

INVESTIGATION OF ALLEGED BREACH BY NATIONAL POWER OF GENERATION LICENCE CONDITION

1. Introduction

The National Grid Company plc (NGC) owns and operates the high voltage transmission system (the Grid) in England and Wales. It is authorised to do so by a licence issued to it under the Electricity Act 1989. Condition 8 of the licence requires NGC to comply with the Grid Code. Generators operating larger power stations also hold licences, and these licences similarly include a condition requiring compliance with the Grid Code. National Power plc (NP) is a licensed generator. Condition 5 of its licence requires it to comply with the provisions of the Grid Code so far as applicable to it.

On 6 November 1997 NGC wrote to OFFER alleging that NP was not complying with the Grid Code, and hence with Condition 5 of its licence, at its four combined cycle gas turbine (CCGT) power stations. NGC said the output at the stations falls when system frequency drops towards 49.5 Hz. NGC suggested that this represented a breach of the Grid Code and therefore a breach of NP's Generation Licence. NGC requested the Director General of Electricity Supply to investigate the alleged breach under section 45 of the Electricity Act.

The Grid Code sets out planning and operating procedures for the Grid and the principles governing NGC's relationship with Users of it. Part of the Grid Code sets out conditions for the connection of generating units. These specify the minimum technical, design and operational criteria for connection, including at generating stations, to the transmission system and enable NGC to comply with its statutory and licence obligations.

NGC alleges NP is not compliant with clause CC.6.3.3 of the Grid Code. This clause comes from the Connection Conditions section of the Code which sets out the technical and design criteria and performance requirements for generating units. The clause states:

“A Generating Unit must be capable of continuously supplying its rated Active Power output within the System Frequency range 49.5 to 50.5 Hz. Any decrease of output occurring in the Frequency range 49.5 to 47 Hz should not be more than pro-rata with Frequency”.

This clause seeks to ensure that generator outputs are maintained or controlled as system frequency varies. Such a response is important in ensuring stability of the overall system and in defining the other reserve

provisions which need to be available to allow satisfactory control of system frequency.

NGC explained that it had been in discussion with NP and other CCGT operators regarding the compliance of all CCGT power stations with clause CC.6.3.3. It said that, whilst considerable progress was being made with other operators, it remained of the opinion that NP was non-compliant with the Grid Code.

2. Initial Submissions

Offer asked NGC and NP to provide submissions giving their positions. The following points were made in the submissions.

2.1 National Grid Company Submission

In its initial submission which accompanied a letter of 9 January 1998, NGC said that NP was not complying with Grid Code clause CC.6.3.3 in respect of the four NP CCGT power stations constructed since privatisation. It said that this had imposed both significant extra cost and risk to the supply of electricity. NGC said that additional costs had arisen to carry additional MW response to manage the impact of non-compliance under the normal range of system frequencies. For system frequencies outside that range, NGC did not carry extra MW response and so the level of risk to the system had increased. NGC noted that other CCGTs were non-compliant but positive progress was being made towards meeting the CC.6.3.3 requirements.

NGC gave its interpretation of Grid Code clause CC.6.3.3 as follows. The term “rated” means a varying number equal to the maximum declared Availability (related to ambient temperature) on any given day. Thus for a fall in frequency down to 49.5Hz, there should be no reduction in power output from the generating unit. If the frequency falls below 49.5Hz, there should be no greater than a pro-rata reduction in the output of the Unit from its initial output down to a frequency of 47Hz. NGC says the two sentences of CC.6.3.3 should be read together, reflecting both a capability and an operational requirement in relation to both elements, namely the ranges 49.5 to 50.5Hz and 49.5 to 47Hz. The second sentence qualifies the general requirement referred to in the first.

NGC said the dispute with NP was over three points:

- Compliance on a Module or individual Generating Unit basis: In a standard configuration, a CCGT module consisted of 3 Units, namely two gas turbines and one steam turbine. NGC said that it seemed difficult to come to any view other than that CC.6.3.3

required the obligation to be met by each Generating Unit separately and not by the CCGT module as a whole. NGC would not object in principle to the Grid Code being changed to reflect the requirement on a Module basis, provided the necessary safeguards were included to ensure correct operation for all declared Availabilities.

- Ambient temperature for rating: NGC said that the Grid Code was silent on temperatures, so that in its context the term “rated” meant a varying number equal to the maximum declared Availability (related to ambient temperature). It said the component parts of the power station should meet the functional requirements of the Grid Code across the range of expected temperatures. If this were not the case, a Generator would only be compliant when ambient temperatures were at or below the rated temperature. Alternatively, each generator could in effect declare compliance at different temperatures. This information would need to be collected as NGC would need to manage the overall levels of response at varying ambient temperatures. NGC recognised that operation above 30°C was rare and burdensome to generators, and it would be willing to reflect this in changes to the Grid Code. It said that other generators were willing to implement CC.6.3.3 on the basis of NGC’s interpretation.
- Tolerance of output when assessing compliance: NGC said that the requirement is absolute as no tolerance was allowed for in the Grid Code. There were tolerances mentioned in other Grid Code clauses and the lack of such reference in CC.6.3.3 demonstrated that no tolerance was allowed for. As the clause referred to “continuously supplying”, the inclusion of a tolerance would undermine the principle of continuous supply. NGC accepted there would be a control system tolerance, but these measurement tolerances were of an order of magnitude less than the tolerance claimed by NP.

In a further submission, attached to its letter of 26 January, NGC included comments on the cost implications of non-compliance. NGC said that as an interim measure, it had managed the impact on system security by carrying additional amounts of response to cover contingencies expected from the operating standards. In carrying out estimates of the costs of this extra response, average plant characteristics were applied to all CCGT plant. NGC said that if a looser interpretation of CC.6.3.3 were advocated, this would result in change of position by operators who are presently working towards ensuring that their plant is compliant. NGC said that for Summer 1997 response and reserve cost were estimated at about £5million. For summer 1998, estimates suggested cost of the order of £6-7million if all

CCGTs remained non-compliant. NGC said that there was the prospect of around 20GW of CCGT plant on the system by 2000/01. If all CCGT plant were to be non-compliant additional response would be required throughout the year and the cost would rise significantly to the order of £18million.

NGC said that if the tolerance of 2.5 per cent, as suggested by NP, were allowed, plant designs and operators would make use of this so that costs would be accordingly increased in excess of those given.

NGC commented that as additional response was not carried for contingencies outside the operational standards, there was an increased level of risk to the system. Considerable further additional cost would be incurred to remove this risk. As an example, NGC said that if an incident were to occur, albeit of low probability, system frequency would fall quicker than would be expected and would be likely to cause at least one stage of load to be shed. NGC estimated that the cost of such an incident occurring in summer, when demand is 35,000MW, would be approximately £18 million.

2.2 National Power Submission

In its initial submission accompanying its letter of 8 January, NP argued there had been no breach of the Grid Code, that system security was not imperilled by the mode in which it operated its CCGT plant, and that the approach that NGC wanted NP to adopt would result in higher costs to the system and to end customers.

NP pointed out that clause CC.6.3.3 referred to two frequency ranges. For the range 49.5 to 50.5Hz, the requirement was of the capability at rated Active Power. The term “rated Active Power” was undefined and implied that any level of output could be used. NP said that the control systems installed on its CCGT plant were capable of keeping output constant over this frequency range by deloading, over-firing, or a combination of both.

For the frequency range 47 to 49.5Hz the requirement was that the rate of decay of output is “not more than pro-rata with frequency”. NP said that it could not be inferred that the ratio should be 1:1. It said that the fact that the ratio used was not specified in the clause made compliance relatively straightforward.

In commenting on NGC’s interpretation, NP said that NGC sought to apply two additional requirements that could not be justified by reference to CC.6.3.3. The first was that the rated Active Power applied to the instructed MW level of each generating unit, although for CCGT power stations there was no such figure since instructions related to the module.

The second was that the decay below 49.5Hz must be no more than a 1:1 ratio.

NP observed that Operating Code No. 5, which specifies the procedures to be followed when monitoring and testing compliance with the Grid Code connection conditions, contains no specific test for frequency response and hence no tolerances for frequency response, but provides that testing “will be carried out as part of routine monitoring...”. NP said that as a consequence, the tolerance for frequency response will be associated with that of the response of output to frequency change as set out in the Ancillary Services Agreement (OC.5.5.2.2) or with that of the dispatch instruction (OC.5.6.15). NP says that at the international standard design criterion of 15°C, even NGC’s interpretation of CC.6.3.3 can be complied with, within these tolerances. However, for higher temperatures it may be necessary to reduce output to meet the NGC interpretation.

NP commented on the process of commissioning new power stations, specifically the connection to the grid system. NP said that there is a contractual commitment to comply with the Connection Conditions of the Grid Code contained in the Supplemental Agreement. This requires NP to submit a report certifying that, amongst other things, the Connection Conditions have been complied with. NP said that NGC can ask for this report to be prepared by the Independent Engineer but on no occasion has NGC asked for this.

NP said that to assist generators in demonstrating compliance, NGC produces Guidance Notes listing tests that needed to be performed. NP observed that these Notes had no legal standing. NP said that recent versions of the Notes described the testing procedures NGC would like to see undertaken, whereas versions provided at the time of commissioning of NP’s plants did no more than list the various Connection Conditions. For CC.6.3.3, the latest test requirements in these Guidance Notes were significantly more onerous than the Grid Code.

NP said that it had made various modifications to each of its CCGT power stations which should make them capable of complying with the tests specified in the latest issue of the Guidance Notes. NP said it was significant that the most recent Guidance Notes do not necessarily attempt to test the consequence of the highly unlikely event that the frequency falls below 49.5Hz. Testing compliance for the event is left to normal monitoring under OC.5.5.2.1 of the Grid Code.

NP noted that the Guidance Notes say that following approval of the generators’ test report, NGC will issue final or interim notification depending upon whether NGC believes that all the Connection Conditions have been met. NP said the notifications for Killingholme and Deeside

contained no reservations about CC.6.3.3 compliance and that whilst those for Little Barford and Didcot B indicated reservations, no details were given. NP also said that NGC had now indicated that Killingholme and Deeside no longer complied with CC.6.3.3 and that NGC had not complied with the provisions of OC.5.5.2.1 which required it to produce test data demonstrating why it believed there had been a failure to comply with the Connection Conditions.

NP also commented on security of the system and costs. It said that the characteristics of gas turbines were such that output would naturally move with system frequency. A gas turbine can be made to mimic a steam turbine by limiting the output to that which would occur at a system frequency of 49.5Hz. This would result in a loss of output whenever system frequency was above this level. NP said it may be more economic to schedule other plant rather than incur higher operating costs at CCGT plant.

On the issue of system security, NP said that NGC was required by its Licence to ensure that for specified system infeed losses the frequency stayed above defined levels. It said that, if the output of some generating plants fell more than others with falling frequency, then more responsive plant should be scheduled to maintain the same level of security. If the right mix of plant was not scheduled by the normal process, suitable plant should be constrained on. NP said the issue was one of cost and not system security as NGC could schedule sufficient responsive plant from that available.

On the cost to customers of adopting NGC's interpretation, NP said that CCGTs had brought benefits of lower unit costs and reduced emissions. Their operating characteristics required a slightly higher level of response to be carried at low load periods or scheduling out-of-merit steam plant. These costs had to be weighed against the benefits. NP also said that there might be occasions when it was correct to pull back CCGT output instead of carrying additional reserve, but there was at present no mechanism to make the correct choice for minimising overall costs.

3. Comments On Other Each Other's Submissions

Offer invited NGC and NP to give views on the other's submission. The comments included the following points on compliance with the Grid Code.

3.1 NGC Comments on NP Submission

In its submission dated 20 February 1998, NGC commented that system security would not be imperilled if NP acted alone, because extra frequency response could be purchased as cover. However, it believed there would be an increased risk to system security, and a likelihood of significantly higher

costs, if all generating plant on the system were to operate in accordance with NP's interpretation.

NGC said that if NP's interpretation of pro-rata was accepted, it would be neither practical nor possible to plan and operate the power system. NGC also suggested it would defeat the objective set out in OC.2.1 to establish generic technical minima to enable compliance with Statutory and Licence obligations.

Commenting on NP's suggestion that compliance should be at any single ambient temperature, NGC said such an approach would similarly defeat the objective of establishing generic technical minima. NGC said it is the duty of the Generator to ensure that the complete power station meets the design performance criteria across the range of anticipated operating temperatures.

On NP's suggestion that CC.6.3.3 defined a capability which might or might not be used, NGC said that CC.6.3.3 defined an operational requirement as well as a capability.

NGC said that neither of the tolerances quoted by NP were relevant; CC.6.3.3 does not contain a tolerance.

NGC said that NP's submission focuses on the frequency range 49.5Hz to 50Hz, whereas the issue was non-compliance with CC.6.3.3 for all frequencies down to 47Hz.

NGC had found nothing in NP's submission which altered its view on the question of NP's breach of the Grid Code.

3.2 NP comments on NGC Submission

NP responded to NGC's submission in a document accompanying its letter of 25 February 1998. On the interpretation of CC.6.3.3, NP commented on three points. On rated Active Power, NP said the meaning used by NGC could not be right as this would be the same as the defined Grid Code term "Offered Availability" and the clause did not use the term. NP further said that it was normal practice to quote equipment ratings at specified ambient conditions and if this construction was to be placed on the term "rated Active Power" then it must surely have something to do with design criteria. NP also noted the NGC position regarding general CCGT compliance with NGC's interpretation at 30°C. NP said that this appeared to confirm that no CCGT plant could comply with NGC interpretation.

On the use of the term "pro-rata", NP said NGC's construction went beyond the dictionary definition of the term.

NP said it could not see how an operational requirement in addition to a capability requirement could be placed on the 49.5 to 50.5Hz range from the wording of CC.6.3.3. The wording specifically referred to the generating unit being “capable” of the performance described.

NP commented on three aspects where its interpretation differed from NGC’s. These were that compliance should be judged at a design temperature, there should be a tolerance when assessing compliance and that compliance needed only be on a module basis for CCGTs. When interpreting “rated Active Power”, NP said that NGC’s approach would need to make some reference to temperature in describing the plant performance. NP’s view was that it should relate to the International Standards Organisation’s design temperature of 15°C.

NP said that NGC’s submission demonstrated a confusion over NP’s position on tolerances. NP’s position was that assessment of compliance must be carried out within the provisions of Grid Code clauses OC.5.4 and 5.5, which allow a tolerance in assessing compliance with the various Connection Conditions. It contended that the relevant tolerance for demonstrating compliance in respect of uninstructed frequency response was the despatch tolerance of 2.5 per cent.

NP agreed with NGC that the literal wording of CC.6.3.3 referred to each generating unit but a CCGT can only be despatched as a module so measurement of compliance should be on that basis also. NP was encouraged to see that NGC would not object to the notion that performance should be in respect of the module.

4. Discussion

4.1 Views of the Parties

Clause CC6.3.3 says:

“A Generating Unit must be capable of continuously supplying its rated Active Power output within the System Frequency range 49.5 to 50.5 Hz. Any decrease of output occurring in the Frequency range 49.5 to 47 Hz should not be more than pro-rata with Frequency”.

NGC claims that NP is in breach of clause CC.6.3.3. It says

- that compliance should apply to each generating unit within a CCGT module

- that compliance should be achieved at all expected ambient temperatures
- that no tolerance is applicable to the clause.

NGC says that, on these assumptions, NP's four CCGT stations are not compliant with the clause.

NP concedes that its stations would be in breach of the clause if NGC's interpretation of the clause were accepted. However, it disputes this interpretation, and says

- that compliance should sensibly apply to each generating module, not to each unit
- that compliance should be applied at a specific temperature
- that the clause should be applied with a tolerance.

On this basis, NP claims compliance with the clause and further says

- that the clause requires only a capability as opposed to an operational service for the frequency range 49.5-50.5 Hz
- that the pro-rata performance required between 49.5 and 47 Hz is open to interpretation, and is not necessarily 1:1.

NGC comments on these further points

- that the clause defines an operational, as well as a capability requirement.
- that if pro-rata were open to interpretation, it would be neither practical, nor possible, to plan and operate a power system.

The clause in dispute is short but describes an important aspect of generator performance from the points of view of system security and costs to customers. The parties disagree about the meaning of several of the words and phrases in the clause, and about certain factors relevant to the consideration of the meaning of clause CC.6.3.3.

4.2 Phrases in Dispute and Related Issues

Generating Unit: Although at the outset there appeared to be disagreement about the meaning of this term, NP later accepted that NGC's interpretation is literally correct, but NP considers it inappropriate. There is accordingly

no disagreement that CC.6.3.3 applies to each generating unit within a CCGT module. There remains doubt about how compliance could be demonstrated for units within a module, and in view of this, the Grid Code requirement may need clarification.

Capable: NP says that the clause requires only a capability in the range 49.5 to 50.5 Hz; NGC says that both a capability and an operational requirement are implied. In a strict sense, no operational requirement is expressly imposed by that part of the clause, but in the absence of mechanisms elsewhere in the Grid Code to invoke an operational requirement from the capability, it is reasonable to assume that an operational requirement is implied by CC.6.3.3.

Rated Active Power: This term is not defined in the Glossary and Definitions section of the Grid Code. NGC says the term “rated” means a varying number equal to the maximum declared Availability (related to ambient temperature) on any given day. NP claims that NGC’s interpretation corresponds to another defined term, Offered Availability. It says that if this meaning had been intended, CC.6.3.3 should have used the appropriate term. There would be advantage in consistency of use of defined terms in the Grid Code. Although NGC’s explanation of the meaning of the term seems sensible, the present wording of the clause does not unambiguously confirm NGC’s interpretation.

Not more than pro-rata with frequency: The second sentence of the clause refers to the way in which output of the generator can vary when system frequency is in the range 47 to 49.5Hz. NP says that NGC should not necessarily infer a constant of proportionality of unity in applying this term. Although the clause does not specify the constant of proportionality, the ratio 1:1 is usually implied in common usage of the term “pro-rata”. NP’s interpretation, which would allow any constant of proportionality to be chosen, would leave the phrase substantially bereft of meaning.

Temperature

NGC says that compliance should be achieved at all expected ambient temperatures. NP says that it should be applied at a specific temperature. The arguments of both parties have some merit. Equipment or system ratings are sometimes specified at a single chosen temperature and sometimes over a range of temperatures which is usually bounded by the extremes of expected conditions. CC.6.3.3 gives no guidance on this point.

Tolerance

NGC says that no tolerance is applicable to the clause or only a small amount. NP says that the clause should be applied with tolerance at a

greater level than allowed by NGC. CC.6.3.3 gives no guidance and the Grid Code generally gives little guidance on tolerance levels. Equipment specifications often include specific tolerance levels for measured quantities. The lack of any tolerance level seems inappropriate for engineering systems with inherent monitoring inaccuracies but if a specific tolerance level had been intended for parameters in CC.6.3.3, it should have been included in the clause.

5. **Conclusions**

NGC has complained that National Power is in breach of its Licence with respect to compliance with clause CC.6.3.3 of the Grid Code. It has requested that the Director General should take enforcement action.

Under section 45 of the Electricity Act the Director General is under a duty to investigate a complaint that a licensee is in breach of its licence. If he is satisfied that the licensee is in breach of its licence he is generally required by Section 25 of the Act to make an order to secure compliance. Complaints under Section 45 are different from disputes which can arise, for example, under Section 23 of the Act. Where there is a Section 23 dispute on which he is required to adjudicate, the Director General is bound to come to a definite conclusion. Sometimes this has to be done where the issues or the evidence are not clear cut, but a result must nevertheless be reached. In contrast, he cannot take enforcement action under Section 45 unless he is satisfied that a licensee “is contravening or is likely to contravene” its licence. It is more difficult to be satisfied where there is ambiguity on an important point. A greater degree of certainty is required in the case of enforcement proceedings than in determining a dispute.

NGC and NP agree that NP would be in breach of clause CC6.3.3 on the basis of NGC’s interpretation of that clause. However, they disagree on the proper interpretation. On the basis of the evidence and arguments about the meaning of the clause presented during this investigation, NGC’s views are in general more persuasive. Nevertheless, some of NP’s points have merit. Clause CC6.3.3 is silent on several aspects of definition of the required service. It does not have a single, unambiguous meaning and is to some extent open to interpretation. Interpretations have been given of several phrases, but an element of ambiguity remains. No evidence has been provided as to whether NP is in breach of the clause under such alternative interpretations. In the light of this, it is not possible to conclude, with the necessary degree of certainty, that NP is in breach of the clause at its four CCGT stations.

The investigation has highlighted shortcomings in the meaning of phrases used in clause CC6.3.3. It has also raised more general issues about the specification of performance requirements in the Grid Code. NGC requires

an operational service which provides a contribution to frequency response over the range of frequency variation defined in CC6.3.3. While it would be possible for the Director General to give an interpretation of CC6.3.3 which would define the service to be provided, there are wider issues concerning the extent to which the provision of this service should be explicitly required by the Grid Code, or procured through commercial or incentive arrangements. It seems sensible to invite the industry to discuss these issues more fully using established procedures for reviewing the Grid Code. The Director General therefore looks to NGC to review the Grid Code with regard to the service it requires, with a view to clarifying a minimum compliance requirement in the Code whilst procuring the remainder of the service by incentive or commercial means. Resolution of these issues should be achievable before Summer 1999, when the need for the service will next be greatest.

To summarise, the meaning of clause CC6.3.3 of the Grid Code is in certain respects ambiguous. It would be sensible for NGC to review the Grid Code with a view to clarifying it. But even if the Director General were to interpret the present wording of the Code, no evidence has been brought forward as to whether NP would be in breach of the Code on alternative interpretations to that of NGC. On this basis the Director General is not satisfied that there is a breach of the Code. Accordingly he is not presently minded to issue an order under Section 25 of the Electricity Act 1989.

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