Report on Standards in the Hydrogen Energy Fuel Cell Industry

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About IHFCA

International Hydrogen Fuel Cell Association (IHFCA) was established in Beijing in July 2022 as an international non-profit organization dedicated to promoting worldwide hydrogen collaboration and FCV rollout and commercialization. Launched by the China Society of Automotive Engineers (China SAE) alongside global industry leaders including FORVIA, Toyota, Hyundai, SAIC, Sinopec, Valterra Platinum & other leading companies and organizations, IHFCA is committed to accelerating the commercialization and rollout of Fuel Cell Vehicles (FCVs). The IHFCA Standardization Working Committee specifically aims to leverage the technical capabilities of non-governmental scientific organizations to advance cross-border exchange and cooperation. By promoting the development and widespread application of hydrogen and fuel cell technologies, the committee actively supports the realization of global carbon neutrality.

INTERNATIONAL HYDROGEN FUEL CELL ASSOCIATION

Table of Contents

Foreword ..... **iii**

Executive Summary ..... **iv**

Acknowledgements ..... **v**

Abbreviations ..... **vi**

1. Introduction **1**

1.1 Industry Overview 1

1.2 Role of Standardization 2

1.3 Scope and Methodology 3

2. Strategic Context **4**

2.1 Standardization Landscape 4

2.2 Stakeholder Ecosystem 6

2.3 Maturity Assessment 6

3. Regulatory and Technical Baseline **8**

3.1 Methodological Approach 8

3.2 Regulatory Inventory 8

3.3 Key Standards 10

4. Gap Analysis **17**

4.1 Technical Barriers 17

4.2 Environmental Barriers 17

4.3 Standardization Gaps 19

5. Root Cause Analysis **21**

5.1 Geopolitical Divergence 21

5.2 Structural Misalignment 22

6. IHFCA Strategic Response **25**

6.1 Technical Route Framework 25

The Foundational Layer: General Purpose & Safety 26

The Supply Layer: Hydrogen Production, Storage, Distribution & Refuelling 26

The Application Layer: Fuel Cells, Vehicles & Applications 27

6.2 Strategic Roadmap (2025-2040) 27

7. Implementation Mechanisms **29**

8. Conclusion **31**

Contact Us **31**

Bibliography **32**

Annexes **36**

Annex A: IHFCA Hydrogen standard system framework 36

Annex B: Regional Standards List of Hydrogen and Fuel Cell (EU, US, China, Japan, Korea) 38

EU: 38

US: 42

Japan: 45

Korea: 48

China: 52

Foreword

Hydrogen fuel cells stand at the strategic core of the global energy transition, powering applications from heavy-duty transportation to stationary power generation and industrial decarbonization. As the world is approaching the Net Zero era, the establishment of robust, standardized frameworks for the hydrogen industry becomes critically important. This review analysis examines an ecosystem of over **300** hydrogen and fuel cell standards and technical specifications pivotal to meeting global climate goals, focusing on high-impact technical regulations. These standards assist the sector by clarifying safety measures, suggesting ways to improve compatibility across borders, and outlining consistent testing methods. They help build a base for growth while addressing safety needs for public use and infrastructure. In addition, these common approaches can support international trade, making it easier for equipment like electrolyzers and fuel cell stacks to fit into global supply chains.

The hydrogen fuel cell industry is increasingly part of global conversations regarding energy security and industrial strength. Major economies in Europe, North America, and Asia are prioritizing hydrogen technologies to help support low-carbon objectives. Yet the fact that raw materials like platinum group metals come from limited sources may create supply chain risks [1]. Countries generally wish to avoid replacing a reliance on fossil fuels with a dependence on imported technology. In this environment, standardization serves as a practical tool for market access and economic stability. As regulations place more attention on carbon intensity and safety, harmonized standards can help hydrogen products meet requirements and manage trade barriers. Setting these technical benchmarks goes beyond engineering work to influence how the industry competes in a low-carbon economy.

This analysis recognizes the need to support innovation while meeting safety requirements. As hydrogen technologies grow in sectors like shipping and logistics, they are becoming a larger part of climate policy discussions. There is often a difference between the speed of industrial development and the time needed for international regulation. IHFCA hopes to help connect the private sector with global governance bodies to address this timing difference. We aim to use our technical resources to share data from practical applications, helping to inform the technical terms needed for global compatibility. This report highlights our interest in supporting this process so that standards evolve alongside technology. Our goal is to encourage international dialogue that helps the hydrogen industry develop with a focus on trust, safety, and environmental responsibility.

Executive Summary

Hydrogen and fuel cell technologies are moving from research phases to become practical parts of carbon reduction strategies. This shift is visible in sectors like heavy transport, shipping, and industrial heating. As countries work toward Net Zero goals, the industry is advancing from pilot projects to early commercial use. However, there appears to be a difference between projected demand and the number of projects currently moving forward. Differing regulations across regions may contribute to this gap. A lack of common technical standards can create trade barriers and complicate global supply chains. While standards for light-duty vehicles are relatively established, newer areas like liquid hydrogen and high-power applications still face testing gaps. These gaps may influence safety discussions and affect investment decisions [2].

This analysis suggests a difference between the speed of industrial innovation and the timeline of international standardization. Innovation often moves in short cycles, while establishing standards can take several years. This timing gap creates challenges for new technologies seeking regulatory recognition. Additionally, regions like Europe, North America, and Asia often use different regulatory approaches. These regional differences indicate a need for shared technical terms to help connect markets. Without alignment, the industry may face inefficiencies, such as manufacturers potentially having to repeat tests to meet varying compliance requirements.

In response to these industry issues, IHFCA aims to serve as a platform for international collaboration. We hope to connect private sector innovation with global governance bodies. Through our role as a **Category A Liaison** to **ISO/TC 197** and **IEC/TC 105**, IHFCA has developed a plan to support international standards. We advocate for a pre-standardization process that gathers current industry practices. The goal is to organize these practices into voluntary technical specifications. These documents can then serve as inputs for formal standardization. This approach may help speed up the development cycle and assist safety guidelines in matching technological progress.

This report provides a reference for the industry. It outlines a technical path that focuses on aligning safety standards, ensuring equipment works together, and verifying performance throughout the product life. IHFCA aims to help the global community address cost challenges associated with hydrogen technologies by sharing data and discussing topics such as carbon tracking and testing rules. This document suggests that shared standards can support sustainable growth. We hope to encourage ongoing conversation to help build a safe and open global hydrogen market.