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## Vehicle Electrification System Standards

### V. Phase Drive Motors and Generators

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## V.b Overview of HV 3-Phase Electric Machines

### Overview:

#### The Role of the Electric Machine

- Vehicle propulsion
- Vehicle regenerative braking
- Vehicle coasting

#### Light Duty Powertrain Architectures

- Belted Alternator-Starter (BAS)
- Flywheel Alternator-Starter (FAS)
- FAS + BAS
- Integrated
- Electric Axle

#### Transmissions/Transaxles, Drive Units and eAxles

#### Power Density

- Induction vs Permanent Magnet
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### OEM Acronyms:

BAS, FAS, FAS + BAS, eAxle

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### Description:

The 3-Phase electric machine provides propulsion and generated electrical power to HEV, PHEV, and BEV architectures. Electric machines are rated in kW of electrical power and 3-Phase machines provide increased Torque and efficiency levels, when compared to Single Phase Alternative Current (AC) or Direct Current (DC) electric machines.

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### Outcome (Goal):

Students will be able to describe how vehicle electric machine propulsion, regenerative braking, and coasting modes; identify powertrain architectures and powertrain components; and define the term power density.

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### Objective:

Students shall be able to

1. Identify High Voltage Components for each of the Powertrain Architectures
  2. Describe the operation of Propulsion, Regenerative Braking, and Vehicle Coasting
  3. Describe operating modes of each Powertrain Architecture
  4. Compare and Contrast the differences between transmission, transaxle, drive unit, and eAxle Powertrain configurations
  5. Define the term Power Density.
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### Task:

Students will be able to describe how vehicle electric machine propulsion, regenerative braking, and coasting modes; identify powertrain architectures and powertrain components; and define the term power density in the provided pictures or diagrams, using OEM vehicle service, component supplier information, and DOE/NREL/INL/ANL vehicle electrification website information while using proper technical terminology, acronyms, and definitions.

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To comment or offer suggestions on this standard, contact Ken Mays:

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