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King Abdullah Petroleum Studies and Research Center

Commentary

India's Political Ambition of Implementing Plug-In Electric Vehicle Sales Targets

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Policymakers consider the electrification of road transport to be one of the ways of solving India's triple problem of increasing greenhouse gas (GHG) emissions, rising oil imports, and increasing urban air pollution

The Indian transportation sector is going through a massive transition, especially the light-duty vehicle (LDV) sector. Policymakers consider the electrification of road transport to be one of the ways of solving India's triple problem of increasing greenhouse gas (GHG) emissions, rising oil imports, and increasing urban air pollution. Several government ministries and departments have been involved in supporting the transition of the transport sector. Additionally, several states have formulated their plug-in electric vehicle (PEV) policies so that they support the central governmental push for the transition to more PEVs in India (NITI Aayog and Rocky Mountain 2019).[1] However, despite its efforts, the country still lacks a dedicated federal-level 2030 PEV sales target.

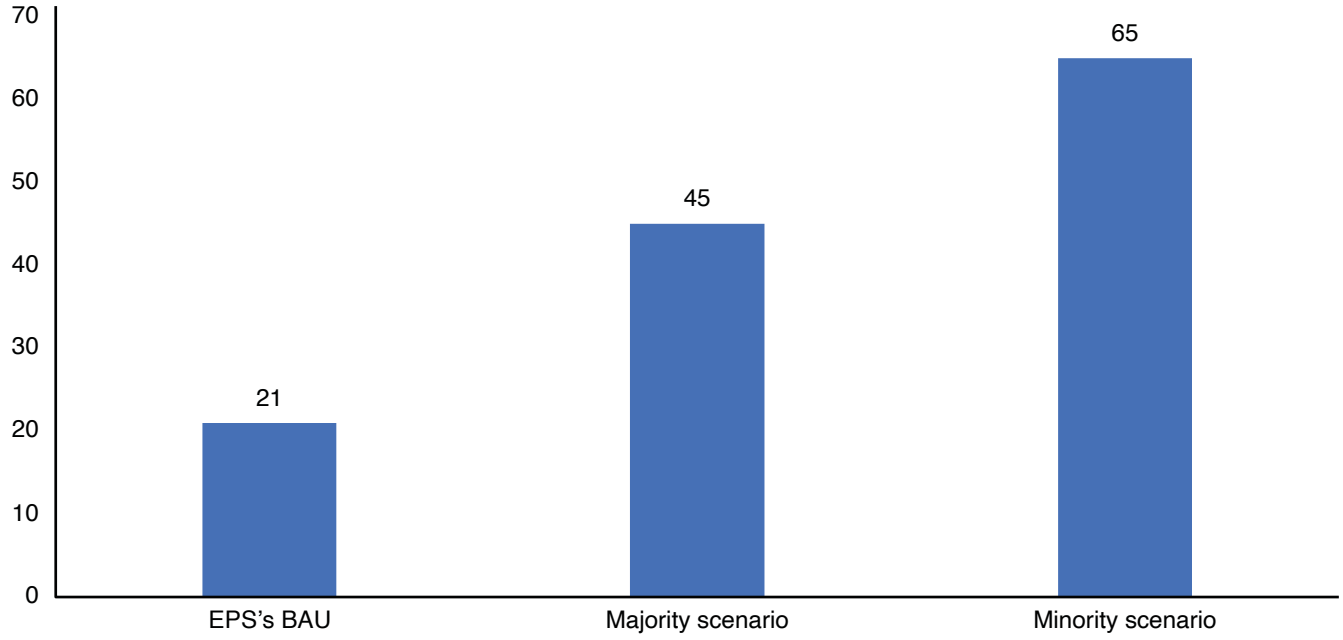
Using a bargaining-model framework, this commentary develops a series of PEV sales target scenarios that could be adopted by the stakeholders involved in India's PEV policymaking. It also analyzes the potential impact of different PEV adoption scenarios on India's oil imports, GHG emissions, and urban air pollution.

To simulate the bargaining process among the different stakeholders around India's 2030 PEV sales target, we utilized the KAPSARC Toolkit for Behavioral Analysis (KTAB) approach. To do so, we carried out semi-structured interviews with Indian subject matter experts.[2] They were asked to assign each stakeholder a numeric value for the following properties:

- Position: what is the stakeholder's advocacy with respect to support for/opposition to a more ambitious PEV sales target?
- Influence: the relative degree of political power for each actor.
- Salience: the relative priority each actor assigns to the PEV sales target by 2030 compared with other issues over which it must exert influence.

Table 1 in the appendix shows the baseline dataset, which represents the aggregated data from the experts' input. Figure 1 represents the outcome of the KTAB simulation. Most stakeholders form a consensus supporting a target in the range of a 40%-50% sales target. However, the prime minister, the Ministry of New and Renewable Energy (MNRE), the Ministry of Finance, manufacturing industries, the Ministry of Road Transport and Highways (MoRTH), the Ministry of Environment, Forest and Climate Change (MoEFCC), NITI Aayog (Government Thinktank) and the PEV industry advocate for a significantly higher PEV sales target by 2030 than most stakeholders.

Figure 1. Range of stakeholders' positions on a 2030 PEV sales target.



Sources: KTAB simulation and EPS.

To analyze the impact of these aspirational PEV sales targets on GHG emissions, oil imports and urban air pollution, we utilized an open-source system dynamics-based model, the India Energy Policy Simulator (EPS). The model was created by Energy Innovation LLC and adapted for India in partnership with the World Resources Institute, India (Energy Innovation 2020). We compared three scenarios in particular:

1. Majority scenario: Stakeholders backing the positional range of a 40%-50% sales target, with an average target of 45%, as modeled by KTAB.

2. Minority scenario: A minority of stakeholders advocating for a higher PEV sales target. These stakeholders advocate a sales target in the range of 50%-80%, with an average of 65%.

3. EPS in-built business-as-usual (BAU) scenario.[3]

These scenarios were simulated using the electric vehicle sales mandate policy lever in the EPS model. This particular policy option in the EPS allows PEVs to reach a fixed percentage of new passenger vehicle sales by a certain year (2030). The EPS assumes that the PEV market share increases linearly from now until 2030.

The desired impact is captured in Figure 2 and is divided into four categories:

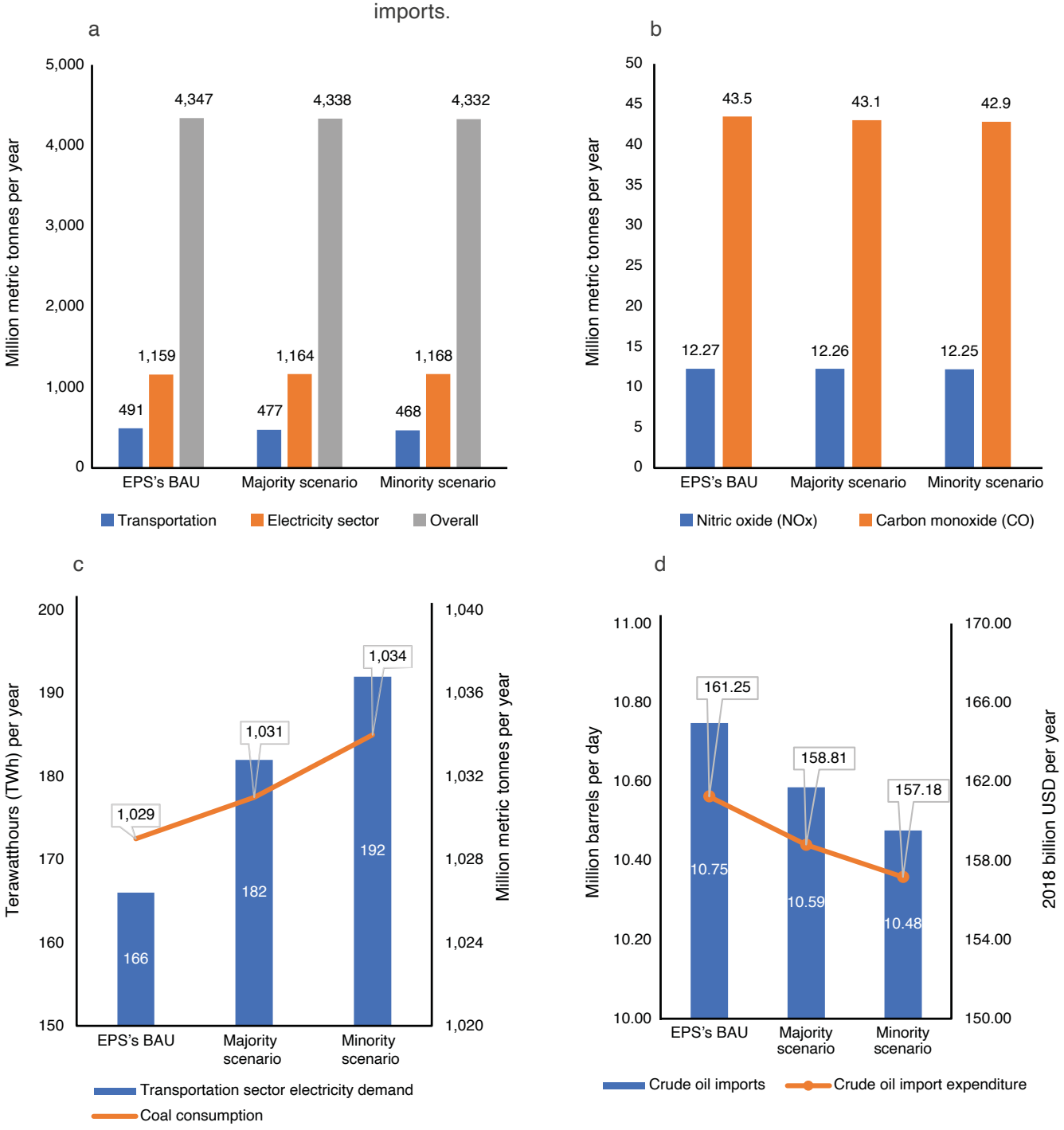
1. Impact on carbon dioxide (CO_2) emissions (Figure 2a).

2. Impact on exhaust emissions (Figure 2b).

3. Impact on the electricity sector (Figure 2c).

4. Impact on energy imports (Figure 2d).

Figure 2. Comparing different scenarios in terms of impact on (a) CO_2 emissions, (b) exhaust emissions, (c) the electricity sector, and (d) energy imports.



Sources: EPS and KTAB analysis.

Relative to the BAU scenario, achieving a 45% (majority scenario) PEV market share could result in an additional CO_2 emissions reduction of some 14 million metric tonnes per year from the transportation sector (Figure 2a). The aggressive 65% PEV sales by 2030 (minority) scenario would correspond to an emissions reduction in the transportation sector of about 23 million metric tonnes per year. However, emissions from the electricity sector could increase by about 5 million and 9 million metric tonnes per year in 2030 in the majority and minority scenarios, respectively. CO_2 emissions from the electricity sector are likely to increase as most of India's electricity generation comes from coal. This results in an overall additional CO_2 emissions reduction of about 9 million metric tonnes per year in 2030 for the majority scenario and 15 million metric tonnes per year in 2030 for the minority scenario.

India will also gain a reduction in urban air pollution (Figure 2b). Relative to the BAU scenario, achieving a 45% (majority scenario) PEV market share could result in an additional reduction in 2030 of about 0.01 and 0.4 million metric tonnes per year of nitric oxide (NOx) and carbon monoxide (CO), respectively. Similarly, for the minority scenario, a 65% PEV sales target for 2030 could result in an additional reduction of about 0.02 and 0.6 million metric tonnes per year of nitric oxide (NOx) and carbon monoxide (CO) in 2030, respectively.

Studies have claimed that deploying PEVs in India will only increase the electricity sector's CO_2 emissions because most of India's electricity generation comes from coal-fired power plants (Nimesh et al. 2020). Similar trends were seen when comparing the scenarios in Figure 2c. The electricity demand from India's transportation sector and coal consumption could increase by about 16 terawatthours (TWh) per year and 2 million metric tonnes per year, respectively, in the majority scenario. Similarly, electricity demand from the transportation sector and coal consumption could increase by about 26 TWh per year and 5 million metric tonnes per year, respectively, in the minority scenario.

In March 2015, India's prime minister emphasized the country's need to bring down its oil import dependence from 77% in 2013-14 to 67% by 2022, and to halve it by 2030 (Deccan Herald 2019). Further, in 2018 India imported over 82% of its crude (The Economic Times 2018). Relative to the BAU scenario, the majority and minority scenarios could see India importing about 0.16 and 0.27 million fewer barrels per day, respectively (Figure 2d). This would also translate to a reduction in the cost of oil imports of about US$2.4 billion and US$4 billion per year for the majority and minority scenarios, respectively.

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To conclude, this commentary provides an insight into India's PEV policymaking governance and the potential range of a PEV sales target by 2030. It also highlights the potential societal impact of India's 2030 PEV sales target on its air pollution, oil imports, and GHG emissions. The commentary holds value for both local and global stakeholders associated with the energy and automotive sectors, as it highlights the Indian government's ambition concerning the electrification of the passenger vehicle sector.

Endnotes

[1] India's electric vehicle policymaking is a complex process, mainly due to the country's complex politics and governance system. The Constitution of India defines the distribution of power between the central government and the states under legislative, administrative, and executive heads. The legislative section is divided into three lists: Union List; State List; and Concurrent List. The Union List consists of 99 items on which the parliament has exclusive power. The State List consists of 61 items on which the state legislature has exclusive power to make laws, and the Concurrent List has 52 items of joint responsibility (Sahoo 2016). Both electric and motor vehicles, or mechanically propelled vehicles, belong to the Concurrent List, which makes the decision on the 2030 PEV sales target even more difficult (Government of India 2020).

[2] Subject matter experts were selected from Indian think tanks. The result, therefore, could be biased toward an ambitious target.

[3] The BAU scenario in EPS assumes the PEV market share would reach 21% by 2030.

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Appendix

Table 1. Baseline dataset - average of expert inputs.

CODE	Actor	Description	Group	Influence	Position	Salience
PM	Prime Minister	Narendra Modi	Government	89.5	58.5	60.5
LS	Lok Sabha (House of People)	House of the People	Government	56.5	36	33.5
RJ	Rajya Sabha (Council of States)	Council of States	Government	51	34	31.5
BJP	Bharatiya Janata Party	Bharatiya Janata Party	Government	66.5	44	34.5
INC	Indian National Congress	Indian National Congress Party	Government	39.5	20.5	30
MoEF	Minister of External Affairs	S. Jaishankar	Government	19	19.5	13.5
MoCI	Minister of Commerce and Industry	Piyush Goyal	Government	62	63.5	58.5
MoF	Minister of Finance	N. Sitharaman	Government	68	55	61.5
MoEFCC	Minister of Environment, Forest and Climate Change	Prakash Javadekar	Government	57.5	61	69.5
MoS-MoDNER	Minister of State (MoS) Independent Charge - Ministry of Development of North Eastern Region	J. Shingh	Government	25	31.5	25
MoS -MoChH	MoS - Ministry of Chemicals and Fertilizers	M.L. Mandaviya	Government	13	16.5	9
MoRTH	Minister of Road Transport and Highways Shipping	Nitin Jairam Gadkari	Government	76.5	67.5	70
MoPNG	Minister of Petroleum and Natural Gas	Dharmendra Pradhan	Government	71	49.5	63
MoChH	Ministry of Chemicals and Fertilizers	Shri D.V. Sadananda Gowda	Government	13	16.5	9
MoHIPE	Minister of Heavy Industries and Public Enterprises	Anant Geete	Government	59	54	60.5
MOP-MNRE	Minister for Power - Minister of New and Renewable Energy	Raj Kumar Singh	Government	57	57.5	72.5
UK	Uttarakhand	Trivendra Singh Rawat	State Government	41	57	55.5
HP	Himachal Pradesh	Jai Ram Thakur	State Government	38	50	54.5
J & K	Jammu & Kashmir	N/A	State Government	6	13.5	17.5
SKK	Sikkim	Prem Singh Tamang	State Government	24	45.5	49
ASM	Assam	Sarbananda Sonowal	State Government	27	34.5	38

CODE	Actor	Description	Group	Influence	Position	Salience
WB	West Bengal	Mamata Banerjee	State Government	28	30	38
ARP	Arunanchal Pradesh	Pema Khandu	State Government	27	38.5	41
MAN	Manipur	N. Biren Singh	State Government	23	33.5	39
TP	Tripura	Biplab Kumar Deb	State Government	23	33.5	39
MZ	Mizoram	Zoramthanga	State Government	23	33.5	39
MGH	Meghalaya	Conrad Sangma	State Government	23	33.5	39
NG	Nagaland	Neiphiu Rio	State Government	23	33.5	39
GJ	Gujrat	Vijay Rupani	State Government	46	43.5	52.5
AP	Andhra Pradesh	Y. S. Jaganmohan Reddy	State Government	41	41.5	46.5
MH	Maharashtra	Devendra Fadnavis	State Government	55	53.5	61.5
RJH	Rajasthan	Ashok Gehlot	State Government	30	32.5	34.5
TN	Tamil Nadu	Edappadi K. Palaniswami	State Government	44	44	50
OD	Odisha	Naveen Patnaik	State Government	31	33	37
KR	Kerala	Pinarayi Vijayan	State Government	29.5	38.5	36
HAR	Haryana	Manohar Lal Khattar	State Government	41	32.5	50.5
KAR	Karnataka	B. S. Yediyurappa	State Government	42.5	50	51
BH	Bihar	Nitish Kumar	State Government	30.5	30	36
UP	Uttar Pradesh	Yogi Adityanath	State Government	36.5	32	30.5
MP	Madhya Pradesh	Kamal Nath	State Government	32	30	33
PUN	Punjab	Amarinder Singh	State Government	29	29.5	31
JHR	Jharkhand	Raghubar Das	State Government	26	29	33
Delhi	Delhi	Arvind Kejriwal	State Government	48	70	66
TEL	Telangana	K. Chandrashekhar Rao	State Government	34	45.5	46

CODE	Actor	Description	Group	Influence	Position	Salience
NTPC	National Thermal Power Corporation Limited		Energy Companies & PSU	49	50	65
State Discoms	State distribution companies		Energy Companies & PSU	55	40	59.5
MOP PSUs	Ministry of Power PSUs		Energy Companies & PSU	43.5	41	55.5
MOPNG PSUs	Ministry of Petroleum and Natural Gas PSUs		Energy Companies & PSU	47	25	46
MOC PSUs	Ministry of Coal PSUs		Energy Companies & PSU	35	28.5	33
Pet. And chem.	Petroleum and chemicals industry		Industry	51.5	25	56
Auto. Ind.	Automobile Industry		Industry	83.8	33.5	84.5
EV Ind.	EV Industries		Industry	62.5	73.5	84.5
Manu. Ind.	Manufacturing Industries		Industry	50.5	65	81.5
S.P. Gen.	Solar Power generators		Industry	41	56	63.5
CSTEP	Center for Study of Science, Technology and Policy		Think Tank	27	47.5	61
TERI	The Energy and Resources Institute		Think Tank	36.5	62.5	71
NITI	NITI Aayog, government		Think Tank	65	76	86
CEEW	Council On Energy, Environment and Water		Think Tank	29	46.5	53
CSE	Centre for Science and Environment		Think Tank	31	58.5	68
CPR	Center for Policy Research		Think Tank	27.5	45.5	55
IRADE	Integrated Research and Action for Development		Think Tank	21.5	32.5	41

Source: KAPSARC expert interviews.

About the project

Promoting the adoption of energy-efficient vehicles has become a key policy imperative in both developed and developing countries. Understanding the impacts of various factors on the adoption rates of these vehicles forms the backbone of KAPSARC's research into light-duty vehicle demand. These factors include (i) consumer-related factors – demographics, behavioral, and psychographics; (ii) regulatory factors – policies, incentives, rebates, and perks; and (iii) geo-temporal factors – weather, infrastructure, and network effects. Our team is currently developing models at different levels: micro-level models using large-scale data comprising new car buyers' profiles, and macro-level models using aggregated adoption data to understand and project the effects of various factors that affect the adoption rate of energy-efficient vehicles.

About KAPSARC

The King Abdullah Petroleum Studies and Research Center (KAPSARC) is a non-profit global institution dedicated to independent research into energy economics, policy, technology and the environment, across all types of energy. KAPSARC's mandate is to advance the understanding of energy challenges and opportunities facing the world today and tomorrow, through unbiased, independent, and high-caliber research for the benefit of society. KAPSARC is located in Riyadh, Saudi Arabia.

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