Summary of Meeting and Actions

Meeting Name	Frequency Response Working Group
Meeting No.	11
Date of Meeting	Thursday, 8th July 2010
Time	10:00am – 3:00pm
Venue	Room B1-8, National Grid House, Warwick

This note outlines the key action points from the eleventh meeting of the Frequency Response Working Group.

1) Introduction/apologies for Absence

At the 11th July Working Group (WG) meeting replacement members Guy Phillips from E.ON and Richard Coates from Ofgem joined the group

Apologies were received from William Hung (NGET), Steve Curtis (NGET), Mick Chowns (RWE) Chris Hastings (Scottish-Southern) Dan Jerwood (GDF SUEZ Energy UK), John Welsh (Scottish Power Systems),Mark Baker (Scottish Power),Chris Proudfoot (Centrica), Francois Luciani (EDF-energy)

2) Minutes from Previous Meeting/Outstanding actions

The draft minutes of the Grid Code/BSSG Frequency Response Working Group meeting held on 1st June 2010 were approved subject to some agreed amendments and will be accessible from the National Grid Code Website.

TI informed the group a presentation was given at the Ops Forum which included a summary of work completed by the working group. The members of the forum included parties who may provide commercial services in the future.

The WG members were informed that the CUSC Amendment CAP182 aims to change the CUSC to allow inter-connectors to get selected and recompensed for providing mandatory frequency response as mandated in the Grid Code does not impact on this groups work.

MA presented the group with his updated options scenario inclusive of the comments received from the previous meeting. This will now be available on the National Grid website.

Action: KA

An outstanding action of the Group was to consider how payment mechanism for system inertia could be enforced.

Action: All

3) System Inertia

AJ provided a presentation on system inertia and some background to why it is necessary in the management of frequency. It was advised that the background to the issues of system inertia had been described in earlier group presentations which are available on the National Grid website. KA to upload the new presentation on the National Grid website.

Action: KA

AJ briefly stated that synchronous generators contributed additional short term power to the system immediately following the loss of a generating unit through the energy stored in the rotating mass of the turbine and generator. He went on to say that modern generation technologies which are decoupled from the prime mover (e.g. via a Power Electronic Converter) are insensitive to changes in system frequency. This impacts the system in increasing the rate of change in system frequency and the minimum frequency that is reached before the action of primary response.

AJ demonstrated the effect of rate of change of system frequency and minimum frequency on a 25GW system with the system inertia constant (H) varying between 0MW/MVA and 12MW/MVA. He then went on to show the short term power injection provided by a synchronous generator (i.e. synchronous generation inertia) and the subsequent provision of primary frequency response. It was explained that based on the 2020 scenario, over half the generation fleet could be made up of new generation technology such as wind, which does not contribute to system inertia; the consequence therefore is a higher rate of change of frequency and lower minimum system frequencies prior to primary response.

Under this scenario, NGET as System Operator would be unable to secure the system with the frequency response requirements as currently defined. As explained in previous meetings, in order to secure the system (if no additional inertia requirements where introduced) very fast acting frequency response would be required, with the potential of increased costs. For instance, you would either need to increase the number of generators providing primary frequency response to counteract the decrease in MW provided by system inertia or change the response requirements for faster acting response. One member suggested the use of energy storage as a solution but it was suggested the cost of such measures would need to be considered against other options - such as an obligation to provide synthetic inertia as described below.

AJ discussed the high level proposals for the provision of a synthetic inertia to be provided by Generators which do not naturally provide this capability. AJ advised that such a high level requirement would be similar to that of a synchronous machine but would be activated by a control system based on a change in frequency. This was on the basis that for small changes in frequency (e.g. for a generation loss of say 300MW) then the short term injection of active power would be less than that for a large change in frequency such as an 1800MW loss. AJ stated that the short term injection in active power would be required in about 200ms and then the subsequent exponential decay lasting for no longer than about 10 seconds, line with the requirements for primary response. These initial settings are very much open to debate and AJ advised that further study work would be required based on the minimum needs of the transmission system but also on the feedback of manufacturers.

AJ then went on to explain that in general, the provision of inertia did not require any pre-fault curtailment, however, after the delivery of the response, the wind turbines would need a recovery period prior to being able to repeat the provision of inertia. In principle, the wind generation will be aiming to operate at maximum output by following the peak output on the capability curve. As the wind turbine provides additional power to the system it moves away from this optimum operating point. Following the delivery of this short term injection of active power there is a requirement for the wind turbine to return to the optimum operating point. During this time the wind turbine is in the energy recovery period, potentially resulting in the post fault power injection being less than the pre fault power injection. The amount of energy recovery is dependant upon the type of turbine, wind speed and the place on the capability curve. AJ advised that during the energy recovery period, the reduced power output could be quite large resulting in another drop in system frequency. AJ demonstrated this effect in the presentation.

AJ stated that National Grid had forwarded their high level proposals for Synthetic Inertia for the manufacturers in late June and where currently in the process of receiving their comments. AJ advised that NGET needed to work with manufacturers to understand in detail the impact of the recovery period. Further studies would need to be carried out to assess the impact on the Transmission System. He advised that discussions were in early stages with the manufacturers but the reduced power output during the recovery period may have been larger than first expected. This could potentially take some time to resolve; which may mean that a final set of proposals for publishing to the GCRP in September may be more difficult to achieve than originally envisaged.

One member discussed the impact / requirement of an offshore wind farm connected via a Transmission Network utilising HVDC Converter technology. AJ advised that the

Transmission Owner would need to provide the Generator with data signals so the Offshore Generator would know the onshore AC system frequency. The issue of communications times was discussed. The issue of using the HVDC converter alone was also discussed in so far as its ability to provide an inertial response but it was stated that as part of this provision, additional active power would need to be injected into the network for a short time period and this power would need to come from somewhere, generally the external system.

TI suggested that a manufacturer consultation could be held. AJ advised that as part of this process NGET would work closely with all manufacturers on the requirements / capabilities and would also welcome the opportunity for the manufacturers to engage in a consultation.

With regard to an e-mail from CH sent before the meeting, AJ advised that he would reply to the elements concerning system inertia outside the meeting.

Action: AJ

AJ advised that he would continue with the study work and engage with manufacturers to develop a set of technical performance requirements for an inertial response capability.

4) Frequency Response Option Development

In order to move things forward MA took an action to draw up a draft version of a strawman to be circulated around the WG for comment. MA insisted that it would be advantageous for other members of the group to produce another strawman to see the contrasting views for each option. As previously mentioned MA is inherently restricted in only being able to view the issues as the System Operator. Therefore input from the Group would be appreciated. In the last meeting the members had identified several generic key points that needed to be addressed with each option.

MA presented what he thought was the main themes arising form the last meeting in terms of each option.

- Who would be responsible for maintaining system frequency?
- Is an obligation on providers required?
- If there is an obligation, should the requirements be tradable?

Currently the obligation is placed on the SO to maintain system frequency; the SO instructs generating units to maintain frequency within the required limits. However the SO does not have a method itself in maintaining system frequency. Consequently to meet these requirements the obligations are passed on to the generating units connecting to the system.

The question was raised that if there was an obligation, what it would mean for the industry, should the obligation be placed on the portfolio player? If the obligation is placed on generator should it not be extendable to auxiliary units such batteries?

MA stated that if the current Grid Code obligation was removed, there would be an increased risk to system security. To maintain the current levels of system security, the obligation on to generation to ensure the correct volumes are available is required. The SO cannot be the held responsible for providing volumes without the ability to provide it itself. MA suggested the obligation to maintain system frequency could be passed from the SO to another party, with another option to allow the SO to provide system frequency response itself. In turn the SO will be able to fulfil its obligation without the increased risk to system security.

RT questioned why the removel of the obligation on the generators would mean an increase in system security;, if the frequency response market provides correct market signals, frequency response requirements will be met. He explained that in the energy market there is no obligation on any party to ensure that there are sufficient volumes of energy but the market has been shown to provide it.

MA suggested that there could be an obligation put on the suppliers/providers to ensure they have to sufficient frequency response. However, there would be no single entity responsible for the overall provision. Therefore, there are benefits in the responsibility being on a single market entity with the residual role taken by the SO. It was considered whether this role could be passed on to another party other than the SO; if the coordination role is taken on by another party ultimately this will lead to two system operators. This did not seem to be a feasible option.

An option to remove or relax the Licence obligation on the SO was discussed; the idea was to relax the obligation to state that reasonable endeavours where the SO would do all reasonable endeavours to ensure there are sufficient volumes of frequency response available. However if investment was not available this would not be the main concern for the SO. Ultimately during certain periods it will lead to high frequency deviation and offset demand. The other option was to allow the SO to self provide response through the acquisition of plants which would mean licence and other changes.

The group moved on to discuss whether requirements should be tradable. MA asked the group whether self provision should be tradable. BN supported a tradable market, however he was concerned with how development would be stimulated to allow supplier/providers to acquire specialised plants to deliver FR. Currently there is no stimulus to do so. RT also supported tradable requirements but insisted it will be dependent on the types of contracts that were available and whether these contracts were open to everyone. It was identified that contracts such as STOR have no obligation to provide it. However it was available, this showed potentially that an obligatory route may not be necessary.

MA highlighted to the group with the SO self providing response, the energy market would not need to worry about the provision of FR. RT was unsure what the definition of self provision would mean for the SO's activities e.g. the exclusion of the SO owning generation.

MA explained it will allow the SO to own assets, have contracts with other providers and produce tenders. RT showed concern as would be no test to measure whether self provision was the most economic solution. The SO will be incentivised to use its own assets instead of the wider available sources. This was also supported by BN.

It was discussed how demand side should be incorporated within the work of the group, if not included it had a potential to undermine the frequency response market i.e. unlocking the potential of smart meters.

AJ advised that an auction processes could be used where National Grid would define what is needed on the day, people would bid in until the auction is full. Once your bid was accepted; if you do not provide the required response you will be penalised for not doing so. If the auction is not attractive enough people may not bid in or decide to bid their self out. This option will promote competition where generation and demand will be competing against each other in a transparent way, unlike the current system. In addition the option will be open to all providers as long as they have the capability to provide frequency response. RT advised there will have to be a test to ensure delivery, to stop non physical players taking part at gate closure. AJ agreed with the statement and advised that a fundamental requirement would have to be a second by second monitoring which will ultimately be reflected in the price. RT thought this option was most desirable to him as it ties in with an overall optimisation of the energy market and frequency response market. AJ advised in terms of obligation the SO will still have right to define what is required but it will be up to players to provide that requirement. Furthermore players will not have to be de-loaded to provide the required response.

RT advised the SO would have to have something in place to prevent localised concentration on the day (at post gate closure) - maybe consider a zonal system. MA thought the auction option would favour providers with short term contracts over those providers that prefer long term contracts. It was debated whether there should be a Grid Code obligation imposed. AJ thought that there should be a minimum requirement. If provider supplier decides to take part they must have the capability to provide that response but the requirement may not be based on a strict 10,10,10. The group considered whether the minimum requirements should be based on different technology type. It was noted that the minimum requirement may not match plant types therefore it was important that response is matched with provision.

MA advised that if the minimum requirements were changed to accommodate plant types delivery for response will be compromised. In order to over come this, the SO would again have to take the coordination role ensuring response availability was on the system at anyone time. A member suggested that wind may not provide response within the required time scale; AJ advised this was not true and that wind had the ability to provide response at primary level with fast ramp rates.

It was noted with this option a generator will have the flexibility to choose which market it may want to operate in. i.e. if the energy market seems more profitable than the frequency response market, the generator could choose to generate in the energy market.

It was discussed whether metering on generation would need to be improved; currently information was not provided second by second but on a half hourly basis. The group sort to understand whether agreed requirements would be deliverable. As a consensus, it became apparent that enhanced monitoring would be required where pre event testing and compliance issues would need to be considered. A member suggested a generator would only have to comply with a declared matrix (requirements) rather than a fixed obligation. MA questioned whether this declared matrix would be fixed or flexible within an auction. BN suggested that several generators would benefit from having a flexible matrix every auction. MA stated that for the optimum dispatch solution to be developed, it would be extremely complex as well as difficult for SO to coordinate to have such flexible matrices.

The Group summarised that an Obligation was required in the Grid Code to ensure each generator capability was known and understood when bidding in the market. This could be based on technology type or generation itself. AJ insisted that the mandatory requirement to provide Primary/Secondary response within the time scales today must be mandatory. The requirements would have to be tested with an ancillary service matrix developed. RT believed that a requirement to have an obligation on all generators was not necessary, however if requirements were set sensibly huge capital investment will not be required to comply. Several members agreed that a day a head scheduling for FR would be required.

The design of the market should not be too complex as will reduce competition by prohibiting new entrants but he acknowledged that there needs to be some form complexity to ensure the market operates accordingly.

AJ added there needs be straight option to allow interested parties in taking part regardless of their size. If a party can produce a matrix that is compliant with the requirements of the auction they should not be discriminated. In favour of the Auction process RT believed there was possibility for the auction to run in parallel with the current arrangement i.e. National Grid would seek X amount from the auction and any deficit amount would be picked up by the current arrangement. A transition between the two arrangements would be possible. The complexity between the interaction of the energy market and the response market would be passed on to the providers to ensure adequate coordination (similar to the current FFR contract). MA agreed this was a possibility to consider and questioned whether this would be done within 48 settlement period. RT thought a-day-a-head scheduling would be appropriate to ensure providers are able to match their running profiles with requirement matrix.

A member questioned how a failed generator would be replaced within the auction process. It was suggested that this could be done through current residual balancing method. Ideally, there would have to be alternative replacement arrangements outside the auction arrangement.

MA to circulate a draft paper to include; a summary of the groups' discussions on possible market arrangements on how things could work.

Action: MA

The group noted that delivery of the groups work for November was a portion of the TOR. MA suggested if there is a significant change made due to the group's work, large consultation would be needed.

TI informed the Working Group that there were two Consultations currently live relating to the NETS SQSS. One concerning the Use of System Charing implications from increasing the largest system loss and the other relating to a fundamental review of the SQSS, itself.

TI took an action to review the SQSS Fundamental Review and specifically the increase of the largest secured loss to 1800MW and update the Working Group at the next meeting.

Action: TI

5) Next Meeting

The next meeting of the Working Group is to be confirmed, National Grid to coordinate with the members. **Action: KA**

Appendix 1 – Working Group Attendance

Members Present:

Tom Ireland	TI	Working Group Chairperson
Kabir Ali	KA	Technical Secretary
Antony Johnson	AJ	National Grid
Malcolm Arthur	MA	National Grid
Richard Coates	RC	Ofgem
John Morris	JM	EDF energy
Bob Nicholls	BN	E.ON UK
Guy Phillips	GP	E.ON UK
Raoul Thulin	RT	RWE

Apologies:

William Hung	WH	National Grid
Stephen Curtis	SC	National Grid
Mike Chowns	MC	RWE
Chris Hastings	CH	Scottish-Southern
Dan Jerwood	DJ	GDF SUEZ Energy UK
John Welsh	JW	Scottish Power (DNO Representative)
Mark Baker	MB	Scottish Power
Chris Proudfoot	CP	Centrica
Francois Luciani	FL	EDF energy