

# Role of Digitisation and e-commerce in Indian Economic Growth

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# Three engines of e-commerce growth

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## E-payment

- Mobile payment
- Net-banking
- Credit card

## Communications

- Internet Viewing, experiencing and ordering on line
- Social media: recommendations / opinion

## Transport

- Affordable packet delivery at homes / offices
- GPS, tracking, shared transport

*Smart-phones and 4G have accelerated it*

# Business flourishes with Digitisation

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- Access to **markets** across Geography
- Access to **suppliers, components** across geography
- Access to **technology / knowledge**
- **Coordination** of production across multiple Centres
- Coordination of wide-scale **distribution**
- **Access** to financial status and finances

But above all Enabling

## **New Business Models**

Ola and Uber example: have totally changed transport and added huge efficiency

Let us examine another sector: **Electric Vehicles** and the role of Digitisation

# Why is Electric Vehicle (EV) the future transport?


*Better efficiency with less number of moving parts*

| Area                       | Petrol / Diesel | EV       |
|----------------------------|-----------------|----------|
| Energy efficiency          | 17 – 21%        | 90 – 95% |
| Moving parts (reliability) | 2000+           | 20+      |

- In **five years**, EV capital costs will be less than that of petrol vehicles
  - with acceptable range and **operational costs at a fraction** of that of petrol vehicles
- But if we wait, India will **import most EV sub-systems** and batteries instead of oil

*Falling battery costs*

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

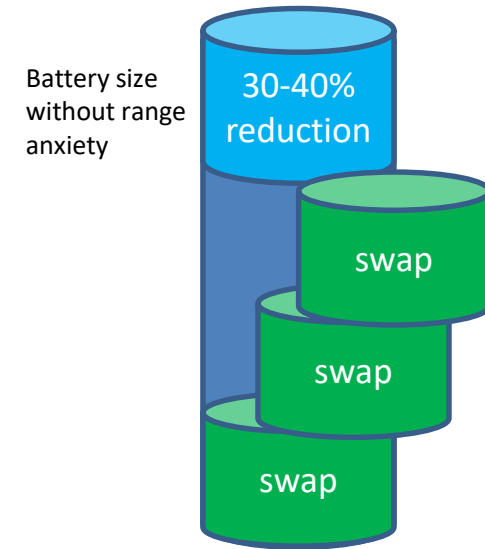


# So how do we enable Electric Vehicle today

- World-over EVs happen today with 30 to 40% subsidy
- India does not have enough money for subsidy
  - So how do we do it without subsidy?
    - must make economic sense
- At the same time scale early
  - And take leadership in the world at least in some segments
  - As far as possible, **Make in India** and develop the complete eco-system from end to end

# Approach

- Focus on higher efficiency: **Wh/km** (equivalent to kms/litre of petrol)
  - Lower Wh/km brings down **battery size, weight and cost**
  - For e-autos in last six months: 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: **one-third** as compared to charging in two hours below 25 deg C
  - **Possible** with swapping



# Approach (contd)

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- 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 **zero-rated GST** for strictly **three years**
  - Drive Volumes using public vehicles
    - Get companies to buy vehicles in bulk (100,000 plus) and lease
    - Get companies to buy batteries in bulk and set up energy business
    - Private vehicles to leverage the eco-system
- No subsidy needed as with these 5 steps, capital cost of vehicle similar to that for petrol vehicles, and ₹/km operation costs same as petrol / diesel / CNG
  - Manufacture motors and drives, chargers, batteries, cells and battery-chemicals in India



# High Quality Three wheelers: e-rickshaw, e-auto

- Use **swapping**: 50 km range Li-Ion **Locked battery**
  - swap in 2 minutes at some 200 locations in a city
  - **Quality** electric vehicles at **similar price as petrol/CNG vehicles**
  - Charged Li-ion **hire price** per km less than that petrol/CNG vehicles
- **50** vehicle, battery & subsystem manufacturers, aggregators, energy business enable
  - Common and **modular Locked battery pack** specs driven with industry
  - Vehicles efficiency (35 Wh/km for e-rick, 45 Wh/km for e-auto), safety and easy battery-swapping
- **Launch in November 2017**
  - 100K order: can target 1 million 3-wheelers in 18 months

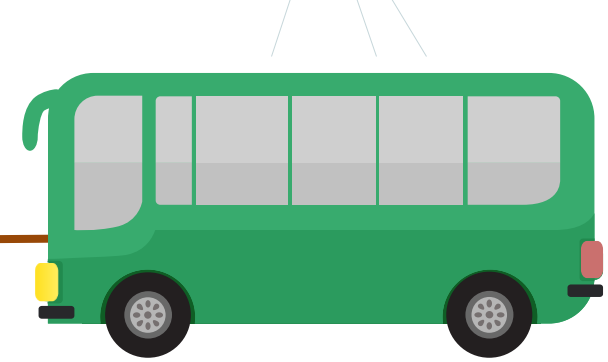
Everything other than battery cells made in India

Large e-auto and e-cargo rickshaw and autos to follow



# For City-Buses

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- Most city-buses travel less than 30 kms per trip
  - Some 8 to 10 trips per day: Ten minutes break between trips
- **Batteries with 50 kms range: Swap batteries** (using robots) at trip-terminal point
  - Operation costs per km is no more than for diesel vehicle
- High performance (**low Wh/km**) buses without battery
  - Capital Costs **similar to** that of today's buses
- 30 bus, battery and subsystem manufacturers/ swappers define
  - **Common Locked battery pack specs**
  - Specs for vehicles: efficiency, safety, easy battery-swapping (with robotics)
- Could launch in **January 2018**: can target 10000 buses in 15 months

# Get going at Speed

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- Build Volumes
  - Prices depend much on volumes
  - Focus on **Make in India**
    - Everything other than battery cells are manufactured in India
- Will enable **personal vehicles** to take off
  - Two-wheelers can use the **same battery module** as used in 3-wheelers
  - Four-wheeler need more work
- Other **vehicles** in future
  - Long-distance buses, Tempos, Trucks, Agricultural Equipment and vehicles

Cell to Pack Manufacturing  
2017 – some 15 companies



Cell Manufacturing: 2019 -20



India has little Li, Mn, Co  
Battery Recycling to recover 95% of  
Li, Mn and Co

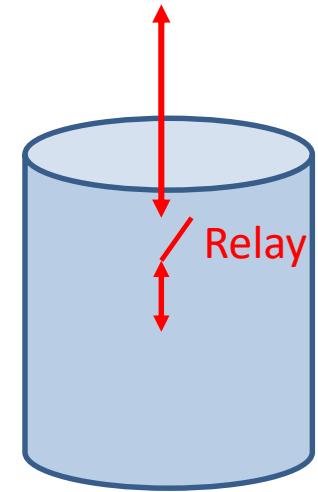
# EV program will be a big-boost to India's economy

- But how is it **related** to digitisation and e-commerce?
- Two fundamental tenets
  - EVs in India today **WITHOUT SUBSIDY**
  - **Swapping** as an enabler
- Energy Business supplies electrical energy to EVs with Locked Batteries (**L-Batt**) as containers
  - What is L-Batt?

# L-Batt

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- Can not be charged except through **authorised Chargers**
- Can not feed power except to **authorised vehicle**
  - Encrypted Key exchange between Charger / vehicle and L-batt
  - Relay turns on only after authentication (each L-batt has an unique ID)
- Important for Energy Business, as they **charge by kWh used**
  - Charge includes depreciation and interest cost of batteries besides costs of charging and swapping
  - Without Locking, a vehicle owner auto can charge – discharge a battery multiple times and not pay the Energy Business
- At swap-point
  - a **mobile phone** will read actual kWh used and transmit to **CMS** for **e-payment**
  - Program the new battery to be usable to specific vehicle and inform **CMS**



# L-Batt designed

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- To contain all data about usage: at what time
  - what **speed and acceleration** the vehicle had been driven?
  - how much **energy** of battery was used, L-batt State?
- Data read by authorised chargers and send to **CMS** where it analyses
  - The efficiency of the **vehicle**
  - The **driver**-characteristics (does she speed, how often she applies breaks, etc.)
  - The **Battery** characteristics: State of Charge, state of cells and unbalanced cells, cell temperature, state of health
  - Determine how to **pair** multiple modules
- Similarly during charging battery, charger sends all information to the **CMS** for analysis
  - How to **extend life** of each battery module
  - Enable **second use** of battery module (when its capacity deteriorates to below 80% of initial level)

# Charging Buildings and Swapping-Outlets

- L-Batt **charged** in special air-conditioned buildings, which are guaranteed 24 x 7 power and have all safety precautions
  - **Large number of swapping outlets** in one-two km radius
- Software designed to **track each module**
  - What are the number of charged and discharged packs at each **outlet**?
  - How much is the rate of L-batt **off-take** at each outlet?
  - Coordinate vehicles (e-rickshaws) to **transport** charged L-batts to outlets and carry back discharged L-batt
  - All **payments**: from vehicle owners to Energy Business, from Energy business to transport operator and to each outlet
  - Charging uses a **combination** of kWh used as well as holding-time of a L-batt

# To Sum Up

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- It is the digitisation, communications, e-payment, that will **enable EVs** in India today without subsidy
  - Will create huge business opportunity for EV and battery manufacturers, manufactures of motors, controllers, EV sub-system manufacturers, battery chargers, energy companies, retail outlets, logistic players
- Was not possible yesterday
- A large number of similar business would get **created** by digitisation and communications