

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

TSC Category	Decentralisation					
TSC Title	Energy Storage Systems Management					
TSC Description	Apply Energy Storage Systems (ESS) technologies with a good understanding of technical, economic and sustainability issues					
TSC Proficiency Description	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
				<Insert TSC Code>	<Insert TSC Code>	<Insert TSC Code>
				Apply knowledge of power engineering in tender specification and project management for implementation of ESS	Assess ESS technologies and impose conditions to harmonise interfacing requirements with power system network	Manage research and demonstration projects for adopting ESS with an understanding of power infrastructure capacity and the intermittency of renewable energy sources
Knowledge				<ul style="list-style-type: none"> • Interfacing requirements of ESS with power grids • Standalone system and grid connected ESS • Sizing of ESS for microgrids • Specifications and tender requirements of ESS projects • Limitations of ESS, including power range, energy density, efficiency and response time • Testing and commissioning ESS projects • Requirements for safety, efficiency and reliability of electrical installations according to Singapore standards and regulations 	<ul style="list-style-type: none"> • Simulation studies of ESS technologies • Impacts of ESS on the performance of power grids • Integration of intermittent generation sources (IGS) such as solar • Methods of demand forecasting and econometric models • Economics of energy supply and energy-environment interactions • Energy markets and the principles of energy pricing • Regulation and governance and issues faced in the energy sector 	<ul style="list-style-type: none"> • Regulatory and market frameworks for ESS in Singapore's electricity market • Impact of ESS on deferment of grid investments to meet short term peak demand • Development of cost-effective ESS solutions in Singapore • Policy on ESS applications such as ancillary services in frequency control, voltage regulation, spinning and standby reserve, black start services, peak shaving, load levelling, etc.

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<p>Abilities</p>				<ul style="list-style-type: none"> • Specify technical performance and procurement requirements of ESS projects • Evaluate third party ESS proposals • Witness testing and measurement to verify compliance with industry standards, regulatory and project requirements • Interpret testing and measurement data for compliance with performance requirements of bidirectional energy flow metering • Verify and approve ESS maintenance reports • Monitor performance of ESS installations • Identify ESS challenges and provide optimal solutions • Enforce regulatory requirements of ESS installations • Enforce regulation on ESS battery disposal 	<ul style="list-style-type: none"> • Evaluate and choose suitable ESS technologies for specific projects • Evaluate and adopt best-in-class ESS systems that have fast dynamic response, scalable, and cost-competitive • Conduct simulation study for performance verification of ESS proposals • Review design system configuration of ESS infrastructure, to include AI that facilitates automatic operation to optimise power grid performance based on data analytics • Analyse impacts of ESS infrastructure on power supply quality, reliability and demand capacity • Oversee operation and maintenance ESS infrastructure • Monitor & evaluate the performance of ESS infrastructure for continuous improvement • Identify ESS challenges and provide optimal solutions • Conduct an integrated analysis of energy systems and forecast the management of energy data and demand 	<ul style="list-style-type: none"> • Monitor technology trends and international practices in ESS adoption • Support the development of legislative packages to promote and regulate the advancement of ESS infrastructure • Support policies on ESS feed-in tariffs, taking account of demand management and balancing, operating reserve and peaking power management • Develop technical requirements and performance standards for ESS infrastructure • Collaborate with stakeholders to build ESS infrastructure in alignment with Singapore's energy policy and power grid infrastructure • Plan optimum locations for ESS infrastructure • Establish regulation on end-of-life battery disposal
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