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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 23AUB201 – AUTOMOTIVE ELECTRICAL DRIVES AND CONTROLS

II YEAR / III SEMESTER

Unit 2 –Charging and Starting Systems

Topic : DC Fast Charging and Super Charger

DC FAST CHARGING

- **DC Fast Charging** refers to a high-powered charging method for electric vehicles.
- It delivers direct current (DC) electricity directly to the vehicle's battery, allowing for significantly faster charging compared to alternating current (AC) charging methods.
- Designed to rapidly charge electric vehicles, significantly reducing the time needed to recharge compared to standard AC charging.
- Commonly used in public charging stations, particularly along highways and in urban areas, to support long-distance travel and increase convenience for EV users.

DC FAST CHARGING

- **Power Levels**:
  - DC fast chargers typically operate at power levels ranging from **50 kW to 350 kW** or more.
  - Depending on the vehicle's battery capacity and state of charge (SOC), DC fast charging can replenish an EV's battery to **80% in 20 to 30 minutes**.
- **Range Recovery**:
  - Provides approximately **100-200 miles of range** in as little as **30 minutes**, depending on the charger and vehicle specifications.

CONNECTORS USED

- **CCS (Combined Charging System)**:
  - Widely used in Europe and North America.
  - Combines AC and DC charging capabilities into one connector.
  - Supports higher power levels (up to 350 kW).
- **CHAdeMO**:
  - Originating in Japan, used by several manufacturers including Nissan and Mitsubishi.
  - Supports DC charging typically up to **62.5 kW** (with newer versions offering higher power).
  - Requires a separate AC charging port for standard charging.
- **GB/T**:
  - The standard for DC fast charging in China.
  - Supports both AC and DC charging but differs in connector design from CCS and CHAdeMO.

DC FAST CHARGING

❖ Infrastructure

- **Installation**: DC fast charging stations require more robust electrical infrastructure due to the high power levels involved, often necessitating dedicated electrical upgrades and grid connections.
- **Location**: Typically installed at strategic locations such as highway rest stops, shopping centers, and urban areas to enhance convenience and accessibility for EV users.

DC FAST CHARGING

❖ Benefits

- **Reduced Charging Time**: Significantly cuts down the time needed for charging, making long-distance travel more feasible.
- **Enhanced Range**: Allows EV owners to recover range quickly, minimizing downtime.
- **Convenience**: Facilitates the adoption of electric vehicles by addressing range anxiety and enhancing the overall user experience.

DC FAST CHARGING

❖ Limitations

- **Cost**: The installation of DC fast chargers is more expensive than AC charging stations due to the required infrastructure and equipment.
- **Battery Health**: Frequent use of DC fast charging can lead to increased wear and tear on some battery chemistries, potentially impacting long-term battery life.
- **Availability**: While growing rapidly, the network of DC fast chargers may not yet be as widespread as traditional gas stations, particularly in rural areas.

SUPERCHARGER

- **Superchargers** are a specific type of high-power DC fast charging station designed primarily for electric vehicles (EVs), notably those manufactured by Tesla.
- Superchargers provide rapid charging for Tesla vehicles, enabling long-distance travel by minimizing downtime during charging.
- Supercharger stations are strategically located along maior highwavs and in urban areas to facilitate convenient access for Tesla owners.

SUPER CHARGER

❖ **Power Levels**:

- Tesla's Superchargers initially operated at **120 kW** but have evolved to the **V3 Supercharger**, which supports charging rates up to **250 kW**.
- The higher power levels allow for faster charging, typically replenishing about **75 miles of range in just 5 minutes**.

❖ **Connector Type:**

- Tesla vehicles use a proprietary connector for Supercharging, although recent updates have included compatibility with CCS connectors in some regions to allow other EVs to charge at Supercharger stations.

SUPER CHARGER

- **Network and Infrastructure**
- **Global Expansion**:
  - Tesla has deployed a vast network of Superchargers worldwide, with thousands of stations in North America, Europe, and Asia.
- **Station Design**:
  - Supercharger stations typically feature multiple charging stalls to accommodate several vehicles simultaneously, often with amenities such as restrooms and dining options nearby.

THANK YOU !!!