



Gas Insulated Switchgear (GIS) CUSC Panel

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nationalgrid

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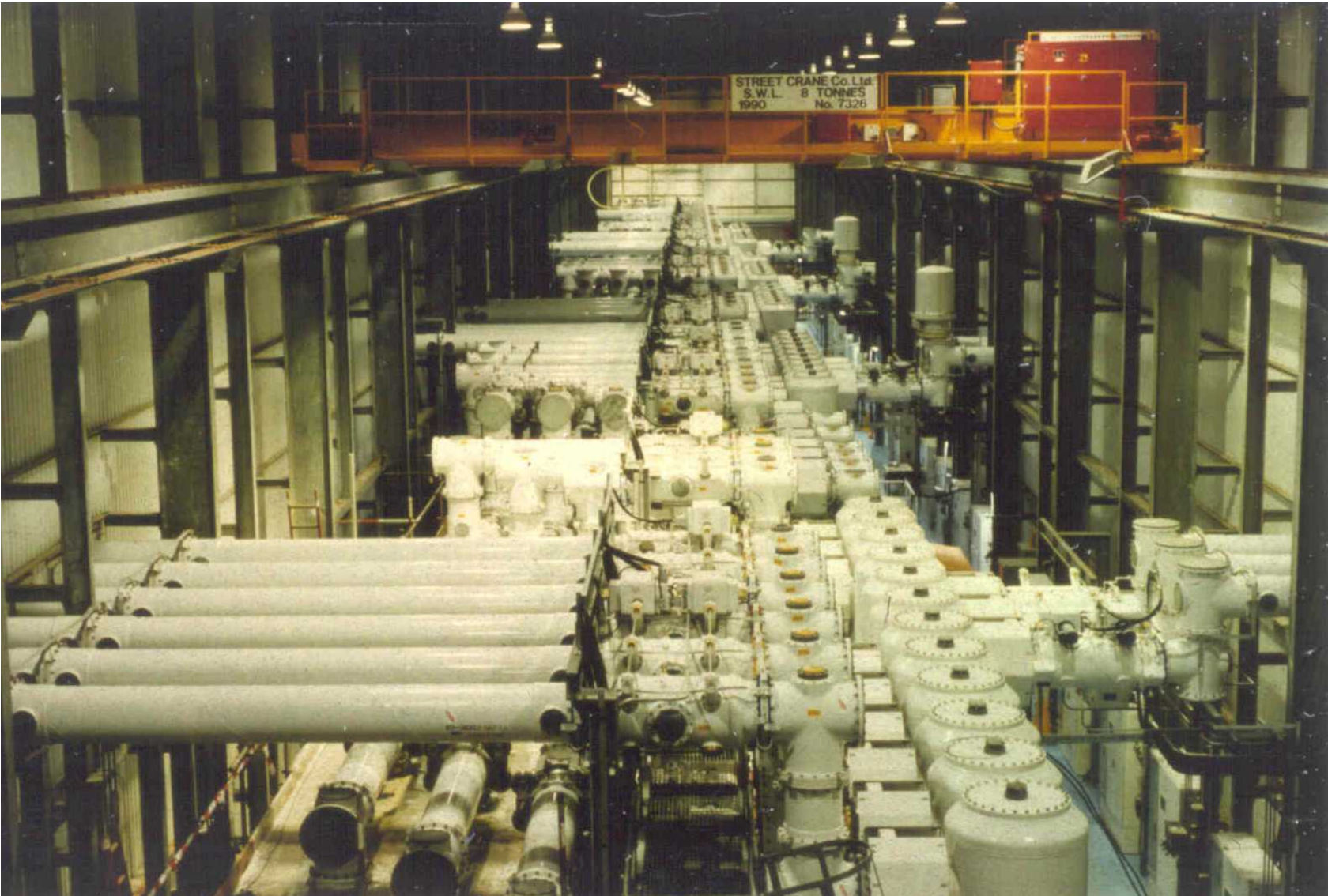
Background

- ◆ Issue raised by RWE at November 2007 GCRP
- ◆ Due to nature of the equipment it is difficult to identify a single construction and operational ownership boundary
- ◆ No international standard for GIS design (unlike AIS) in terms of dimensional standards
 - National Grid and UK market lack bargaining power within the global market

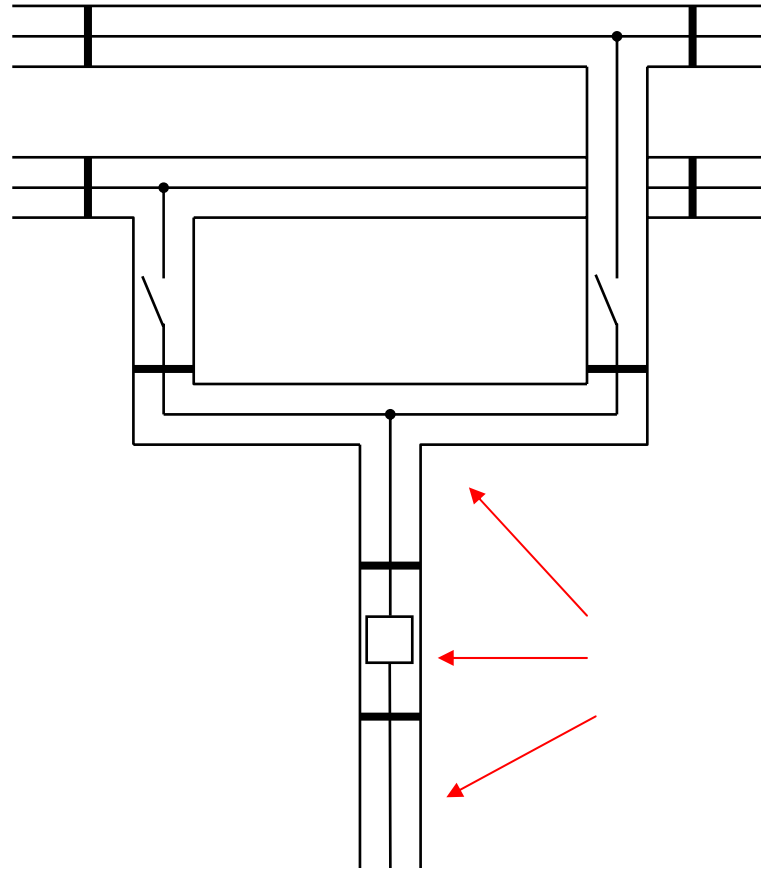
What is GIS Substation?

- ◆ A substation is generally used to connect transmission circuits, either to generators, distribution networks or to other transmission circuits. They also provide protection and control to the network.
- ◆ A 'standard' substation, with Air Insulated Switchgear (AIS) uses a large air gap (~4m) to insulate the live conductors from the ground
- ◆ Gas Insulated Switchgear uses ~0.4m of SF₆.
- ◆ GIS is often used in urban, coastal and high pollution areas although it has a higher capital cost (~£2m a GIS bay Vs. £1m AIS)

What does GIS look like?



Constructed with Gas Zones



Main GIS Issues

Construction:

1. Once National Grid has chosen a manufacturer there is no effective competition for provision of generator's bay
2. Could be more economical for a single party to construct all GIS assets
3. Nature of GIS assets impose non-standard ownership boundaries – Introduces additional complexity to connection offers and construction programme

Operational:

4. Ownership boundaries must be developed on a site by site basis – can lead to more complex operation and safety procedures for site owner

1. No Effective Competition for Provision of Generator Bays

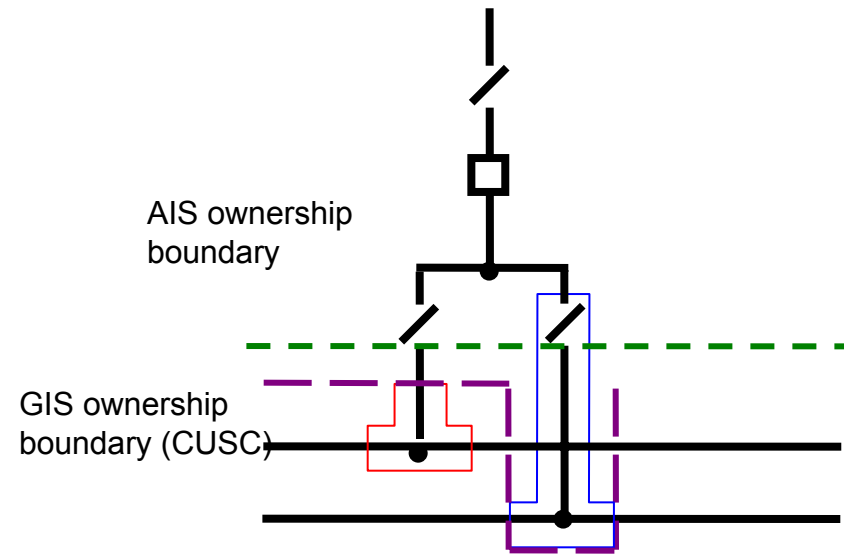
- ◆ **A generation connection site will often require licensed and unlicensed works**
- ◆ **National Grid will determine the type of GIS equipment required for licensed assets**
- ◆ **Difficult and costly to use another manufacturer's GIS assets**
 - No international standards
 - National Grid/ UK not a substantial enough player in global market
- ◆ **Limits User's procurement choice – National Grid can build as unlicensed works or a quote can be sought direct from the manufacturer**
- ◆ **Apportionment of capital costs to individual bays has limited transparency**
 - Risk of incentive to move cost away from majority asset owner

2. Economical for a Single Party to Construct all GIS assets

- ◆ **When National Grid is responsible for the construction of both licensed and unlicensed works construction process is complex**
 - ◆ For the licensed works National Grid is the client and the Alliance is the Principle Contractor whereas for the unlicensed element National Grid and the Alliance are subcontractors.
- ◆ **When Generator chooses to self-build this is further complicated by a joint commissioning process, with specific difficulties with coordinating outages. Additional resource and commercial agreements are required to manage interface issues between contractors**
- ◆ **AIS substations do not have similar issues as there are no shared gas zones**
- ◆ **Construction by a single party would also benefit from economies of scale**

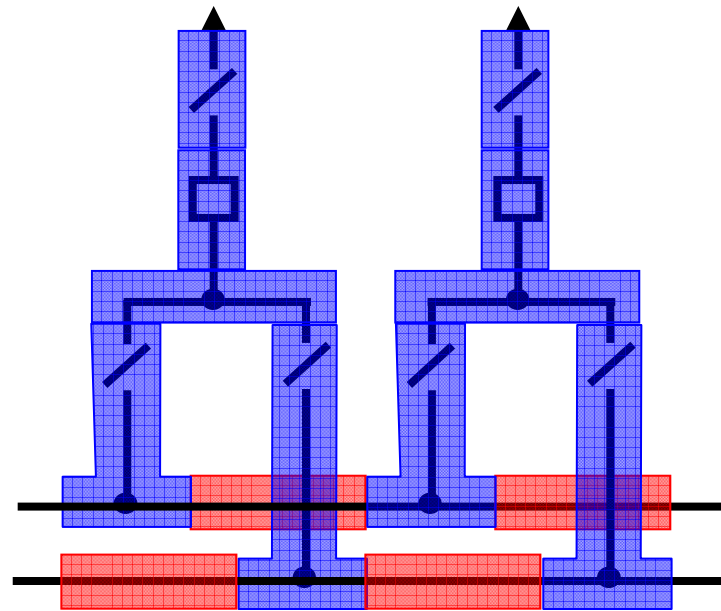
3. Non Standard Boundaries – Complexity for Contracts and Construction Programme

- ◆ CUSC 2.12 defines the electrical boundary and the default ownership boundary for GIS as the gas zone separators on the busbar side of the busbar selection devices
- ◆ Differences in manufacturer's design and application of non-standard boundaries for project specific reasons, leads to inconsistencies across sites
- ◆ Complex to implement contractually
- ◆ Connection offer delays can effect construction programme

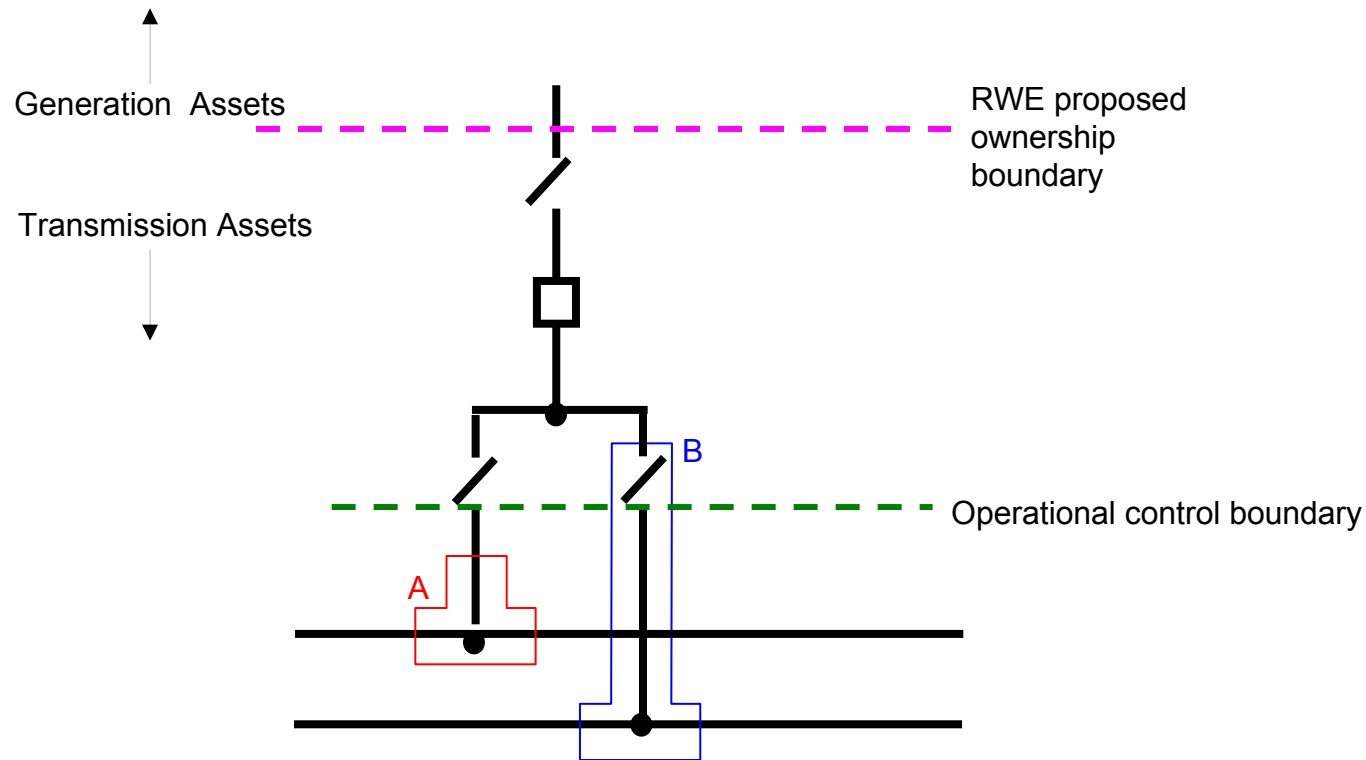


4. Site Specific Operation and Safety Procedures

- ◆ Site specific boundaries and their interaction with GIS gas zones creates complex and onerous operational and safety issues
- ◆ Best Practice is different at every GIS site
- ◆ E.g. “Tiger Bars”
- ◆ Adds complexity to:
 - ◆ Control
 - ◆ Asset Management
 - ◆ Maintenance
 - ◆ Safety management



RWE's Proposal



Ownership and electrical is moved to include all connected GIS assets at a GIS Substation e.g. up to the cable sealing/GIS to AIS termination