



Exploring Purchase Intention Toward New Energy Vehicles Among Chinese Consumers: An Integration of Theory of Planned Behavior and Perceived Risk Theory

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Abstract

Amidst the escalating global energy crisis and environmental pollution, new energy vehicles (NEVs) have garnered significant attention as a low-carbon transportation option. Focusing on Chinese consumers, this study integrates the Theory of Planned Behavior (TPB) and Perceived Risk Theory to explore the influence of behavioral attitude, subjective norms, and perceived behavioral control on the purchase intention of NEVs. For the first time, perceived performance risk is incorporated into the TPB framework to reveal its moderating mechanism. Data were collected through an online survey targeting potential NEV consumers across China, yielding 301 valid responses. Empirical analysis using SPSS demonstrates that behavioral attitude, subjective norms, and perceived behavioral control all significantly and positively affect purchase intention, with perceived behavioral control exerting the most pronounced influence. Furthermore, perceived performance risk negatively moderates these relationships, diminishing the positive drivers of purchase intention. To foster the development of NEVs in China, the government should enhance perceived behavioral control by expanding charging infrastructure and providing economic incentives such as subsidies and tax reductions. Enterprises should mitigate perceived performance risk through technological advancements in battery safety and range, while also conducting educational campaigns to improve behavioral attitudes toward NEVs.

Keywords: Theory of Planned Behavior, Purchase Intention, New Energy Vehicles, Perceived Performance Risk

1. Introduction

In recent years, the global energy crisis and environmental pollution have become increasingly severe issues. As a low-carbon and clean mode of transportation, new energy vehicles (NEVs) have gradually become the focus of attention for governments and consumers worldwide. China, as the world's largest automotive market, has shown remarkable progress in the NEV field. According to data from the China Association of Automobile Manufacturers (2024), NEV sales in China reached 12.866 million units in 2024, a year-on-year increase of 35.5%, accounting for more than 75% of global NEV sales. This achievement is largely due to strong government support—such as purchase tax exemptions and the construction of charging infrastructure—which has injected robust momentum into the market. However, even though the market penetration and consumers' purchase intentions for NEVs have significantly increased, NEVs still account for only 8.90% of the total vehicle stock in China. This suggests that despite continuous policy support and an improving market environment, consumers still face many concerns and obstacles in their purchase decisions.

Existing research often focuses on the driving effect of policy incentives on market penetration, while the psychological mechanisms of consumers remain underexplored. The technical characteristics of NEVs (such as battery endurance, charging convenience, and safety) bring uncertainties that may trigger consumers' perceptions of performance risk, thereby inhibiting their purchase intentions. For instance, the "2024 New Energy Vehicle Consumption Insight Report" by the China Association of Automobile Manufacturers highlights that range anxiety, maintenance costs, and insufficient charging facilities remain core concerns for consumers. This phenomenon indicates that while the Theory of Planned Behavior (TPB) has been widely applied in consumer behavior research, its explanatory power in scenarios involving high-

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risk technological products is limited. TPB posits that behavioral attitude, subjective norms, and perceived behavioral control are the key drivers of behavioral intention (Ajzen, 1991); however, most studies focus on their main effects and seldom systematically examine the moderating role of technological risk. For example, Tu and Yang (2019) integrated TPB with the technology acceptance model without incorporating performance risk, and Zhao and Wang (2019) treated risk only as a direct influence factor without revealing its moderating mechanism. In light of these gaps, this study innovatively introduces perceived performance risk into the TPB framework and poses the following research questions: (1) How do behavioral attitude, subjective norms, and perceived behavioral control affect the purchase intention of NEVs? and (2) How does perceived performance risk in the relationships? The aim is to reveal the moderating role of perceived performance risk in the relationships among behavioral attitude, subjective norms, perceived behavioral control, and purchase intention, thereby providing a new theoretical perspective and practical insights for the market promotion of NEVs.

2. Objectives

The objectives of this study are as follows:

- 1) To verify the influence of the core variables in the Theory of Planned Behavior.
- 2) To explore the moderating effect of perceived performance risk.

2.1 Theoretical Background and Framework Construction

This study employs the Theory of Planned Behavior (TPB) as its core framework and integrates Perceived Risk Theory to construct a model of the factors influencing the purchase intention of new energy vehicles. According to TPB, an individual's behavioral intention is jointly determined by behavioral attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). TPB has been widely applied in consumer behavior research, with its central hypothesis being that a more positive attitude toward a behavior, stronger perceived social pressure, and greater confidence in one's control over the behavior will positively influence behavioral intention (Ajzen, 1991).

In the context of NEVs, previous studies have demonstrated that consumers' recognition of environmental values (behavioral attitude), policy support and social expectations (subjective norms), as well as economic capability and charging convenience (perceived behavioral control) are key drivers of purchase intention (Tu & Yang, 2019). For example, Zhang (2023) found that consumers' positive attitudes toward pure electric vehicles indirectly enhanced purchase intention through environmental awareness and technological trust. However, most existing studies focus on the main effects of TPB, and few have investigated how technological risk may weaken these effects.

As a technology-intensive product, NEVs may elicit significant performance risk perceptions (such as range anxiety, charging efficiency, and battery safety), which in turn can influence consumer decisionmaking. Perceived Risk Theory suggests that consumers evaluate the potential negative outcomes associated with a product or service when making decisions (Stone & Grønhaug, 1993). In the case of NEVs, performance risk manifests as concerns over insufficient range, lack of charging facilities, battery degradation, and similar issues (Li et al., 2023). Research has indicated that such risks may weaken consumer confidence through cognitive dissonance mechanisms—even if individuals maintain a positive attitude towards NEVs, high perceived performance risk may still suppress purchase intention (Wang et al., 2022). For example, Krishnan and Koshy (2021) found that range anxiety significantly reduced consumers' willingness to adopt electric vehicles, and Hoang and Vu (2022) further validated in the Vietnamese market that technological reliability is a core barrier to purchase decisions. Therefore, this study innovatively introduces perceived performance risk as a moderating variable to examine its mechanism in influencing the relationships among the core TPB variables and purchase intention. This integrated framework not only expands the application boundary of TPB in high-risk technological product consumption scenarios but also offers a new perspective for understanding consumer decision-making under technological uncertainty.

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2.2 Research Hypotheses

2.2.1 Behavioral Attitude and Purchase Intention (H1)

Behavioral attitude refers to consumers' subjective evaluation of purchasing NEVs, including their degree of favorability, perceived benefits, and overall emotional inclination toward the behavior. According to TPB (Ajzen, 1991), an individual's attitude toward a behavior is an important predictor of their behavioral intention. When consumers hold a more positive evaluation of a behavior, their willingness to engage in that behavior typically increases. This hypothesis has been widely supported in consumer behavior research. For instance, Xiong (2018) found that a positive attitude significantly enhanced consumers' willingness to participate in crowdfunding. Similarly, NEVs are often viewed as a "green consumption" choice due to their energy-saving and low-carbon characteristics, and consumers' behavioral attitudes may be driven by factors such as environmental protection awareness, acceptance of technological innovation, and economic benefits.

H1: The more positive consumers' behavioral attitudes toward NEVs, the stronger their purchase intention.

2.2.2 Subjective Norms and Purchase Intention (H2)

Subjective norms refer to the perceived social pressure that consumers experience when making purchase decisions, usually emanating from significant others (such as family, friends, or colleagues) or societal expectations. According to TPB, subjective norms influence behavioral intention through social influence mechanisms. When consumers perceive strong support or encouragement from their surroundings for purchasing NEVs, their purchase intention is likely to increase. He (2010) found that positive expectations from family and friends or the broader social environment significantly enhanced urban residents' willingness to engage in green consumption. Since NEVs carry both environmental significance and social responsibility, the purchase decision is particularly susceptible to the influence of the social environment. Huang (2012) noted that the tendency to conform plays an important role in consumers' purchase of NEVs, with social norms boosting purchase intention. Kahn (2007) further pointed out that consumers might purchase NEVs not only out of personal needs but also to gain social recognition or display environmental consciousness.

H2: The stronger the subjective norms perceived by consumers, the more significant their purchase intention.

2.2.3 Perceived Behavioral Control and Purchase Intention (H3)

Perceived behavioral control refers to consumers' self-assessment of their ability to execute the purchase behavior, including their evaluation of the resources needed (e.g., economic capability), knowledge (e.g., technical understanding), and external conditions (e.g., availability of charging facilities). TPB posits that perceived behavioral control is a crucial determinant of behavioral intention, especially when actual obstacles to behavior exist. Pan (2014) demonstrated the positive impact of perceived behavioral control on consumers' decision-making in the context of used car purchases. For NEVs, purchasing and using the vehicle involves high economic costs (such as purchase price and maintenance fees), technological adaptation (e.g., understanding of battery technology), and infrastructure support (e.g., distribution of charging stations), all of which may influence consumers' perceived behavioral control. Yang (2019) indicated that both perceived control and self-efficacy dimensions positively affect the purchase intention of electric vehicles. When consumers believe they have the financial capacity or that charging facilities are adequate, their purchase intention will increase; conversely, if they perceive obstacles, their intention may decline.

H3: The stronger the consumers' perceived behavioral control, the more significant their purchase intention.

2.2.4 The Moderating Role of Perceived Performance Risk (H4-H6)

1) Perceived performance risk refers to consumers' subjective concerns regarding potential deficiencies in the performance of NEVs, such as insufficient driving range, prolonged charging times, or

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battery safety issues. Perceived Risk Theory posits that when consumers perceive higher risk, their decisionmaking may be inhibited—even if they maintain a positive attitude toward the behavior. Wang et al. (2022) found that concerns over vehicle performance significantly weakened the positive influence of behavioral attitude on purchase intention in the context of energy-saving vehicles. Similarly, Zhang (2023) demonstrated that perceived risk negatively affected consumers' positive attitudes toward pure electric vehicles. For NEVs, even if consumers recognize the environmental and economic benefits, uncertainty about battery life or technological reliability may lead to hesitation. This risk perception might stem from insufficient market information, negative media reports, or personal experiences. For instance, if consumers hear about incidents of battery fires, their trust in the product may decline, thus diminishing the conversion of positive attitudes into purchase intention.

H4: Perceived performance risk negatively moderates the relationship between behavioral attitude and purchase intention.

2) Although subjective norms promote purchase intention through social pressure, perceived performance risk may weaken this positive effect. Wu et al. (2023) observed that perceived functional risk significantly reduced the influence of social impact on purchase intention, and Arshad and Sahban (2021) similarly indicated that perceived risk negatively moderated the relationship between social norms and behavioral intention. In the case of NEVs, even if consumers receive support from family and friends, high concerns regarding performance risk (such as inconvenient charging or safety issues) might limit their purchase intention. For example, recommendations from peers may prompt consumers to consider buying an NEV, but if they believe the vehicle cannot meet practical needs, such social pressure might not translate into action.

H5: Perceived performance risk negatively moderates the relationship between subjective norms and purchase intention.

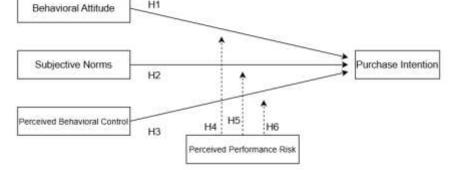
3) Perceived behavioral control reflects consumers' confidence in their own ability to purchase an NEV; however, high perceived performance risk may undermine this confidence, thereby weakening its positive effect on purchase intention. Hu et al. (2019) found that perceived risk negatively affected users' behavioral intentions in the context of cloud storage services, and Li et al. (2012) similarly noted that perceived technological risk diminished the impact of perceived behavioral control. For NEVs, if consumers are worried about technological reliability or insufficient infrastructure, even if they believe they are capable of purchasing and using the vehicle, their purchase intention may decrease. For example, the scarcity of charging stations may lead consumers to doubt their control over the purchasing process.

H6: Perceived performance risk negatively moderates the relationship between perceived behavioral control and purchase intention.



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H1

Figure 1 Theoretical model

Based on the above hypotheses, the theoretical model of this study is presented as shown in Figure 1.

3. Materials and Methods

3.1 Sample Selection and Data Collection

This study targets potential consumers of new energy vehicles (NEVs) in China. Data were collected exclusively through an online survey distributed via the "Wenjuanxing" platform, a widely recognized and reliable questionnaire tool in China. To ensure geographical diversity, the survey covered major economic regions nationwide, including East China, South China, North China, and the Central and Western regions. A total of 301 valid questionnaires were obtained after filtering incomplete or inconsistent responses.

The demographic characteristics of the sample are as follows: males account for 46.18% and females for 53.82%; the majority of respondents are aged 25–35 (46.18%), followed by those aged 36–45 (25.58%); regarding education, undergraduates account for the highest proportion (52.82%), with those holding master's degrees and above accounting for 6.65%. Annual household income is predominantly in the 100,000–150,000 RMB range (46.84%), followed by 50,000-100,000 RMB (27.91%). Occupations are mainly company employees (38.87%), freelancers (24.25%), and government or institutional staff (22.59%). The details are summarized in Table 1 below.



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Variable	Category	Number	Percentage (%)	Variable	Category	Number	Percentage (%)
	Male	139	46.179		Below 50,000 RMB		13.953
Gender	Female	162	53.821	Ŧ	50,000–100,000 RMB	84	27.907
	Below 25	55	18.272	Income	100,000–150,000 RMB	141	46.844
	25–35	139	46.179		Above 200,000 RMB	34	11.296
Age	36-45	77	25.581		Private Business Owner	13	4.319
	Above 46	30	9.967		Company Employee	117	38.87
	Below College	20	6.645	Government/Institution		68	22.591
	College Diploma	102	33.887	Occupation	Student	25	8.306
Education	Undergraduate	159	52.824		Freelancer	73	24.252
	Master's and Above	20	6.645		Others	5	1.661

Table 1. Basic Characteristics of the Research Subjects

Source: Compiled by the author

3.2 Measurement Tools

The questionnaire for this study was developed based on the Theory of Planned Behavior (TPB) and Perceived Risk Theory, and comprises five core variables: behavioral attitude, subjective norms, perceived behavioral control, perceived performance risk, and purchase intention. All items were adapted from well-established scales in both domestic and international literature and were modified to suit the context of NEV consumption.

Table 2. Scale Design

Variable/Dimension	Item Code	Item Description	Reference Source
	A1	I believe purchasing new energy vehicles (NEVs) is a wise choice.	
Behavioral Attitude	A2	I believe purchasing NEVs benefits everyone.	Ajzen (1991)
	A3	I think efforts should be made to promote and use NEVs.	
	B1	My family and friends think I should purchase an NEV.	
Subjective Norms	B2	NEVs align better with government policy requirements.	Zhang et al. (2023)
	B3	NEVs better match my social status.	
Perceived	C1	I have sufficient financial resources and capability to purchase an NEV.	$\mathbf{P}_{\mathbf{n}\mathbf{n}\mathbf{l}} \text{ at al } (2016)$
Behavioral Control	C2	I can resolve potential issues encountered during the NEV purchasing process.	Paul et al. (2016)

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	C3	I have adequate knowledge to evaluate the			
	C5	performance of NEVs.			
	D1	I worry that the battery range of NEVs may not meet			
	DI	my travel needs.			
	D	I worry that the long charging time of NEVs may			
	D2	affect daily use.			
Perceived	D3	I worry about potential safety hazards in NEV batteries	L_{i}^{i} at al. (2022)		
Performance Risk		during usage.	Li et al. (2023)		
	D4	I worry about unstable performance of NEVs under			
	D4	extreme weather conditions.			
	D5	I worry that the reliability of NEVs is inferior to			
		traditional fuel-powered vehicles.			
	E1	I intend to purchase an NEV in the future.			
Develope Intertion	E2	When purchasing a car, I actively consider NEVs.	Bagozzi & Burnkrant		
Purchase Intention	n E3	I am willing to recommend NEVs to my family and	(1979)		
		friends.			

Source: Compiled by the author

All items are measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Data analysis was conducted using SPSS 26.0.

Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Behavioral Attitude	301	1.000	5.000	3.305	0.997	0.060	-0.850
Subjective Norms	301	1.333	5.000	3.316	0.997	0.136	-0.905
Perceived Behavioral Control	301	1.333	5.000	3.413	1.003	-0.036	-1.028
Perceived Performance Risk	301	1.000	4.600	2.660	0.966	-0.074	-0.989
Purchase Intention	301	1.333	5.000	3.339	1.044	-0.014	-1.047

 Table 3. Descriptive Statistics

Descriptive analysis was conducted to examine the overall distribution of quantitative data using metrics such as means, standard deviations, skewness, and kurtosis. As shown in Table 3, the mean scores of all variables ranged from 2.660 to 3.413, indicating a moderate to upper level of agreement among respondents. The skewness and kurtosis values (absolute values <3 for skewness and <5 for kurtosis) suggest that the data approximately follow a normal distribution, confirming the stability and reliability of the sample.

3.4 Reliability and Validity Testing

The reliability and validity of the measurement scales were tested using Cronbach's α coefficients and exploratory factor analysis (EFA). As shown in Table 4, the Cronbach's α coefficients for all variables exceed 0.8 (behavioral attitude = 0.823, subjective norms = 0.828, perceived behavioral control = 0.829, perceived performance risk = 0.878, purchase intention = 0.810), indicating good internal consistency. The Kaiser-Meyer-Olkin (KMO) measure was 0.897 (p < 0.001) and Bartlett's test of sphericity was significant (χ^2 = 2420.986, df = 136), demonstrating that the data were suitable for factor analysis. Using principal

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component analysis, five factors were extracted with a cumulative variance explanation of 72.327%; all item factor loadings were above 0.7 with no cross-loadings, thereby confirming the structural validity of the scales.

Fable 4. Results of Reliability and Validity Testing						
Variable	Cronbach's α	Factor Loading Range	Cumulative Variance Explained			
Behavioral Attitude	0.823	0.78-0.82	20.03%			
Subjective Norms	0.828	0.76-0.83	13.34%			
Perceived Behavioral Control	0.829	0.72-0.82	13.22%			
Perceived Performance Risk	0.878	0.73-0.81	13.22%			
Purchase Intention	0.810	0.72-0.83	12.52%			

4. Results and Discussion

4.1 Hypothesis Testing

Multiple regression analysis was conducted with purchase intention as the dependent variable and behavioral attitude, subjective norms, and perceived behavioral control as independent variables ($R^2 = 0.344$, F = 53.410, p < 0.001). The results indicate that:

H1 (Behavioral Attitude \rightarrow Purchase Intention): Supported ($\beta = 0.236$, p < 0.001). A one-unit increase in positive attitude toward NEVs increases purchase intention by 23.6%, holding other variables constant. This aligns with Ajzen (1991) and confirms that environmental consciousness and perceived benefits significantly drive purchase decisions.

H2 (Subjective Norms \rightarrow Purchase Intention): Supported ($\beta = 0.181$, p = 0.001). Social pressure (e.g., family or policy influence) contributes moderately to purchase intention, consistent with Zhang et al. (2023).

H3 (Perceived Behavioral Control \rightarrow Purchase Intention): Supported ($\beta = 0.343$, p < 0.001). Perceived control (e.g., charging convenience, financial capability) exerts the strongest influence, emphasizing practical barriers as critical determinants (Yang, 2019).

Table 5. Results of R	Regression Analysis	and Moderation Effects

Variable	Unstandardized Coefficient (B)	Standardized Coefficient (β)	t-valuet	p-valuep
Constant	0.675	-	3.108	0.002
Behavioral Attitude	0.247	0.236	4.476	0.000
Subjective Norms	0.190	0.181	3.338	0.001
Perceived Behavioral Control	0.357	0.343	6.530	0.000

Hierarchical regression analysis was then used to test the moderating effects of perceived performance risk. The results show that:

H4 (Risk × Behavioral Attitude): Supported ($\beta = -0.184$, p < 0.001). High perceived risk weakens the positive effect of attitude on intention (Figure 4.1). For example, consumers with a mean attitude score of 4.0 but high risk (mean +1 SD) show 18% lower purchase intention than those with low risk.

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H5 (Risk × Subjective Norms): Supported (β = -0.243, p < 0.001). Social influence diminishes when performance concerns arise. Even with strong peer recommendations, purchase intention drops by 24% under high-risk perceptions.

H6 (Risk × Perceived Control): Supported ($\beta = -0.122$, p = 0.003). Confidence in overcoming practical barriers (e.g., charging access) is less effective when consumers doubt NEV reliability.

Table 6.	Test Results	of Moderation	Effects
Table 0.	Test Results	of woderation	Effects

Interaction Term	Regression Coefficient (β)	t-valuet	p-valuep	ΔR^2
Behavioral Attitude × Perceived Performance Risk	-0.184	-3.89	0.000	0.137
Subjective Norms × Perceived Performance Risk	-0.243	-4.21	0.000	0.145
Perceived Behavioral Control × Perceived Performance Risk	-0.122	-2.97	0.003	0.112

4.2 Discussion of Research Results

This study finds that the core variables of the Theory of Planned Behavior (TPB)—namely, behavioral attitude, subjective norms, and perceived behavioral control—significantly and positively influence the purchase intention of NEVs, with perceived behavioral control ($\beta = 0.343$) being the most influential. This result underscores the central role of consumers' confidence in practical conditions such as charging convenience and economic capability in technology-driven consumption decisions (Yang, 2019). In contrast, the influence of subjective norms ($\beta = 0.181$) is relatively modest, suggesting that relying solely on social pressure or policy promotion may not sustainably boost purchase intention, and that more refined demand-activation strategies are needed (Zhao & Wang, 2019). Notably, the moderating effect of perceived performance risk reveals the "psychological threshold" imposed by technological uncertainty: when consumers harbor high concerns regarding range, battery safety, and related issues, the positive effects of behavioral attitude, subjective norms, and perceived behavioral control on purchase intention are all diminished. The strongest moderation was observed for subjective norms ($\beta = -0.243$), indicating that in high-risk contexts, consumers are more likely to rely on individual rational judgments rather than external social pressure. This implies that in scenarios characterized by high risk, differentiated marketing strategies are crucial for effectively boosting purchase intention.

5. Conclusion

5.1 Research Conclusions

Based on an empirical analysis integrating the Theory of Planned Behavior (TPB) and Perceived Risk Theory, this study examines the mechanisms driving consumers' purchase intention for new energy vehicles (NEVs) and reveals that behavioral attitude, subjective norms, and perceived behavioral control significantly and positively influence purchase intention, with perceived behavioral control exhibiting the strongest effect ($\beta = 0.343$, p < 0.001), followed by behavioral attitude ($\beta = 0.236$, p < 0.001) and subjective norms ($\beta = 0.181$, p = 0.001). These findings align with Ajzen's (1991) TPB framework and are corroborated by prior studies such as Tu and Yang (2019), which emphasize the role of positive environmental and technological attitudes, and Huang (2012), which underscores social conformity; and Yang (2019), which highlights perceived control over economic and infrastructural factors.

However, this study further identifies perceived performance risk as a critical moderator that negatively impacts these relationships—most notably weakening the effect of subjective norms ($\beta = -0.243$, p < 0.001), followed by behavioral attitude ($\beta = -0.184$, p < 0.001) and perceived behavioral control ($\beta = -0.122$, p < 0.001). This extends the work of Wu et al. (2023) and Wang et al. (2022) by demonstrating how



technological uncertainty and performance concerns can diminish the positive drivers of NEV adoption, thus offering valuable insights for governments and enterprises aiming to address consumer hesitancy and promote NEV markets in contexts of rapid innovation.

5.2 Countermeasures and suggestions

Based on the research conclusions, both the government and enterprises should work together to address the core issues. The government should increase investments in core NEV technologies-particularly in battery technology and charging efficiency-and establish special funds to encourage collaboration among companies, universities, and research institutions to promote technological breakthroughs. This will help improve the performance stability of NEVs and reduce consumers' risk perceptions. Furthermore, efforts should be made to accelerate the construction of urban and rural charging networks and fast-charging stations, thereby enhancing charging convenience, alleviating range anxiety, and boosting consumer confidence. Additionally, policies such as "old-for-new" exchange programs and battery insurance can help lower the economic burden and stimulate purchase intention. Enterprises, on their part, need to invest in the development of high-performance batteries, openly publish data on driving range and safety test results to increase technological transparency and consumer trust, and establish a nationwide after-sales service network-providing lifetime battery warranties and roadside assistance. By offering test-drive activities and experience-based marketing through user recommendations, companies can help alleviate consumer concerns and enhance brand influence. These recommendations aim to tackle the core obstacles in consumer decisionmaking from both technological and market perspectives, thereby supporting the long-term development of China's new energy vehicle industry.

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