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Hydrogen Technological Innovation Systems in Practice: Comparing Danish and American Approaches to Fuel Cell Development

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Abstract: This paper investigates Danish and American hydrogen fuel research from a modified technological innovation system (TIS) perspective. We ask: which approach to hydrogen research is more effective, and what do the differences between the two cases tell us about the research process and theories of innovation? To answer these questions, we begin by justifying our selection of hydrogen systems and Denmark and the United States as our case studies. We proceed to introduce a modified theoretical framework of TIS and focus on seven core elements of hydrogen research: knowledge development and diffusion, entrepreneurial experimentation, political and social influence, market formation, legitimation, resource mobilization, and positive externalities. We conclude by offering insights from our comparison as they relate to hydrogen research strategy and policy, effectiveness at achieving national goals, and the need for further research and better conceptual models about innovation.

Keywords: Denmark; United States; hydrogen economy, Technological Innovation System (TIS)

Abbreviations:

DMFC	Direct Methanol Fuel Cell
DOD	Department of Defense
DOE	Department of Energy
FCH-JU	Fuel Cell and Hydrogen Joint Undertaking
HT-PEM	High Temperature Proton Exchange Membrane fuel cell
LT-PEM	Low Temperature Proton Exchange Membrane fuel cell
NIS	National Innovation System
NREL	National Renewable Energy Laboratory
OECD	Organization of Economic Cooperation and Development
RIS	Regional Innovation System
SGIP	(Californian) Self Generation Incentive Program
SMEs	Small and Medium sized Enterprises
SOFC	Solid Oxide Fuel Cell
TIS	Technological Innovation System

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