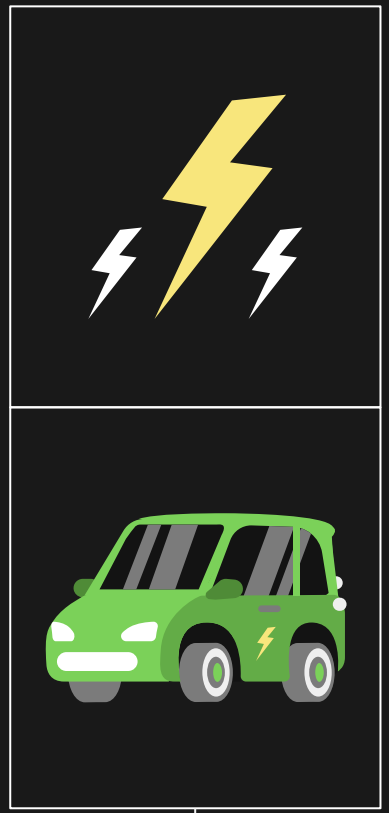
INDIA’S POWER GRID OF 21st CENTURY



INTRODUCTION

Solar power has a major share in renewable power generation in India

Power grids will help accommodate EV chargers in the future

Preparing for the future

- India is currently the fifth largest producer of solar energy.
- Independent small users contribute significantly at macro scale.
- Improving the renewable energy mix can help achieve the target of reducing emissions through EVs.
- EVs are still in early stages but recent developments look promising.
- Policies for stimulating foreign investments will uplift the overall infrastructure of EV industry.

Challenges

- Unavailability of required charging infrastructure.
- Lack of public awareness towards EV.
- Non-motivating return on investment in EVs.
- Inefficient current renewable mix for implementing 100% zero-emission vehicles.

Problem

01.

EV charging infrastructure

Government policies to adapt EV

Market Investment policies

SOLUTION

Fast charging, mainly along travel corridors with high charging power, to enable long-distance travel (DC high power charging).

Charging (near home) as a substitute for private charging

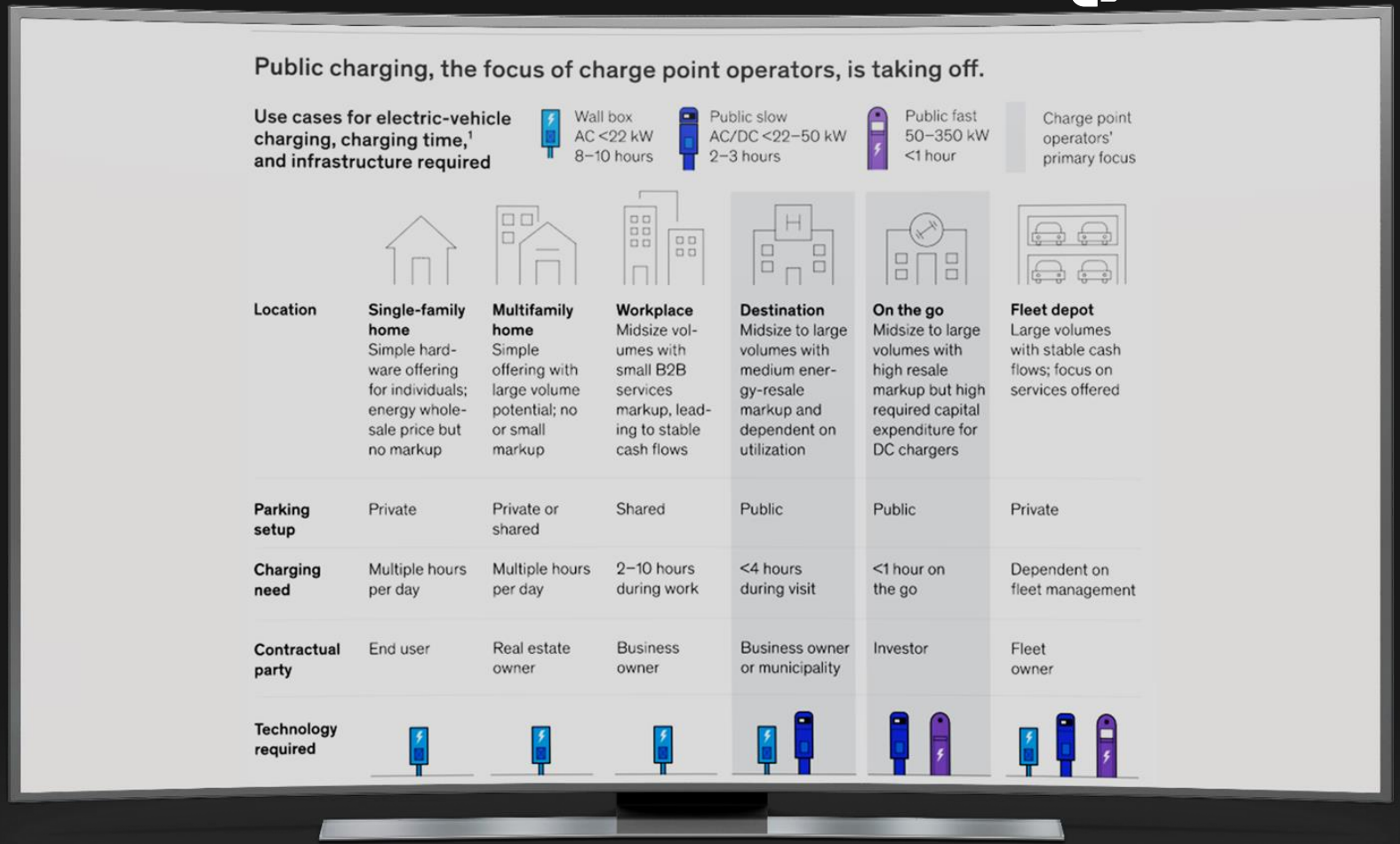
Charging at point of interest like grocery stores

< 10%

50-80%

15-25%

EV charging infrastructure at public & private level



Strategy to increase EV adoption

EV adoption picks up from now to 50% adoption)	EV adoption is close to (100%)
➢ Target market Tier-1 cities ➢ Development of charging within the city	➢ Target market Tier-2, 3 cities ➢ Development of charging across the city

Market policies

- Company-Employee EV Policy
- Filling Stations
- Parking location
- Cab companies
- Pollution car taxation
- Charge Ready Program
- Private EV companies
- Government Departments vehicles
- District Level Implementation Committee
- Creation of State EV Board

Problem

02.

Solar policy

Integration at transmission or distribution level

Utility scale or residential

Current Policies

The Rooftop PV and Small Scale Generation Programme aim to encourage the development of rooftop and ground-mounted solar systems.

The Clean Energy Cess was introduced to levy the initial amount of INR 50 now grown to INR 400 to every tonne of coal used in the country which provides up to 40 percent of the total costs of Renewable energy projects.

Potential Policies

Usage of wasteland — **17%** **WASTELAND**

Income Tax and Land Lease Exemptions

4 Years — **0%** **TAX** ↓ 8 Years — **50%** **TAX** ↓ 15th Year — **10%** **TAX** ↓

Sell Renewable Energy

Integration of solar PV

Distribution level integration

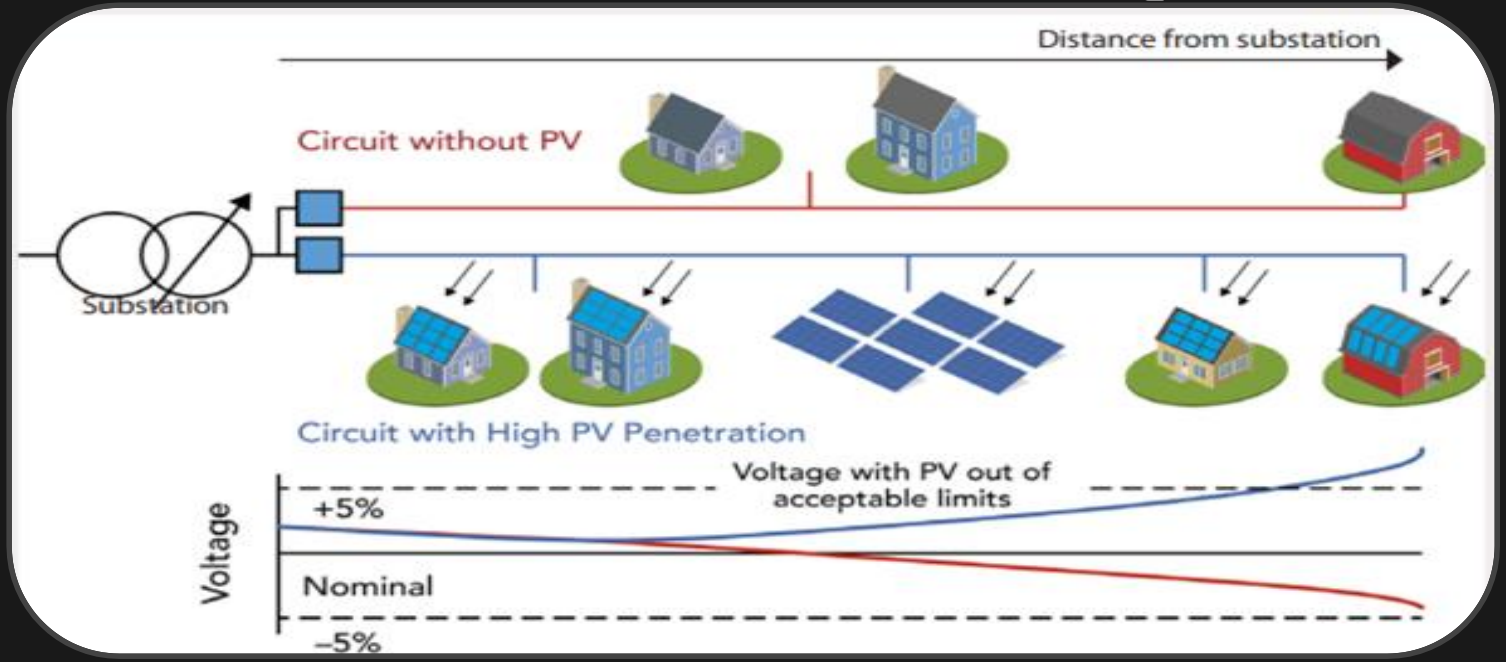
Small (1-25 kilowatt [kW]) PV systems

- **Generate electricity for on-site consumption and interconnect at low-voltage points of the grid, typically 600 volts and below.**

Deploying distributed PV

- **Reduce transmission and distribution line losses**
- **Increase grid resilience and lower generation costs**
- **Reduce requirements to invest in new utility generation capacity.**

CHALLENGES



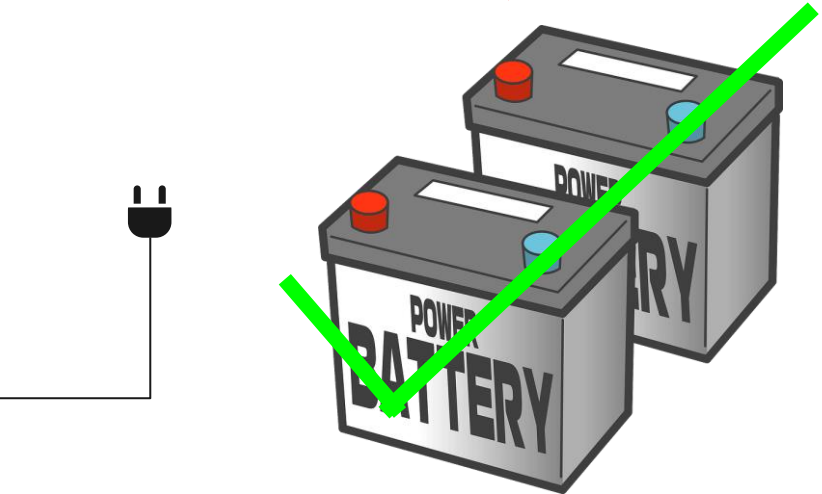
- **Distributed Generation (DG) power can flow in both directions.**
- **Traditional distribution and transmission planning do not address the benefits and challenges of DG systems.**
- **Quantifying the ability of distributed PV to reliably help meet electricity demand can be challenging.**

Problem

03.

Strategy for battery energy storage

Battery storage systems



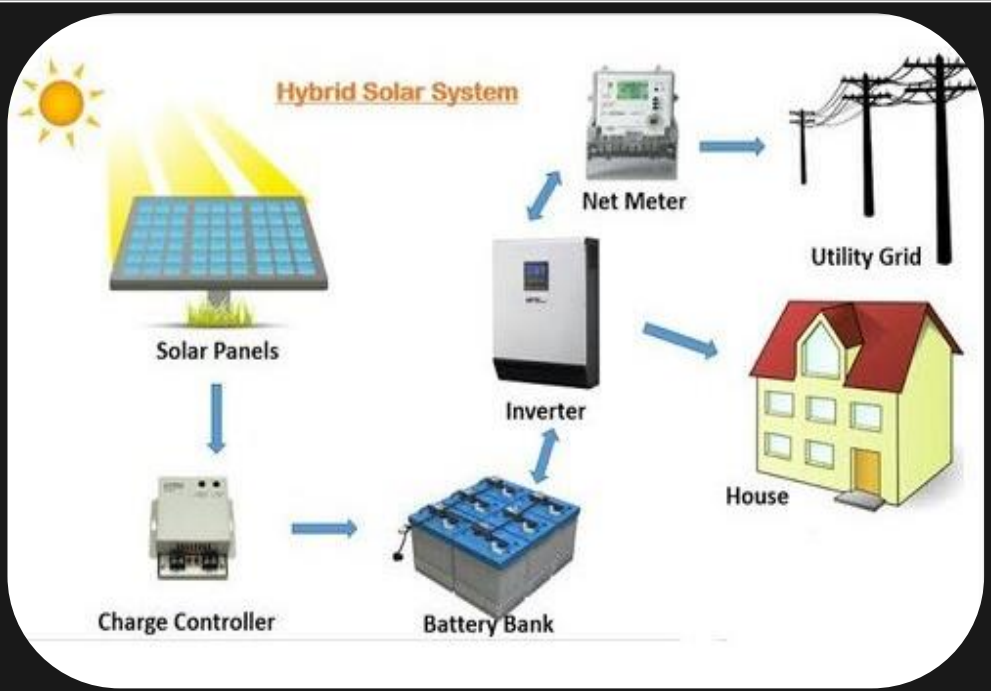
BESS

Battery energy storage systems (BESS), are devices that enable energy from renewables, like solar and wind, to be stored and released.

Deployment of BESS

1. **Transmission network.**
2. **Distribution network near the load centers.**
3. **Co-located with Variable Renewable Energy (VRE) generators.**

Hybrid Solar Power System

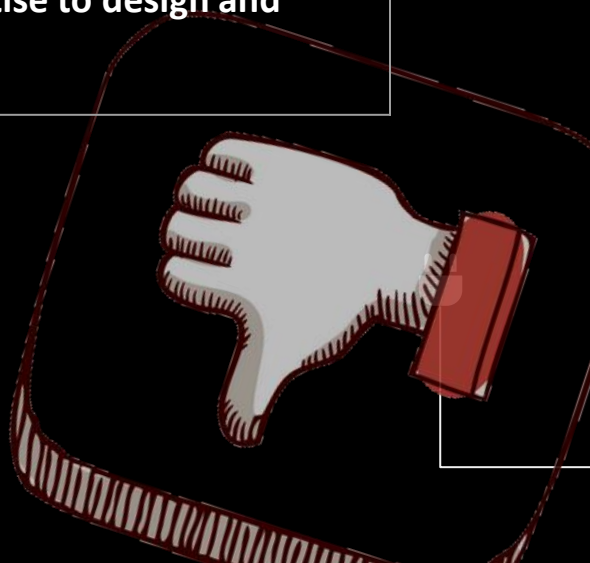


A hybrid solar power system is similar to a grid-tied solar power system but comes with an energy storage system.

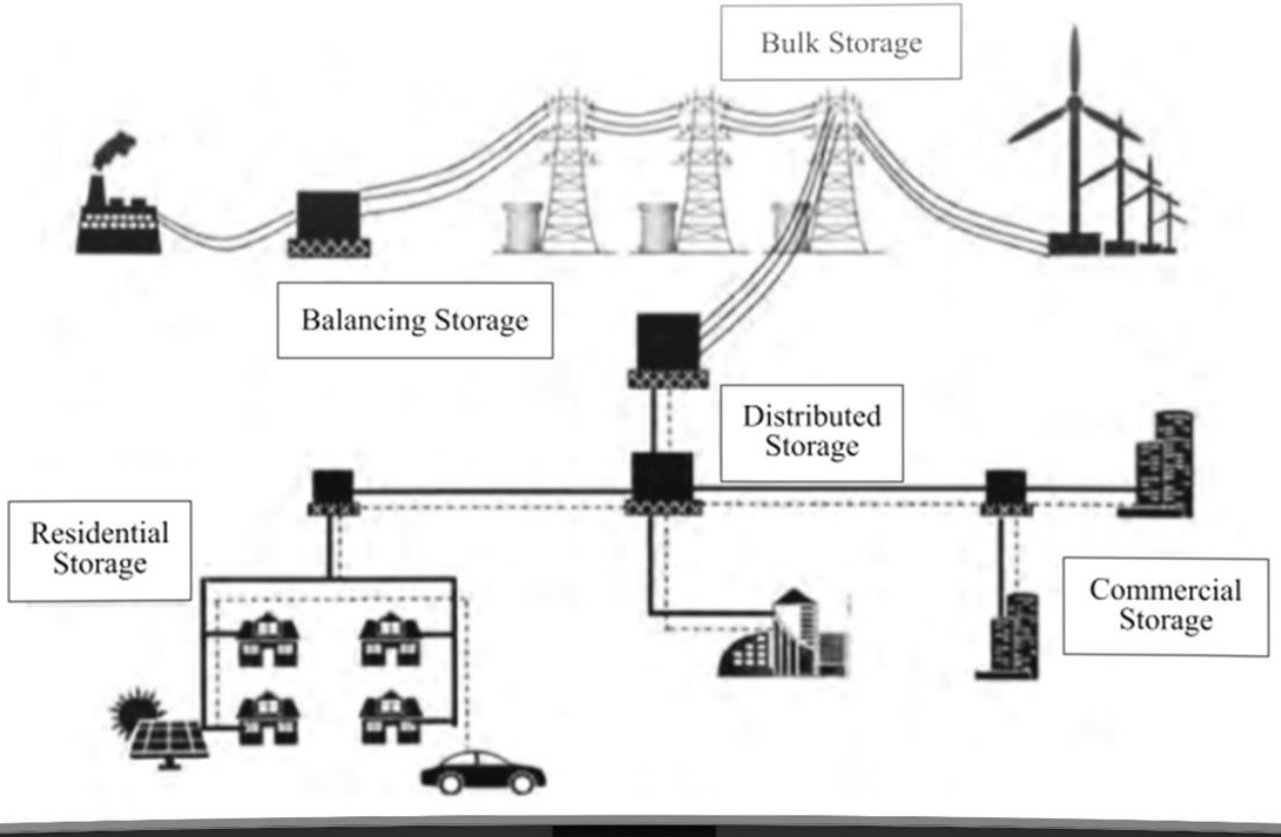
In the last couple of years, this type of solar power system are becoming very popular.

A well-designed hybrid solar power system provides dual benefits like reducing the electricity bill and providing backup power during a power outage.

Pros	Cons
The excess solar power is utilized to charge batteries & stored for later use when production is lesser than demand.	The system costs more as the batteries needs to be changed regularly.
The battery provides additional opportunities to save money as the energy storage system makes sure it is using its power instead of the power of the grid.	This solar power system is more complex as it may require a solar installer with a higher level of expertise to design and install.



The Hybrid Battery Energy Storage System



Advantages of this system

- With proper storage systems, we can ensure that there is no power shortage in any conditions.
- Distributed energy decentralizes the grid.
- Hybrid system has lesser generation and transmission losses, and also similar to transmission networks it helps during peak energy demand periods.
- Energy flows bi-directionally according to the demand, impacting other utility customers served by the same distribution circuit.

Problem

04.

Complete electrification of vehicles

Profitable EV investment

Promoting DER usage

Incentivizing Evs

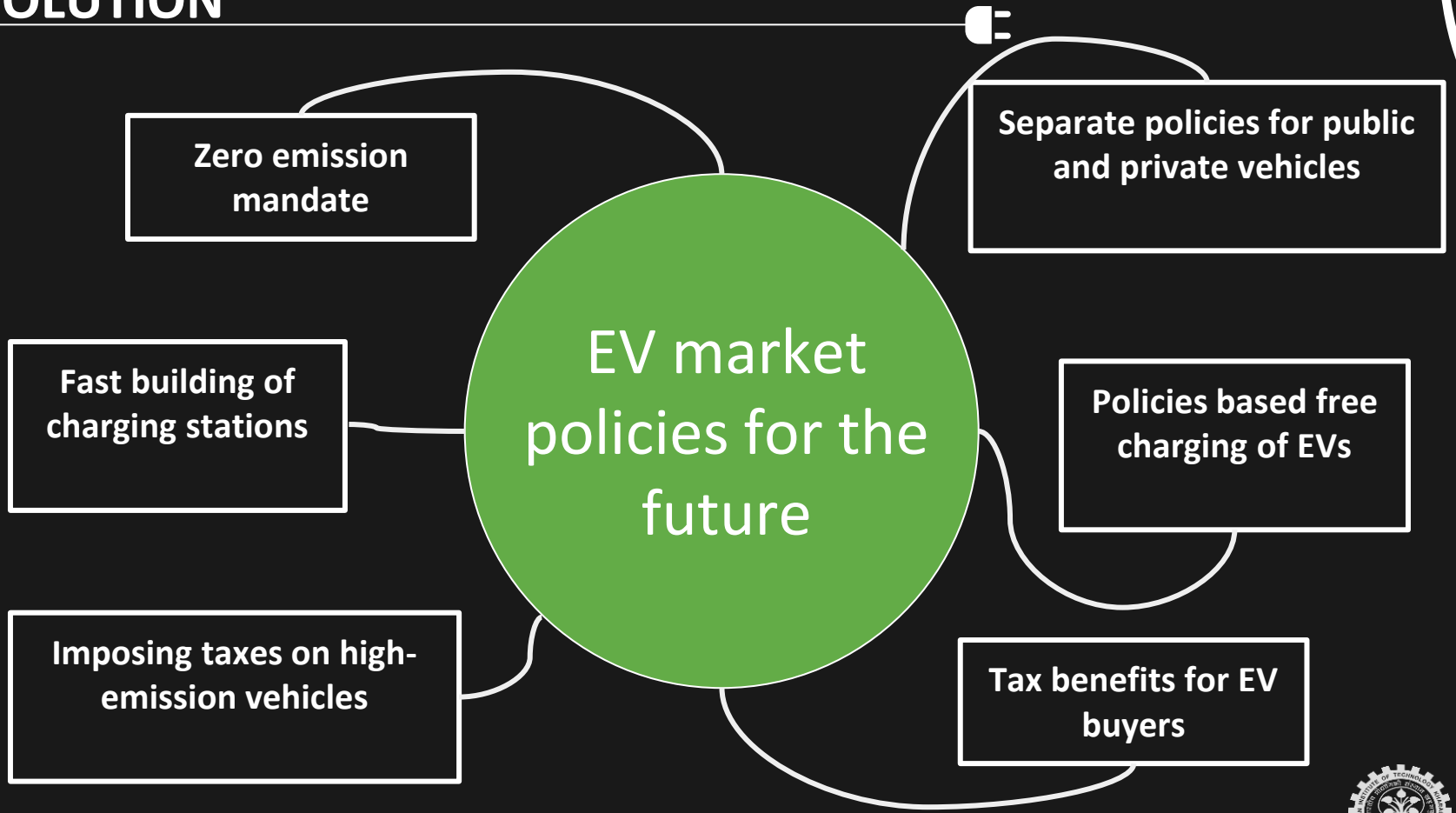
Energy Transition

SOLUTION

Improving the renewable energy penetration.

- Presently India produces 150 GW of renewable energy.
- Excluding large hydro power, solar energy has the largest share.
- Solar rooftop (SRT) and Solar-Wind Hybrid plants are still unexplored in India.
- Offshore wind power is another promising technology the government has identified.

SOLUTION


Zero emission mandate
Separate policies for public and private vehicles
Fast building of charging stations
EV market policies for the future
Policies based free charging of EVs
Imposing taxes on high-emission vehicles
Tax benefits for EV buyers

EXISTING POLICIES

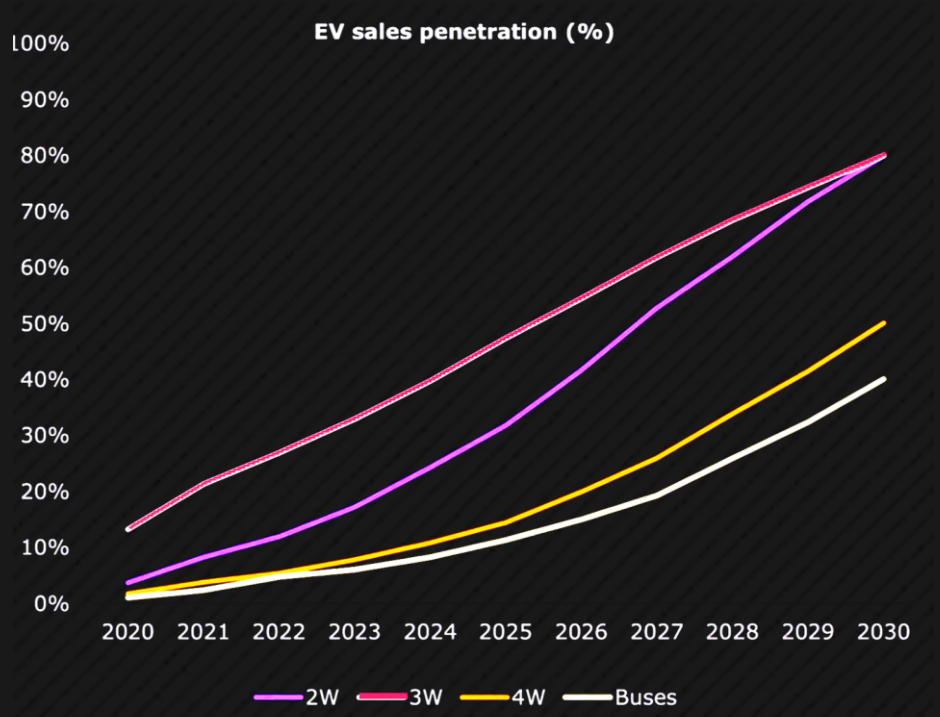
FAME-II

- Faster Adoption and Manufacturing of (Hybrid) Vehicles in India.
- Includes subsidies for buying pure-electric and hybrid EVs.
- A budget outlay of Rs 895 Cr was laid out in the first phase.

- FAME-I was launched in 2015, for promoting adoption of EVs.
- FAME-II, the second phase of EV schemes, has now been extended till March 2024.
- A total of 1,24,415 vehicles have benefited under the scheme.

RESULTS

- Complete electrification will help reduce global carbon footprint
- Recent developments indicate promising boom in EV sales penetration.
- Grid transition and DERs will play an important role in this.



Problem

05.

Policies Accelerating Energy Transition

Additional Revenue , Incentives to customers

Policies

Feed In Tariff

This is a policy designed to accelerate investment in renewable energy technologies by providing them remuneration ("tariff") above the retail or wholesale rates of electricity

Every kilowatt-hour energy generated from a renewable electricity facility receives a confirmed technology-specific feed-in tariff for 20 years.

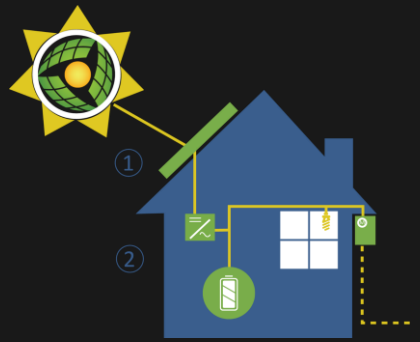
Policies

Power Futures Market

Power futures market acts as a platform for price fluctuation management and the risk reduction in power market transactions and will help improve the safety of the entire power system.

Residential Energy Storage System

Pilot programs that let utilities pay battery-equipped households for using their stored power when needed



Revenue , Incentives to customers

Revenue through production

Revenue can be earned by sending excess Renewable Energy produced to the grid.

Exempting EVs from certain taxes

Exempted electric vehicles from consumption and sales taxes in the initial phase.

THANK YOU