Power Electronics

modern Loads are very high.

technology that regulates, Processes and stabilizes the input electricity

↳ Power processors

→ Power Electronics and EV. (next Big thing)

EV charging Infrastructure

- Wired, wireless, Private, Public
  Battery, Offgrid.

(OCPI) protocol.

→ Common standard → Open charge point

- location is imp

Ports available. (EVSE) port

Connector s (CHAdemo, CCS)

chargers have to be universal

* Types of EV chargers

1) AC chargers - lvl2, lvl 1
   → u need an onboard charging system in the car

2) DC charger.
   → charger is directly connected to the Battery
   DC → rapid charger. Lvl 3 fastest

Differences - onboard vs Off Board chargers.

onboard -
rectifiers.
some ~~se~~ addition to the cost.

Types of
lvl 1 -
single

Types of connectors / interface

→ AC lvl 1 → AC plug.
if PEV's come with lvl 1 cordset
no additional equipment.

→ Standard
Nema connector and SAE J1772
connector.

8 hours at 120v can provide 40 miles
of charging.

slow chargers - lvl 1
common chargers - car will charge
in 5-12 hours
3 kw - 6 kw.
untethered / tethered cables

lvl-2 - fast charging
80 amperes / 19.2 kw
residential operate at low
conditions 7.2 kw, 30 Amp

~~kw 8~~

→2kw, 22kw.

·lvl-3

3 types of DC charging

S~~A~~AE, CCS, CHAdemo, Tesla.

CCS → can use all 3 levels at some extent.

Tesla → supercharger

But its very closed and unique.

Significance of Pins in Conductor

large, control, proximity pins

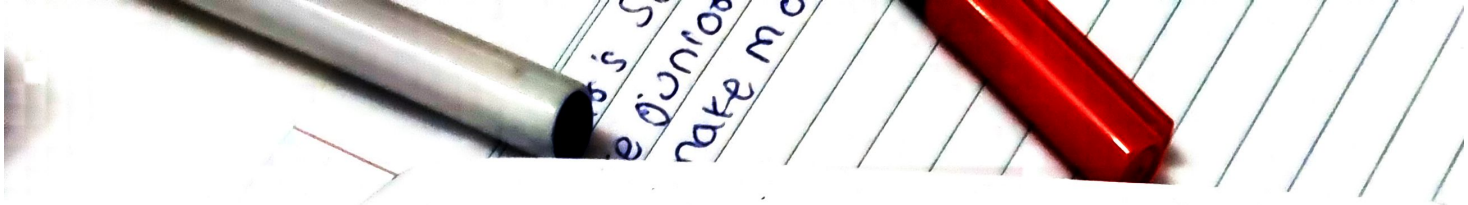
large → Powertransmission

Proximity → ensures connectivity

control → controls charging current By ~~sending~~ sensing pwm signal

another control pilot signal can be used to command vehicle to reduce max ~~current~~ charging current.

(4)



Types of connector

lvl -1

Single phase, →

tvl-2

+ three phase AC charging.

lvl-3

DC charger

→ 3 power and seven signal pins

Chademo

* CCS combo 1 and 2.

PLC → Powerline communication

Retrofitting is a problem

Wireless Charging Interface.

→ Inductive Charging.

→ lvl 2 operation

Battery Swapping
exchange your Batteries
at Energy operater outlet
only possible for lower power
rating.
'SOH. day by day decreasing

Battery specification for different
EV segments.

Battery management System
Evolution of Battery
- Lead-Acid Battery.
- Nickel cadmium Battery.
- nickel metal hydride
- lithium-ion Battery.
The Best choice among
all the other options

BMS → Battery management system

Topology

- Distributed → master controlled
  Modular → master-slave.
  Centralized → central.

Operation of BMS

- BMS monitors, cells, voltage, Battery Pack.
- uses master disconnect

State of charge (Battery capacity)

$$= \frac{\text{remaining capacity (Battery)}}{\text{total capacity (Battery)}}$$

State of charge (coulomb counting)

Charging current is measured and integrated over time to find energy in Battery

State of Health

$$= \frac{\text{total capacity}}{\text{total Beginning of life}}$$

- over temp protection
- No overcharge
- over discharge.
- under temp protection

Cell Balancing

Passive cell Balancing.

- Burns excess charge using Dummy load

turns on MOSFET for cell whose voltage is higher

- Active cell Balancing.

Examples → capacitor or inductor or remote cell connection

lossless cell Balancing
reduces loss and complexity
high voltage cell will be
removed.

- Over current protection

Enviromental and mech concerns
Ingress protection
To protect against liquid or
Solid particles
IP ratings.

EV
Protocals in charging.

- conventional EV charger.
vanilla charger
severe ripples, reduce efficience

Renewable Based mix Energy System