PRESIDENCY UNIVERSITY
Private University Estd. in Karnataka State by Act No. 41 of 2013

School of Engineering

Department of Electrical and Electronics Engineering

A brief report of Industrial Visit

"KPTCL-Sir M V EDC 220kV/66kV/11 kV Sub Station, Bengaluru"

DATE: 28.10.2022

The Department of EEE, SoE, Presidency University has organised an industrial visit to " ***KPTCL-Sir M V EDC 220 kV/ 66 kV/ 11 kV Sub Station, Hoody divsion, Bengaluru*** " for 5 EEE 1 section students on 28.10.2022 (Friday). As a part of the curriculum, the department of EEE provides an opportunity for industrial visits to all the students. Total 41 students visited the industry accompanied by two faculty members. The team started from Presidency University at 9.20am and reached the Hoody substation at 10.45am.

Fig1. Industrial visit to Sir M. V KV EDC Sub-Station, Hoodi Bangalore

Sir M. Visvesvaraya 220/66/11 KV EDC Sub-Station is a Gas Insulated Substation established in the year 2015 in order to prevent overloading of 220KV lines in Bengaluru. The substation receives power from 220KV NIMHANS substation, 66/11KV Peenya substation and 66/11KV Nelamangala substation.

A gas insulated substations (GIS) are high voltage substation in which the major conducting structures are contained within a sealed environment with a dielectric gas known as SF6, or sulfur hexafluoride gas as the insulating medium. In comparison, a conventional (AIS) or Air-Insulated Substation, atmospheric air is the dielectric gas medium, as these types of substations are almost always located at outdoor locations.

GIS technology originally began in Japan in the 60's, where there was a critical need to develop substations with a greatly reduced footprint. GIS was slowly adopted by various other countries over the following years. After about 5 years of evaluation and testing, GIS system construction increased to about 20% of new substations in countries with severe space limitations. With GIS technology, the clearance needed for phase to phase or phase to ground for all equipment is much less than that of an AIS or air insulated substation. The total space required for a GIS is roughly a tenth of that needed for a conventional AIS facility. While the conventional, AIS requires several feet of air insulation to isolate a conductor, SF6 gas insulation only needs inches, allowing a GIS facility to fit into areas far smaller than that of a AIS facility. A GIS is mainly constructed where real estate space is expensive or scarce therefore it is required for the metropolitan city like Bengaluru.

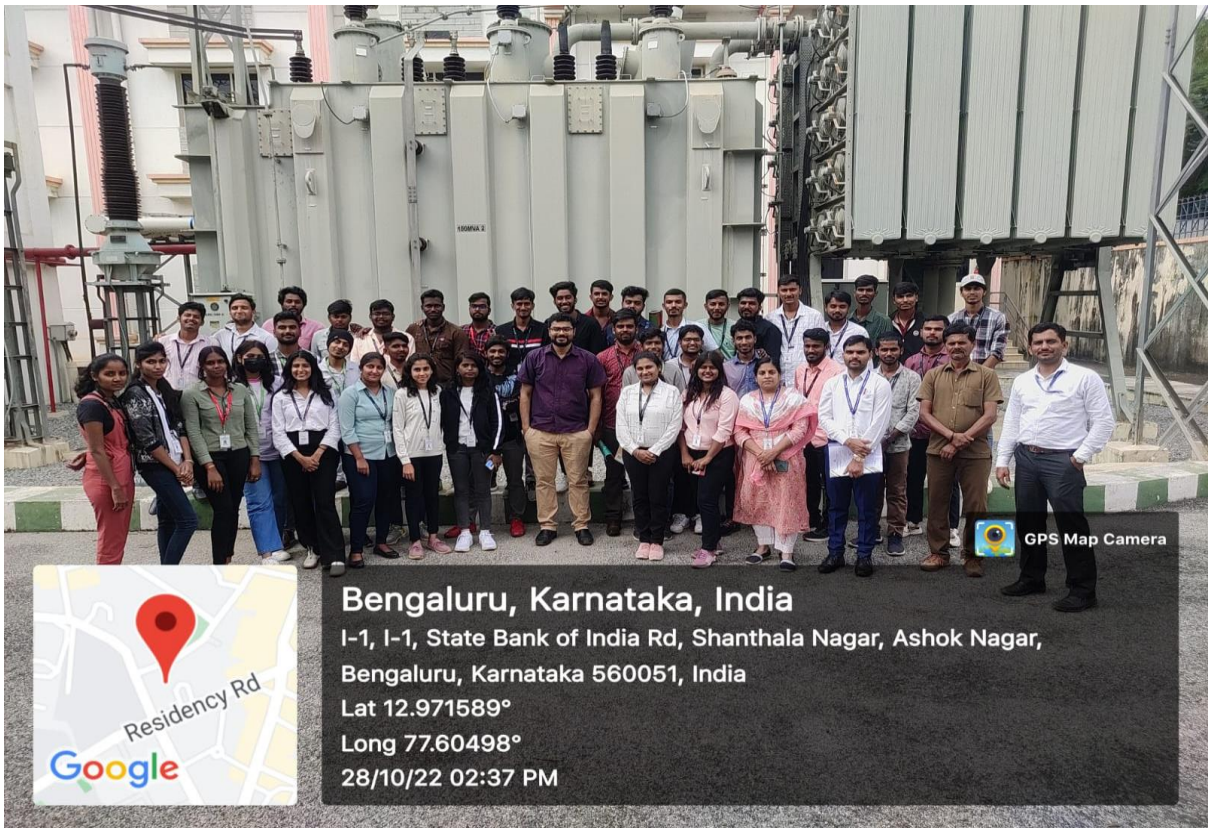

Fig 2 The Team with the KPTCL Engineer Mr Sumanth at the substation

The Team was received by the Mr Sumanth, Assistant Engineer, KPTCL. He gave a brief introduction about the need of the GIS substations and explained about the operation of

Sir M. V KV EDC Sub-Station. Then the officials explained how the entire power system operation is controlled using SCADA. Then Mr Sumanth started explaining about various installations in the substation. Double Busbar Configuration - Most GIS designs were initially developed for a double bus, single break arrangement. This popular approach has good reliability, and is simple to operate. Additionally, it allows for easy protective relaying , excellent economy, and provides a small footprint.

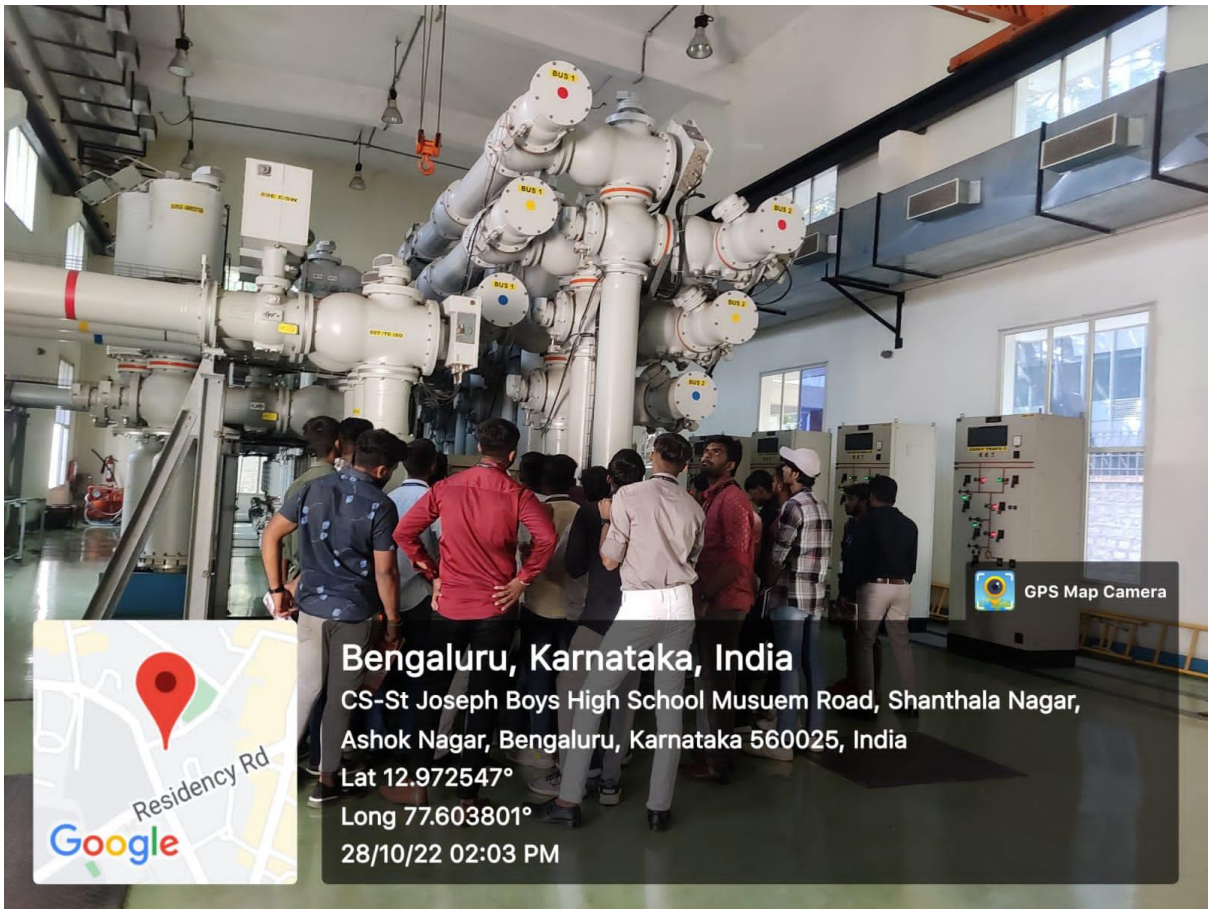

Fig 3. Mr Sumanth explaining about double busbar configuration in the GIS substation.

Sulfur hexafluoride is a nontoxic, inert and nonflammable gas consisting of a sulfur atom surrounded by and tightly bonded to six fluorine atoms. Sulphur hexafluoride (SF6) is the most common insulation gas in high voltage technology because of the electron attachment (electron affinity.) SF6 is around five times the density of atmospheric air at mean sea level, and has no color, odor, or taste. SF6 is almost purely water insoluble, and as with all other gases, its solubility decreases as the temperature of the water increases.

SF6 gas is enclosed in GIS systems at pressures between 400 to 600 kPa absolute. This pressure range is ideal, to prevent the gas from condensing into a liquid at the lowest potential temperatures which the equipment may be subjected to. SF6 is a gas in which the speed of

sound propagation is about three times less than in air, (at atmospheric pressure.) The sound of the interruption of the arc will thus be quieter in SF6 than in air.

Fig 4. Mr Sumanth explaining about the properties and maintenance of SF6 related to temperature, pressure, dielectric strength etc.

SF6 has a three times higher dielectric strength at 0.1 Mpa (1 atm or atmospheric conditions) compared to air. When the pressure within the GIS enclosure increases, so does the dielectric strength of the SF6 gas, due to the increase in density. At pressures such as those within a GIS enclosure, the dielectric strength of the SF6 gas can become much higher than that of atmospheric air. For connecting a GIS conductor directly to a transformer, a special SF6-to-oil bushing that mounts on the transformer is needed. Transformer side - The bushing connection is immersed in oil on the end with the transformer's high-voltage leads. SF6 gas side - has a removable link or sliding contact for connection to the GIS conductor. The bushing may be an oil-paper condenser type or solid insulation type. Because leakage of SF6 into the transformer oil must not occur, most bushings have a center section, allowing SF6 leaks to disperse into the atmosphere rather than the transformer.

Fig 5 Group photo of the Team in front of KPTCL-Sir M V EDC Sub Station, Hoody, Bengaluru

The team left the Sir M V EDC Sub Station, Hoody at 2.50pm and reached back at Presidency University at 4.15pm

Event Co-Coordinator's	HoD-EEE	Associate Dean-SOE	Dean-SOE
1. Mr. Ravi V Angadi	Dr. V Joshi Manohar	Dr. Shrishail. B. Anadinni	Dr. Abdul Sharief
2. Dr Jisha L K			

Head of the Department
Electrical and Electronics Engineering
School of Engineering
PRESIDENCY UNIVERSITY
Rajanukunte, Yelahanka, Bengaluru -64

Associate Dean (Core Branches)
School of Engineering, Presidency University
Rajanukunte, Yelahanka, Bengaluru - 560 064.

Dean, SoE
Presidency University
Bengaluru - 560064