THE PUSH FOR ELECTRIC MOBILITY IN INDIA- BUSINESS OPPORTUNITIES FOR SWISS SMEs

DR. PANKAJ AGARWAL
CEO, PANITEK POWER AG

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PANITEK
Enabling Smart Energy

ABOUT US

Panitek, is an **Indo-European** establishment which partners with clean energy solution companies to solve the biggest energy challenges in emerging countries.

Our core competency lies in developing and investing in projects and technologies in the field of **clean, efficient** and **sustainable energy.**

We are active in the domain of **electric mobility**, **renewable power**, **smart grid**, **energy storage** and more.

EXECUTIVE MANAGEMENT

Dr. Pankaj Agarwal
FOUNDER AND CEO

Founder and CEO of Panitek Power, a cleantech investment firm, based in Leichtensein, Switzerland and India. Completed his Ph.D. in Chemical Engineering from University of Florida, Gainesville, MBA from the Rotterdam School of Management and Bachelors in Chemical Engineering from the Indian Institute of Technology, Kanpur, India.

Florian Kind
MANAGER-PROJECTS

Florian joined Panitek in 2018, with several years experience in project and process management. Florian obtained a Master of Science degree in Electrical Engineering from ETH Zurich and went on to start his career at ABB. He also worked as hardware development engineer and project manager at BRUSA, following which he worked at a Swiss SME focusing compressors for fuel cells, heat pumps and process industries.

BOARD MEMBERS

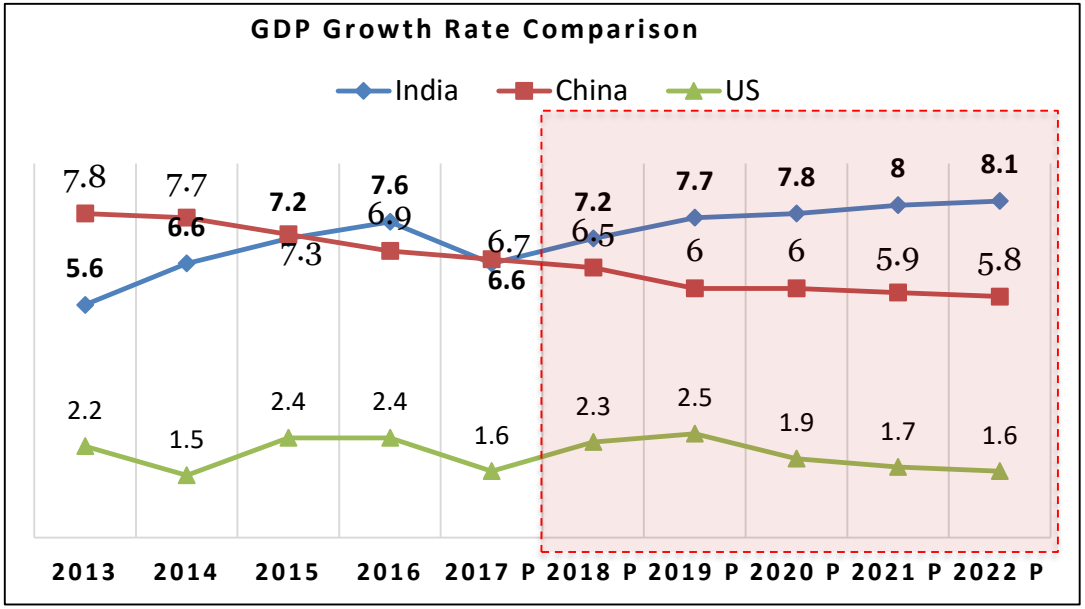
Christoph Ospelt
DIRECTOR

Christoph is the founder and CEO of Lenum AG in Liechtenstein. He is also the co-owner and managing director of the sister company EK Energiekonzepte in Zurich. He studied environmental sciences at ETH Zurich and continued his education as a Master of Science in Building Technology at the MIT. His current research activity at the University of Liechtenstein.

Martin Wittwer
DIRECTOR

Martin is the founder and managing director of Soma Consulting based in Dubai and Zurich. Martin holds an MBA in Finance from the University of Chicago and a licentiate degree in Economics from the University of St. Gallen HSG. Martin worked for 8 years as Senior Vice President Operations at Kudelski Group before becoming Chief Client Officer of the Monterosa Group.

INDIAN STORY



P = Projected
Source: International Monetary Fund

- GDP $8.6 trillion (PPP), 3rd largest economy
- Growth rate of 7.2%, Fastest growing economy
- 3.3 Million km of roads, 2nd largest network
- 23 million daily passengers, 2nd largest railway network
- 462 million internet users, 2nd largest
- 767 Million people between 15-64 years
- 377 million urban population, 30 people move to cities every minute

NEW INDIA

Facilitating ease of doing business by making governance **citizen-friendly** and **cost effective** :

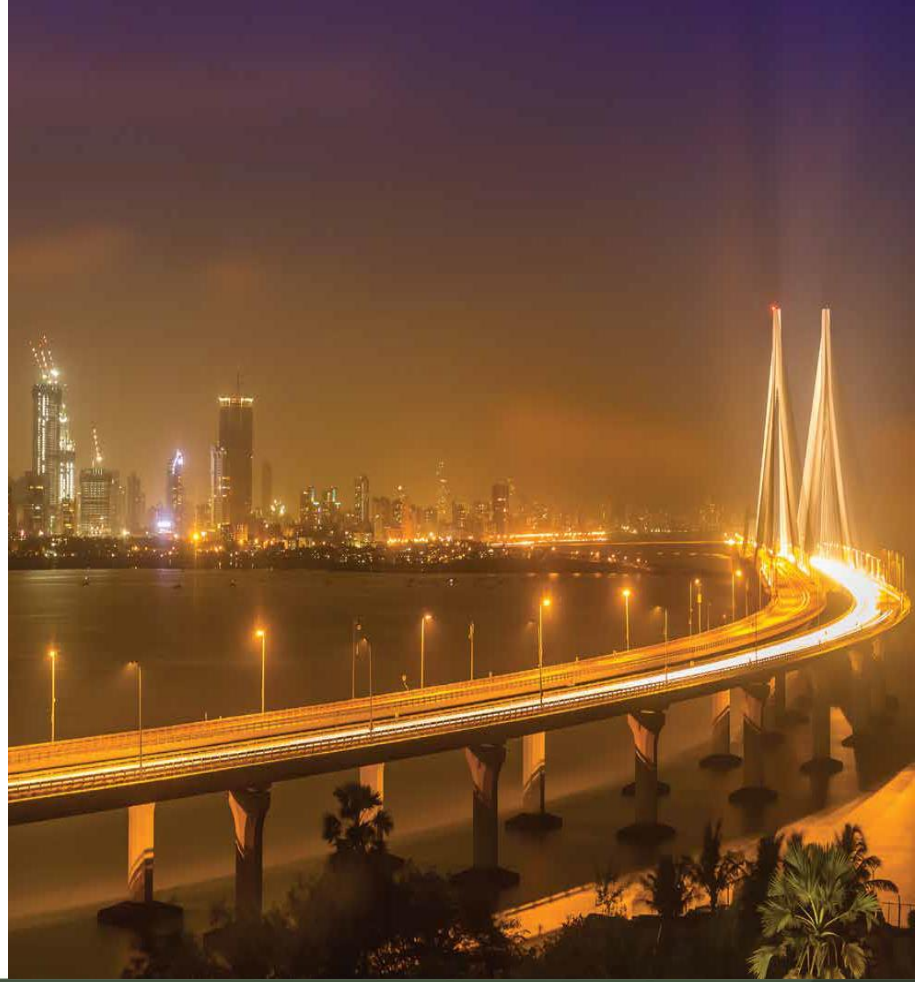
- Make in India
- Digital India
- Skill India

Applying economically and ecologically beneficial **sustainable smart solutions** to infrastructure and services

- Smart Cities Mission
- Ambitious Renewable Energy Targets

Fostering **Innovation and R&D**

- India- Design and Innovation
- Start-up India



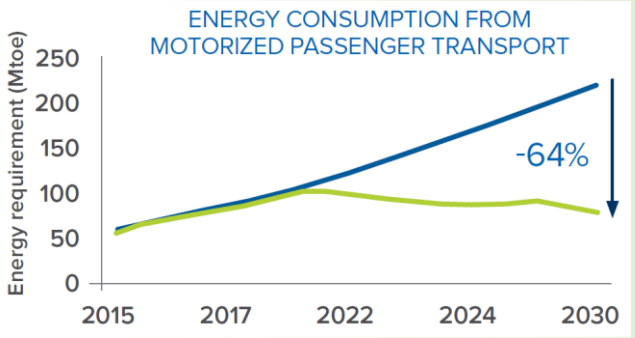
ENVIRONMENTAL TARGETS

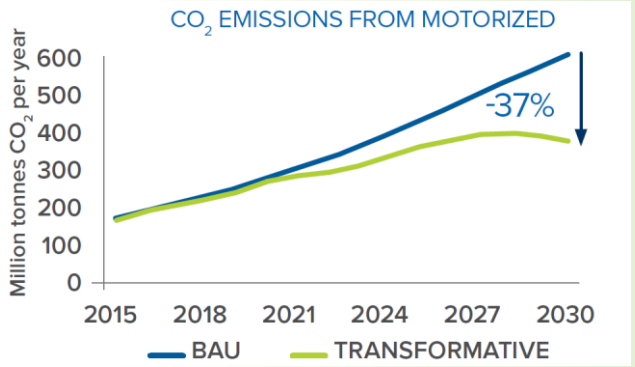
India on course to achieve 2030 Paris Agreement Climate targets:

- Reduce emissions intensity by 33-35%
- 40% cumulative electric power installed capacity from non-fossil sources
- Increase forest cover to create additional carbon sink of 2.5-3 billion tons

Additional targets not part of commitments under Paris Agreement:

- 100 GW installed capacity of solar PV by 2022
- New air pollution emissions standards for light- and heavy-duty vehicles for 2020 (Bharat VI)





Source: NITI Aayog and Rocky Mountain Institute. India Leaps Ahead: Transformative mobility solutions for all.

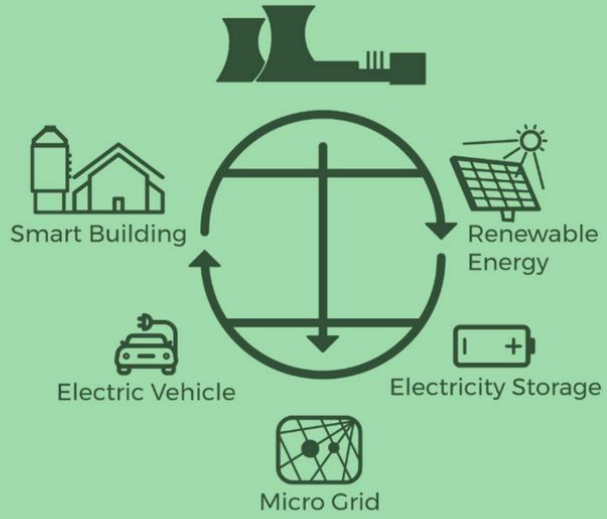
LEAPFROGGING TO DECENTRALIZATION IN INDIA

From a traditional top-down network.....

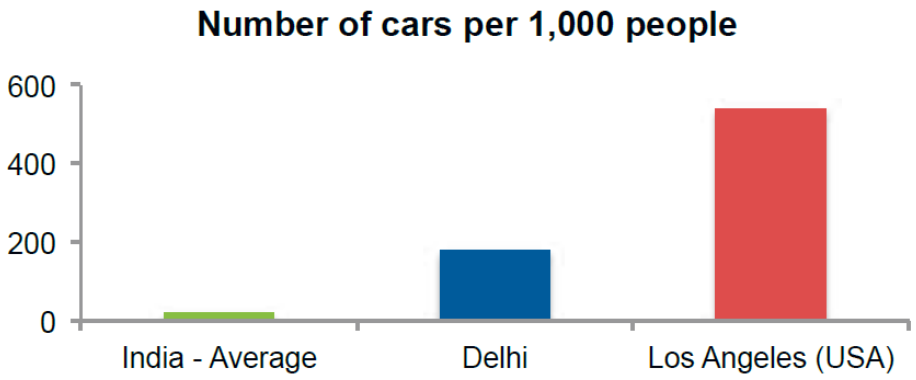
Centralized Generation

... to a meshed network with two-way flow of energy and information

Distributed Generation



MOBILITY IN INDIA-TODAY



- More than 80% of India's consumed petroleum is imported
- India spent USD 155.4 billion on crude oil imports in 2014–15
- India is suffering GDP losses of 1–6% due to poor urban planning
- Traffic fatalities cause more than 150,000 deaths annually
- Large share of all trips, (~66% in 2007) are still largely served by nonmotorized, public and commercial modes of transit

NEW MOBILITY PARADIGM

Enabling factors:

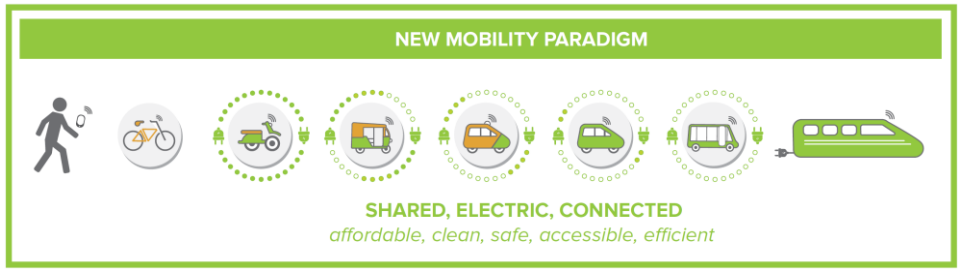
- Low private-vehicle ownership (cars)
- High share of non-motorized transit
- Prevalent mobility services

Frame conditions:

- Confluence of IT and manufacturing skills
- Dynamic entrepreneurial culture
- Ability to build right the first time

Targets:

- reduce oil dependency of road transport
- reduce carbon footprint
- improving health and pollution level

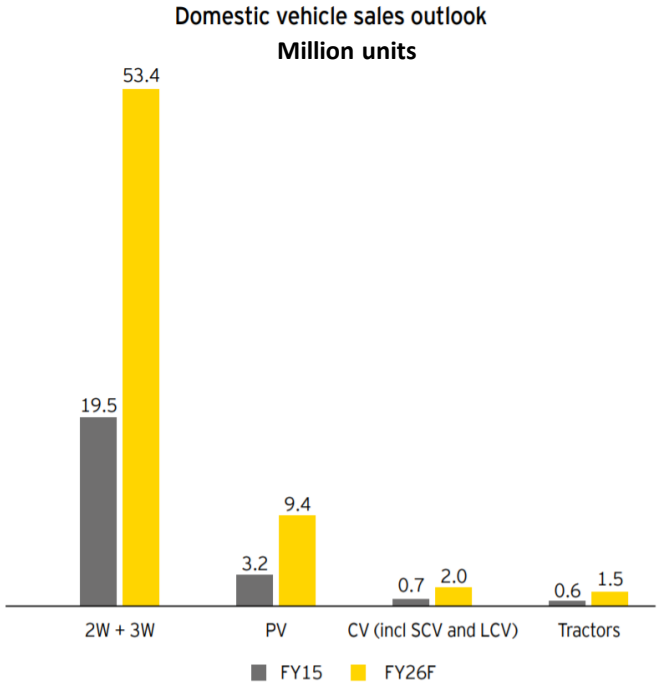


TRANSFORMATION PROCESS

Programmes and initiatives that balance economic development and environment

- **Smart Cities Mission**
  Develop 100 cities all over the country making them citizen-friendly and sustainable
- **National Mission for Electric Mobility**
  To encourage reliable, affordable and efficient xEVs that meet consumer performance and price.
- **Green Mobility Fund:**
  Sustainable Vehicles and Fuels

AUTOMOTIVE MARKET IN INDIA



Source: EY: Making India a world class automotive manufacturing hub.

- Automotive sector accounts for 7 % of India' s GDP
- India is world's 2nd largest two-wheeler manufacturer
- Automotive Mission Plan (AMP) 2016 – 26 – market to quadruple with 10% CAGR for vehicle sales
- Push to manufacturing through the "Make in India"
- Between 200'000 – 400'000 Electric passenger vehicles to be deployed by 2020
- EV to have 50% share in new vehicle sales by 2030

E-MOBILITY ECOSYSTEM

POLICY

- Regulations
- Incentives

O.E.M

RENAULT

TATA MOTORS

TOYOTA

MARUTI SUZUKI

TECH ENABLERS

- Software Companies
- Battery, Motor & Electric Component
- Technology Providers

INFRA

- Charging Stations
- Power Generations

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GOVERNMENT AND POLICY

Fast Adoption and Manufacturing of Electric Vehicles (FAME)

- subsidies to consumers for battery operated 2-W, 3-W and 4-W models
- FAME phase II under progress

Public Private Partnership (PPP) model

- xEV One project: ARAI and OEMS form consortium to jointly develop electric vehicle components supplier base
- pilot for public fast charging vehicles network in Bangalore

Green Mobility Fund:

- MoUD's recently announced USD 12 Billion fund for cities with populations above 500,000 and all state capitals

Joint Initiative: Technology Platform for Electric Mobility (TPEM)

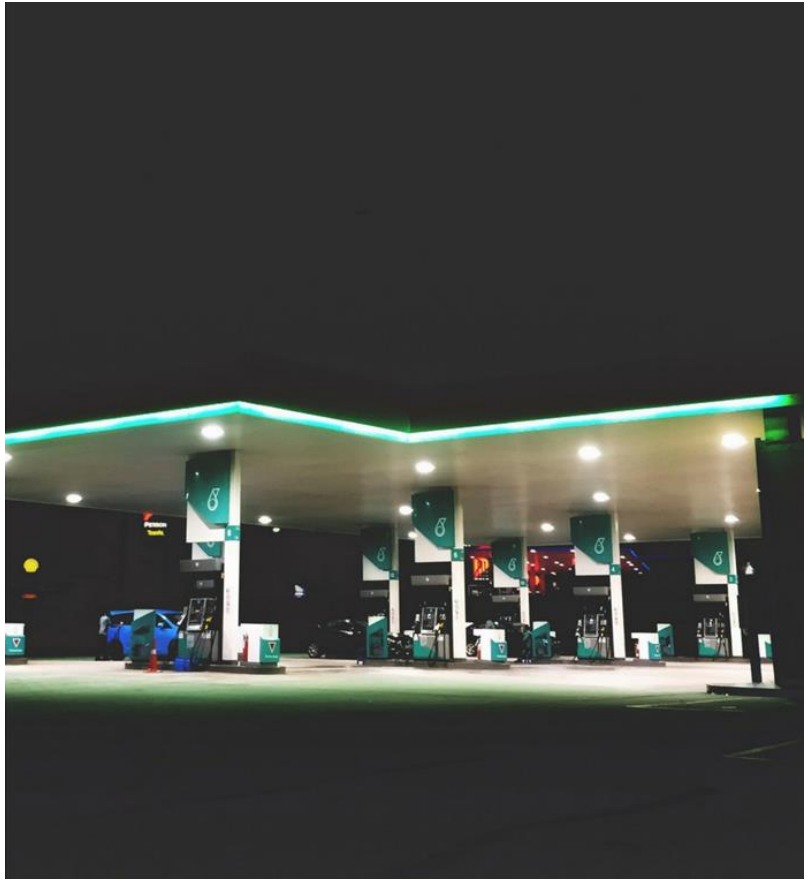
- develop technologies & products that specifically address India needs
- develop a global competitive edge in select technologies of Electric Mobility
- strengthen the industry technology capability sufficiently to phase out the consumer subsidy program for electric vehicles in the near future

NEW BUSINESS MODELS

- **Shared mobility and mobility services** lower demand for private-vehicle ownership by usage-based pricing models
- **Battery lease models** shift expenses to operational costs
- **Standardized swappable batteries** for 2- and 3-wheelers with pay-per-use business models
- **Energy based models** allow for pricing according to consumption and with respect to power grid requirements, offering Renewable Energy-orientated tariff models

O.E.M

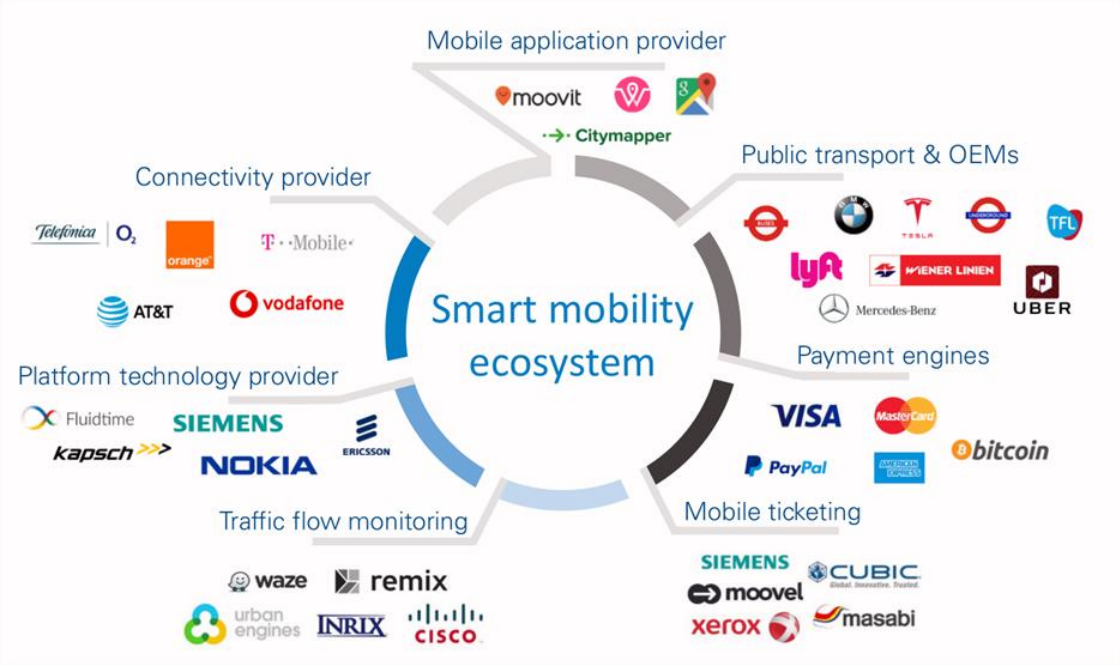
- Wide spectrum of production and business opportunities as well as complementary goods and services
- New competencies needed in data processing and SW solutions: connectivity, shared mobility, autonomous driving
- Highly competitive market landscape; increasing investments in production capacities and research & development
- Most global O.E.Ms have an established presence in the market along with Indian players



INFRASTURCTURE

- **Charging Station** – Key factors to meeting customer needs:
  - Robust charging infrastructure: standard AC as well as fast DC charging
  - Charging station density or battery swapping infrastructure
  - Smart & user friendly payment services
- **High EV adoption rates** expected in developed, dense cities with strict emission regulations, higher consumer incentives and evolved charging infrastructure
- **Smart integration of charging infrastructure to power grid** with solar PV, storage systems and energy management solutions
- **Uniformity** and **standardisation** to be introduced and promoted
- EVs can act as **distributed energy resources**, providing on- and off-grid benefits, including lower Renewable Energy integration costs
- Electric vehicles acting as "**batteries on wheels**" could help better manage India's electric grid

TECHNOLOGY ENABLERS



Source: Arthur D. Little. Integrated Mobility Platforms.

The confluence of IT/mobile application and innovations in manufacturing is transforming the sector-

- Big Data, IoT, Connected Mobility etc. to bring in positive disruptions
- Connected and shared mobility options will enable mobility services without need to private ownership

New business models will facilitate reduced cost of ownership and result in mass deployment-

- Battery manufacturing and leasing models
- Battery swapping technologies and connection systems
- Electric vehicle and component resale and lease market

E-MOBILITY LANDSCAPE

New companies to sprout from new technologies and opportunities.

- Light weight 2 Wheelers for electric bicycles and scooters
  (e.g. Start-up “Ather”)
- Light weight 3 Wheelers for e-rickshaw and public transport
  (e.g. Start-up “Strom Motors”)
- Medium weight 4 Wheelers for electric cars and vans
  (e.g. “Uniti / Bird Group”)
- Heavy weight buses and trucks
  (e.g. “Goldstone-BYD”)
- Autonomous driving technologies
  (e.g. “atimotors, fluxauto”)
- Zero emission transport services
  (e.g. “Lithium Urban Technologies”)

DRIVERS OF E-MOBILITY

Shared-mobility
User Experience

Strong OEM Push
New Energy Solutions
Ability To Build Right The First Time

Reduce Oil Imports
Reduce Carbon Emission
Favourable Policy

Low Cost and High Skill Labour
Positive Environmental Impact
Sustainability

Low Ownership Cost
Low Production &
Service Cost

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E-MOBILITY HAS STARTED

Right place	UNTAPPED MARKET
Right time	GOVT PUSH & POLICY
Right solution	TECHNOLOGY AND BUSINESS MODEL

Dr. Pankaj Agarwal, CEO
pankaj@panitek.com

Florian Kind, Manager-Projects
florian.kind@panitek.com

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