

“Prospects for Hydrogen and Fuel Cells”

International Energy Agency

Table of Contents

Executive Summary

1. Introduction

- The Role of Hydrogen and Fuel Cells
- Investment and Targets in R&D
- The Importance of Technology Learning
- Background and Scope of this Study

2. Hydrogen Technologies

- Hydrogen Production
- Hydrogen Transportation and Distribution
- Hydrogen Refueling Stations
- Large-Scale Hydrogen Storage
- On-Board Hydrogen Storage

3. Fuel Cells and Other Hydrogen End-Use Technologies

- PEM Fuel Cell Applications: Light Duty Vehicles
- Niche Markets for PEM Fuel Cells in the Transport Sector
 - Buses
 - Delivery Vans
 - Wheelchairs and Carts
 - Forklifts
- Hydrogen Fuelled Airplanes
- Prospects and Applications for Stationary Fuel Cells and Other Hydrogen Uses

4. Competing Technology Options

- Competing Options in the Transportation Sector
 - Biofuels
 - Plug-In Hybrids and other Electric Vehicles
 - Lessons from Hybrids and Electric Vehicles
 - Synfuels from Gas and Coal
 - Non-Conventional Oil
 - Compress Natural Gas
 - Alternative Fuels and Energy Policy Targets
 - The Impact of Taxes
- Competing Options for Stationary Applications
 - Residential uses
 - Power Generation

5. Defining the Energy Context

- The Energy Technology Perspectives (ETP) Model
- Overview of the Analysis
- The ETP BASE Scenario
- The MAP Scenario

6. Key Drivers for Hydrogen and Fuel Cells: Sensitivity Analysis

- Governmental Policies and Socio-Economic Parameters
- Competing Technologies and Fuels
- Hydrogen and Fuel Cell Technologies
- Overview of the Sensitivity Analysis Results

7. Scenario Analysis and Regional Activities

- Global Scenario Analysis
- Regional Differences

8. Conclusions and Challenges Ahead

- Market Prospects for Hydrogen and Fuel Cells
- Technology Prospects
- Uncertainties Regarding Hydrogen and Fuel Cell Prospects
- RD&D Challenges and Opportunities

Annex 1. ETP Model Characteristics

Annex 2. Regional Investment Costs, Discount Rates and Fuel Taxes

Annex 3. Benefit/Cost Ratios of Hydrogen Technologies and Fuel Cells

Annex 4. Greenhouse Effects of Hydrogen Airplanes

Annex 5. Existing Hydrogen Fuel Stations

Annex 6. Definitions, Abbreviations, Acronyms, and Units