Kerala's EV Startegy

Towards 1 million EV's in Kerala by 2022

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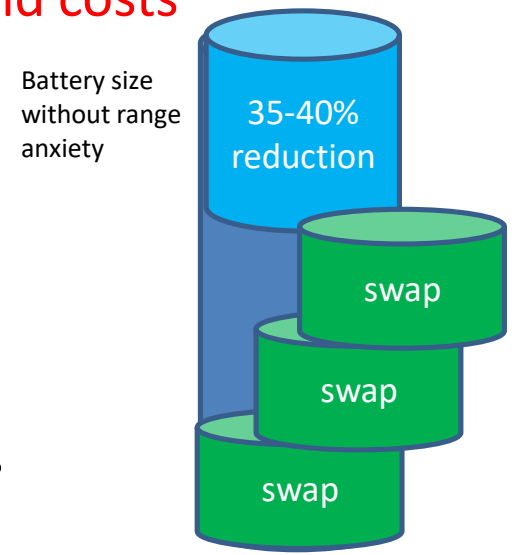
Kerala Recognised

Year	Li battery costs per kWh
2012	USD 600
2015	USD 450
2017	USD 250
2020	USD 150
2024	< USD 100

- EV is the future: four times higher energy efficiency and 50% less moving parts
- India has low affordability and can afford minimal subsidy
  - EV must make business sense
  - Battery contributes to 50% of costs: falling rapidly over last five years but still expensive
- India's vehicles different from that in most of the world
  - 79% two-wheelers, 5% Autos and e-rickshaw, 3% Buses and large goods vehicle
  - 12% Economy Cars (< ₹1 million) and 2% Premium Cars (> ₹1 million)
- 98% of public and affordable vehicles: not the focus of the rest of the world; India could attempt to get leadership here

Strategy for EVs for Public Transport

- Higher efficiency Wh/km (kms/litre of petrol) reduces battery size, weight and costs
  - For e-autos in last one year: from 70 to 80 Wh/km to 45/50 Wh/km
  - E-buses: from 1600 Wh/km to 900 Wh/km



- Split battery into smaller size (one third) and swap
  - No waiting time to charge battery: no public infrastructure required
- Battery-life severely affected by Fast Charging at 45 deg C
  - Swapped battery can be charged in conditioned environment and in two hours to maximise its life
- Separate vehicle business (without battery) & energy business (battery)
  - Capital cost similar to that for petrol / diesel vehicle
  - Operation cost today same as petrol / diesel vehicle
    - WITH no SUBSIDY; but lower GST for strictly three years
- Drive volumes aided by Public procurement

EV Strategy for Private Transport (2/4-wheelers)

- Batteries dominate the cost of an EV (Tesla uses battery for 540 kms)
  - and also vehicle weight (reducing the energy efficiency or kms/kWh)
  - Smaller battery creates range anxiety
    - Use Public Fast Charger: waiting time + public charging infrastructure: takes an hour to charge battery
    - Fast Charge in 15 to 20 minutes: needs expensive batteries (life impacted as temperature crosses 40°C)
- Suppose EVs have a small low-cost battery with limited range built-in: Affordable
  - Example: 100/ 50 km range for e-car / e-scooter: Enough within cities for 90% of days
  - Use only night-time Slow Charging: maximising battery life
- When one needs to drive longer distances (10% of days)
  - use a RANGE EXTENDER battery to overcome range anxiety
    - Swap-in a second (swappable) battery doubling the range at a petrol pump (3 to 5 minutes)
    - Swap the swappable battery again for still longer range (300 kms or 400 kms)

Proposed Kerala Strategy

- Target : 1 Mn EVs on road by 2022
- Enable 15k + 25k + 50k e-autos year-wise from 2019 onwards
- 4W/2W Range Extension battery-swapping
- KSRTC to transition its fleet of 6000+ buses to electric by 2025
  - Long-range buses with large batteries; city-buses with swapping
- KSEBL to setup charging stations; swapping by private players
- Incentives
  - Road tax to be fully exempted for initial 3 years
  - Incentive of ₹30k on 3W
  - Subsidized electricity (₹5 - ₹5.50)

Vehicles on Drive

Pilot with Battery swapping at CBEEV, IITM Campus

Test vehicle with school kids, residents and staff in IITM campus

To

- India needs innovative approach
  - Or will be flooded by imports in f
  - Kerala can show the way
- Time is of essence
  - Several industries and start-ups have worked hard over the last few years
    - They need to be encouraged and see a continuous forward movement
  - More focus on Make in Kerala/ India and start-ups and R&D institutions
    - With attempts to preserve India's GDP and grow jobs
- Can we do it by 2030: Certainly

- Vehicles: Ashok Leyland, Tata Motors, Mahindra, Eicher, Bajaj, Kinetic, Lohia, Electrotherm, Goenka, Hero-Eco, Okinawa, Ather, Avon Cycles, TVS Motors
- Li Ion Battery and recycling: Exide, Amar Raja, Exicom, ACME, Grintech, Greenfuel, Ion Batteries, Attero, Sun-mobility
- Energy Operators: Essel Infra, Sun-mobility, BPCL, NTPC, PGCIL, Kerala DISCOM, Goldstone
- Chargers, Motors and Monitoring: Delta, ACME, Exicom, TVS Motors, Esmito
- Most State Governments, STUs

For deeper understanding, look at the blog "understanding the EV Elephant": https://electric-vehicles-in-india.blogspot.in/2017/12/