



Technical Visit to HDVC Gurun, Kedah

By

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Introduction

On Monday, 15 June 2026, the Electronic Engineering Technical Division (eETD) of The Institution of Engineers, Malaysia (IEM) successfully organised a technical visit to TNB HVDC Gurun, Kedah. The visit attracted a total of 31 registered participants comprising engineers, academicians, industry practitioners from various disciplines. The objective of the visit was to provide participants with practical industry exposure to the operation, maintenance, and management of High Voltage Direct Current (HVDC) transmission systems, which play a critical role in ensuring the reliability and stability of regional power networks.

The technical visit was designed to enhance participants' understanding of HVDC transmission technology and its significance in facilitating cross-border electricity exchange, improving grid stability, and supporting regional energy security. Through this programme, participants gained valuable insights into the operational aspects of HVDC converter stations, power system control, grid interconnection, and modern electrical infrastructure that support Malaysia's power transmission network and ASEAN energy cooperation initiatives.

Technical Briefing

The visit commenced with a welcoming session and safety briefing conducted by Ir Mohd Alif Mohd Noor, senior representatives from TNB HVDC Gurun. Participants were subsequently introduced to the background, development history, and strategic importance of the TNB–EGAT HVDC Interconnection, which serves as a major electricity transmission link between Malaysia and Thailand.

During the presentation, TNB engineers explained that the TNB–EGAT HVDC Interconnection was developed to strengthen cross-border electricity exchange and improve the reliability of power supply between the two countries. Participants learned that the project originated from technical studies conducted in the early 1990s, followed by project inception in 1995 and implementation beginning in 1997. The HVDC interconnection achieved commercial operation in October 2001, marking a significant milestone in regional power system integration and cooperation.



Figure 1: Welcoming greetings by TNB HVDC Gurun

The briefing further highlighted Malaysia's existing international power interconnections. In addition to the HVDC link with Thailand, participants were informed of the TNB–EGAT AC interconnection established in 1981 and the TNB–Singapore Power AC interconnection commissioned in 1985 through submarine cables. These interconnections play an important role in enhancing regional energy cooperation, strengthening grid resilience, and supporting future ASEAN power integration initiatives.

The speakers elaborated on the technical and economic benefits of HVDC transmission technology. Participants learned that the TNB–EGAT HVDC Interconnection enables the sharing of spinning reserve capacity between Malaysia and Thailand, thereby improving overall system reliability and operational flexibility. The interconnection also facilitates economic power exchange between both countries by allowing electricity transfers based on system demand and generation availability.



Figure 2: Technical presentation by Ir Mohd Alif on development of the TNB–EGAT HVDC Interconnection.

Furthermore, the HVDC link serves as a strategic source of emergency power support during unexpected generation outages or system disturbances. The presenters emphasised that the project has also facilitated valuable technology transfer and knowledge sharing between TNB and EGAT in areas such as HVDC system studies, equipment design, operation, maintenance, and asset management.

The presentation concluded with an overview of the major components of an HVDC transmission system, including converter stations, converter transformers, thyristor valve systems, harmonic filters, protection systems, and advanced monitoring and control infrastructure. Participants gained valuable insights into how power electronics and control technologies are integrated to ensure efficient, stable, and secure operation of long-distance power transmission networks.

Facility Tour

Following the technical briefing, participants were taken on a guided tour of the TNB HVDC Gurun facilities. The tour provided first-hand exposure to the operational environment of one of Malaysia's most important cross-border power transmission infrastructures and enabled participants to observe the practical implementation of HVDC technologies discussed during the presentation.



Figure 3: Participants visiting the HVDC Control Room

Participants visited several key operational areas, including the control room, converter transformer yard, harmonic filter installations, valve hall viewing area, and other supporting facilities. During the tour, TNB engineers explained the functions of the major HVDC system components and their roles in facilitating reliable power transfer between Malaysia and Thailand. Participants were also introduced to the operation of converter stations, which convert alternating current (AC) to direct current (DC) for transmission and subsequently convert DC power back to AC for integration into the national grid.

The engineering team demonstrated how advanced monitoring, control, and protection systems are utilised to manage power flow, maintain system stability, and ensure operational safety. Participants gained valuable insights into real-time system supervision, preventive maintenance practices, fault management procedures, and the stringent operational requirements necessary to maintain uninterrupted power transmission through the interconnection.

The visit also highlighted the importance of electrical protection schemes, equipment redundancy, condition-based maintenance, and cybersecurity measures in safeguarding critical national infrastructure. Particular emphasis was placed on the strategic role of the TNB–EGAT HVDC Interconnection in enhancing grid reliability, supporting regional energy cooperation, facilitating emergency power support, and enabling economic power exchanges between Malaysia and Thailand.

Throughout the facility tour, participants had the opportunity to interact directly with TNB engineers and technical personnel, who shared practical experiences related to system operation, troubleshooting, maintenance planning, asset management, and future developments in the power transmission sector. The engagement session provided valuable industry perspectives and enabled participants to better appreciate the multidisciplinary expertise required in modern power systems engineering.



Figure 4: Participants attending the technical tour of the TNB HVDC Gurun facilities.

Conclusion

The technical visit to TNB HVDC Gurun, Kedah was highly informative and beneficial for all the participants. The programme successfully provided valuable industrial exposure to high-voltage power transmission systems, HVDC technology, converter station operations, grid management practices, and modern power system infrastructure.

Participants gained a comprehensive understanding of the historical development, operational principles, and strategic significance of the TNB–EGAT HVDC Interconnection. The visit highlighted the important role of HVDC technology in supporting national energy security, enhancing power system reliability, facilitating regional electricity trading, and strengthening cross-border energy cooperation between Malaysia and Thailand.

In addition to technical knowledge, the programme fostered stronger engagement between IEM members and industry practitioners while promoting continuous professional development among engineers. The knowledge-sharing sessions and facility tour provided participants with valuable insights into the challenges and opportunities facing the modern power transmission industry. The programme concluded with a souvenir presentation by representatives from IEM eETD to TNB HVDC Gurun as a token of appreciation for their hospitality and knowledge sharing, followed by a group photography session involving participants and TNB personnel.



Figure 4: Souvenir presentation by representatives of IEM eETD to TNB HVDC Gurun.



Figure 5: Group photograph of participants and representatives from TNB HVDC Gurun.