POWER ENGINEERING COMPETENCY FRAMEWORK FOR POWER ENGINEERING PROFESSIONALS IN PUBLIC SERVICE
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT

TSC Category	Digitalisation					
TSC Title	Substation Automation Systems Management					
TSC Description	Manage the upgrading of existing substations and switch rooms to digital substations using advanced substation automation systems (SAS)					
TSC Proficiency Description	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
				<Insert TSC Code>	**<Insert TSC Code>**	**<Insert TSC Code>**
				Interpret automation requirements and standards and their impact on SAS structures and functions	Review SAS architecture design and functions for compliance with requirement specifications, standards and cyber security requirements	Approve SAS proposals and evaluate performance standards for implementation of substation automation systems
Knowledge				• Substation automation system (SAS) structures and functions • Concepts of electrical grid data communication and electrical substation modelling • Data model and domain specific services • Ethernet based communication • Digital SAS architecture, topology and design • Definitions and roles of station and process bus • Application functions of SAS including control, monitoring, protection and evaluation • Cyber security fundamentals for utility automation and communication systems • IEC 61850 standard and other relevant regulations, standards and codes of practice	• Functional requirement specifications of a digital substation automation systems (SAS) • Transfer of process data and commands within and between Intelligent Electronic Devices (IEDs) and substations • Modern substation automation systems (SAS) architecture and design • Architecture of functions in SAS including control, monitoring, protection and evaluation • Evaluation procedures for physical system architectures • Cyber security technologies and standards for utility automation and communication systems • IEC 61850 standard and other relevant regulations, standards and codes of practice	• Existing power system and substations in Singapore • New developments in digital and automation technologies • Energy efficiency issues and challenges • Industry best practices and use cases on substation automation systems (SAS) • Tendering and contracting for SAS • Evaluation procedures for physical system architectures • Challenges and issues in upgrading and integration • Cyber security framework development and application • IEC 61850 standard and other relevant regulations, standards and codes of practice

Abilities				• Review proposals for SAS based on performance, availability, fault scenarios • Identify impact of requirement specifications on designing the architecture of a SAS • Analyse different solutions with respect to performance, availability, failure scenarios, repair rate and costs • Test SAS functions including process supervision, measuring and archiving, system supervision, control and interlocking, automatics, protection and self-supervision • Ascertain cyber security effectiveness and manage certificates and private keys Review compliance with industry standards, regulatory and project requirements	• Evaluate proposals for SAS based on selection criteria for the best solution for a given user specification and associated costs • Evaluate SAS architecture design including switchgear interfaces, station level interfaces, redundancy of functions and accepted degree of function integration as per requirement specifications • Evaluate SAS functions including process supervision, measuring and archiving, system supervision, control and interlocking, automatics, protection and self-supervision • Provide technical guidance on cyber security certificates and trust, secure communication and user management • Review compliance of functional architecture with the communication standard IEC 61850 • Review compliance with industry standards, regulatory and project requirements	• Approve proposals for SAS based on technical, economic, social and environmental considerations • Approve the most recommended digital solution for a given set of requirement specifications • Approve SAS architecture design and functions as per requirements, regulations and standards • Recommend solutions to issues on upgrading and integration • Review compliance with cyber security policies and standards including IEC and ISO standards • Recommend procedures to ensure compliance with the communication standard IEC 61850 and other relevant regulations and standards