

PS1.3 What are the key changes to substation design and operation arising from the increasing deployment of Power electronic inverter-based technology and applications, what are the key interfacing challenges?

Nowadays, the amount of power electronic inverter-based technology is significantly increased into the power system. However, the connections of power electronic inverter-based devices can introduce many challenges to the substation design and operation. One of the key challenges is numerous data that must be monitored and controlled between power system and power electronic inverter-based device. For instance, the firing angle of the converters must be monitored so that the system operators can control the reactive power injection from the RC STATCOM.

To illustrate, STATCOM is one of electronic inverter-based devices. One of the characteristics is the fast response time comparing to conventional device. The bandwidth of the controllers used in power electronic devices is typically operated at 1000Hz, which is much faster than the bandwidth of the controllers used in conventional reactive power sources. Moreover, most of the inverter-based devices are compact and complicated design. To be implemented STATCOM in a substation, engineering design must meticulously be studied in all fundamental principles, operation, and maintenance. Furthermore, the hierarchy monitoring and control system are required with the fast action.

Besides, interfacing between existing substation equipment and inverter-based device must be considered. This requirement must be clearly defined and mentioned at the design stage so that the issue can be mitigated. For example, EGAT has mentioned in specification that the power electronic inverter-based device shall be compatible with National Control Center or Regional Control Center's communication protocol.

In addition, interfacing's limitation of the inverter-based device must be concerned. In the paper ID 10998_2022, the author has mentioned that the Relocatable Containerized STATCOM (RC STATCOM) can be parallel up to 4 units of ± 50 Mvar to achieve ± 200 Mvar, because the limitation of data processing, monitoring and control system.

In conclusion, the design engineer must thoroughly study their power system to meet requirement and limitation of the substation and power electronic inverter-based device. This will bring the most efficient in term of investment and technical.