

# E-MOBILITY - Operator's Perspective



Bangalore Metropolitan Transport Corporation



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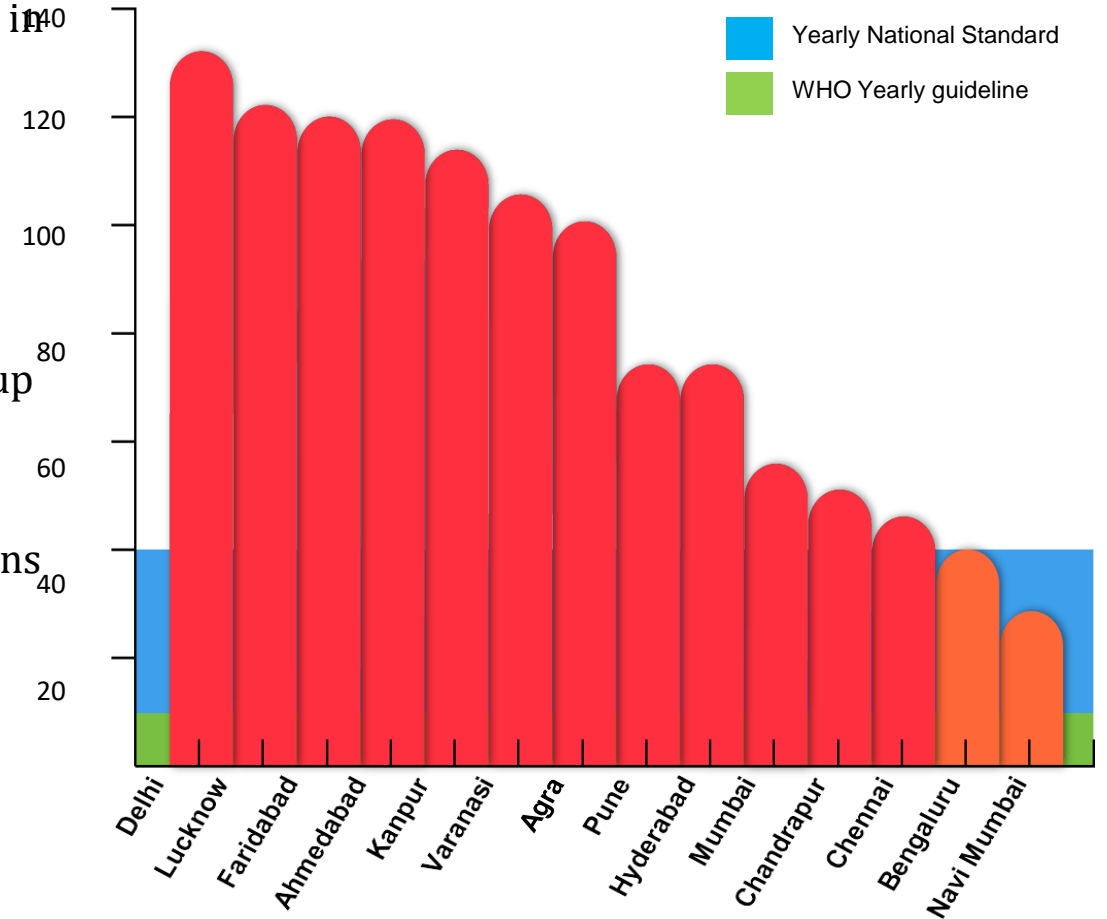
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# NEED FOR CLEAN TRANSPORT

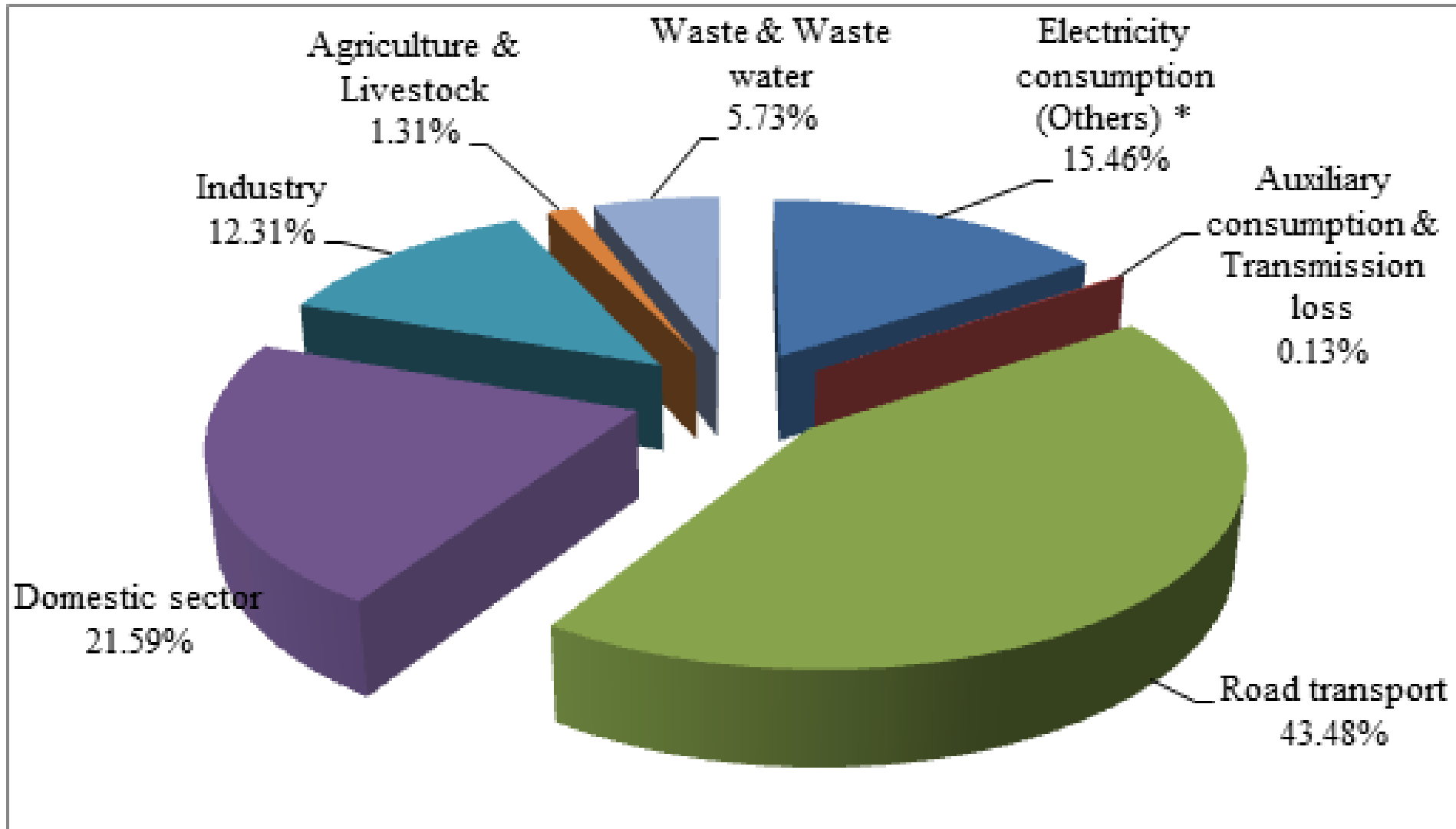
- India has 13 of the top 20 world's most polluted cities
- PM concentrations across major Metros in India are already in violation of National Ambient Air Quality Standard
  - ▣ *Transport sector main contributor*
- According to a recent research paper published by the university of Chicago ambient air pollution is costing India up to USD 500 billion a year\*
- Trucks and Buses contribute over 50% to the PM10 emissions in transport.

PM2.5 levels across cities for 2015 (Green Peace India, 2016)



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# CURRENT CO2 EQ. EMISSIONS (IISC REPORT)





# BMTTC AT A GLANCE

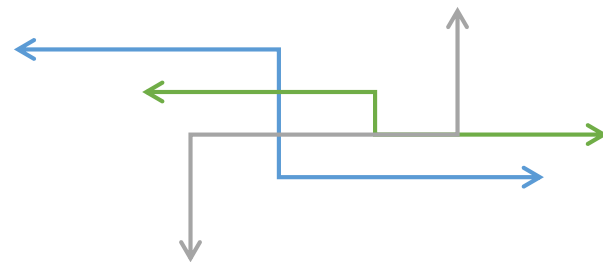
Born on **15 Aug 1997**



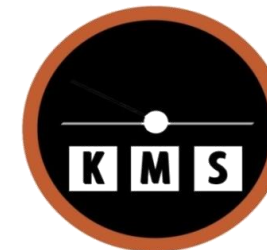
**6400 Buses (850 AC Buses)**  
**6174 Schedules**



**45 lakh Passengers Daily**



**49 Depots, 53 Bus Stations**  
**70872 Daily Trips**



**11.48 lakh service**  
**Kilometres per day**



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## WHY E- Mobility

- Zero Local Pollution
- Reduced Noise Pollution
- Reduction in Fuel Cost - Rs 6/km Vs Rs 26/km
- Flucuating diesel prices to stable electricity tarrif - linked to PPAs
- Easy to Maintain - moving parts - 300 to 3
- Reduced Manpower Req for Maintenance - 1/bus to 1/15 buses
- Reduction in off-road buses - 4% to <1%



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## Challenges in Adoption of EVs

- High Initial Cost - Opex Models (GCC)
- New & evolving technology - assign tech & maintenance risk to SP
- Lack of domestic manufacturing capacity - allow consortiums
- Dependence on foreign suppliers - long term service contracts
- Need for initial govt support - FAME I is a very good support
- Need to come out of govt support for large scale adoption - volume game
- Lack of Contracts Management Capacity - purchase to service contracts



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# Challenges in Adoption of EVs



- Opex Models will reduce manpower cost for RTCs
- Capacity Building for Contact Management with in RTCs need to be done
- Grid Dependancy :
  - Initial : Planning for charging technology and charging locations
  - Full Scale : Battery Swapping, Oppurtunity Charging and routing plan optimisation
- Role of State Govts - GoK EV policy, EV cell in BESCO
- EV adoption rate Vs Diesel bus scrap rate



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# WHY GROSS COST MODEL

- ***Evolving Technology***
  - ❖ Challenges in choosing the right technology for BMTTC operations
  - ❖ High risk involved
  - ❖ Size of battery Vs Range Anxiety
- **High Capital Cost ; Battery cost is *60% of bus cost***
  - ❖ Funding constraint for direct procurement
  - ❖ No upfront investment from STU
- **No Manufacturer in India**
  - ❖ Maintenance depends on foreign OEM
  - ❖ Spare parts availability
- **Lack of Technical Know-How** for Operation and Maintenance of Electric buses
  - ❖ Operator made responsible for operating and maintaining the buses
  - ❖ Performance driven approach





# STEPS FOLLOWED FOR TENDERING

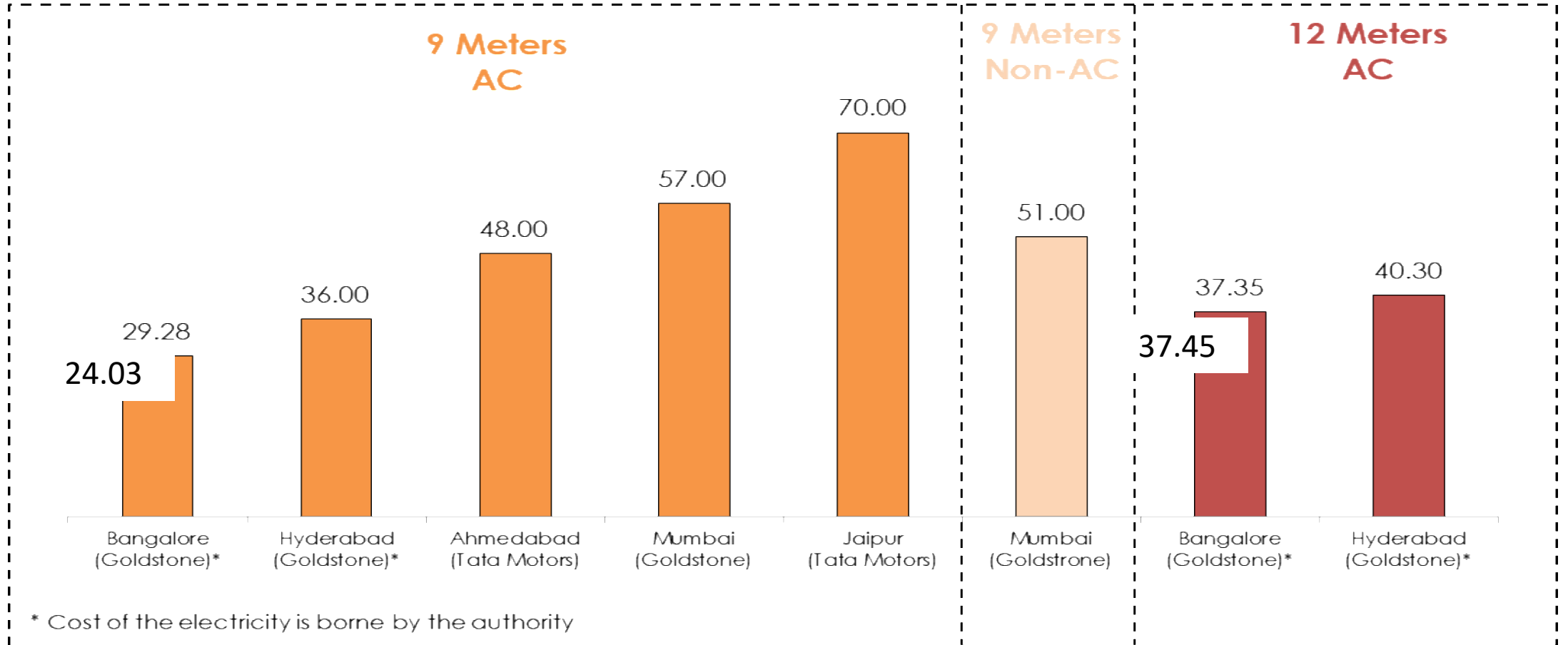


- **Pilot project:** 2 Electric Buses deployed earlier to study performance
- Convened **Stake holder consultation** prior to floating of RFP :
  - ❖ Major STUs
  - ❖ Industry Expert
  - ❖ All OEMs
- Utilized the services of organization like CSTEP, WRI & IFC for structuring of RFP
- Convened two rounds of Contract Management Group (CMG) Meetings
- Convened two rounds of pre bid meeting after floating RFP to understand the concerns of the stake holders – Technology, better role clarity & market capacity
- Approval of Evaluation by Tender Approval Committee



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# COST COMPARISON ACROSS STATES



# Reduced tariff for higher Bus Kilometers



Bus Kilometres	Rate /km for AC bus In Rs/Km		Rate for Non AC bus In Rs/Km	
	Effective rate Rs/km	Reduction In Rs/km	Effective rate Rs/km	Reduction In Rs/km
200 Assured*	37.35	--	24.03	--
225	36.42	0.93	23.43	0.60
250	35.48	1.87	22.83	1.20
275	34.55	2.80	22.23	1.80
300	33.62	3.73	21.63	2.40
301 and above	32.68	4.67	21.03	3.00

- CPKM of EV-AC buses will be much less than the present CPKM of even the ordinary buses.



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# REASONS FOR GETTING LEAST QUOTE

- Technology agnostic
  - ✓ Specified only broad specs like floor height, seating capacity, bus dimension
  - ✓ **Battery swapping**
- Single bidder v/s Consortium
  - ✓ Restriction of only the Bus manufacturer to come-in - relaxed
  - ✓ Consortium of **OEM, Operator and Financer allowed**
- ITS data – Actual running data provided to the Bidders
- **Deployment Plan** shared – For clarity on likely EPKM & CPKM to assess financial viability,
  - ✓ Low cost financing from the financers was made possible



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# REASONS FOR GETTING LEAST QUOTE

- Bus code - Existing bus reference shared for easy understanding of BMTTC's requirement
- Assurance of at least 200 Bus kilometers
- Assurance of payment – **Escrow** account provision under the contract
- Buses to be owned by the Operator at the end of the contract



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# TCO - ICE Vs EV (AC -10 years)



- ICE:
  - Purchase Price: Rs 1 Cr
  - Fuel Cost :
    - $90 \times 70 \times 365 \times 10 = \text{Rs } 2.32 \text{ cr}$
  - Maintenance Cost:
    - $200 \times 8 \times 365 \times 10 = \text{Rs } 0.54 \text{ cr}$
  - Total Cost of Ownership:
    - = Rs 3.9 cr
- EV:
  - Purchase Price: Rs 2 cr
  - Fuel Cost:
    - $200 \times 6 \times 365 \times 10 = \text{Rs } 0.43 \text{ cr}$
    - Maintenance Cost:
      - $200 \times 3 \times 365 \times 10 = \text{Rs } 0.21 \text{ Cr}$
    - Total Cost of Ownership:
      - = Rs 2.64 cr



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# TCO - ICE Vs EV ( NON AC -10 Y)



- ICE:
  - Purchase Price: Rs 0.3 Cr
  - Fuel Cost :
    - $50 \times 70 \times 365 \times 10 = \text{Rs } 1.27 \text{ cr}$
  - Maintenance Cost:
    - $200 \times 3 \times 365 \times 10 = \text{Rs } 0.21 \text{ cr}$
  - Total Cost of Ownership:
  - = Rs 1.78 cr
- EV:
  - Purchase Price: Rs 0.75 cr
  - Fuel Cost:
    - $180 \times 6 \times 365 \times 10 = \text{Rs } 0.39 \text{ cr}$
    - Maintenance Cost:
      - $200 \times 2.5 \times 365 \times 10 = \text{Rs } 0.18 \text{ Cr}$
  - Total Cost of Ownership:
  - = Rs 1.32 cr



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## ROAD MAP FOR BMTTC - EV FLEET

- 80 buses by 2018
- 500 buses by 2019
- 1000 buses by 2021
- 1000 buses by 2023
- 1000 buses by 2025
- 3000 buses by 2030



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Future of Urban Mobility Looks to be Electrified...

**THANK YOU!**



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