## SAFETY ALERT

**Notification of partial discharge induced failures of FKI Eclipse high voltage switchgear.**

Number: SA 08/07

<table>
<thead>
<tr>
<th>DIO Secretariat  Sponsor: RA Cawthorne</th>
<th>Date of issue: 27 Nov 2007 Reviewed: 8 June 2012</th>
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</thead>
</table>

Contact if different from above Sponsor:

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Who Should Read this:

Who Should Read this: CEstOs, Top Level Budget Holders, Project Sponsors, MOD Project Managers and others within the IPT (for both Prime, PFI/PPP and traditionally procured contracts), Defence Estates Advisors and Property Managers/Site Estate Representatives with responsibility for MOD projects and Property Management Works Services (including the legacy work of EWCs/WSMs) Coordinating Authorising Engineers, Authorising Engineers Electrical, Authorised Persons Electrical, purchasers and installers of final electrical distribution equipment.

When it takes effect: Immediately  
When it is due to expire: No Expiry except on update.

**Document Aim:**

To notify all relevant parties of partial discharge induced failures of FKI Eclipse high voltage switchgear and to identify remedial action.
<table>
<thead>
<tr>
<th>Product</th>
<th>Eclipse</th>
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<tbody>
<tr>
<td>Manufacturer/Supplier</td>
<td>FKI Switchgear</td>
</tr>
<tr>
<td></td>
<td>Newport Road, Blackwood, South Wales, NP12 2XH, UK</td>
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<tr>
<td>Problem</td>
<td>Partial discharge within bus bar chamber</td>
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<tr>
<td>Scope</td>
<td>All Eclipse switchgear</td>
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<tr>
<td>Risk</td>
<td>Unplanned outage of HV supply. Destruction of HV switchgear.</td>
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<tr>
<td>Action</td>
<td>Partial discharge inspection to identify defective units and where identified apply live operation restriction until remedial action completed.</td>
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</table>

1. Requirement:

1.1. Addressees of this Safety Alert are to bring the contents to the attention of their Authorising Engineer Electrical (AE(E)) or equivalent to assess what action if any is appropriate.

1.2. AE(E) are to identify if the equipment noted above is present on any sites for which they have responsibility.

1.3. Any action required by this Safety Alert is to be taken at the earliest possible opportunity.

1.3.1. The earliest possible opportunity should be established commensurate with operational requirements and the risk to personnel and property; with the highest priority given to heavily used/urgent operational requirement facilities and the lowest to unoccupied or rarely occupied or non essential facilities.

1.4. In addition to the actions identified below steps should be taken to ensure adequate substation heating in place and operating at all times.

1.4.1. If switchgear anti-condensation heaters are fitted they should be checked to ensure they are operational.

1.5. The problem identified has principally occurred on FKI Eclipse high voltage switch boards containing bus bar earthing switches or bus bar cable end boxes and as such inspection priority should be given to these units.

1.6. Except where the operational procedures identified in 1.7 below are in place, the following operational restriction is to be put in place and arrangements are to be made for a partial discharge inspection of the switchgear;

1.6.1. Live switchgear operation for fault localisation and supply restoration is to be prohibited.

1.6.1.1. The operational restriction is to remain in place until such time as a partial discharge inspection has been conducted and any remedial action is completed.
1.6.2. Where audible discharge is present all live switchgear operation is to be prohibited and substation access is to be restricted to urgent operational requirements and safety inspections only.

1.6.2.1. The operational restriction is to remain in place until such time as a partial discharge inspection has been conducted and any remedial action is completed.

1.7. Where equipment such as ultra TEV is available and local operational procedures require its use prior to any switching operation then subject to AE(E) approval no operational restriction is required.

1.8. Where partial discharge inspections identify discharge activity AE(E)s are to ensure that FKI are contacted and arrangements are made for any recommended remedial action to be completed at the earliest possible opportunity.

1.9. Where partial discharge inspections do not identify discharge activity and there is no ultra TEV or equivalent available for site use, the operational restriction may be lifted provided periodic partial discharge inspections are conducted to monitor for any deterioration.

1.10. The operational restriction imposed by this Safety Alert may only be lifted on the Authority of the AE(E) on the completion of any required remedial action or on the adoption of appropriate monitoring procedures.

2. Background:

2.1. The background to this problem is detailed in the Energy Networks Association DIN 2007/0094/00 dated 8th November 2007, an extract of which is attached as an appendix to this Safety Alert.

2.1.1. For those with access to the NEDERS system see also; DIN 2006/0140/00.

2.1.2. Whilst not formally reported, Mr J Moore of FKI has indicated that in these instances of Eclipse failure there was NO or INADEQUATE substation heating which led to condensation on unscreened cast resin and polymer insulated components with the associated changes in electrical stress distribution being the root cause of the partial discharge that caused the failures.

2.1.2.1. This situation has been identified as the cause of failure of both YMV and VMX switchboards within the MOD estate.

3. Further Information:

3.1 COMPLIANCE WITH THE CONTENTS OF THIS ALERT WILL ENABLE COMPLIANCE WITH THE HEALTH & SAFETY AT WORK ETC ACT 1974 AND ITS SUBORDINATE REGULATIONS.

3.2. The appropriate MOD officer shall arrange for the RPC/ Maintenance Management Organisation (MMO) contractor to carry out all actions in accordance with this Alert.
3.3. Any work required as a result of this Alert must be carried out in accordance with JSP 375 Vol 3 – MOD’s Safety Rules & Procedures.

3.4. Defects are to be immediately reported to the MMO and the Authorising Engineer, who is to ensure that any appropriate Operating Restrictions are applied.

3.5. On MOD Establishments occupied by United States Visiting Forces (USVF) responsibility is jointly held by USVF and DIO (USF). At base level this jointly managed organisation is to take appropriate action to implement the contents of this Alert. Where this Alert contains procedures which differ significantly from USVF practice DIO (USF) code of practice will be issued.

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julian.moore@fkiswitchgear.com
URGENT

From: Bernard Pentecost ENA Ref: DIN 2007/0094/00
Tel: 020 7706 5100 (Please inform switchboard that your enquiry relates to NEDeRS)
Fax: bernard.pentecost@energynetworks.org Date: 12 Nov 2007

DANGEROUS INCIDENT NOTIFICATION (DIN)
(This form to be used only if a SERIOUS injury or fatality has or could have occurred. See Engineering Recommendation R1/5 for notes of guidance on use)

Incident Date/Time: 8 Nov 2007 09:45

Manufacturer: FKI

Equipment: Circuit Breaker - Eclipse - FKI

Serial Number: 91252901/1

System Voltage: 11 kV Year Manufactured: 2005

Rating: Date Commissioned: 20/12/2005

Indoor/Outdoor: Indoor Date Last Maintained:

Op. Environment: No exceptional environmental factors

Area of Failure: Busbar Chamber

Cause(s): Partial discharge activity

Other Plant Affected: All busbars on three panel board (two circuit breakers and a right hand earth switch).

Hyperlinks: 1 DIN 2006/0140/00
Incident Description: Following a survey of Eclipse switchgear instigated by the failure detailed in DIN 2006/0140/00 the Eclipse switchgear located at Grafton Generation SW substation was found to be emitting high levels of Ultrasonic discharge (although at the time not audible). The substation was switched out for further investigation in conjunction with the manufacturer where evidence of severe corrosion was visible (the substation was commissioned in 2005). The corroded components were replaced and the switchgear returned to service with the right hand earth switch removed together with the accompanying barrier board. Some of the components have been taken to EA Technology, Capenhurst for further investigation. The manufacturer was also offered components for testing however, the offer was declined.

Injuries Sustained: None

Immediate Action: 2 Increased levels of Ultrasonic discharge have been detected in a number of substations containing Eclipse switchgear within CE-Electric both at primary level and distribution level. At one primary substation the source was similar to that discussed at the Partial Discharge User Group Forum. At distribution level the source has been similar to the conditions detailed in DIN 2006/0140/00. Investigations are on-going and an update will be issued if further relevant information becomes available.