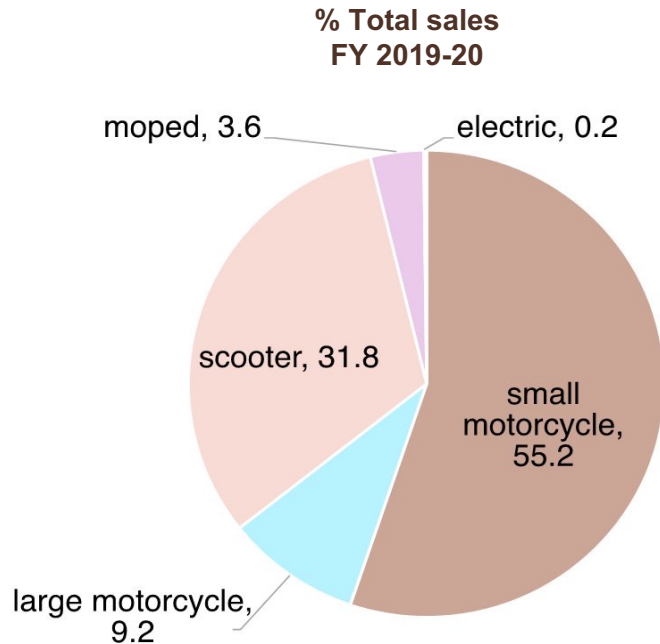


Estimating electric two-wheeler cost parity in India

Shikha Rokadiya

1st September 2021

Electric two wheelers still occupy a very small market share, will need to compete with top-selling ICE models



Small motorcycles < 150 cc

- 75% between 75 cc – 110 cc
- **Hero Splendor plus** top-selling in FY 2019-20 @ 3.5 million units

Scooters < 150 cc

- >97% models between 90 cc – 125 cc
- **Honda Activa** top-selling in FY 2019-20 @ 3.8 million units

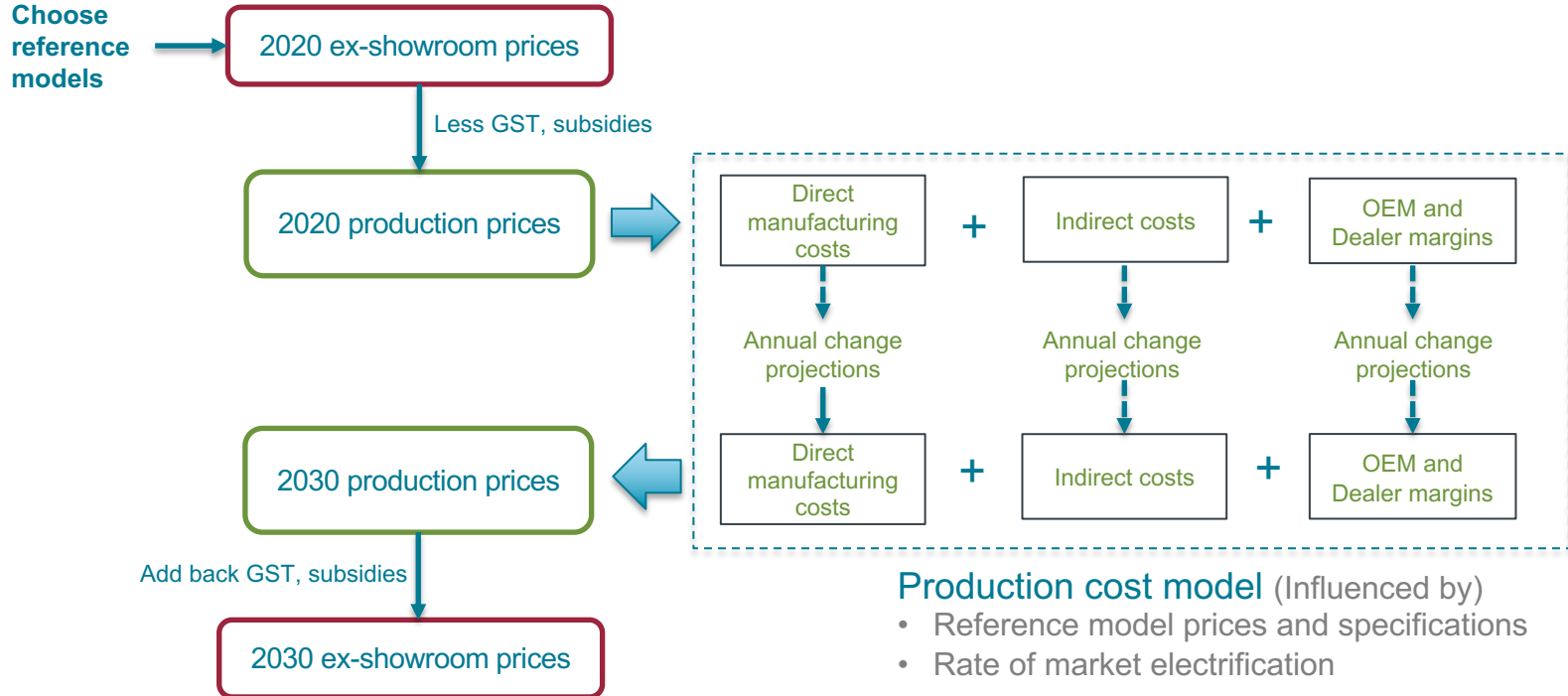
Cost modelling approach

We analyze timing of cost parity between EVs and ICE to the consumer in terms of two costs.

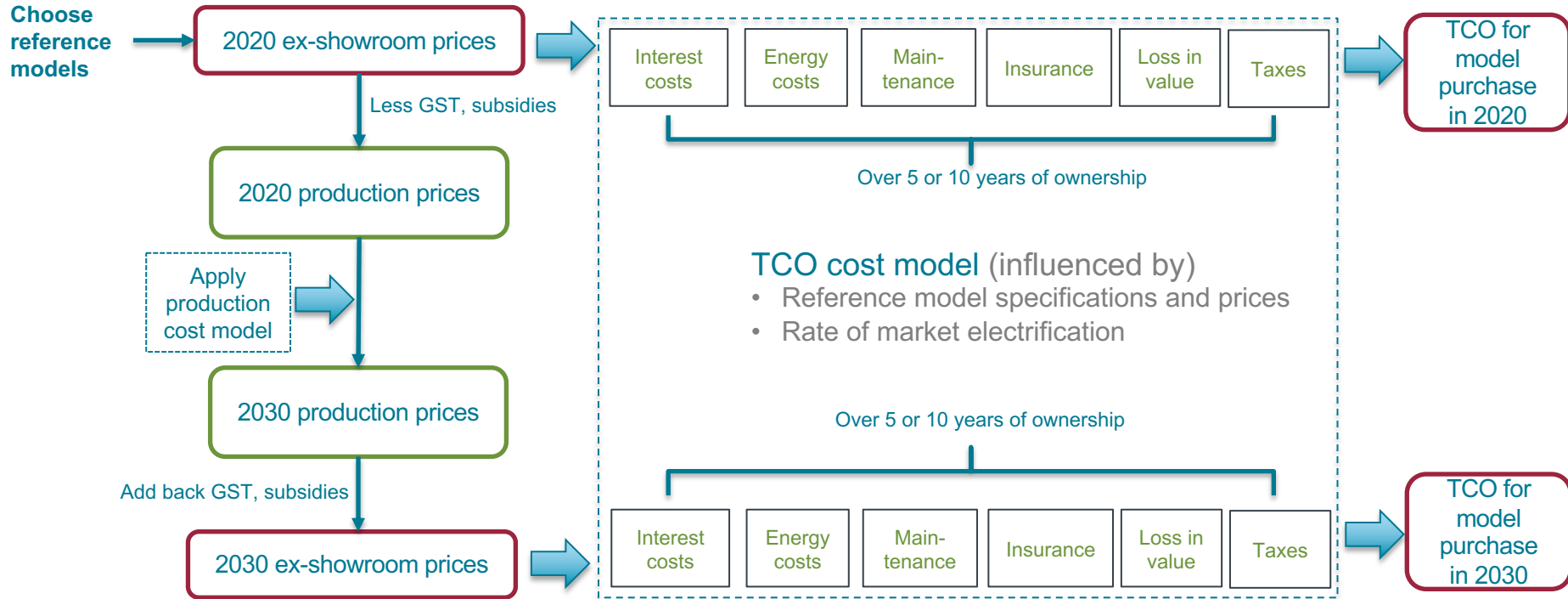
Upfront costs

Total ownership costs

Upfront cost modelling approach



TCO cost modelling approach



Choosing reference models

Approach:

Choose electric models that match performance specifications of conventional as closely as possible.

Motorcycles: **RV400** (3kW peak power)

Scooters: **Ather 450x** (6 kW peak power)

We estimate battery pack sizes for short, mid, and long-range models based on reference model specifications.

Real-world range	Short range	Mid range	Long range
Motorcycle	100 km	150 km	250 km
Scooter	75 km	125 km	200 km

Battery production linked sales scenarios will determine pace of battery and component cost reductions.

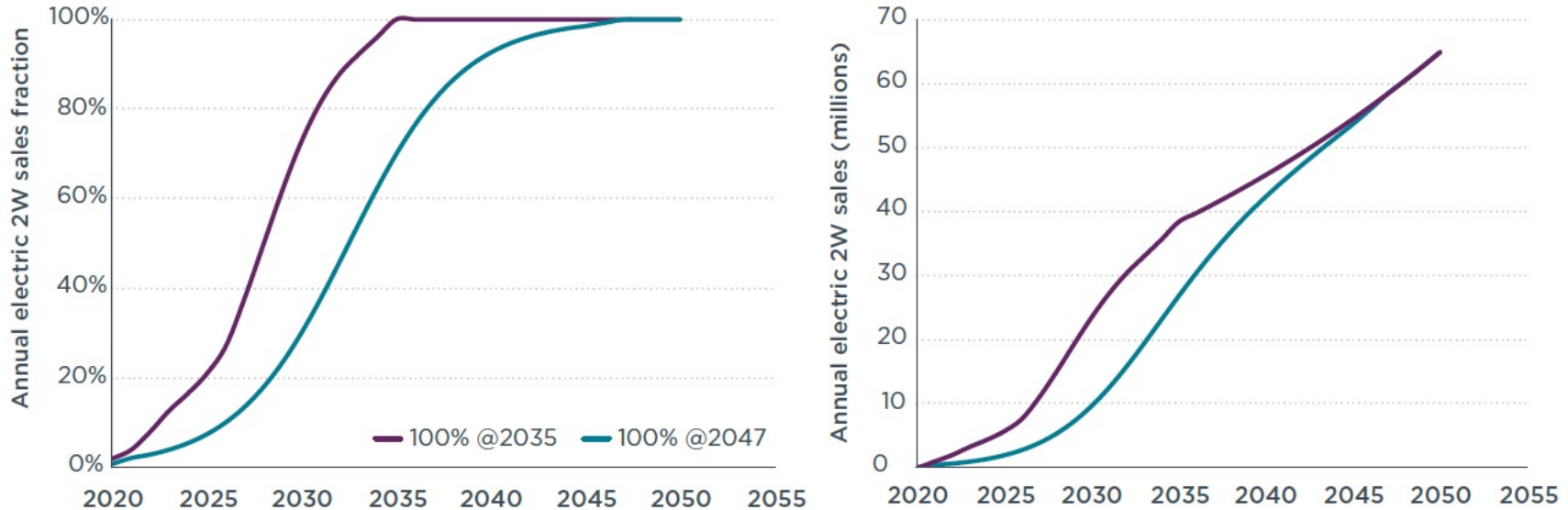
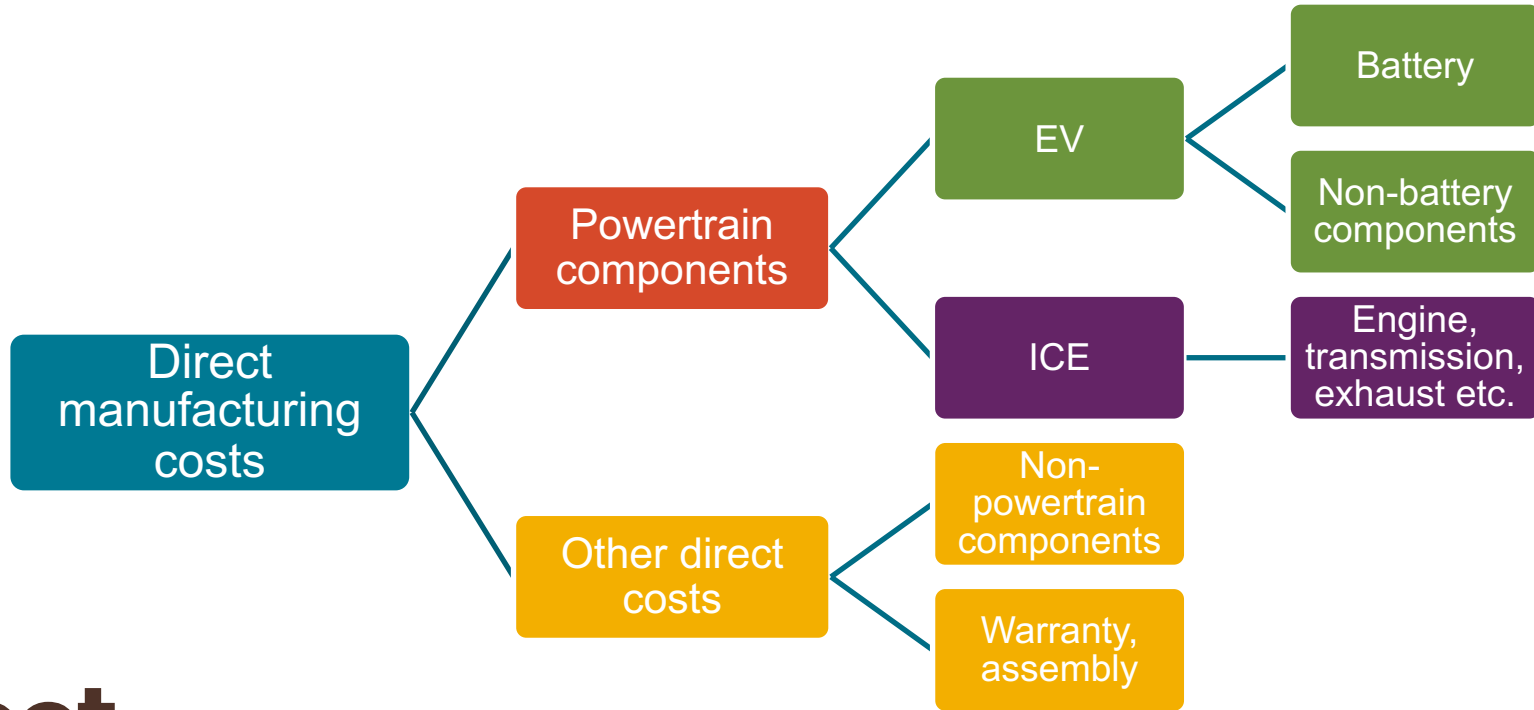


Figure 1. Projected annual new electric 2W sales under two electrification scenarios.

Direct manufacturing cost heads

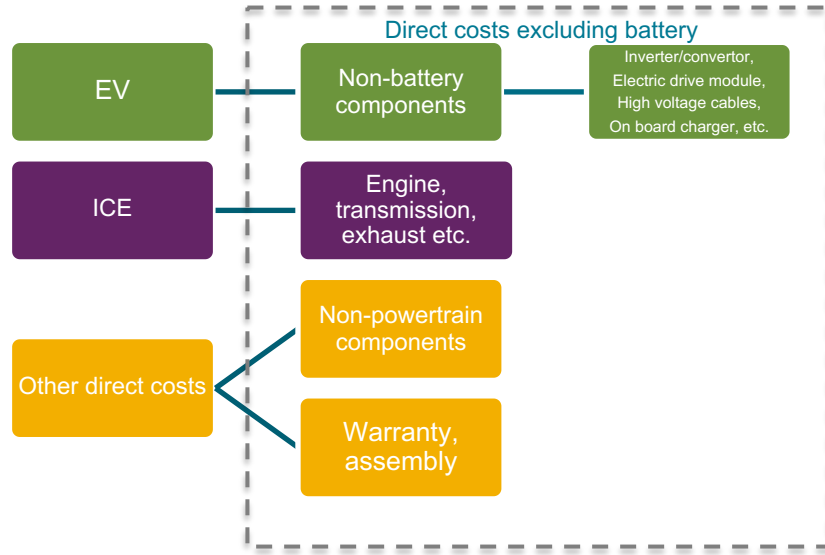


Battery cost projections are based on U.S. benchmark prices achieved in 2018.

Key model assumptions:

- Production linked costs
- Cell costs to hit \$128/kWh benchmark once domestic production reaches 4.5 GWh per year (2018 U.S. levels)
- Post that milestone, cell costs reduce 7% annually
- Pack to cell cost ratio capped at 1.6 for packs < 10kWh
- Annually, pack sizes get smaller due to 0.65% efficiency improvement

Excluding battery, direct cost heads are derived from teardown study on cars.



2017 UBS teardown study on cars manufactured in U.S.

Component costs scaled down to lower power rating of 2W .
(from 150 kW to between 3 to 6 kW)

Annual change in component costs same as per UBS study.

Nic Lutsey and Michael Nicholas, Update on electric vehicle costs in the United States through 2030, https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf.
UBS, UBS Evidence Lab Electric Car Teardown, <https://neo.ubs.com/shared/d1ZTxnvF2k/>.

We assume low levels of profitability in 2020 for EVs with margins stabilizing over time.

OEM profit margins for e2W assumed to increase from 2% to 15% over 2040 as industry gains competitiveness.

As a result of lower starting profits, losses show up as higher indirect cost shares.

OEM profit margins for ICE 2W assumed to be 10% throughout.

Dealer margins assumed to be 5% throughout.

There is room for adjustment factors in our production cost estimates.

High levels of LFP chemistry penetration in India could lower battery costs by 10% - 20%.

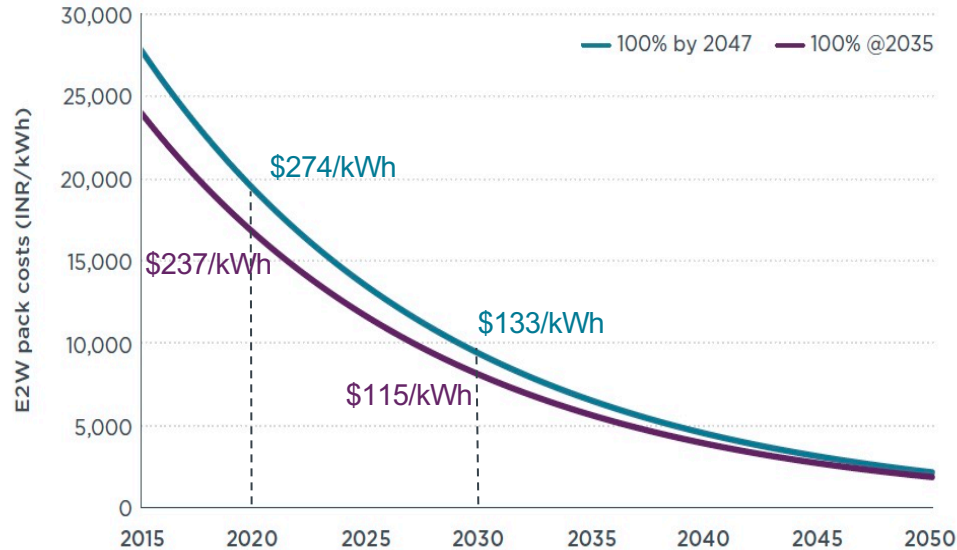
Cheaper capital and labor in India could further lower costs.

Component costs deduced from car component costs, for 2W, costs could be somewhat lower.

Impact of ACC PLI scheme and other state supply-side incentives.

Cost parity analysis results

There is significant penalty involved for not scaling up fast!

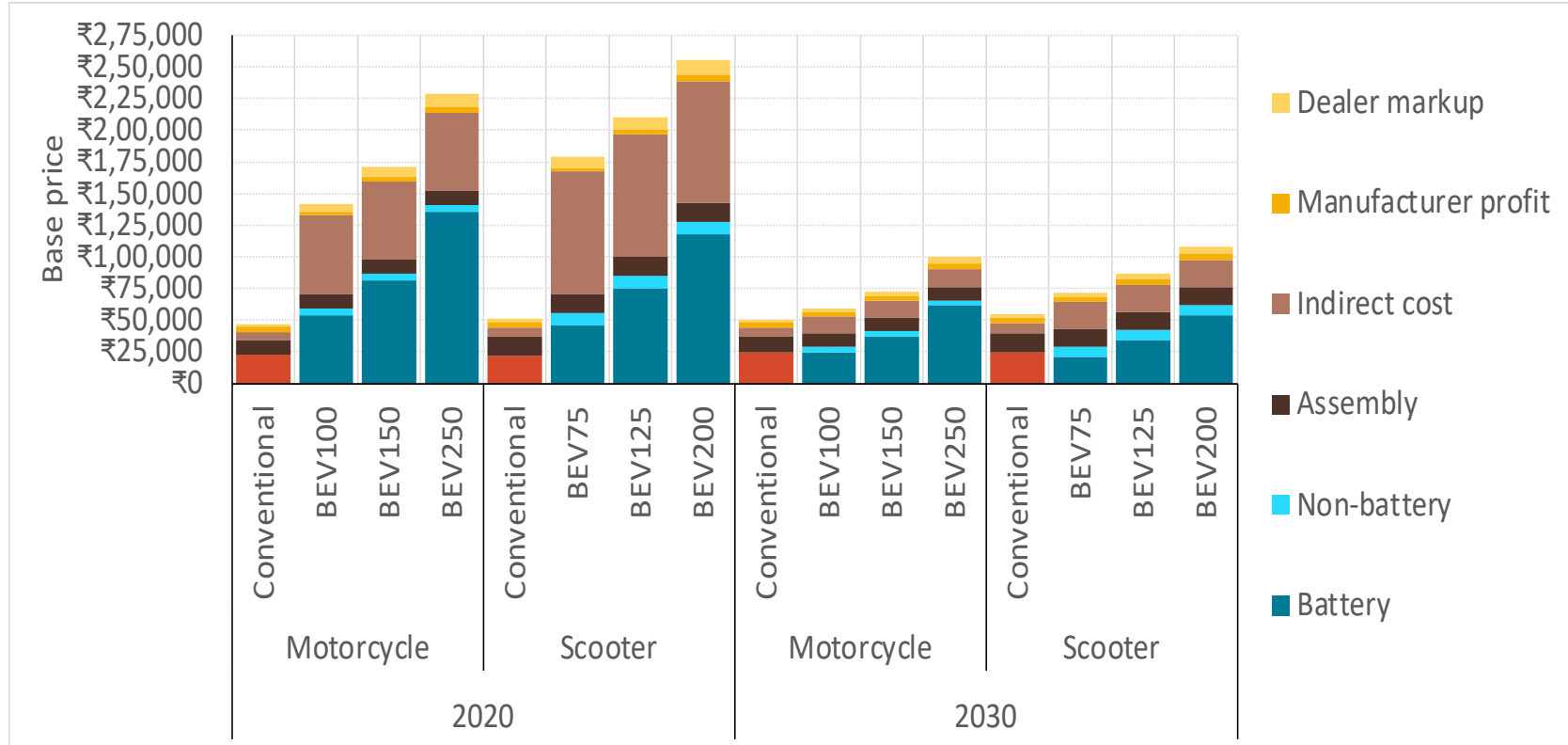


In 100% by 2035 scenario, battery cost curves follow 4-year lag from leading international markets.

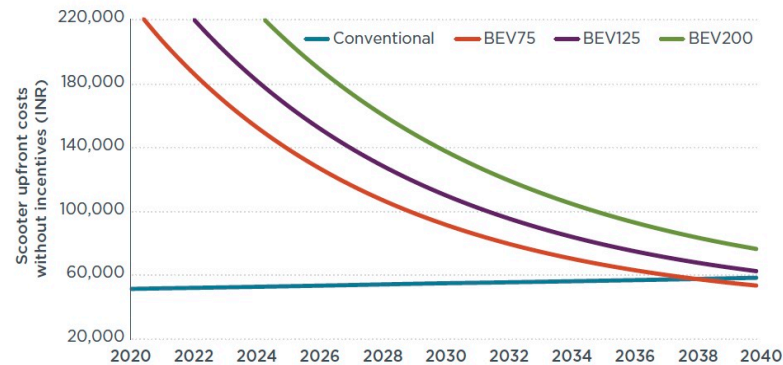
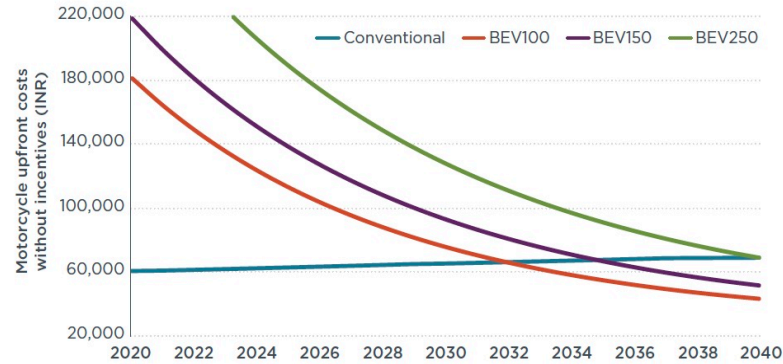
In 100% by 2047 scenario, this is a 7-year lag.

Figure 2. Modeled E2W battery pack cost in US\$ per kWh.

Powertrain cost differential is high between EVs and ICE even after 10 years for mid- and long-range models.



Upfront cost parity without GST and FAME incentives is far away.



Cost parity timelines assuming 100% electrification of new sales by 2035.

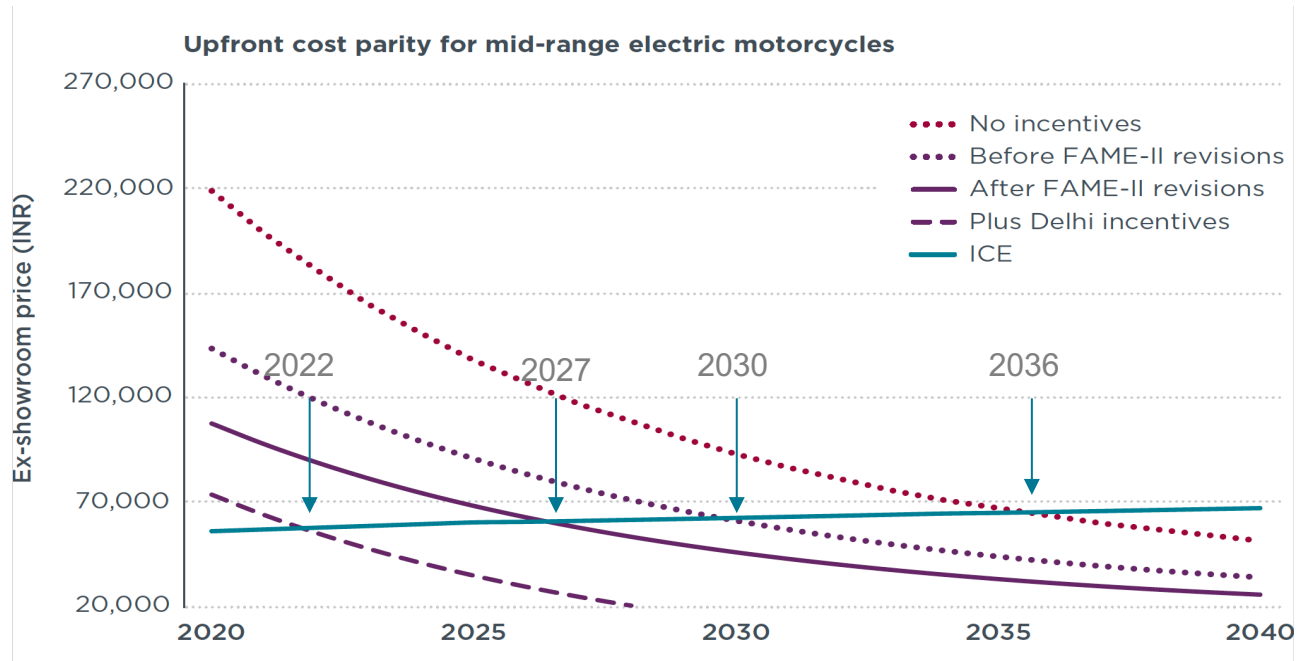
More than a decade away, even for short-range models.

For long range models, even 20 years away!

Slower market scenario pushes cost-parity further by 1-2 years.

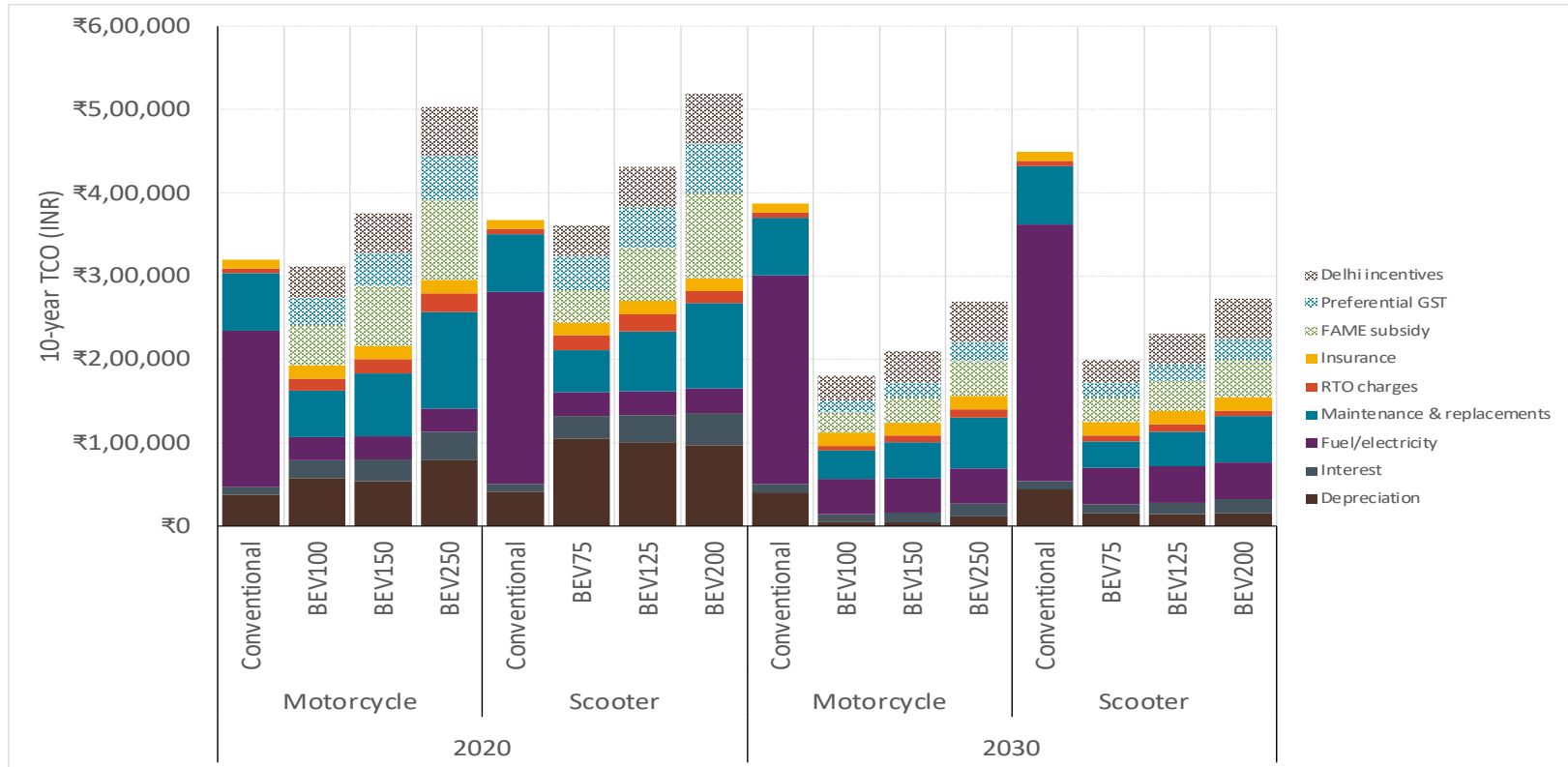
*Upfront costs are on ex-showroom basis and include GST. For EVs, in a no-incentive scenario, same GST as ICE of 28% is assumed.

Combined central and state incentives can bring forward cost-parity within immediate reach.

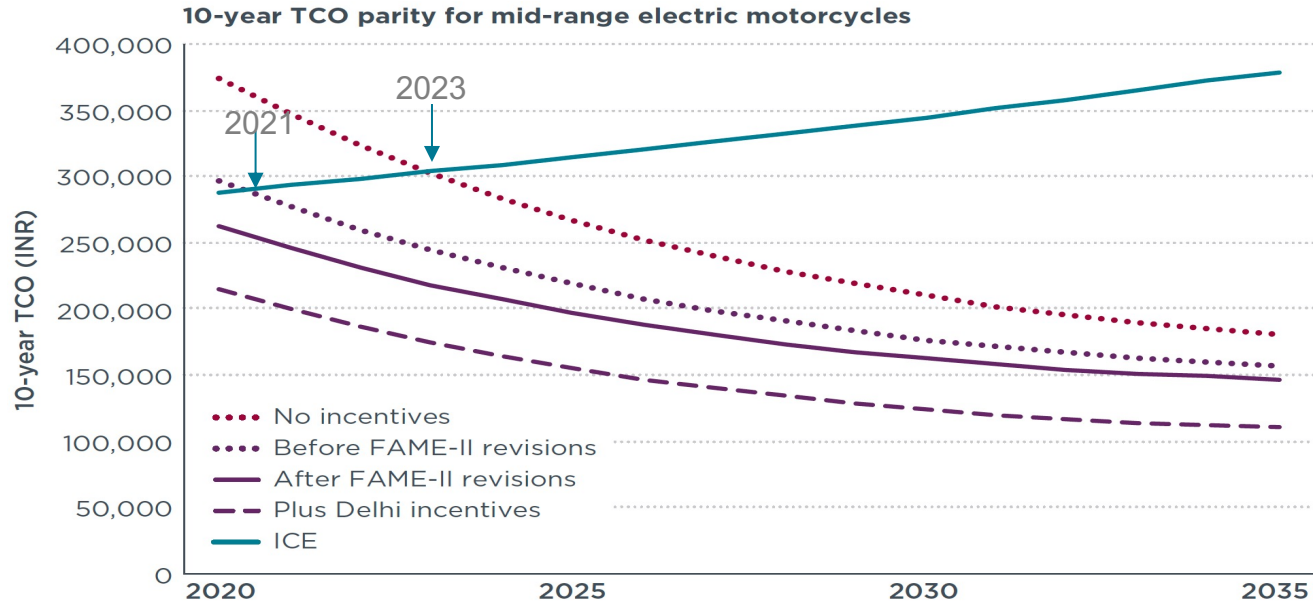


Illustrative example: mid-range motorcycle costs vs. conventional

High costs of petrol make for an TCO attractive proposition.



10-year TCO parity already achieved at earlier FAME-II subsidy levels.



Conclusions and policy implications

Incentives are important and need to continue.

Without incentives, upfront cost-parity at least 10 years away even in ambitious production scenario.

FAME-II revisions are a welcome and timely move by the government that accelerate upfront cost-parity to near 2025 when combined with 5% GST.

State level direct incentives crucial to bridge final cost parity gaps of 2 to 3 years that remain even after FAME-II increase.

Rate of battery cost reductions will drive cost parity.

Our model indicates e2W pack level costs go down to \$115/kWh by 2030 if electrification is pursued ambitiously.

Room for some correction on account of India context and cheaper LFP chemistries.

By delaying domestic battery capacity addition, India could end up delaying crucial price advantages already realized globally from being available to Indian consumers.

Mainstream industry needs to participate for boosting supply.

The demand-side policy scenario looks very favorable for E2W, but leading 2W companies still cautious.

Regulatory measures can address any investor uncertainty.

Potential regulatory pathways:

ZEV credit systems, Fuel consumption standards, Registration restrictions, Low/Zero emission zones.

Thank you!

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THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

TCO sensitivity to energy costs

100% residential charging

50% residential + 50% public charging

100% public charging

Petrol @ INR 80/L

5-yr parity	2024
10-yr parity	2023

5-yr parity	2024
10-yr parity	2024

5-yr parity	2025
10-yr parity	2025

Petrol @ INR 100/L

5-yr parity	2023
10-yr parity	2022

5-yr parity	2023
10-yr parity	2023

5-yr parity	2023
10-yr parity	2023

With preferential GST and FAME-II incentives, cost parity is already achieved in all the above cases.

100% by 2047 scenario pushes back timelines by 1-2 years.

Cost parity for mid-range electric motorcycle without incentives in 100%@2035 scenario.
Residential charging @ INR 7/kWh; Public charging @ INR 14/kWh.
5% annual escalation in all energy costs assumed.

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