

Grid Code Gas Insulated Switchgear (GIS) Working Group

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| Meeting Name | Grid Code Gas Insulated Switchgear (GIS) Working Group |
| Meeting No. | 2 |
| Date of Meeting | 10 th June 2008 |
| Time | 10:00am – 3:00pm |
| Venue | Room A3.1, National Grid Offices, Warwick |

This note outlines the key points from the second meeting of the Grid Code (GIS) Working Group.

Members Present:

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| Duncan Burt | BU | Chairman |
| Richard Dunn | RD | Secretary |
| Emma Carr | EC | National Grid |
| Rod Richardson | RR | National Grid |
| Paul Coventry | PC | National Grid (item 5 only) |
| John Norbury | JN | RWE Trading |
| Jeff Norfolk | JNo | RWE Trading |
| Claire Maxim | CM | E.On |
| John Morris | JM | British Energy |
| Chris Holdsworth | CH | CE Electric UK |
| Dave Sanderson | DS | EdF Energy Networks |
| Daniel Cassidy | DC | Scottish Power |
| Bridget Morgan | BM | Ofgem |

Apologies:

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| Keith Hodson | KH | Central Networks |
| Fraser Ainslie | FA | Scottish Power |

1. Introductions and Apologies

22. DB welcomed DC to his first meeting of the Group. DC was deputising for FA who was on paternity leave. Apologies had been received from KH.

2. Draft Notes of the Meeting held on 26th February

23. JN explained the rationale behind his suggested changes to the draft minutes of the meeting held on 26th February. The Group agreed with the principles of the changes suggested by JN with minor amendment and also agreed that the notes should be expanded to reflect more fully the discussions at the first meeting on:

- a) Circuit Breaker activity for a Generation connection will be much higher than for a DNO connection;
- b) Lack of prospect for competition in construction and maintenance with GIS

Action: RD

24. CH raised the issue of the ENA paper mentioned by KH under minute 7. RD confirmed that this had been subsequently circulated to WG Members by e-mail (3rd March). It was agreed that the ENA paper should be scheduled on the agenda for the next meeting of the Group to assess whether there were any implications from the paper for the GIS issue.

Action: RD

3. Revised Working Group Terms of Reference (TORs)

25. RD explained that due to the timing of meetings revised TORs had been submitted to the May GCRP for consideration and approval. The TORs had been expanded to include a proposed definition of GIS since one did not appear in the Grid Code at

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present. The scope of the Group's work had also been expanded to reflect the discussion at the first Working Group meeting and a diagram illustrating the formal governance process that would be followed under the CUSC and the Grid Code had been added as Annex 1. Finally a target timescale of February 2009 for completion of the Group's work had been added. The GCRP had agreed these revised TORs. The Working Group noted these revised TORs.

4. Review of the Outputs from the Group's First Meeting

26. DB suggested that the Group work through the brainstorming output table from the first meeting of the Group and seek to refine the points therein and this was agreed. EC noted that some points raised in the output table concerned aspects of the charging regime. The Group was formally a joint Grid Code/CUSC Working Group but there also may be a need to bring in a charging expert in due course and pursue any such changes through the TCMF.

Construction

27. CH and others questioned whether it was appropriate for the National Grid Alliance to determine the manufacturer under item 2. The term "single tender" was also misleading and should be amended. The tender award procedures should follow normal procurement rules although clearly for GIS a single award would be most efficient. Generally, bringing in a third party on a GIS site creates additional issues and costs. RR confirmed that National Grid at design stage would consider the issue of future extensions and make provisions, if required. JN highlighted an important issue regarding extension of GIS equipment, stating that such extensions would require type testing and interfacing. It was noted that this can tend to preclude the involvement of a different manufacturer when a GIS site is being extended. DS noted that there were some early design GIS substations on the EdF system in London and new manufacturers did not want to get involved in their extension. DB summarised the discussion on the basis that for new build GIS a single award can be the most efficient solution.
28. JN and JNo noted that although a single award to an Alliance manufacturer for a GIS substation might make good sense to National Grid and a DNO in the round, the cost could seem very high to a generator given that they were not involved in the tendering process and have no basis for assessing a quote by any individual manufacturer for what could be a small number of bays as part of the whole GIS substation. As a result the generator could not demonstrate value for money through its own internal sanctioning process. CM agreed that Generators currently had no capability of assessing whether the single award for GIS was competitive or not and this created considerable problems in justifying the choice of manufacturer through its own internal sanctioning process. Even in the case of the generator being dominant at a particular GIS substation and requiring additional bays, there was a lack of transparency for the generator of a market cost for those new bays.
29. JN also noted that due to the need for National Grid to take decisions on investment in GIS at an early stage, the generator could also be forced into advance investment much earlier than he would wish. DB noted that there was always tension between the investment timescales for National Grid and the generator and that this issue is not exclusive to GIS.

Operation and Maintenance

30. EC indicated that there can be practical problems associated with splitting the responsibility for operation and ownership with GIS e.g. aligning the outages and the isolation arrangements to carry out works. Some Members queried why OC2 and OC8 would not apply as normal to GIS and EC agreed obtain a practical example to explain the issues in more detail at the next meeting.

Action: EC

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31. DB noted that PC's presentation suggested that intrusive maintenance in the gas zone was very rare which suggested that the inability to separate responsibility for operation and the enduring ownership in the gas zone was not such a key issue as he had previously believed. However, if there was a need for access by the maintaining party without ownership e.g. to the molecular sieve this would have to be weighed up in any preferred option which maintained split ownership and responsibility. JNo agreed to research the history of the positioning of gas zone's.

Action: JNo

32. JN suggested that there might be a case for the Group to revisit the issue of ownership boundary from first principles. BM questioned that it might be appropriate to examine a separate solution for CBs at GIS sites operating synchronous generation and CBs at GIS sites not involved in switching generation. DB agreed that there was a case for ensuring that CBs operating synchronous generation received an appropriate maintenance regime given the lifecycle of a generator GIS substation and the prospect of replanting, fgd, LCPD etc. and this was a point that could be fed back to PC.
33. The Group noted that the actual impact of a failure at a GIS generation site could be considerable given the increased importance of the isolators outside the gas zone. However, the risk could be mitigated if there was a clear maintenance policy for GIS sites based on an agreed standard for frequency of failure. It was agreed that simply changing the ownership arrangements in themselves would have no impact on the level of risk and individual owners would need to decide what policy was appropriate and acceptable for their business.
34. JN suggested that one approach would be to adopt a technical solution for Grid Code purposes and then leave it to interested Parties to raise amendments to the CUSC etc. to mitigate the risks involved with constructing, operating and owning the plant. CM noted that to some extent the issues with GIS could be seen as a lack of redundancy and in that respect had more in common with Offshore connections.
35. The Group also discussed the various designs of GIS substations prevalent in Europe where the design provided greater redundancy and hence security. It was agreed that the references to more renewable generation coming on to the system in the brainstorming outputs were unnecessary and could be deleted.

Enduring Ownership

36. DS noted that DNOs were not remunerated through price control arrangements to fund the maintenance of what were currently National Grid assets should enduring ownership end up at lower voltages. In addition it was unclear if CAP048 (compensation arrangements) would apply should there be a failure where the DNO currently owned the busbars at GIS sites. DB agreed that these were important points to capture in the brainstorming output table. JN noted that there was also no regulatory asset base for the generator assets beyond the gas zone. If such assets were owned by National Grid in the future they could be absorbed into the regulatory asset base in due course. He believed the overall costs to industry could be expected to reduce.

5. Presentation by National Grid on GIS

37. PC gave the WG a presentation on the main technical features of GIS. The IEC definition of GIS was "Metal-enclosed switchgear in which the insulation is obtained, at least partly, by an insulating gas other than air at atmospheric pressure".
38. GIS was chosen for its compact size - 10-20% of the land area for AIS was required. Consequently GIS could be built closer to load centres, replacement or extension could take place within existing boundaries and there was a low visual impact. GIS also had strong immunity to pollution due to the low number of exposed insulators

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and therefore could be sited in exposed coastal areas or near sources of industrial pollution. GIS should be used at pollution severity Class III sites or less except where the lifetime related conditions described above apply.

39. A key consideration for GIS design was that any extension should involve using equipment of the same type or special adaptors. Possible requirement for future extension should always be considered at the design stage. Other considerations specific to GIS were that the effectiveness of isolation was gas density dependent, the availability of adjacent circuits, safety issues limited work adjacent to pressurised gas compartment partitions which leads to the partitioning of GIS into gas compartments
 40. PC then explained the detail of the 3 main GIS designs. Originally, the CEGB/National Grid procured GIS from a British manufacturing base. These early designs incorporated bus selector disconnectors in separate gas compartments to the Main and Reserve busbars. The designs incorporated long busbar compartments. However, since the early 1990s National Grid had sourced GIS more and more from a European manufacturing base. Most European GIS designs incorporate bus selector disconnectors within the Main and Reserve busbar gas compartments.
 41. Typical maintenance issues associated with GIS were:
 - the general condition of equipment support structures, earthing connections
 - gas pressure /density level and trend
 - gas quality (HF/SO₂, O₂, H₂O)
 - calibration of pressure/ density gauge/ transducer
 - alarm setting and operation
 42. For Disconnections and earthing switches typical maintenance issues were:
 - Mechanism Heater Operation
 - Number of Operations
 - Trial Operations
 - Motor Operating time and current
 - Operation of position indicating device
 - Condition of auxiliary switches, wiring and connections
 - Condition of linkages and gears, lubrication
 - Operation of interlocks
 43. For Circuit Breakers typical maintenance issues were:
 - Number of Operations
 - Trial Operations
 - Contact timing/travel record
 - Checks according to type of mechanism (spring/hydraulic/pneumatic)
 44. According to a CIGRE report in 2000 there was a failure rate of 2.58 per 100 circuit-breaker bay years for GIS 300-500kV commissioned after 1/1/1985. Main components involved in these failures were
 - circuit breaker or switch – 27.3%
 - Disconnector – 25%
 - Busducts and interconnecting plant – 24.2%
- A breakdown of the symptoms were:
- breakdown to earth, solid insulation – 25.8%
 - breakdown to earth, gas insulation – 36.5%
 - failure to open on command – 13.2%

45. Finally PC mentioned that there is a current CIGRE survey being undertaken (WG A3.06), the results of which are to be published in about two years time, which will cover both AIS and GIS reliability.
46. During questions on the presentation PC confirmed that National Grid kept maintenance intervals for GIS under review in the light of experience but the trend was clearly towards extended intervals for maintenance and this was also being recognised by manufacturers. Most maintenance was external to the gas zone – there was very little intrusive maintenance to the gas zone and the need to de-gas was very rare. Each gas compartment contained a device to prevent any explosive output from the gas zone. Each gas compartment also contained a molecular sieve mainly comprised of Sodium Aluminosilicate to take out the impurities in the gas.
47. PC confirmed that any changes to the manufacturer's design for GIS tend to be driven by safety factors. He was not aware to date of any design changes brought about by shared ownership considerations. It was generally difficult to persuade manufacturers of the need for design changes as we represent only a small fraction of the World market . On decommissioning of the generator, the disconnectors could be locked in the open position and a blanking plate inserted. This would be a permanent arrangement.

6. Next Steps

48. It was agreed that National Grid would amend the brainstorming output table to take into account comments made at the meeting and would also aim to provide a number of strawmen options for consideration at the next meeting of the Group.

Action: EC & RR

7. Date of Next Meeting

49. It was agreed that the next meeting of the Group should be scheduled for Thursday 4th September at NGH (subsequently confirmed to WG Members).

Action: National Grid (RD)