Practical Guidance for the Renewal of Gas Insulated Substations

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Problem; Need Upgrade!

Reliability/ Availability issues

- Increases in equipment maintenance cost/ end of life issues/ equipment failures
- Need more redundancy

New duty requirements

Need a plan & solution

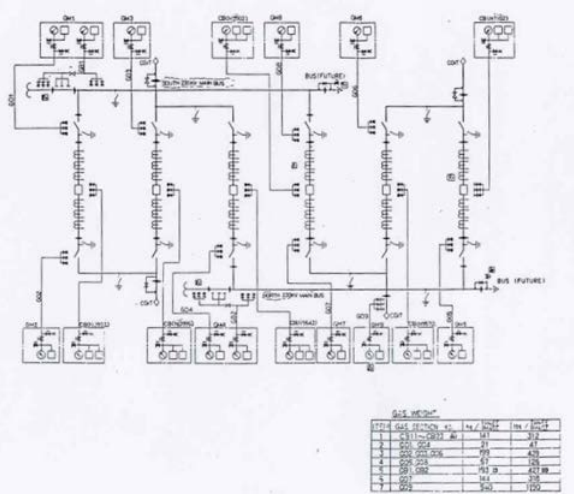
- Can we upgrade using GIS?
  yes & experience is available →
- Let's get started on a plan
  single line and ratings set the stage

Original Manufacture	Number of Renewal Projects
ABB 245kV	1
ABB 550kV	1
Alstom 145kV	2
Alstom 345kV	2
BBC 245kV	1
BBC 550kV	1
Hitachi 550kV	1
ITE 145	1
ITE 245kV	4
ITE 345kV	3
Westinghouse 245kV	2

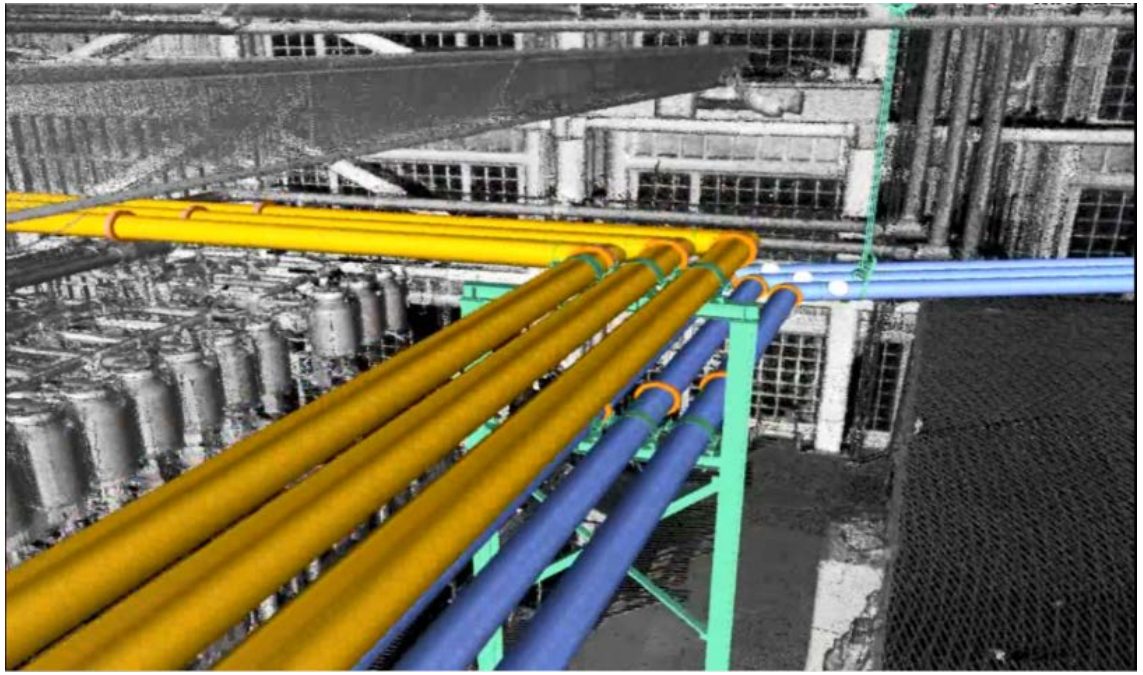
Table 1: North American GIS renewal projects involving GIS replacement performed by Mitsubishi Electric Power Products, Inc.

We need data about the existing Gas Insulated Switchgear

1. Single line & Gas Schematic



2. As Built configuration

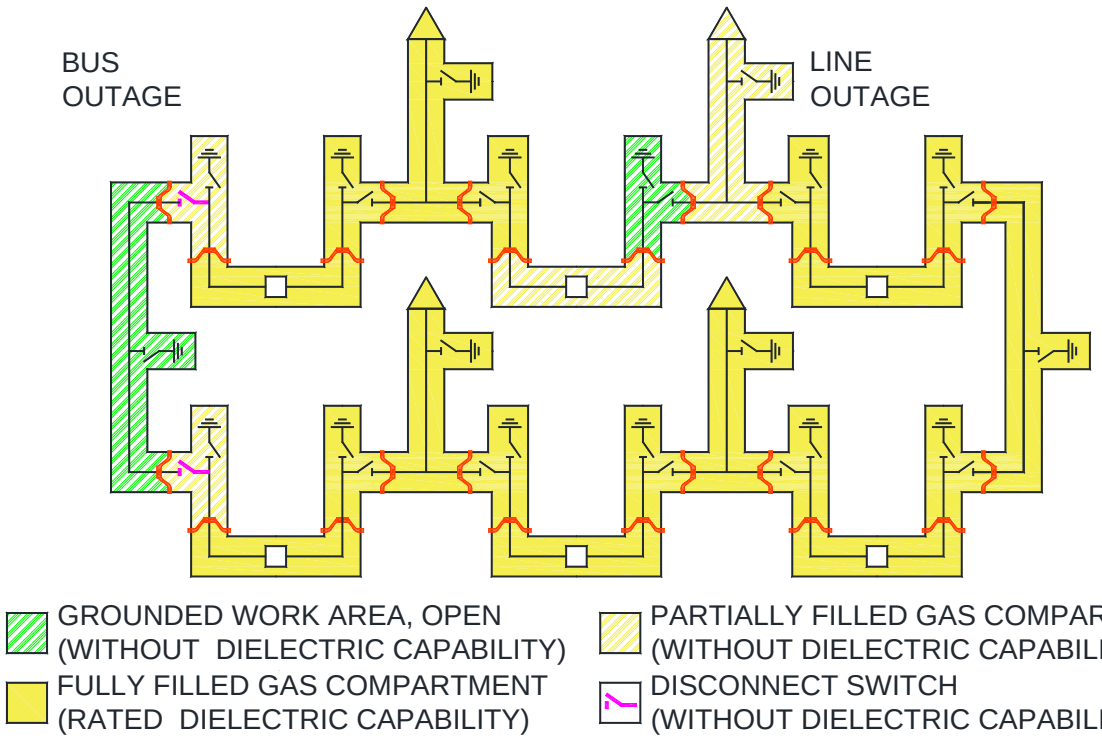


3D laser scanning is a cost effective way to document existing conditions.

Documenting existing conditions and visualizing new equipment design

Detailed Design, dealing with gas zones

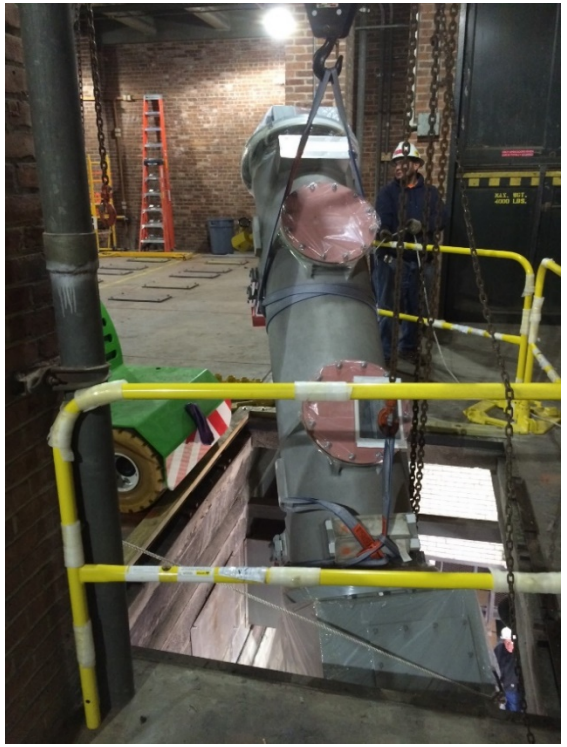
- All planning with GIS needs to consider that proper SF6 pressure is needed to maintain dielectric capability
- Also worker safety requires that work not be performed against pressurized gas barrier
- Manufactures may have recommendations of maximum pressure differential levels and durations for gas barrier



Typically with 7psig between full pressure and work area; work can be performed and manufacturer differential pressure requirements will be satisfied.

Practicalities of Construction

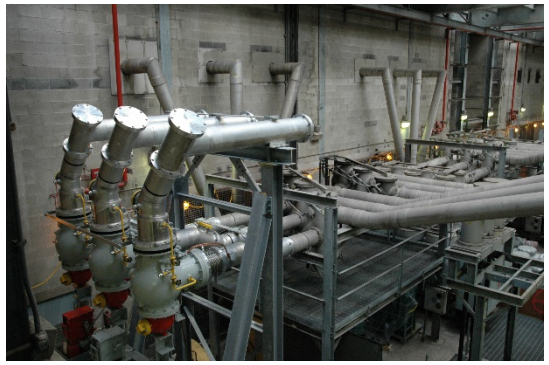
Need to consider what space will be available to move and install the new switchgear.



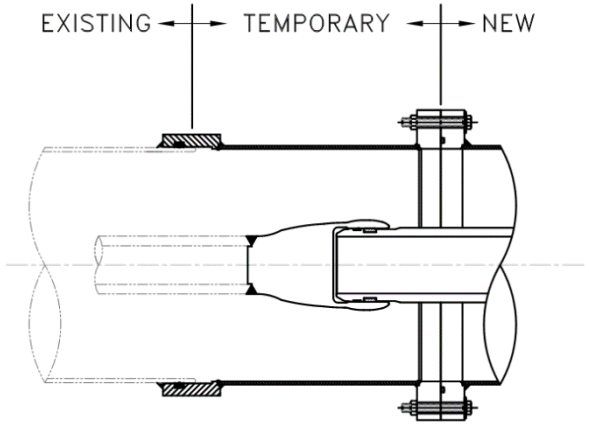
Practicalities of Construction- Maintaining Proper Gas Pressures

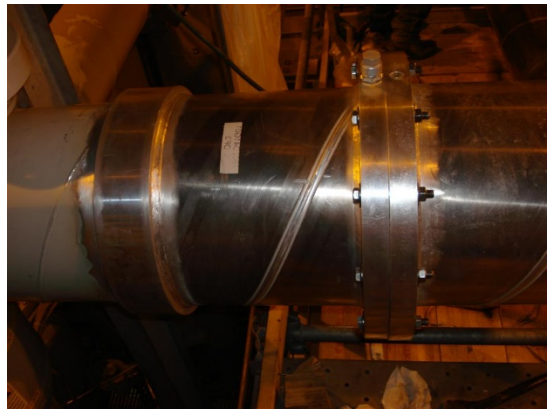
Full pressure cap added to existing GIS

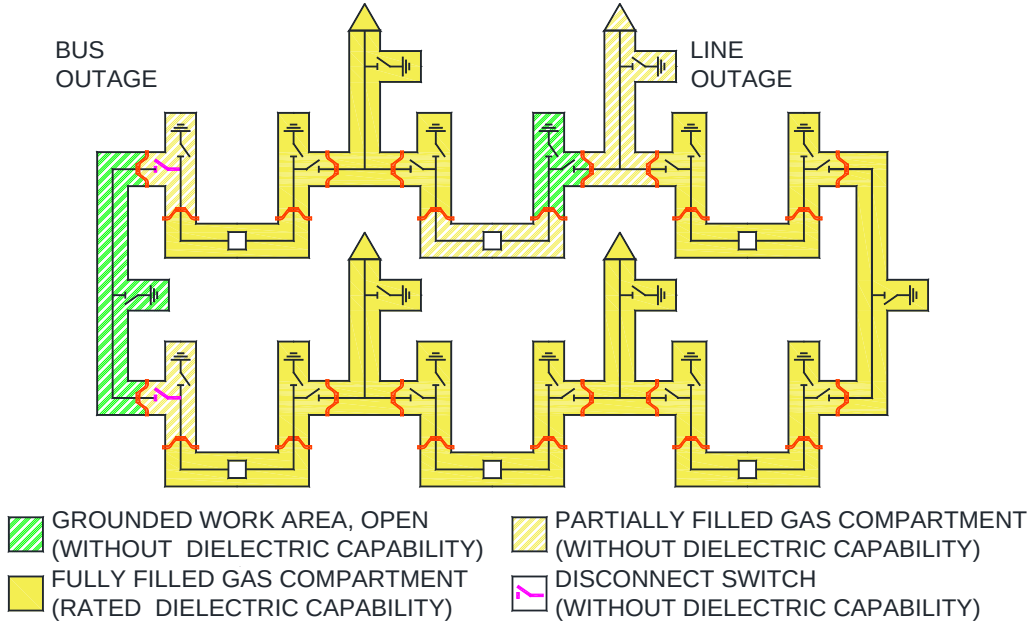
Adding a DS/GS



Cutting and welding a bus adapter to add a gas barrier







High voltage test considerations

The risk of testing at the normal 80% of the factory high voltage withstand voltage may be too high for old equipment

Plans must be made for the high voltage test connection points and the electrical clearances needed in air in to perform the testing with an open air test set.

Normally if tested in sections there is an open gap and grounded bus opposite the section to be tested. The GIS is not designed to be have test voltage on one side of the gap and system voltage on the other.