

# *Research on the Standardization Work Roadmap of Hydrogen Fuel Cell Vehicles (HFCV) in Jinhua*

**Junwei Chu, Yueqiao Li, Wei Hong, Zhengyue Zou**

*Jinhua Academy of Metrology and Quality Science, Jinhua, Zhejiang, 321000, China*

**Keywords:** Hydrogen Fuel Cell Vehicles (HFCV), Standardization Work, Roadmap for Hydrogen

**Abstract:** This article conducts a detailed and in-depth analysis of the work roadmap of the hydrogen fuel cell vehicle industry in Jinhua, combined with the development direction and trend of hydrogen fuel cell vehicle technology. Through extensive investigation and research, and based on the guidance of Jinhua province to accelerate the cultivation of hydrogen energy industry development, it analyzes the research background, formulation basis, standard analysis and implementation prospects from four aspects. We provide theoretical support for the government to formulate relevant industrial policies, guide the healthy and rapid development of the hydrogen fuel cell vehicle industry in Jinhua.

## **1. Introduction**

Standardization is an indispensable technological activity in social and economic development, it is playing an increasingly important role in regulating product quality, assisting industrial development, promoting economy and trade, facilitating people's lives. In order to support and lead role of standardization in the hydrogen fuel cell vehicle industry, developed countries in the automotive industry have gradually established a hydrogen fuel cell vehicle standard system and standardization work roadmap.

## **2. Research background**

Hydrogen fuel cell refers to vehicles that are entirely or partially powered by electricity. The development of hydrogen fuel cell HFCV is an important driving force for effectively alleviating energy and environmental pressures, promoting the transformation of economic development patterns and sustainable development. It is a strong support for achieving the strategic goals of "carbon peaking" and "carbon neutrality". At present, the new round of technological revolution has spurred industrial transformation and reshaping. The century old automotive industry faces unprecedented development opportunities and challenges. HFCV has become an urgent demand for the transformation and upgrading of the automotive industry, and is also the helpful path for our country to move towards an automotive powerhouse<sup>[1]</sup>.

The goal of developing a standardized work roadmap for HFCV in Jinhua is to establish a hydrogen fuel cell vehicle standard system that is closely related, coordinated, hierarchical, reasonably structured, mutually supportive, and meeting application needs with a purpose and a

plan. A series of specific standards determined by the standard system will be formulated to maximize the effectiveness of standardization work, supporting and guiding the rapid development and technological innovation of HFCV in Jinhua, proposing a scientific, holistic, systematic and open standard system for HFCV, proposing standard projects that need to be revised in the future, proposing implementation steps for the construction of hydrogen fuel cell vehicle standards and systems in Jinhua, promoting technological and application innovation, promoting energy transformation. We will promote the large-scale industrialization of HFCV in Jinhua to meet the needs of scientific research, industrialization, market-oriented operation and government management; We will promote integration into international standardization work and promote the internationalization of Chinese standards.

The overall principles of the standardization work roadmap for HFCV in Jinhua is government guidance, enterprise focus and innovative ideas. The purpose is to fully enhance the core competitiveness of HFCV in Jinhua, leverage the technically support role of standards in leading scientific research, standardizing industrialization, promoting marketization and ensuring the healthy development of HFCV industries.

The government should utilize a platform jointly participated by relevant departments, the government should coordinate the construction and development of the hydrogen fuel cell vehicle standard system, coordinate the division of labor and tasks of each department, coordinate the progress of the hydrogen fuel cell vehicle standard system construction, coordinate important issues in the standard system construction. Various professional standardization technical committees in the standard formulation and revision of HFCV in their respective fields should fully leverage the main role of clear levels. A standardized system that coordinates and unifies national and industry standards with different focuses<sup>[2]</sup>.

Many technologies of HFCV are still in the stage of technological achievements. They have not been verified through engineering and industrialization. This part of the standard needs further maturity of the technology. Some hydrogen fuel cell vehicle products are still at the early stages of industrialization, the amount of data supporting standard research is limited. We need to gradually promote the standardization of HFCV based on the maturity of technology and the urgency of standard requirements.

The government should adhere to standard forward research and promote the integration of scientific research and standardization work. The government should proceed from the actual situation of Jinhua, the government should focus on technology or intellectual property rights to support the formulation of standards, especially on transforming the latest achievements of scientific research, industrialization and demonstration operation of Jinhua HFCV into standards to make the progressiveness of standards. For order to reach to the development of technology and industry, the standard system must meet the current industry needs, appropriately considers the trend of future technological development, and play a certain guiding role in the development of HFCV.

Taking the promotion and application of HFCV as the main body, we will fully leverage the leading role of the automotive industry, though collaborating with various related fields such as electricity and electricians, we will form a work mechanism with clear division of labor, mutual cooperation and joint promotion.

### **3. Develop a foundation**

The roadmap for the standardization of HFCV in Jinhua is based on the planning and policies of Jinhua's HFCV technology and industry, with the comprehensive implementation of the development strategy and goals of HFCV as the starting point, the government make the effective

use of the standard system to support the industry as the foothold. By systematically sorting out various relevant factors for the development of the hydrogen fuel cell vehicle industry, we can fully consider the suggestions and opinions of all parties. We research and determine the route and direction of standardization work for HFCV, and form a systematic, scientific and operable Jinhua hydrogen fuel cell vehicle standardization work roadmap<sup>[3]</sup>.

The Jinhua Municipal People's Government attaches great importance to promote the development of the hydrogen fuel cell vehicle industry. The government has identified HFCV as one of the seven strategic emerging industries guiding future economic and social development. It has introduced a series of industrial plans and supportive policies to promote the development of the hydrogen fuel cell vehicle industry, investing a large amount of resources in scientific research and industrialization. Based on these plans, the standardization roadmap for HFCV in Jinhua outlines the technical route, development goals, main tasks, and guarantee measures for the development of Jinhua HFCV.

The government should improve the innovation system and enhance the driving force for development. Enhancing technological innovation capability is the central link in cultivating and developing the hydrogen fuel cell vehicle industry. It is necessary to strengthen the dominant position of enterprises in technological innovation, guide innovation elements to gather with advantageous enterprises, improve the technology new system that is people oriented, country oriented, and combines science, research and use. Through national science and technology plans, key special projects, and other channels, the government should increase to break through key core technologies and enhance industrial competitiveness.

Scientific planning of industrial layout. Jinhua has established a complete automotive industry system. To develop HFCV, it is necessary to not only make good use of the existing industrial foundation, but also fully leverage the role of market mechanisms, strengthen planning guidance, and improve development efficiency.

In order to promote and apply of HFCV. The government should gradually increase the proportion of HFCV used in the public service sector and expand the scale of hydrogen fuel cell vehicle applications in the private sector. The government should support helpful system for the promotion of HFCV, especially in the use process, the government can change from encouraging purchase to facilitating use, the government can establish a long-term mechanism to promote the development of HFCV and introduce production enterprises to continuously increase the production and sales ratio of HFCV.

The government should accelerate the construction of hydrogenation infrastructure and build a convenient, efficient and moderately advanced hydrogenation system. A complete hydrogenation facility is an important guarantee for the development of the hydrogen fuel cell vehicle industry. The government should have scientifically plan, strengthened technological development, explored effective business operation models, actively promote the construction of hydrogen refueling facilities, in order to meet the needs of the industrialization development of HFCV.

The government should strengthen the cascade utilization and recycling management of hydrogen fuel cells. The government should develop management measures for the recycling and utilization of hydrogen fuel cells, establish a hierarchical utilization and recycling management system for hydrogen fuel cells, the government should let people know the rights, responsibilities and obligations of all relevant parties. The government can continuously improve the standard system for HFCV, raise the entry threshold for hydrogen fuel cell vehicle products, strengthen factory safety performance testing, strengthen production supervision of HFCV and establish a sound policy system for HFCV classification registration, tax insurance, traffic management, vehicle maintenance, and second-hand vehicle management. The government should gradually expand the pilot demonstration order of fuel cell vehicles.

## 4. Implementation and Outlook

Many technologies of HFCV are still on the stage of technological achievements and have not been validated through engineering and industrialization. The standardization work roadmap needs further maturity of the technology. Some hydrogen fuel cell vehicle products are still in the early stages of industrialization, and the amount of data supporting standard research is limited. It is necessary to gradually promote the standardization of HFCV based on the maturity of technology and the urgency of standard requirements.

The government should Utilize a platform jointly participated by relevant departments, we will coordinate the construction and development of the hydrogen fuel cell vehicle standard system, coordinate a division with labor. We will task among departments, arrange the progress of the hydrogen fuel cell vehicle standard system construction. We will coordinate important issues in the construction of the standard system, fully leverage the main role of various professional standardization technical committees in the standard formulation and revision of HFCV in their respective fields. The government should plan clearly at different levels .A standardized system that coordinates and unifies national and industry standards with different focuses. The government should take the promotion and application of HFCV as the main body, fully leverage the leading role of the automotive industry, collaborate with various related fields such as electricity and electrical engineering, and the government form a clear division of labor, mutual cooperation, and joint promotion mechanism.

The government should adhere to standardized positive research and promote the integration of scientific research and standardization work. We should proceed from Jinhua's reality, we should pay attention to the technology or intellectual property rights to support the formulation of standards, especially to transform the latest achievements of Jinhua's hydrogen fuel cell vehicle scientific research, industrialization and demonstration operation into standards. At the same time, in order to adapt to the development of technology and industry, the standardization work roadmap should meet the current industry needs, appropriately consider the trend of technological development in the future, and play a certain guiding role in the development of HFCV.

The compilation and revision of the standardization roadmap for HFCV in Jinhua is a work that keeps pace with the times. It should be continuously pushed forward based on the progress of science and technology. The development of industrialization changes in market-oriented applications, the needs of government management, and the laws of standardization work. Due to various reasons such as the need for further maturity of technology and industry or insufficient basic research work, the future revision of the standardization work roadmap for HFCV in Jinhua will focus on four aspects.

There are some safety related standards for HFCV. Safety is the prerequisite and foundation for the sustainable development of the hydrogen fuel cell vehicle industry. The safety of HFCV, as a continuous and close concern of all parties in the industry, requires further in-depth research on which areas require standards. In the future, we will continuously adjust and improve the safety standard system for HFCV, and we will establish a multi-level and three-dimensional standard network centered on safety standards.

There are some standards related to HFCV, infrastructure and ease of use. Infrastructure is the foundation for the development and promotion of HFCV, and the convenience of infrastructure also deeply affects user experience. At present, the insufficient popularity and uneven distribution of infrastructure have become the pain points in promoting HFCV. How to ensure that there is available infrastructure to provide energy replenishment for HFCV.

There are some standards related to the sustainable development of HFCV. The coordinated and balanced development of HFCV and related industries is the foundation for the sustainable

development of the hydrogen fuel cell vehicle industry. The large-scale industrialization of HFCV have closely linked them with various related industries such as infrastructure, emergency rescue, recycling, storage and transportation. How to establish is a new type of inter industry network relationship that promotes and coexists with each other. How to adapt to the development laws of the future market environment, industrial environment, and natural environment. All relevant industries should actively promote research on relevant standards, and establish a comprehensive standardization system.

## 5. Conclusion

The enterprise should use prospective technology and application related standards for HFCV. New technologies, applications and products are considered the fundamental guarantees to enhance the competitiveness of China's automotive industry, accelerate the transformation of the automotive industry, and promote green travel. The entire industry should form a universal concept of down-to-earth basic research and development, it is striving to break through cutting-edge technologies, and it is creating a new pattern of technology development guided by standards and standardization led by emerging technologies. The enterprise should continuously achieve a new breakthroughs in domestic and international standardization work in key areas such as fuel cell HFCV and power batteries.

## References

- [1] Shen Ting, *Roadmap for Standardization of Electric Vehicles in China (Third Edition)*. pp. 18-20, 2021. <http://www.cataarc.org.cn/>
- [2] Chui Jian, *Summary and Analysis of Policies Related to Hydrogen Energy and Fuel Cell Vehicles in China in 2022*. pp. 1-2, 2022. <https://www.ndrc.gov.cn/>
- [3] Huang Yi, *Notice on Issuing the Implementation Opinions on Accelerating the Development of Hydrogen Energy Industry in Jinhua*. pp. 8-10, 2021. <http://fgw.jinhua.gov.cn/>