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PREF. SUBJECT : PS2
QUESTION N° : 1

Q .PS2.1 :
What are the management challenges to maintaining existing substations in both the short term and long term. What new ideas and concepts will provide insight on asset life extension and reduced cost while improving reliability?

Extension of GIS/GIB in 275 kV AIS for reliable grid separation of interconnecting large power sources

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1. Summary

This paper describes our experience that extension of GIS/GIB in 275 kV air-insulated substation (AIS) reduced costs and shortened project period to improve reliability in the event of large-scale power supply interconnection. In order to improve the reliability when interconnecting large power sources, it was necessary to add bus sections and a bus coupler to the substation. Since there was no space for the installation and the substation was composed of air-insulated facilities, site expansion and relocation of the transmission towers and overhead power lines were required. GIS/GIB allowed to add bus sections and a bus coupler without the site expansion and relocation.

2. Concept of bus section/coupler extension to existing 275 kV AIS

When large power sources interconnect to the power grid, the grid had to be separated to avoid the grid congestion as shown in Fig. 1. Additional bus sections and a bus coupler were required to improve reliability. If the air-insulated equipment were used in this time, additional equipment would interfere with the existing facilities as shown in Fig. 3. Therefore, this project would have the site expansion and relocation of transmission towers and overhead power lines. The project would have high costs other than substation facilities and be long term (over 5 years). Additional costs would be required to renew the aged steel structures in the future.

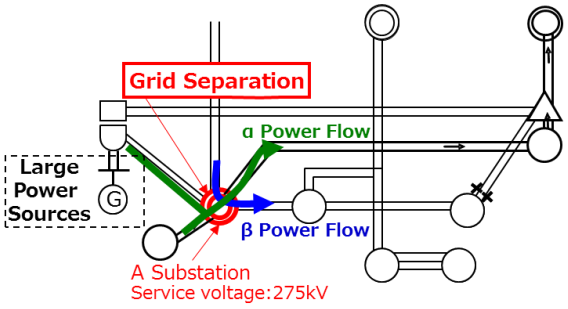

Fig. 1 Grid separation of power grid.

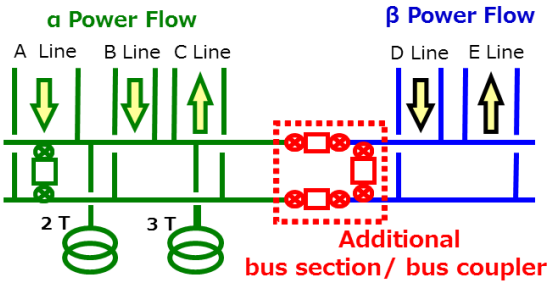

Fig. 2 Single line diagram.

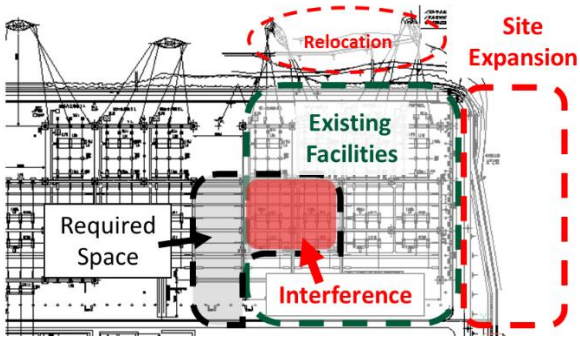

Fig. 3 Ground Plan
For air-insulated facilities extension.

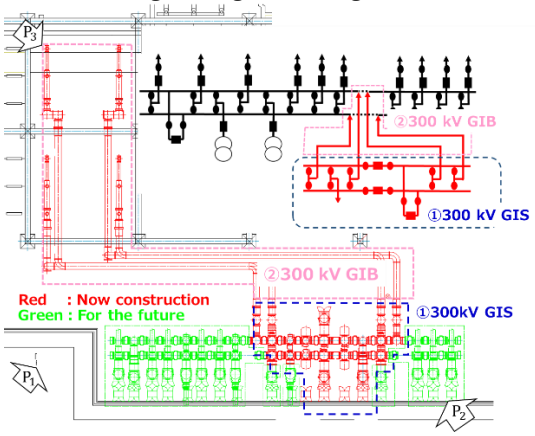

Fig. 4 Ground Plan and Single Line Diagram
For 300 kV GIS/GIB extension.

As shown in Fig. 4, the GIS/GIB allowed to add bus sections and a bus coupler without the site expansion and relocation of transmission towers and overhead power lines. GIS/GIB extension contributed to reduce the cost and shorten the project period (about 2.5 years). P_1, P_2, P_3 in Fig. 4 means the place that the photos were taken as shown in Fig. 5.

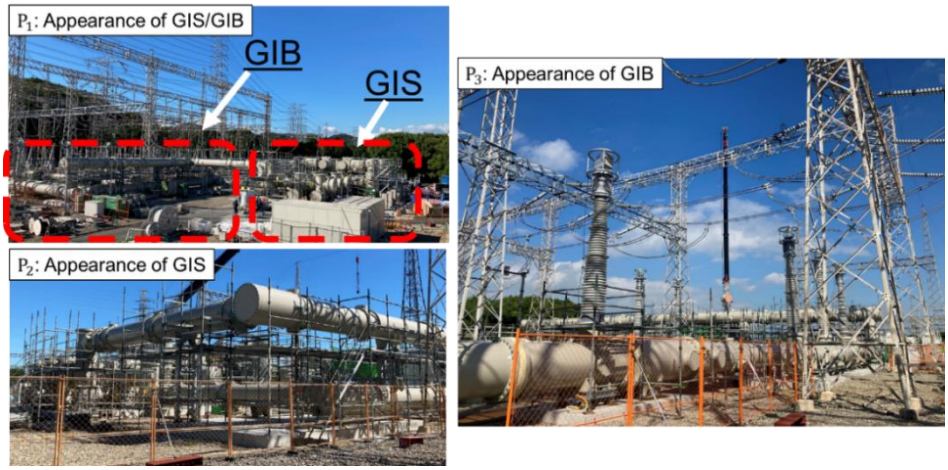

Fig. 5 Appearance of GIS/GIB

3. The future plan of GIS/GIB Substation

Based on the GIS/GIB construction work, the future vision of the substation was examined as shown in Fig. 6. In order to prevent salt pollution, to improve the grid reliability to interconnect large power sources, and to renew aged steel structures, all insulated facilities in 275kV were planned to change to GIS/GIB equipments. The future plan of GIS/GIB substation also has contribution to reduce costs while improving reliability in the long term. It is possible to renew the substation equipments while maintaining existing facilities with minimizing the outage period. Additionally, elimination of air-insulating facility will be able to allow removal of the salt pollution cleaning equipments.

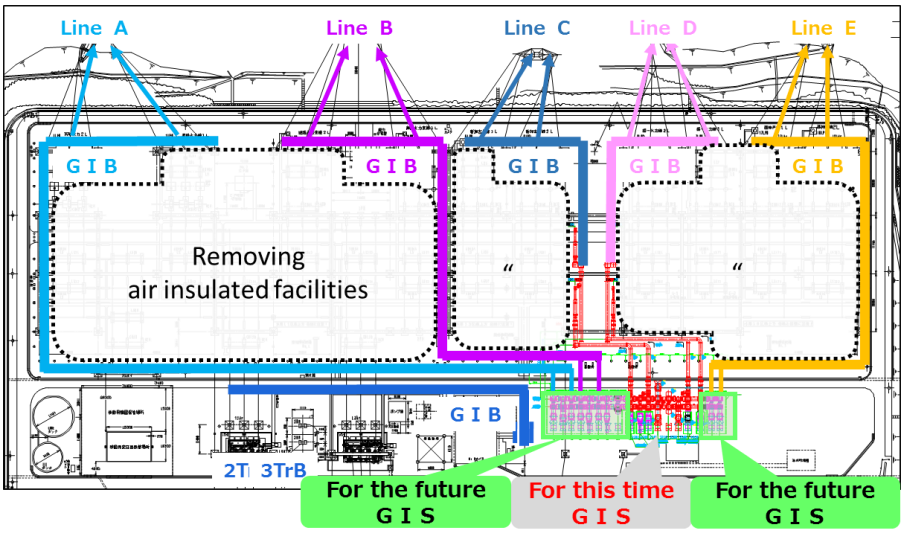

Fig. 6 The future plan of GIS/GIB Substation

4. Conclusion

When interconnecting large power sources, it was necessary to add bus sections and a bus coupler to the AIS, but there was no space to install them. Site expansion and the relocation of the transmission towers and overhead power lines were required. To solve issues, GIS/GIB were used to renew the substation. This approach improved the grid reliability, minimizes the outage period, and made effective use of the existing air-insulated facilities.