

UNIT 3: Generators, Transformers & AI in Transportation



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Term	Description	
Generator	Generators are machines that provide electrical power, particularly during outages, ensuring our daily lives and businesses can continue uninterrupted. They come in various configurations to suit different needs. This <u>Michael Faraday</u> invention has a simple concept: Transform mechanical energy obtained from an external source to electrical energy as the output. Sounds simple, isn't it? Because it is! The generator doesn't make electricity. It uses mechanical energy to move electric charges in its coils, creating current in a circuit. Think of a water pump- it moves water but doesn't create it.	
Portable Generator	Compact and relatively affordable, these generators are ideal for temporary power needs. They typically come in various sizes and can run on gasoline, propane, or natural gas. Perfect for camping trips, power outages, powering tools at job sites, or providing backup electricity for essential appliances at home.	
Standby Generator	Permanently installed, these generators automatically turn on when utility power fails, ensuring seamless backup power for your home or business. They're typically more powerful than portable generators. Ideal for situations where power outages can disrupt critical operations or cause significant inconvenience. Common uses include homes with sensitive electronics, businesses that rely on continuous power, and medical facilities.	

<p>Inverter Generator</p>	<p>A specific type of portable generator, inverter generators offer quieter operation and cleaner power compared to standard portable generators. They achieve this by converting DC electricity to AC electricity with a smoother sine wave, making them suitable for powering sensitive electronics. Ideal for camping trips, tailgating, or powering sensitive electronics, even an electric car, during outages.</p>	
<p>Residential use of a standby generator</p>	<p>A standby generator, also known as an emergency, backup, or whole house generator, is the top choice for powering essential electrical equipment during blackouts or power loss. They activate automatically through an automatic transfer switch, ensuring uninterrupted power supply. Some models operate quietly, conduct weekly self-diagnostic tests, and can connect to natural gas or propane tanks. Lasting 15 years or more, these permanently installed generators provide round-the-clock emergency backup power.</p>	
<p>Uninterrupted standby power</p>	<p>Uninterrupted standby power is crucial for sustaining various industries. Industrial generators have become indispensable tools for meeting this demand, providing reliable backup power during utility outages or in off-grid locations. They come in various types, each optimized for specific applications. The primary types include Diesel Generators, Natural Gas Generators and Propane Generators.</p>	
<p>AC Generator</p>	<p>AC (Alternating current) This type of generator works on the principle of <u>Faraday's law of electromagnetic induction</u>, which states that electromotive force – EMF or voltage – is generated in a current-carrying conductor that cuts a uniform magnetic field. This can either be achieved by rotating a conducting coil in a static magnetic field or rotating the magnetic field containing the stationary conductor. The preferred arrangement is to keep the coil stationary because it is easier to draw induced alternating current from a stationary armature coil than from a rotating coil.</p>	
<p>DC Generator</p>	<p>DC (Direct Current) A DC generator is an electrical machine whose main function is to convert mechanical energy into electricity. When the conductor slashes magnetic flux, an emf will be generated based on the electromagnetic induction principle of Faraday's Laws. This electromotive force can cause a flow of current when the conductor circuit is closed.</p>	

<p>Transformer</p>	<p>Power transformers are electrical instruments used in transmitting electrical power from one circuit to another without changing the frequency. They operate by the principle of electromagnetic induction. They are used in transmitting electrical power between generators and distribution primary circuits. Power transformers are used to step up or step down the voltage in distribution networks. Since they have no rotating or moving parts, these instruments are considered static devices. These instruments work based on an alternating current (AC) electrical system.</p>	
<p>Pole-mounted and pad-mounted transformers</p>	<p>They are the most common used type of residential transformers. A residential electrical transformer is an electrical device used to convert high-voltage electricity into lower, safer voltages for use in homes and small buildings. Pole mounted types are the cylindrical containers you see hanging around electrical poles and pad mounted types are the green or gray boxes you see at the back or front of your houses.</p>	
<p>Low Voltage Dry-Type Transformers</p>	<p>These transformers are most often used inside commercial and industrial buildings for stepping the building service voltage up or down for a piece of equipment that operates at a different voltage.</p>	
<p>Planar transformers</p>	<p>used in electric vehicles to convert electrical energy into a usable form. This conversion is necessary for the operation of the vehicle, as it enables the powertrain to run efficiently and reliably. Planar transformers are increasingly being used in electric vehicles as a power conversion solution. With their compact size, high efficiency, and low profile, they are ideal for use in EVs. Planar transformers are used in battery chargers, onboard chargers, and any DC-DC converters. Planar transformers are also used in charging stations for EVs. They are used to convert AC power to DC power, which is then stored in the battery of the EV.</p>	