Issue 81 'Determining the benefits of Run-up/Run-down rates and Last Time to Cancel Synchronisation (LTCS) publication on BMRS'

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2 About This Document

This document is the Issue 81 Group's Report to the BSC Panel. ELEXON will table this report at the Panel's meeting on 14 May 2020.

There are two parts to this document:

- This is the main document. It provides details of the Issue Group's discussions and proposed solutions to the highlighted issue and contains details of the Workgroup's membership.
- Attachment A contains the Issue 81 Proposal Form

3 Summary

What is the issue?

Issue 81 was raised to identify, assess and quantify the costs and benefits associated with changes to Run-up/Run-Down rates (Ramp Rates) and the publication of Last Time to Cancel Synchronisation (LTCS) on BMRS. It was also raised to recommend whether any changes should be raised, and if so what the solution should be.

Background

In the National Grid Electricity System Operator (NGESO) Cost Benefit Analysis on P297, NGESO received feedback that there may an opportunity to explore with Market Participants how some of the data items originally in P297 could benefit industry. Consequently, NGESO raised Issue 81, believing this to be the best approach to identify and quantify any benefits.

Any changes to the number and publication of Ramp Rates and the publication of LTCS on BMRS would first be dependent on one or more modifications to the Grid Code. This BSC Issue included both Grid Code stakeholders and BSC stakeholders as a vehicle to determine whether Grid Code and consequently BSC changes were required and justified. The Issue Group discussed the issue and considered possible solutions. Issue 81 engaged with stakeholders via two Workgroups (held on the 4 November 2019 and 14 January 2020) and via correspondent, to confirm whether there would be any operational/consumer benefits in changing Ramp rates currently used and publishing LTCS on the BMRS.

Conclusions

The Issue 81 Group identified that, while additional Run Up / Run Down rates would provide some benefit to certain types of generators, it was not able to establish a sufficiently robust cost benefit for this change. Similarly, the Issue Group was not able to quantify the benefits of publishing LTCS and therefore could not justify the costs of making the change. The Issue 81 Workgroup therefore recommends that no changes to the Grid Code or the BSC should be raised.

4 Background

History of P297

The market information provided on the Balancing Mechanism and Report Service (BMRS) has an important role in promoting effective competition in the generation and supply of electricity. A subset of this information is the Dynamic Data Set which is used by the National Grid Electricity System Operator (NGESO) as part of determining which Bids and Offers to accept into the Balancing Mechanism.

In 2013, the Grid Code Electricity Balancing System (EBS) Working Group progressed changes to the Dynamic Data Set, as part of its development of a new EBS. As a consequence, NGESO raised P297 'Receipt and Publication of New and Revised Dynamic Data Items' in July 2013.

The new EBS was developed to replace the previous Balancing Mechanism (BM) Systems. The Balancing suite of systems are those used to operate the Balancing Mechanism Market.

P297 sought to ensure that the Dynamic Data Set published on the BMRS fully corresponded to the revised Dynamic Data Set which the Grid Code requires Parties submit to NGESO. P297 was approved by Ofgem in March 2014, originally for implementation on 5 November 2015.

However, due to delays in fully delivering EBS, the Implementation Date for P297 was revised three times. On the fourth NGESO request to defer the P297 Implementation Date, and following correspondence between the BSC Panel and Ofgem, NGESO raised P373 'Reversing the changes relating to Approved Modification P297' in October 2018. Under BSC change governance, once a Modification has been approved for implementation it cannot be withdrawn. P373 sought to remove or 'cancel out' the P297 requirements to create certainty for industry.

What are Run-up/Run-Down rates (Ramp Rates)?

Ramp rates express the rate of change in terms of Power production or consumption for a particular BM Unit. For BM Units exporting electricity this is either rate at which it decreases or increase its power production and BM Units that are importing electricity this is the rate at which it decreases or increase its consumption.

NGESO's Cost Benefit Analysis (CBA)

Ofgem approved P373 in February 2019. P373 and P297 were both implemented on 27 February 2019. P373 was approved on the understanding that NGESO would seek to assess the costs and benefits of the different components of the P297 solution and take forward any solutions where the benefits outweighed the costs.

NGESO published an assessment of the costs and benefits to the end consumer of taking forward changes originally due to be implemented by the Grid Code Modification GC0068 'Grid Code New and Revised Unit Data and Instructions' and P297.

What is Last Time to Cancel Synchronisation (LTCS)

LTCS is expressed, in minutes with an upper limit of 60 minutes. It is the notification time required to cancel a BM Unit instruction before it synchronises to the system.

P297 contained three solution components:

1. Profiled Balancing Mechanism Unit (BMU) Stable Import and Stable Export Limits (SEL and SIL). Under the changes proposed SEL and SIL would be time-varying MW profiles rather than being submitted as single static MW values.
2. Run-Up Rates (Import and Export) and Run-Down Rates (Import and Export). The changes proposed would allow for a greater number of BMU ramp rates and a change in data resolution to 0.02MW per min
3. LTCS. This currently exists within the Grid Code but is not passed to Elexon as part of the Dynamic Data set for publication on BMRS.

The Cost Benefit Analysis (CBA) determined that SEL and SIL should be taken forward in a new change. Grid Code Modification 0126 'Implementing Profiled Stable Import and Export Limits, and reversing unimplemented aspects of GC0068' was therefore raised by NGESO in April 2019. The solution for GC0126 is currently under development and once the requirements for this change are confirmed by NGESO, the consequential BSC change will be raised.

However, NGESO concluded that sufficient evidence of consumer benefit had not been identified or presented for taking forward Ramp Rates and LTCS. NGESO considered that the best approach was to raise a BSC Issue Group to identify and quantify any benefits associated with changes to Run-up/Run-Down rates and the publication of LTCS on BMRS.

Issue 81

Issue 81 was raised by NGESO on 12 June 2019. It was raised to discuss the Issue, consider possible solutions, and develop requirements; or to define the scope and Issue further. Specifically this Issue sought to identify and quantify consumer benefits by exploring how the data items originally in P297 might be assessed to support the development of Run-up/Run-down rates and LTCS publication on BMRS and how these can fit in with the BSC and Grid Code.

NGESO estimated that the total NGESO IT costs to implement Ramp Rates and LTCS independently from the delivery of EBS would be around £1.65m for Increased Run-Up and Run-Down rates and £150k for LTCS.

NGESO set out that any changes to Ramp Rates and LTCS would need to be scheduled along with other changes to the NGESO and ELEXON's IT infrastructure. NGESO stated that any changes to dynamic data items, as per GC0068 and P297, would need to follow Wider Access and Project TERRE implementation.

There was insufficient evidence provided in the NGESO CBA to fully support Ramp Rates and LTCS being raised as a new Modification. This Issue group therefore, sought to get quantitative evidence from Parties on the benefits to consumers as this would be necessary if this issue was ever to progress to a Modification Proposal.

The P297 proposal for Ramp Rates and LTCS, and which were assessed as part of this Issue are:

- Run-Up Rates (Import and Export) and Run-Down Rate (Import and Export); and
- Last Time to Cancel Synchronisation (LTCS)

The Group discussed the basis on which it would recommend a change. It was proposed by NGESO and agreed by the Group that changes would only be recommended where benefits could be quantified and outweighed costs. The Group noted that the proposed changes were not likely to be a high priority for industry, as evidenced by the low responses to NGESO's CBA and delays in forming a quorate Issue 81 Group.

The Issue Group questioned whether Ofgem's view on whether a change should be progressed is line with NGESO's i.e. unless further quantifiable benefits for the changes are provided, they should not be progressed. NGESO clarified this with Ofgem and confirmed that position. Until any benefits can be determined that would outweigh the cost of the implementation NGESO will not be able to justify supporting any modifications to the BSC and Grid Code.

Run-up and Run-down Rates

Does the NGESO hold data that could help find benefits

The Issue Group asked NGESO to check availability of data needed to understand the magnitude of quantitative benefit of increasing Run Up / Run Down rates. NGESO stated there is no data available to NGESO to allow them to produce a quantitative benefit in changing the number of Run Up / Run Down rates. Any assessment would be dependent on asset owners to provide a quantitative benefit it would have to their asset, as detailed in the NGESO CBA. All the assessments NGESO found as detailed in the CBA are around qualitative benefits, but none of these would be enough to justify the cost versus benefit ratio for NGESO to raise a modification to change.

Ramp Rate costs

NGESO reported that the cost of implementing the Ramp Rate changes would be approximately £1.65 million. The Issue Group asked NGESO to clarify if the costs are standalone for the different aspects – i.e. would the cost of the LTCS change still be £150k if the Run Up / Run Down Rates change was not implemented at the same time. NGESO confirmed that these were two different IT changes and are not dependent on each other.

An Issue Group Member asked whether cost of implementing the Run Up / Run Down rate changes would change as a consequence of the number of Run Up / Run Down rates required. NGESO confirmed the implementation cost was not related to the number of Run Up / Run Down rates that could be selected.

ELEXON asked the NGESO to confirm the factors considered in the CBA for the calculation of consumer benefits of the different aspects of P297. NGESO stated the consumer benefits estimate of the CBA would have been a hypothetical pass through of the quantified operational benefits.

An Issue Group Member queried which NGESO systems would be used to deliver these changes. NGESO confirmed the change would relate to the optimiser systems within the control room in the BM. The costs were based on changes to current BM systems. NGESO noted that it would be unlikely to deliver a change for 3-5 years and therefore the cost would likely change, as it would be made against a different baseline. In other words, the cost is unknown based on changes to any new upgraded systems in the future.

Ramp Rate Benefits

The CBA did not have sufficient quantitative evidence to conclude there are material benefits to the end consumer. The Issue Group agreed in principle these changes could reduce imbalances so at the request of the Issue Group ELEXON conducted an analysis into the impacts of the current set of Run Up / Run Down Rates on imbalance charges to quantify the cost benefits that could be gained by increase the number of Ramp Rates. This analysis is detailed below.

Ramp Rate solution options

The Issue Group discussed proposed allowing for a greater number of BM Unit ramp rates and a change in data resolution to 0.02MW per min. currently ramp rates submitted to NGESO must be a real number, accurate to 1 decimal place, greater than or equal to 0.2MW/minute.

ELEXON asked whether generators would benefit from both more Run Up / Run Down rates and a greater level of granularity; as both were proposed under P297. Some Issue Group Members suggested more granularity would be more useful and asked NGESO what proportion of the stated costs for Ramp Rates (£1.65) would cover this.

NGESO confirmed the cost would be broadly the same for either change. There are very slight changes in cost depending on if the change was to granularity, number of break points or both at the same time. NGESO also stated the costs would be about the same.

Current Usage of Run-Up and Run-down Rates

ELEXON presented an analysis on the current usage of Run-Up / Run-Down rates published on the BMRS which aimed at identifying Market Participant that are likely to use this information. This would allow any analysis to target in on those that benefit and would be impacted by any change.

The first aim was to identify the BM Unit types that utilised the 3 rates at the moment, and could therefore benefit from being allowed to submit more rates. This was done by taking the Run Up Rate Export (RURE), Run Up Rate Import (RURI), Run Down Rate Export (RDRE) and Run Down Rate Import (RDRI) data for all BM Units on BMRS for a given day, in this case the 15 November 2019.

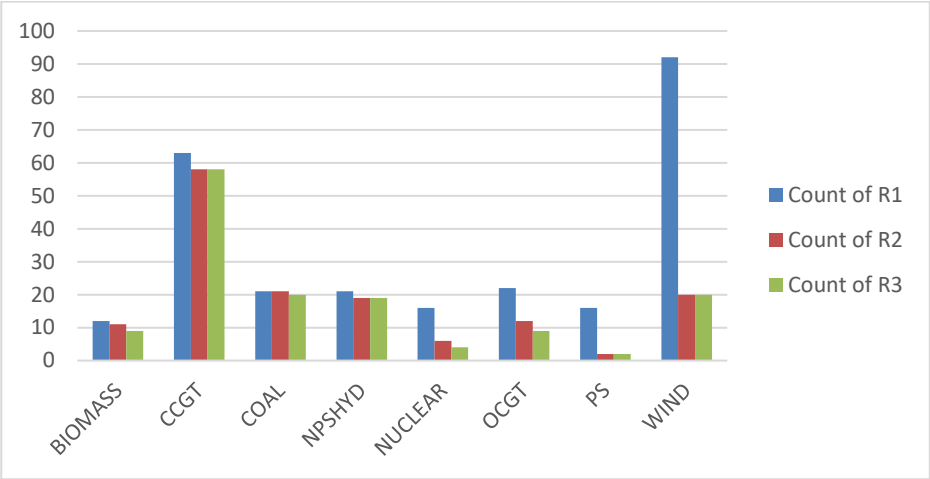
Figure 1 shows the comparative usage of the first, second and third Run Up / Run Down rates currently permitted, broken down by the different types of BM Unit. The analysis showed that Import BM Units rarely used the second or third run up / run down rates already available. As a result, it is reasonable to assume that they would not take advantage of an increased number of Run Up / Run Down rates.

Coal, Closed Cycle Gas Turbine (CCGT) and Biomass BM Units were found to have the highest number of declarations for second and third Export Run Up / Run Down rates. These were the only BM Units for which Parties were likely to utilise any additional Run Up / Run Down rates.

Note that, although the graph shows that Non Pump Storage Hydro (NPSHYD) used the second and third Run Up / Run Down rates, this BM Unit Type was excluded as, in the

large majority of cases, the same values were declared for each of the Run Up / Run Down rates, so there would be no benefit from additional rates for this type of generation.

Figure 1: count of run up / run down rate by BM Unit type



ELEXON then focused on intra-day and seasonal trends for Run Up/ Run Down rates for seven Export BM Units (three CCGT, three Coal and one Biomass); using one year's BMRS data. Across the seven BM Units that were selected 2,572 ramp rate declarations were analysed. The data was grouped by Season and the time of day into six 4-hour blocks, as illustrated by the table below.

Time block	Hours covered
Block 1	23:00- 03:00
Block 2	03:00- 07:00
Block 3	07:00- 11:00
Block 4	11:00 – 15:00
Block 5	15:00 – 19:00
Block 6	19:00 -23:00

The graphs in Appendix 1 show the count of Run-Up / Run-Down rates by season and time block for Import and Export BM Units separately.

In summary, the graphs show:

- three BM Units only declared RURE – no RDRE
- Number of declarations for CCGT (two thousand) were five times higher than Coal and 20 times higher than Biomass
- Number of declarations for Coal BM Units – T_DRAXX-1 and T_RATS-1 were similar, but T_WBUPS had significantly fewer.

- Of the four BM Units with RURE and RDRE, three declared RURE a significantly greater number of times than RDRE; the exception was T_DRAXX-1, who declared RURE a very low number of times
- T_DRAXX-1 declared:
    - RURE 0 times for Autumn / Winter, and 24 times for Spring / Summer
    - the same RDRE values 49 times for Autumn / Winter

The Issue Group noted that additional Run Up / Run Down rates would probably only add significant benefit to Biomass, Coal and CCGT plant, as indicated by the above data presented by ELEXON, and noted that there were not any discernible trends by season or by time block. The Group also noted that any benefits would largely be realised by CCGT and Biomass over the long-term, as coal contained to be phased out to meet net zero carbon emissions.

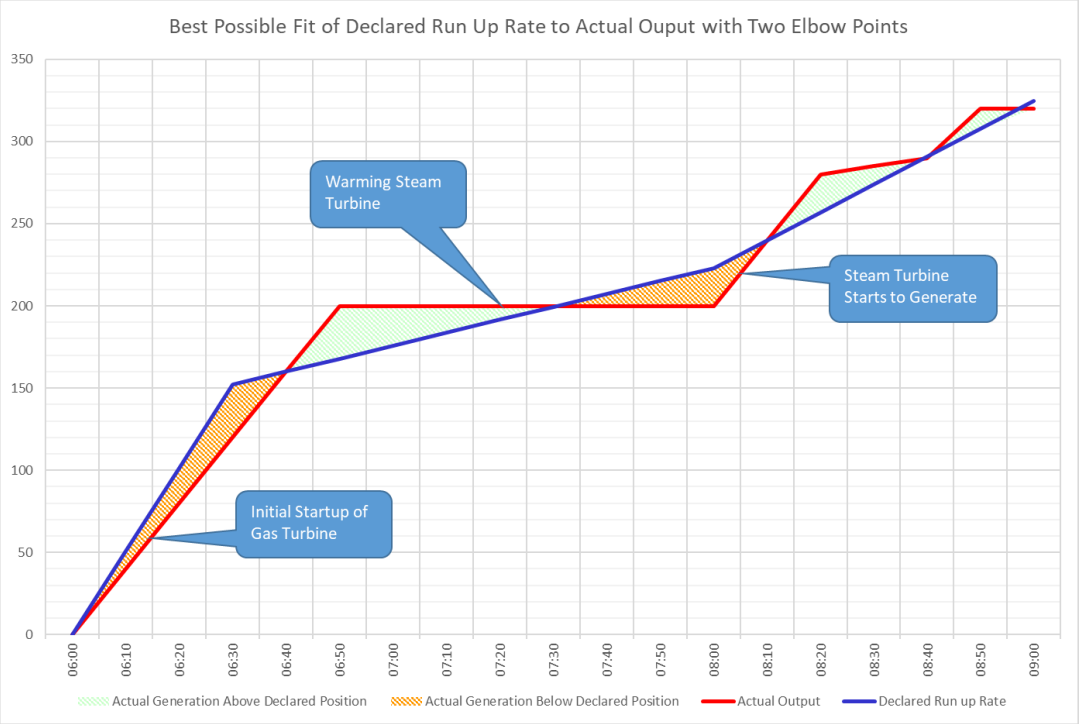
Example of current usage

An Issue Group Member stated, from the perspective of CCGT), having additional Run Up / Run Down rates could reduce their imbalance charges. ELEXON asked whether the Member was able to quantify this benefit. The Issue Group Member added that they had the data and would be looking into this.

The Workgroup Member presented a graph showing a typical start up sequence for a CCGT; as an example of how limited break points prevented its notifications to NGESO from accurately representing the plant output.

Figure 2 shows the difference between the actual output that might be produced by a CCGT during start up and the best approximation to the line that can be produced using two elbow points. Figure 2 is a purely illustrative example of the graph presented by the Issue Group Member. There is a total imbalance of 40 MWh between actual and declared generation, 21 MWh of over-generation and 19 MWh of under-generation, which would result in the occurrence of an imbalance charge.

Figure 2: difference between the actual output of a CCGT during start up and estimate produced using two elbow points



Impacts of limited Run Up / Run Down rate on imbalance charges

The Issue Group identified that the limited number of Run Up / Run Down rates that a BM Unit can currently submit could cause imbalance charges for generators which have to have several hold points during their start up process, with different Run Up / Run Down rates applicable to each phase of the start-up. This can be a particular problem for CCGTs, as they have to warm different modules during the start-up, which can be a more significant issue for BSC Parties owning a single power station, as they cannot modify the output of their other generators to compensate for the imbalance at the unit that is starting up. ELEXON agreed to conduct analysis into the impacts of the current set of Run Up / Run Down Rates on imbalance charges.

Currently, where a BM Unit is given a start-up instruction by NGESO in the form of a Bid Offer Acceptance (BOA) the volume of the BOA is calculated from the ramp rates submitted to NGESO through the BM systems, which may not be able to fully represent the true physical characteristics of the unit. This is illustrated in figure 2 which shows a possible start-up sequence for a CCGT, along with the best possible fit to the output that can be achieved using two elbow points.

By calculating the imbalance charges that can be attributed to the limit in the Run Up / Run Down Rates, the analysis described below provides the cost saving that would be gained by increasing the current number of available Run Up / Run Down rates.

Impact of Run Up / Run Down Rates on Imbalance Charges

Analysis was performed by ELEXON on the output of all CCGTs registered in ELEXON's systems as Transmission connected or Embedded, over the period Jan 2015 to Dec 2019 and the with the support of the operators of CCGT plants.

Methodology

The imbalance volume for CCGT units was calculated as follows:

- instances where NGESO issued a start-up instruction was identified by finding all instances where a CCGT had zero bilateral contract volume but had accepted a BOA;
- the data was then further refined to identify instances where there was a sequence of consecutive Settlement Periods starting with a settlement period where the metered output was near zero;
- the difference between metered volume and BOA volume was calculated as the imbalance volume; finally
- the volume was multiplied by System Sell or Buy price as appropriate to calculate the cost of the imbalance.

Summary Findings

The findings are outlined below and a detailed summary of estimated costs and volumes per year can be found in Appendix 2.

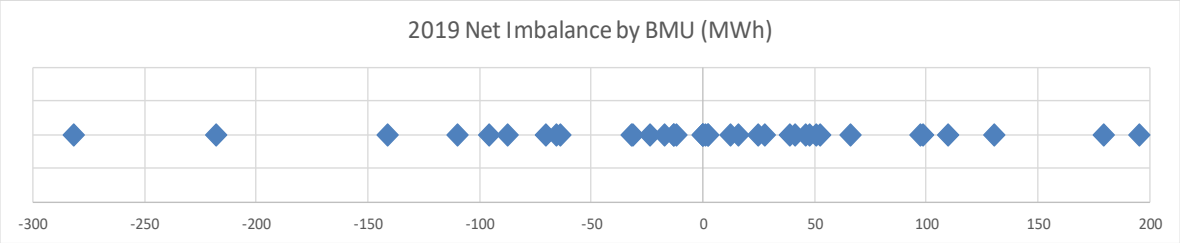
- The average imbalance charge per CCGT BM Unit per year, as a result of the limited number of Run Up / Run Down rates, ranges from -£0.4k to +£1.1k.
- The net imbalance charges per year for individual BM Units ranges from -£13.1k to +£7.5k.
- The total net imbalance charge per year for all CCGT BM Units combined ranges from -£12.8k to £46.7k.
- The total imbalance volume (both positive and negative) during NGESO-instructed start-up of CCGTs ranges from 376 to 15,424 MWh per year.

Figures 3 and 4 below illustrate the scale of impact on individual BM Units.

Net Imbalance by BM Unit

Figure 3 below shows the net imbalance volume during NGESO instructed start-ups for each CCGT BM Unit in 2019. All but four units lie in the range ±150 MWh per year, with the majority of units (54%) lying within ±50 MWh.

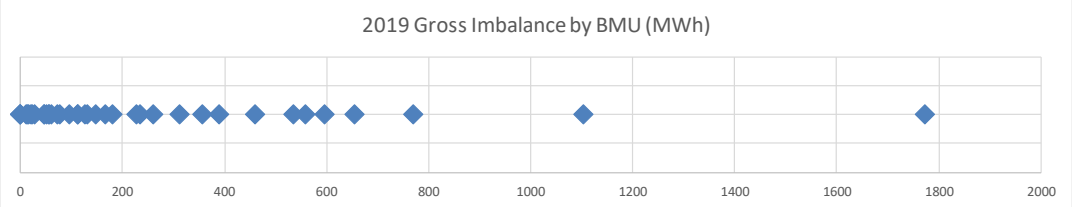
Figure 3: net imbalance volume during NGESO instructed start-ups for each CCGT BM Unit



Total Imbalance by BM Unit

Figure 4 below shows the total imbalance volume (both positive and negative) during NGESO-instructed start-up of CCGTs in 2019, all expect two units are below 800 MWh, with 64% below 200 MWh.

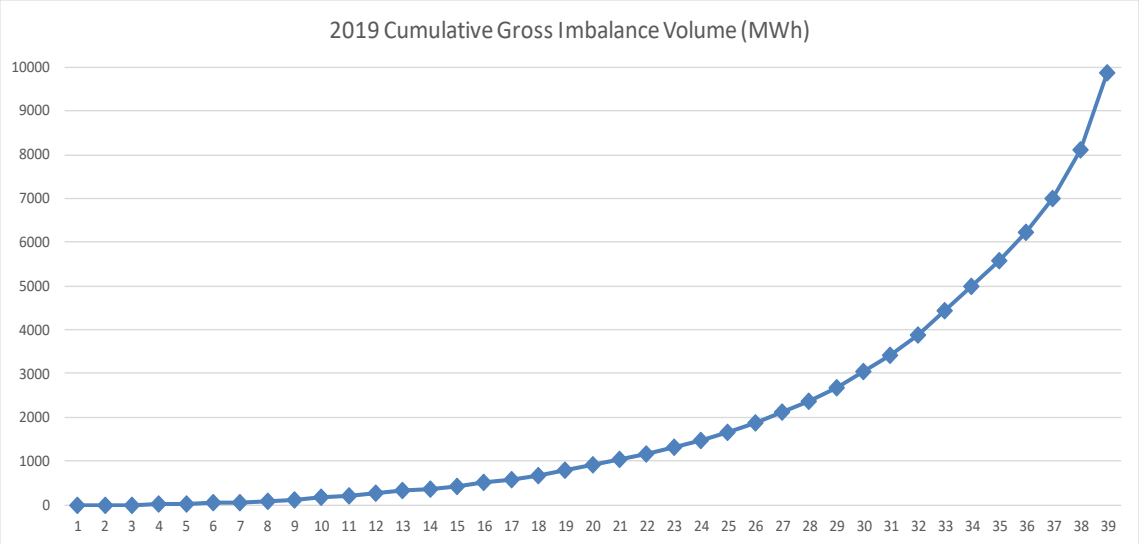
Figure 4: the total imbalance volume (both positive and negative) during NGESO-instructed start-up of CCGTs



Cumulative total Imbalance

Figure 5 below shows the same data as figure 4 in a cumulative form. It can been seen the total volume of just under 10,000 MWh, with a median of about 900 MWh.

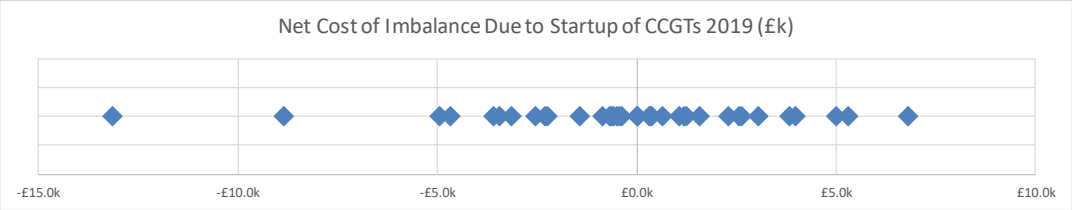
Figure 5: the cumulative total imbalance volume during NGESO-instructed start-up of CCGTs



Cost of imbalance due to start-up of CCGT

Similarly, looking at the net imbalance charges due to NGESO instructed start-up of CCGT BM Units, Figure 6 below shows all except four of the units incurred imbalance charges within ±£5k, with the majority (54%) incurring charges in the range ±1£k.

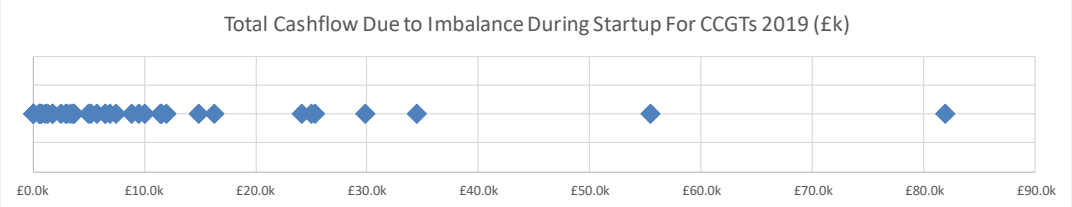
Figure 6: Cost of imbalance due to start-up of CCGT



The total value of all positive and negative imbalance charges

Figure 7 below shows the total value of all positive and negative imbalance charges due to NGESO instructed start-up of CCGT BM Units in 2019 was below £35k for all but expect two BM Units, and below £10k for 67% of units.

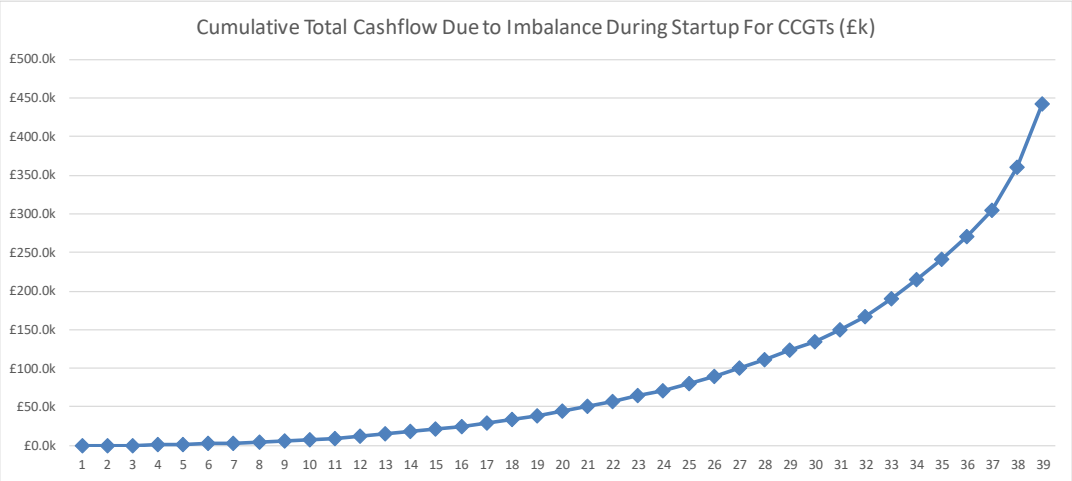
Figure 7: total value of all positive and negative imbalance charges



The total cumulative value for all CCGTs

Figure 8 below shows the total cumulative value across all CCGTs in 2019 was £442k, with a median of £50k. The average net imbalance charge per start-up event due to NGESO instructed start-up of CCGT BM Units in 2019 across all CCGT BM Units was -£38. Our data shows for previous years the average net imbalance charge per event ranged from - £420 to +£194.

Figure 8: cumulative value across all CCGTs in 2019



In summary CCGTs do incur additional imbalance charges as a result of the limited number of ramp rates that can be submitted to NGESO. The above analysis of the available data suggests that the total net value of imbalance charges paid by the industry during ESO instructed start-ups is of the order of £50k or less per year. The average net cost per BM Unit is of the order of £1k. The Issue Group are of the view that the cost of IT system changes needed to enable an increase in the number of ramp rates that can be submitted to NGESO outweighs the benefits.

Last Time to Cancel Synchronisation (LTCS)

An Issue Group Member stated that it would be nice to have LTCS for transparency reasons.

LTCS solution options

The Grid Code already requires relevant parties to submit LTCS to NGESO. The Issue 81 Group explored whether there are benefits in passing the LTCS data to ELEXON as part of the Dynamic Data set for publication on BMRS.

LTCS Costs and Benefits

The Issue Group agreed that the benefits to LTCS were unclear without understanding how NGESO uses this information. The Issue Group questioned the importance that NGESO placed on LTCS in terms of dispatch because this would underpin whether this information would be useful. NGESO clarified that the control room very rarely if ever used LTCS, as the data was difficult to get hold of due to the amount of data contained in its systems. As dispatch is manual NGESO can't think of an occasion where they would instruct a unit and then call them off last minute, as they would have instructed them for a reason.

As the NGESO's CBA focused on consumer benefits, ELEXON asked what factors were considered as part of this analysis? NGESO confirmed that the consumers benefits identified in their CBA were a hypothetical.

NGESO stated that LTCS had not been assessed for its standalone benefits as part of P297 but rather was as an additional benefit that the systems upgrade could deliver to Market Participants. An Issue Group Member agreed that it was a small part of the overall benefits EBS had been planning to deliver.

The Issue Group agreed that nothing in the original proposal could be used to support the introduction of LTCS.

Some Members questioned whether in a future scenario, where dispatch was automated and the mix of intermittent generation was greater, whether LTCS would be more useful, but noted that it would be hard to rationalise at present.

The Issue Group agreed that LTCS could not currently be justified for inclusion on BMRS, as the central implementation costs (ESO & ELEXON) were material (~£300k), with no quantifiable benefits established.

Costs for Market Participants and ELEXON

Based on the P297 consultation responses, ELEXON stated the potential cost for a Market Participant to make the necessary system changes is estimated to be around £100K. Additionally, the ELEXON implementation cost for P297 was approximately £130K; however, this was undertaken seven years ago and against the old BMRS architecture and is therefore likely to be higher due to inflation.

6 Conclusions

Recommendations

Run Up / Run Down rates

The Issue Group noted that additional Run Up / Run Down rates points are likely to only add benefit to Biomass, Coal and CCGT plant. What's more, the analysis by ELEXON showed the average net cost per BM Unit is of the order of £1k and the total net value of imbalance charges paid by the industry during NGESO instructed start-ups is of the order of £50k or less per year. Based on the costs for ELEXON (~£130k) and NGESO (£1.65M) and this potential maximum 'benefit' of £50k per year it would take over 35 years to recover the costs of any change.

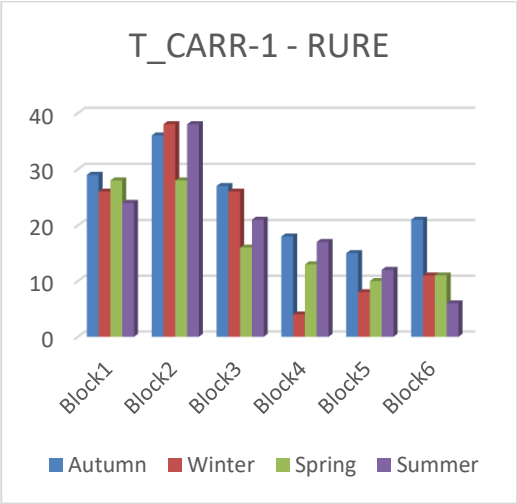
The Issue Group did not find grounds to recommend a change to the current Ramps rates as the quantifiable benefits, in terms of the Imbalance Charges avoided, are not significant enough to warrant the cost of IT system changes needed to enable an increase in the number of ramp rates (or granularity).

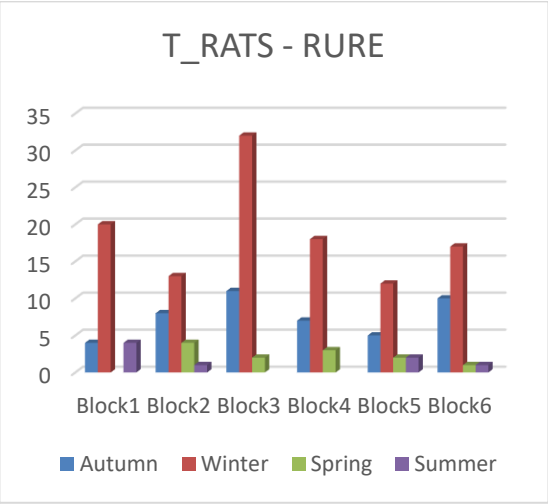
LTCS

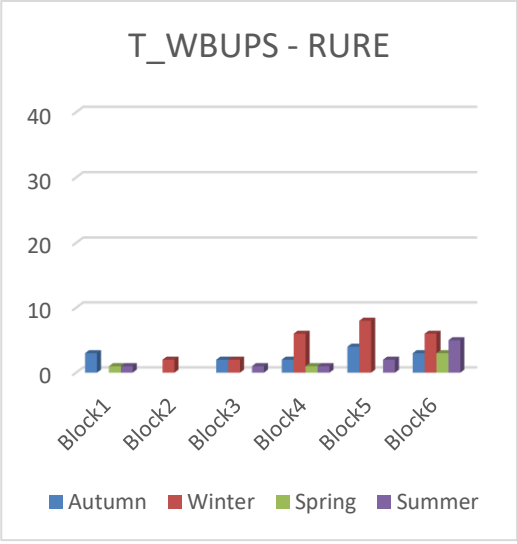
The Issue Group agreed that LTCS could not currently be justified for inclusion on BMRS, as the central implementation costs (NGESO & ELEXON) were material (~£300k), with no quantifiable benefits established.

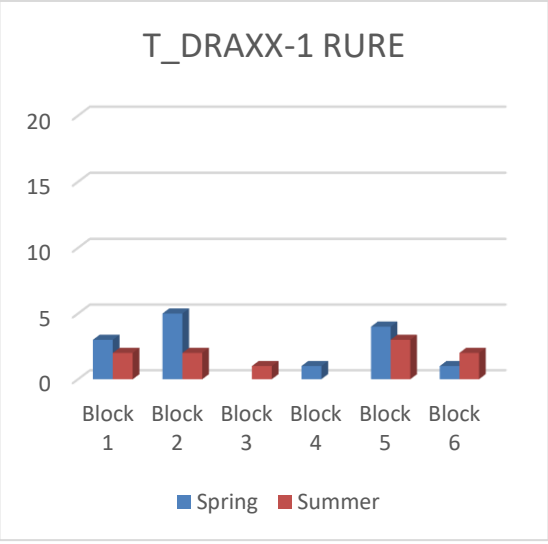
Appendix 1: Run-up or Run-down rates by season and time

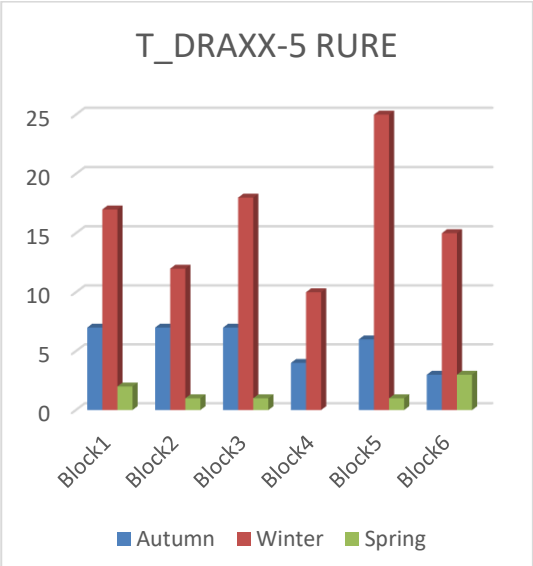
The below graphs show the count of Run-up or Run-down rates by season and time block for RURE, RURI, RDRE & RDRI separately.

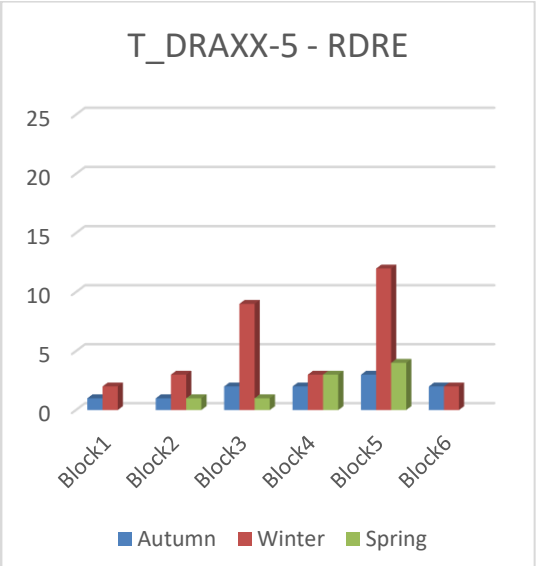


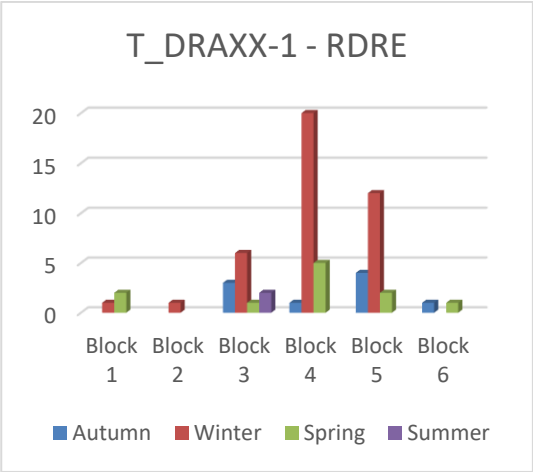


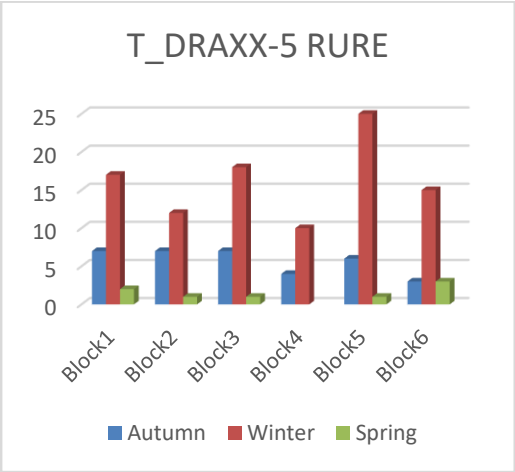


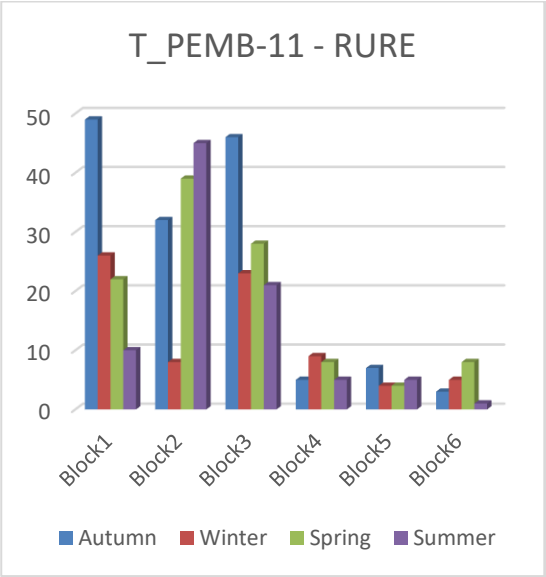


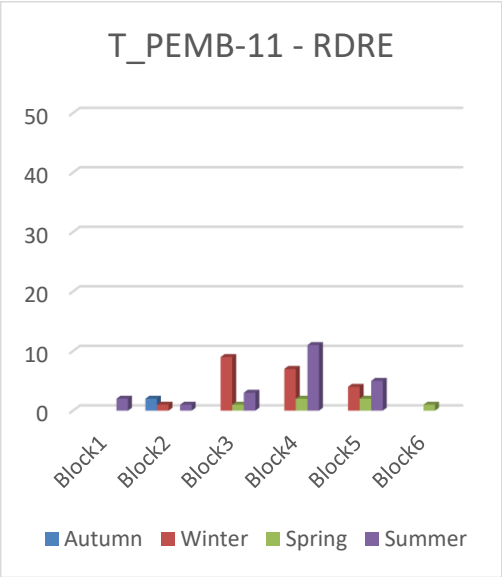


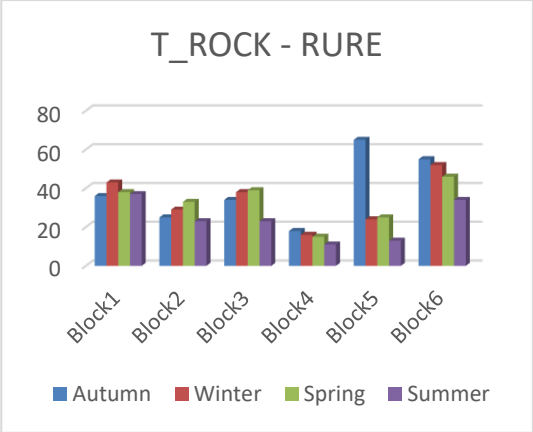


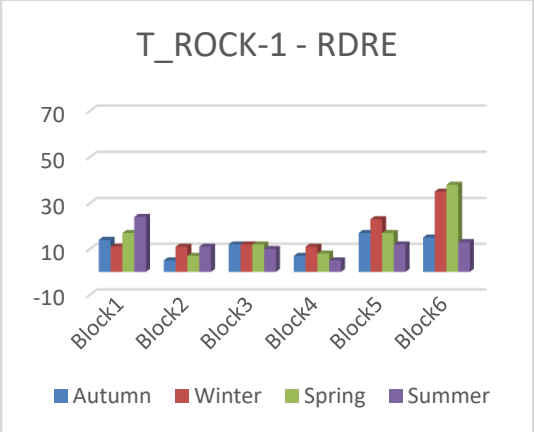












Appendix 2: Impact of Ramp Rates on Imbalance Charges

Summary costs and volumes per year

		2015			2016			2017			2018			2019	
	Total	Average	Largest	Total	Average	Largest	Total	Average	Largest	Total	Average	Largest	Total	Average	Largest
Net Imbalance Volume (MWh)	118.3	2.9	194.0	-313.7	-8.7	-116.0	-228.3	-5.6	-138.9	1540.6	36.7	-536.9	-34.9	-0.9	-281.5
Gross Imbalance Volume (MWh)	6153.6	150.1	1062.2	375.8	10.4	117.3	2021.2	49.3	236.7	15424.1	367.2	1935.5	9883.8	253.4	1772.4
Net Cost (£k)	£46.7k	£1.1k	-£5.0k	-£13.0k	-£0.4k	-£3.9k	-£5.4k	-£0.1k	£7.5k	£36.8k	£0.9k	-£40.8k	-£12.8k	-£0.3k	-£13.1k
Total Cashflow (£k)	£285.9k	£7.0k	£47.8k	£15.1k	£0.4k	£3.9k	£118.1k	£2.9k	£11.6k	£1078.8k	£25.7k	£122.8k	£441.9k	£11.3k	£81.9k

For each year:

- Total represents the sum across all CCGT BM Units for the year
- Average is the mean of the individual annual totals for each CCGT BM Unit, i.e. the average cost or volume per BM Unit per year
- Largest is the greatest magnitude (positive or negative) volume or cost for any single CCGT BM Unit.

Net Imbalance Volume and Net Cost is the sum of the positive and negative values (i.e. (10) + (-20) = -10)
Gross Imbalance Volume and Total Cashflow is the positive sum of the individual values regardless of sign (i.e. |10| + |-20| = 30)

Appendix 3: Issue Group Membership

Issue Group membership and attendance

Issue 81 Group Attendance			
Name	Organisation	1 04/11/2019	2 14/01/2020
Lawrence Jones	ELEXON *(Chair)*	✗	✓
Elliott Harper	ELEXON *(Chair)*	✓	✗
Faysal Mahad	ELEXON *(Lead Analyst)*	✓	✓
Colin Berry	ELEXON *(Design Authority)*	✓	✓
Jamie Webb *(Proposer)*	National Grid ESO	✓	✓
Andy Colley	SSE	☎	✗
Aily armour-Biggs	Global Energy Advisory	✗	✗
Dan Webb	Seabank Power Limited	✓	☎
Iwan Hughes	VPI Immingham	✓	☎
Lisa Waters	Waters Wye Associates	☎	✗
Kate Dooley	ESB	✗	✓
Graz Macdonald	Green Frog Power	✗	☎

Appendix 4: Glossary & References

Acronyms

Acronyms used in this document are listed in the table below.

Acronyms	
Acronym	Definition
BM	Balancing Mechanism
BMRS	Balancing Mechanism and Report Service
BOA	Bid Offer Acceptance
CBA	Cost Benefit Analysis
CCGT	Closed Cycle Gas Turbine
EBS	Electricity Balancing System
LTCS	Last Time to Cancel Synchronisation
NGESO	National Grid Electricity System Operator
RDRE	Run Down Rate Export
RDRI	Run Down Rate Import
RURE	Run Up Rate Export
RURI	Run Up Rate Import
TERRE	Trans European Replacement Reserves Exchange

External links

A summary of all hyperlinks used in this document are listed in the table below.

All external documents and URL links listed are correct as of the date of this document.

External Links		
Page(s)	Description	URL
1	Link to National Grid Electricity System Operator's Cost Benefit Analysis on P297	https://www.nationalgrideso.com/document/135941/download
2	BMRS webpage	https://www.bmreports.com/bmrs/?q=help/about-us
3	P373 webpage	https://www.elexon.co.uk/mod-proposal/p373/
3	Webpage for GC0068 - Grid Code New and Revised Unit Data and Instructions	https://www.nationalgrideso.com/codes/grid-code/modifications/gc0068-grid-code-new-and-revised-unit-data-and-instructions