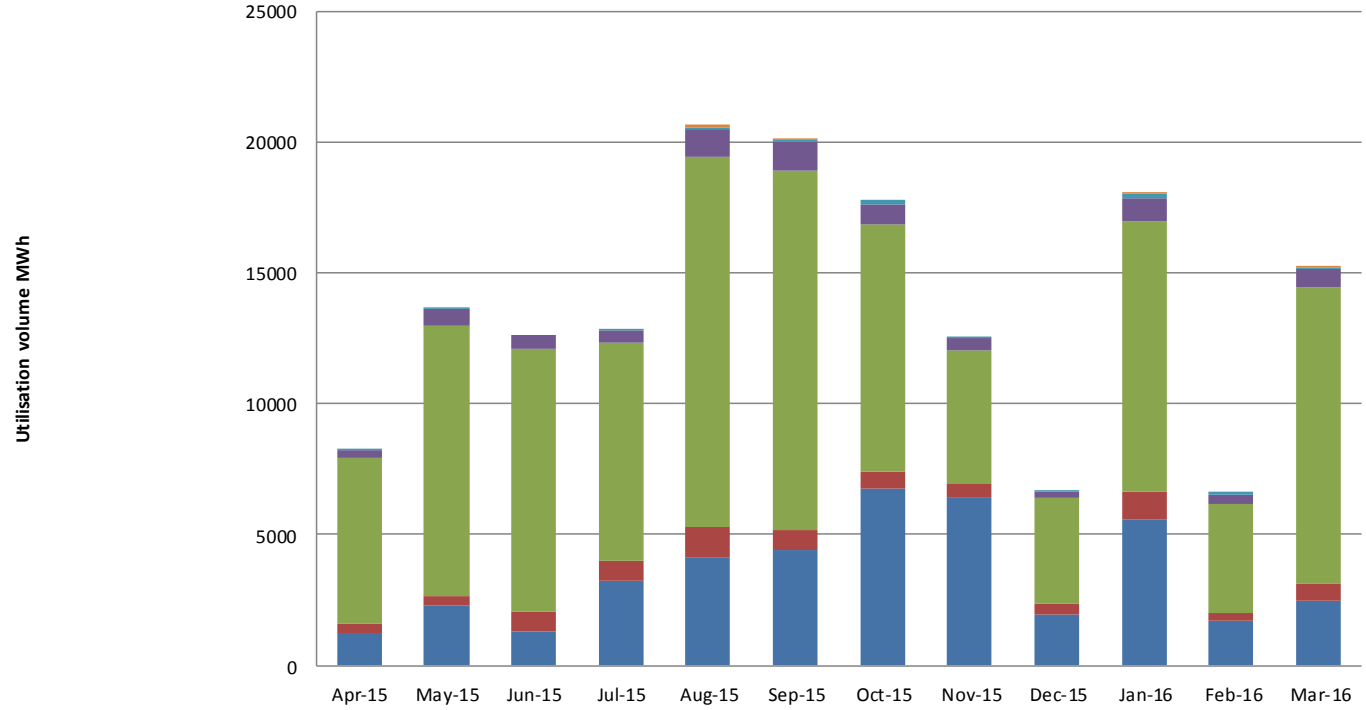
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Other (NBM)	42	53	61	61	59	34	42	35	43	48	37	44
Load Response (NBM)	9	9	3	8	5	5	9	30	25	24	28	19
Generation: Standby/backup (NBM)	155	159	156	161	162	165	151	132	129	119	120	134
Generation: Balancing Support (NBM)	876	900	805	794	782	766	681	592	646	631	640	711
CHP (NBM)	38	39	43	41	38	15	18	17	18	17	15	21
Generation: Balancing Support (BM)	889	943	898	915	823	884	815	948	942	1107	1096	910

STOR Availability Cost



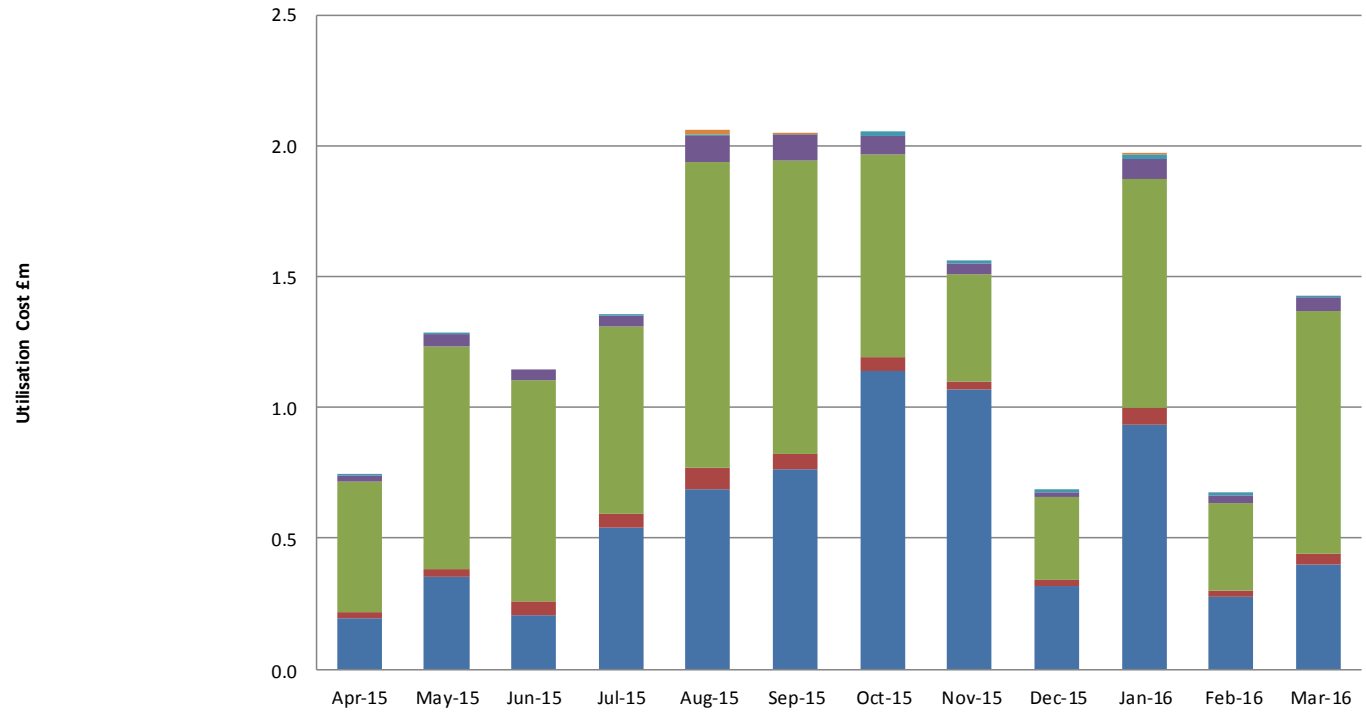
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Other (NBM)	£0.05	£0.07	£0.08	£0.08	£0.08	£0.04	£0.05	£0.05	£0.06	£0.05	£0.05	£0.06
Load Response (NBM)	£0.01	£0.01	£0.00	£0.01	£0.00	£0.00	£0.01	£0.02	£0.02	£0.02	£0.02	£0.01
Generation: Standby/backup (NBM)	£0.15	£0.18	£0.17	£0.18	£0.18	£0.18	£0.16	£0.12	£0.12	£0.12	£0.11	£0.14
Generation: Balancing Support (NBM)	£1.67	£1.95	£1.91	£1.98	£1.94	£1.92	£1.84	£1.77	£1.80	£1.67	£1.62	£1.80
CHP (NBM)	£0.02	£0.03	£0.03	£0.03	£0.03	£0.01	£0.01	£0.01	£0.01	£0.01	£0.01	£0.01
Generation: Balancing Support (BM)	£0.50	£0.61	£0.57	£0.61	£0.58	£0.59	£0.65	£0.95	£0.94	£1.04	£0.95	£0.93

STOR utilisation volume

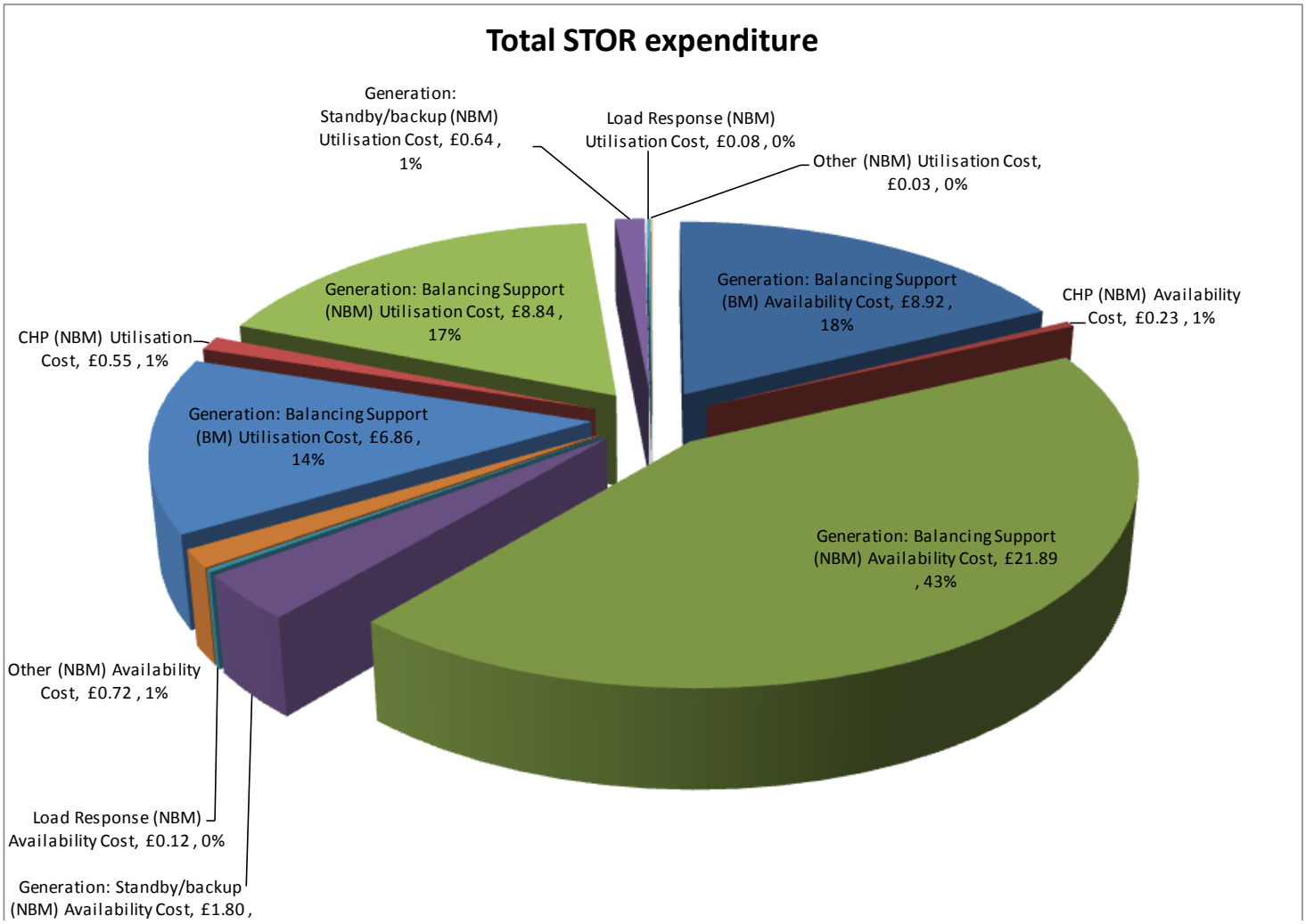


	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Other (NBM)	0	0	0	0	110	6	0	0	0	45	0	58
Load Response (NBM)	19	6	0	37	39	52	154	93	70	175	101	29
Generation: Standby/backup (NBM)	329	591	565	514	1073	1156	799	470	246	912	391	694
Generation: Balancing Support (NBM)	6336	10334	9996	8311	14103	13714	9405	5092	4079	10321	4133	11330
CHP (NBM)	347	386	757	747	1201	789	666	495	395	1032	331	665
Generation: Balancing Support (BM)	1233	2280	1322	3253	4110	4381	6754	6419	1928	5584	1691	2459

STOR Utilisation Costs



	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Other (NBM)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Load Response (NBM)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation: Standby/backup (NBM)	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1
Generation: Balancing Support (NBM)	0.5	0.8	0.8	0.7	1.2	1.1	0.8	0.4	0.3	0.9	0.3	0.9
CHP (NBM)	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Generation: Balancing Support (BM)	0.2	0.4	0.2	0.5	0.7	0.8	1.1	1.1	0.3	0.9	0.3	0.4



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.

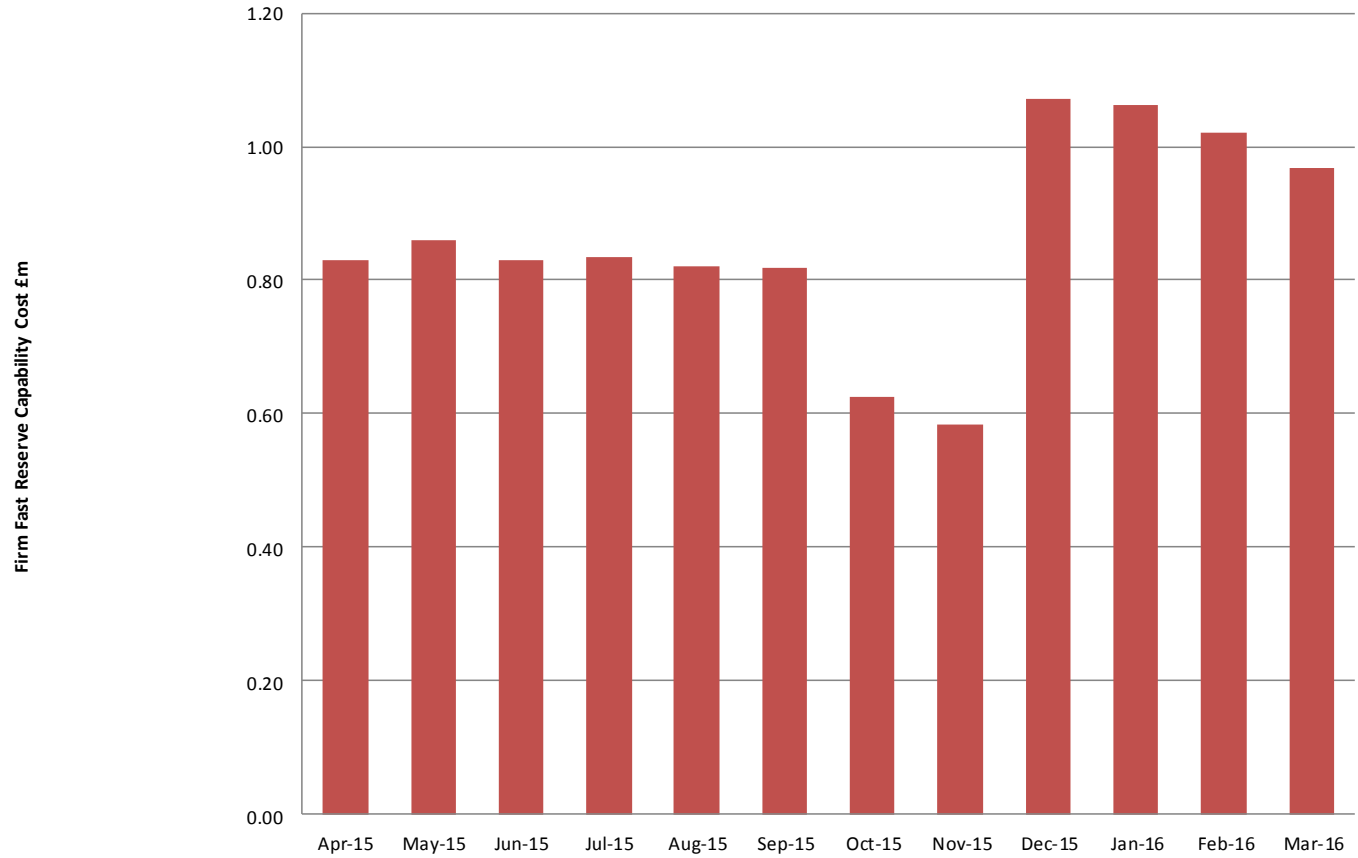
Fast Reserve is used, in addition to other energy balancing services, to control frequency changes that might arise from sudden, and sometimes unpredictable, changes in generation or demand.

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).

Currently there are no demand side providers of fast reserve although 120MW has been contracted to start between Nov 2016 and Mar 2017.

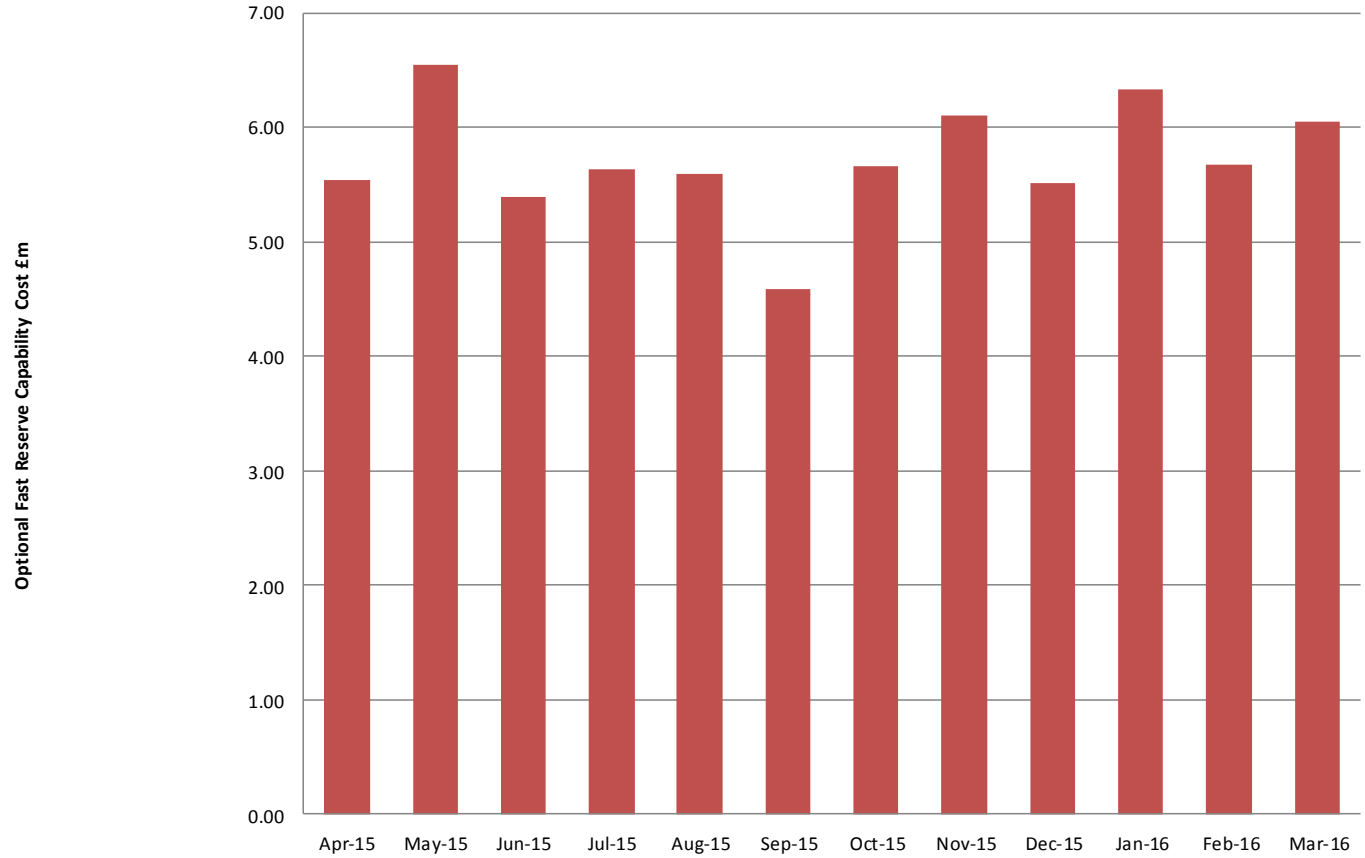
The following charts display the monthly expenditure of the contracted Firm Fast Reserve service and those for the optional Non-Firm Fast Reserve service.

Firm Fast Reserve Capability Costs



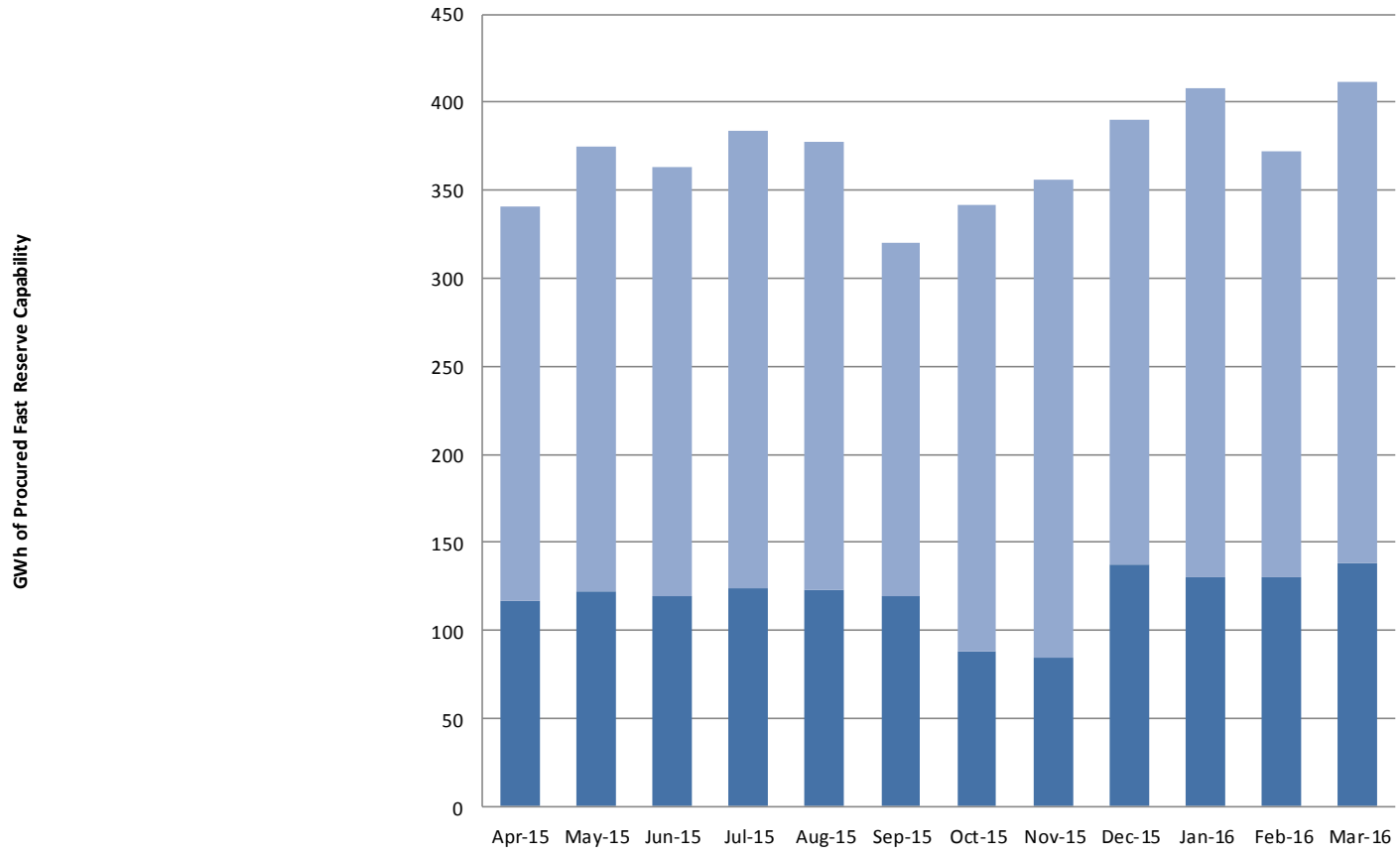
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Generation: Balancing Support (BM)	0.83	0.86	0.83	0.83	0.82	0.82	0.63	0.58	1.07	1.06	1.02	0.97

Optional Fast Reserve Capability Costs



	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Generation: Balancing Support (BM)	5.53	6.54	5.39	5.63	5.59	4.58	5.66	6.10	5.52	6.34	5.67	6.04

Optional and Firm Fast Reserve Procured Capability



	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Generation: Balancing Support (BM) Optional Fast Reserve	224	252	243	260	255	200	254	272	252	278	242	274
Generation: Balancing Support (BM) Firm Fast Reserve	117	122	120	124	123	120	88	85	137	130	130	138

Contingency Balancing Reserves

Demand Side Balancing Reserve (DSBR) and Supplemental Balancing Reserve (SBR) are both services designed to support National Grid in balancing the system in the unlikely event that there is insufficient capacity in the market to meet demand.

Demand Side Balancing Reserve (DSBR)

The DSBR service is targeted at industrial and commercial energy consumers who volunteer to reduce demand between 4 and 8 pm on winter weekday evening in return for a payment. Demand reduction can be delivered by reducing/shifting load, by running on site backup generation or by running small embedded generators.

Supplemental Balancing Reserve (SBR)

SBR 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 (DSBR) and (SBR).

The table at the beginning of this report contains the expenditure on DSBR and SBR split by provider type for the time period 1st April 2015 to 31st March 2016.

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 comsumer'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.