Specification of Competency Standards
for the Automotive
Unit of Competency

Functional Area - Vehicle Servicing

Title	Master the complicated techniques of power systems on battery electric vehicles
Code	111759L4
Range	This unit of competency is applicable to technicians working at vehicle service and inspection departments. Practitioners should be able to master the operating principles of various types of battery electric vehicle systems to enhance the efficiency and accuracy of inspection and fault diagnosis.
Level	4
Credit	5 *(For Reference Only)*

Competency	**Performance Requirements**
	
	1. Knowledge (Power system of battery electric vehicles)
	• Master the use of special service tools, personal protection and first-aid equipment for relevant tasks.
	• The principles of electrical and electrochemical engineering:
	  ◦ Master basic theories of electricity and electrochemistry
	  ◦ Good understanding of the working principles of electric motors, generators and alternators, their output characteristics, and relevant electric power supply control methods
	  ◦ Understand the performance, structure, operating principles, characteristics, safety precautions, recycle measures and applicative limitations of different kinds of secondary batteries, including but not limited to lead acid batteries, sodium-based batteries and lithium-ion batteries
	• Electric energy management:
	  ◦ Good understanding of the methods of battery charging and energy control, traction power and regeneration regulation, and associated thermal control management, the structure and operating principles of all related components
	• Power systems of battery electric vehicles:
	  ◦ Good understanding of the layout, characteristics, structure and operating principles of different powertrains
	  ◦ Master the control principles of electricity supply and regeneration as well as the structure, functions and the common faulty functions of their related circuits and components

	2. Performance (Inspection, fault diagnosis and performance analysis of battery electric vehicle system)
	• Conduct inspection, fault diagnosis and analysis procedures according to fault symptoms (including recurrent or intermittent defects) of electric systems and related components, including but not limited to:
	  ◦ Efficiency declining in charging and discharging of battery, including the efficiency of electricity regeneration
	  ◦ Declining in acceleration and speed of vehicle
	  ◦ Shortened driving range
	  ◦ Inaccurate or unstable vehicle speed control
	  ◦ Abnormal operating temperature, such as traction motor, traction battery, power electronics, etc.
	  ◦ Occurrence of abnormal operating noise or vibration from the power system
	  ◦ Review the causes of defects and diagnostic methods; submit written report to seniors covering preventive measures, instructions on inspection and maintenance, as well as suggestions for improvement.

Assessment Criteria	The integrated outcome requirements of this unit of competency are that the practitioner being assessed shall prove that he/she is: • Capable of mastering the structure, functions, control and operating principles of the battery electric vehicle system, the rechargeable energy storage system including the onboard charger, and related sub-systems/components to enhance the efficiency and accuracy of inspection and complicated fault diagnosis; • Capable of mastering the characteristics of battery electric vehicle system output as well as the affecting factors, such as motor control efficiency, electric energy management and regeneration, thermal management, etc., to solve the complicated technical problems effectively and accurately, including noisy operation, driving range deficiency, hesitating or weak acceleration, and abnormal regeneration effect; and • Capable of compiling report covering preventive measures, compiling instructions on inspection and maintenance, and providing suggestions for improvement, etc., according to specific defects found in respective power systems.
Remark	The credit for this competency unit assumes that the practitioner already possesses extensive knowledge of battery electric vehicles and is familiar with the use of special service tools/equipment and the application of diagnostic principles. When working on the high-voltage electrical systems, the practitioner concerned should be a recognised competent person in electrified vehicles, such as a registered vehicle mechanic who has completed an electric vehicle – low voltage training course, or equivalent, and the servicing process should be under the high-voltage system power-down condition, which is confirmed by the checking result of special service tools / authorised competent person. If the live high-voltage system is involved during the operation, the practitioner concerned should be a recognised competent person in electrified vehicles, such as a registered vehicle mechanic who has completed an electric vehicle – high voltage training course, or equivalent. The major ordinance involved in this unit of competency is as follows: • Road Traffic (Construction and Maintenance of Vehicles) Ordinance • Occupational Safety and Health Ordinance (This UoC replaced 108741L4)