Change Proposal – F40/01 (Page 1 of 2)	CP No: 921 *Version no 2.0*

Title *(mandatory by originator)*
Changes to Ensure Correct Processing of MIL/MEL Messages by BMRS

Description of Change *(mandatory by originator)*

Two related problems have been identified with the processing of Maximum Import Limit (MIL) and Maximum Export Limit (MEL) data by BMRS:

1. The BMRS loads MIL/MEL data in the order received from National Grid, and has no controls to prevent correct data being overwritten by out-of-date data. Potentially this can lead to errors in the MIL/MEL data reported to Parties.

2. The BMRS can only process a MIL/MEL file containing data for part of a Settlement Period if a file has previously been loaded containing data for the whole Settlement Period. If this isn't the case the file will be rejected, and its contents will not be reported to Parties.

These problems are most likely to become apparent when National Grid receives a re-declaration shortly after Gate Closure. The reason for this is that National Grid sends two types of MIL and MEL files to BMRS: the initial values which arrive just after Gate Closure and contain values for all BM Units for the Gate Closure Settlement Period only; and MIL/MEL Re-declarations for individual BM Units, which can contain values for any period from Gate Closure to the current period. Because it can take longer for a Gate Closure file to be constructed by NGC than for a Re-declaration, a Re-declaration file which is received by NGC just after Gate Closure can be received by the BMRS before the Gate Closure file to which the Re-declaration applies. In this situation, the Re-declaration file will be processed as follows:

- If it contains data for the whole Settlement Period, it will be loaded onto the database and reported to Parties, but will subsequently be overwritten with out-of-date when the Gate Closure file is processed.

- If it doesn't contain data for the whole Settlement Period, it will not be loaded onto the database or reported to Parties.

Changes are therefore required to the BMRS to ensure that:

- MIL/MEL data cannot be overwritten by earlier data (i.e. where 'earlier' relates to the time at which NGC received the data from the Party, not the time at which the BMRS received the data from NGC); and

- MIL/MEL re-declarations are not lost, even if received prior to data for the rest of the Settlement Period.

This Change Proposal supersedes CP 855, which proposed to solve the issue by amending BMRS

to process MIL/MEL files in sequence number order (delaying processing of any file received out of sequence). This solution would have required a Modification to the BSC, as Table 1 in Annex V-1 states the frequency with which data is to be available on the BMRS and specifies that changes to MEL and MIL data will be processed 'as received' by BMRS. CP855 was therefore withdrawn, and replaced by this CP, which proposes a solution consistent with the requirement to process files as received.

Proposed Solution(s) *(mandatory by originator)*

Any solution to the issues described above must take account of a number of constraints:

1. There is no guarantee that files will be sent by National Grid (or received by BMRS) in the correct order. National Grid cannot guarantee that files will be sent in the correct order as they are generated by two separate systems running asynchronously (i.e. Gate Closure files coming from the EDT system and Re-declarations of MIL/MEL coming from EDL);
2. Table 1 in Annex V-1 of the BSC requires the BMRS to make MIL/MEL data available 'as received'; and
3. The format of the Tibco messages and BMRS screens used to publish MIL/MEL data to Parties only supports publication of data for whole Settlement Periods.

In light of these constraints, the following solution is proposed:

- The MIL/MEL interface from the Transmission Company to BMRS will be enhanced to include a timestamp, identifying the time at which each item of MIL/MEL data was received from the Party. (As well as the timestamp, it is also proposed to add a sequence number, to resolve any ambiguity in case of duplicate timestamps. This issue is discussed in more detail in Attachment 1 to this Change Proposal).

- Whenever BMRS processes MIL/MEL data, it will compare the timestamp (and sequence number if appropriate) to that of the data already on the database. Only data with a later timestamp (and sequence number if appropriate) will be loaded. This ensures that the data stored on the BMRS and published to Parties is unaffected by the order in which files are received and loaded. (Attachment 2 to this Change Proposal provides a number of examples of the required processing).

- If BMRS receives data which covers only part of a Settlement Period, and therefore cannot be published to Parties, it will be loaded into the database with a 'pending' status. Later, when data for the remainder of the Settlement Period is received, the pending data will be applied to produce the correct net profile.

This solution allows the BMRA to process files in order of receipt (as required by Annex V-1 of the Code), while ensuring that the correct net profile is published to Parties irrespective of the order in which files are received.

It should be noted that the timestamp and sequence number information on the MIL/MEL interface will not be published to Parties (i.e. there will be no change to the format of Tibco messages or BMRA screens).

This revised Change Proposal does not require a change to the BSC, because Central Services will continue to process files as received.

In addition to BMRS changes, this CP impacts National Grid as follows:

- Changes to systems to add 'Notification Date/Time' and 'Sequence Number' data items to the MIL/MEL interface (as described in Attachment 1 to this CP)
- Corresponding updates to the *BMRA & SAA Interface Specification* document

Justification for Change *(mandatory by originator)*
Preventing the loss of MIL and MEL Re-declarations and an improvement in BMRS data quality.

Other Configurable Items Potentially Affected by Proposed Solution(s) *(optional by BSCCo)*

Impact on Core Industry Documents *(optional by originator)*

Related Changes and/or Projects *(mandatory by BSCCo)*
None

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Attachments: 2
Attachment 1 – *Detail of Proposed Interface Changes*
Attachment 2 – *Example of Required BMRS Processing*

Attachment 1 – Detail of Proposed Interface Changes

In simple terms, this CP proposes to add a timestamp field (identifying date and time of receipt by NGC) to each MIL or MEL record sent to BMRS. However, impact assessment of version 1 of this CP by National Grid identified the issue of how to deal with files received simultaneously (or sufficiently close to simultaneously that the resolution of the timestamps on the database can't distinguish between them).

For example, suppose that National Grid receive two MEL redeclaration files so close together that they are assigned the same timestamp. Under these circumstances, the decision by National Grid of which to regard as earlier must be somewhat arbitrary. However, it is important that BMRS knows which should be regarded as earlier, in order to ensure that the MEL data published to Parties is consistent with that used by National Grid. Three possible solutions to this issue were identified in the National Grid impact assessment:

- Option 1 – Increase the accuracy of the timestamps from one second to one hundredth of a second, in order to minimise the probability of duplicates.

- Option 2 – Leave the timestamps at an accuracy of one second, but introduce an algorithm within National Grid systems to 'adjust' any duplicate timestamps. For instance, if two MEL re-declarations were received at 14:23:47, the one NGC regards as later could be sent to BMRS with an adjusted timestamp of 14:23:48.

- Option 3 – Include a sequence number as well as a timestamp on each record. In cases of duplicate timestamps, National Grid would assign an earlier sequence number to earlier files, allowing BMRS to identify the correct sequence.

Of these three options, ELEXON proposes that option 3 should be implemented, for the following reasons:

- National Grid has indicated that option 1 would be significantly more expensive for them to implement (as it would require database changes). In addition, the risk of duplicate timestamps would remain (albeit much less likely).

- Option 2 would be potentially complex to implement and test, as the algorithm for 'adjusting' timestamps would have to cope with the theoretical possibility of large numbers of files arriving close together.

It is therefore proposed that each MIL or MEL record will be assigned a sequence number in addition to the timestamp. It should be noted that the sequence number will not necessarily be consecutive, and will not always increase over time. However, when two records have the same timestamp, the earlier record will always have a lower sequence number. So, given two records with timestamps t1 and t2, and sequence numbers s1 and s2, the BMRS should regard record 1 as earlier if:

$$t1 < t2 \text{ OR } (t1 = t2 \text{ AND } s1 < s2)$$

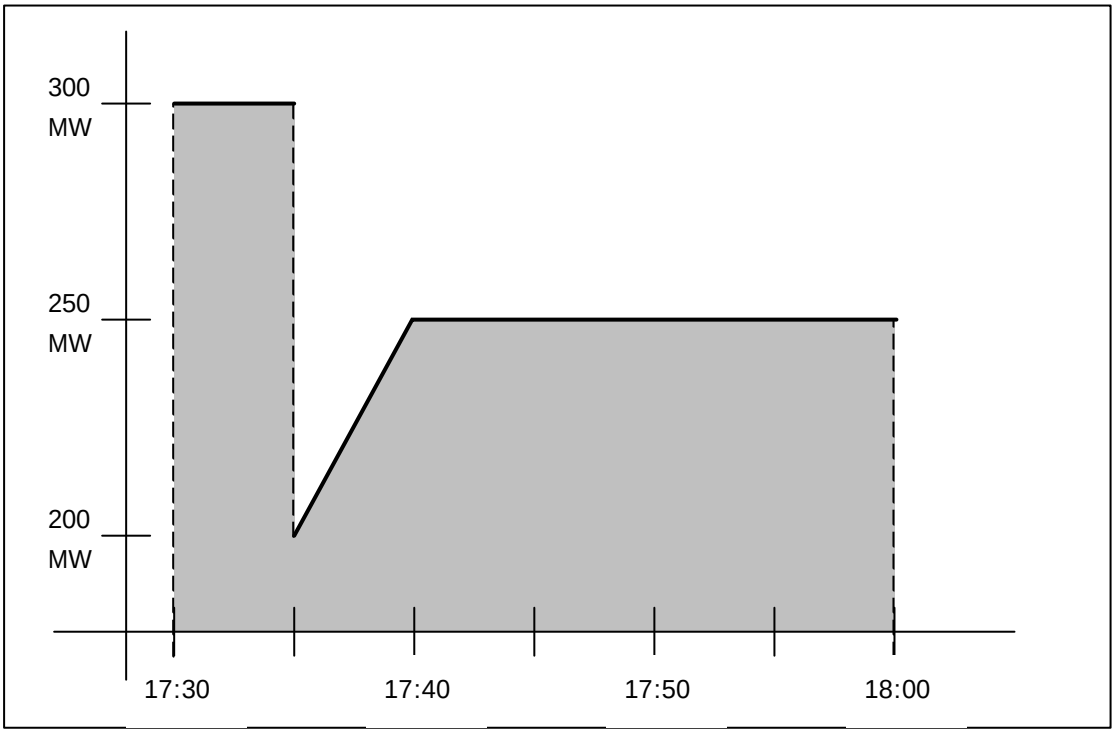
In a Gate Closure file, the different MIL/MEL records will have potentially have different timestamps and sequence numbers, reflecting the fact that different data was received at different times. However, in a re-declaration file, each record will have the same timestamp and sequence number.

Attachment 2 – Example of Required BMRS Processing

To illustrate the required BMRS processing, suppose that National Grid sends the following MEL data to the BMRS for a given BM Unit:

	From		To		Timestamp	Seq No
	Time	MW	Time	MW		
File 1	17:30	300	18:00	300	20030703 16:33:42	13
File 2	17:35	200	17:45	300	20030703 16:35:27	7
File 3	17:40	250	18:00	250	20030703 16:35:27	11

Regardless of the order in which these files are received and processed, the end result should be that the following MEL profile will be stored on the BMRS database:



However, the processing required to arrive at this final processing will vary depending upon the order in which the files are received by BMRS, as illustrated in the following examples.

Example 1 – Files Received in Correct Sequence

The only scenario which the BMRS currently handles correctly is if the three files are received in the correct order:

- File 1 is processed, creating a single record on the database running from 17:30 to 18:00 with a level of 300 MW.

TABLE 1.1 – DATA LOADED FROM FILE 1					
From		To		Timestamp	Sequence
17:30	300 MW	18:00	300 MW	20030703 16:33:42	13

- File 2 is processed, overwriting the data for 17:35 – 17:45. (This requires the existing record, running from 17:30 to 18:00, to be replaced by new records running from 17:00 to 17:35 and 17:45 to 18:00):

TABLE 1.2 – DATA LOADED FROM FILES 1 & 2					
From		**To**		**Timestamp**	**Sequence**
17:30	300 MW	17:35	300 MW	20030703 16:33:42	13
17:35	200 MW	17:45	300 MW	20030703 16:35:27	7
17:45	300 MW	18:00	300 MW	20030703 16:33:42	13

- File 3 is processed, overwriting the data from 17:40 to 18:00. (This requires the existing record from file 2 to be 'shortened', so that it ends at 17:40 at a level of 250 MW. Also, the existing record running from 17:45 to 18:00 is completely superseded by the new data):

TABLE 1.3 – DATA LOADED FROM FILES 1, 2 & 3					
From		**To**		**Timestamp**	**Sequence**
17:30	300 MW	17:35	300 MW	20030703 16:33:42	13
17:35	200 MW	17:40	250 MW	20030703 16:35:27	7
17:40	250 MW	18:00	250 MW	20030703 16:35:27	11

Example 2 – Files 2 and 3 Received in Incorrect Order

Currently, the BMRS will not handle correctly the situation in which file 3 is received prior to file 2. File 2 will overwrite file 3, leading to the publication of incorrect data for the period of overlap of the two files (i.e. 17:40 – 17:45). However, this Change Proposal will allow correct processing of the three files:

- File 1 is processed, creating a single record on the database running from 17:30 to 18:00 with a level of 300 MW (as illustrated in Table 1.1 above).
- File 3 is processed, overwriting the data for 17:40 – 18:00. (This requires the existing record, running from 17:30 to 18:00, to be 'shortened', so that it ends at 17:40):

TABLE 2.1 – DATA LOADED FROM FILES 1 & 3					
From		**To**		**Timestamp**	**Sequence**
17:30	300 MW	17:40	300 MW	20030703 16:33:42	13
17:40	250 MW	18:00	250 MW	20030703 16:35:27	11

- File 2 is received, covering the period from 17:35-17:45. However, comparison of timestamps and sequence numbers indicates that only the portion from 17:35-17:40 is later than the data already on the database. This portion is therefore loaded (and the existing record from file 1 'shortened' to end at 17:35), leaving the database in the same state as example 1 (see Table 1.3 above).

Example 3 – Files Received in Reverse Order

For the final example, consider the hypothetical case in which the three files are received in reverse order (i.e. file 3, then file 2, then file 1). Currently, the BMRS is unable to process a re-declaration covering part of a Settlement Period unless the database already contains data for the whole Settlement Period. Therefore the system would reject files 3 and 2, and the database would end up containing data from file 1 only.

This Change Proposal will allow correct processing of the files as follows:

- Files 3 and 2 will be loaded upon receipt, but held in a 'pending' state (and not published to Parties at that time).

- Once file 1 is received, it will be processed and loaded onto the database. This will then trigger the processing of files 1 and 2, resulting in the correct net profile being published to Parties.