

# Global Small Air-cooled PEM Fuel Cells Supply, Demand and Key Producers, 2026-2032

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## Abstracts

The global Small Air-cooled PEM Fuel Cells market size is expected to reach \$ 723 million by 2032, rising at a market growth of 35.0% CAGR during the forecast period (2026-2032).

By 2025, Small Air-cooled PEM Fuel Cells will have a global production capacity of approximately 68.65MW, with an average price of approximately US\$1,228/kW and a gross margin of approximately 13%-28%.

The hydrogen fuel cell industry initially focused on high-power water-cooled systems for passenger and commercial vehicles. These liquid-cooled fuel cell stacks, characterized by high power ratings and complex thermal management, laid the foundation for large-scale automotive and industrial applications. Over time, the industry has expanded to include small air-cooled hydrogen fuel cells, designed for low-power applications where simplicity, lightweight design, and rapid deployment are crucial. This evolution reflects a shift from infrastructure-dependent high-power systems to compact, modular fuel cell stacks suitable for urban transportation, light industrial, and portable power applications. Small air-cooled PEM fuel cells are compact electrochemical devices that generate electricity through the reaction of hydrogen and oxygen. These systems can be configured in both open-air and closed-air air-cooled configurations. In open-air systems, ambient air is drawn directly into the cathode by a fan, serving as both the oxidant and cooling medium. Closed-loop systems isolate the cathode from the environment, supply air via a blower or compressor, and integrate a dedicated cooling system. While closed-loop systems offer better performance control, they are heavier, larger, and typically more than 30% more expensive than open-loop systems. Bipolar plates in small air-cooled PEM fuel cells are generally divided into graphite bipolar plates and metal bipolar plates. Graphite bipolar plates are lightweight, corrosion-

resistant, and dimensionally stable, but have relatively low mechanical strength and limited physical durability. Metal bipolar plates, on the other hand, have advantages such as high mechanical strength, thinness, and good airtightness; however, uncoated metal surfaces are prone to corrosion.

Typical systems have a rated power of 10 kW or less and are mainly used in shared two-wheelers, three-wheelers, sightseeing vehicles, forklifts, automated guided vehicles (AGVs), industrial drones, portable power supplies, and light vessels.

Key components include the fuel cell stack, proton exchange membrane (PEM), bipolar plates (graphite or metal), membrane electrode assembly (MEA), catalyst, gas diffusion layer, and auxiliary control and safety systems. Fuel cell stacks typically account for 60% to 65% of the total system cost. Material selection, manufacturing precision, and component quality directly impact energy density, efficiency, durability, and operational reliability. Air cooling, achieved through natural convection or forced ventilation, eliminates the need for complex liquid circulation, reducing maintenance requirements and supporting modular, lightweight designs. Modular stack architectures enable scalable power output and flexible integration into various vehicle platforms. Advanced membrane electrode assembly (MEA) design, optimized catalyst distribution, and improved airflow management further enhance cold-start performance, durability, and energy efficiency under diverse environmental conditions.

This report uses the fuel cell stack as the primary statistical unit because overall system configurations can vary depending on manufacturer specifications and customer requirements. Auxiliary components, control electronics, and system packaging may also differ, leading to customized solutions. By using the fuel cell stack as a standardized reporting unit, this study allows for both system-level customization in practical applications and a consistent analysis of the low-power air-cooled hydrogen fuel cell market.

The primary drivers of global growth in small air-cooled PEM fuel cells are applications in drones, automated guided vehicles (AGVs), robots, micro-vehicles, and portable power solutions. Drones, AGVs, and robots are projected to account for 42.03% of total revenue by 2025. China leads in both production capacity and market applications, with its market size expected to reach \$46.37 million by 2025, followed by Europe, the United States, Japan, and South Korea. While golf carts, sightseeing vehicles, and other vehicles, as well as two-wheelers, delivery trucks, and three-wheelers, will only account for 10.43% and 12.40% of revenue respectively in 2025, both segments are expected to experience strong growth through 2032, with a CAGR exceeding 38.9%.

From 2025 to 2032, the continued commercialization potential of these applications, along with the strategic transformation undertaken by existing high-power fuel cell manufacturers to address slowing growth in traditional markets, will further accelerate market growth and bring more expertise and production capacity to the low-power fuel cell sector. Technological Differentiation Small air-cooled PEM fuel cells are mainly divided into two configurations: open-type and closed-type. By 2025, closed-type air-cooled units will account for 57.10% of the market share, becoming the leading technology choice. Compared with open designs, closed-type systems offer better thermal management, higher durability, and higher operating efficiency.

**Competitive Landscape** The market is jointly dominated by leading global companies and emerging Chinese manufacturers:

**Leading Global Companies:** HiTS, Hydrogen Craft, Sinosynergy, Ballard Power Systems, Intelligent Energy.

**Emerging Chinese Manufacturers:** Shanghai Hydrogen Propulsion Technology, H-Rise, Heshun Electric. The top five companies account for approximately 49.21% of global revenue, indicating a moderate market concentration that still leaves room for new entrants.

This report studies the global Small Air-cooled PEM Fuel Cells production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Small Air-cooled PEM Fuel Cells and provides market size (US\$ million) and Year-over-Year (YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of Small Air-cooled PEM Fuel Cells that contribute to its increasing demand across many markets.

### **Highlights and key features of the study**

Global Small Air-cooled PEM Fuel Cells total production and demand, 2021-2032, (MW)

Global Small Air-cooled PEM Fuel Cells total production value, 2021-2032, (USD Million)

Global Small Air-cooled PEM Fuel Cells production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (MW), (based on production site)

Global Small Air-cooled PEM Fuel Cells consumption by region & country, CAGR, 2021-2032 & (MW)

U.S. VS China: Small Air-cooled PEM Fuel Cells domestic production, consumption, key domestic manufacturers and share  
Global Small Air-cooled PEM Fuel Cells production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (MW)  
Global Small Air-cooled PEM Fuel Cells production by Type, production, value, CAGR, 2021-2032, (USD Million) & (MW)  
Global Small Air-cooled PEM Fuel Cells production by Application, production, value, CAGR, 2021-2032, (USD Million) & (MW)

This report profiles key players in the global Small Air-cooled PEM Fuel Cells market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include Plug Power, Intelligent Energy, Ballard Power Systems, Horizon Fuel Cell Technologies (Qingneng), Spectronik, Doosan Corporation, Enoah, Pearl Hydrogen, HiTS, Hydrogen Craft, etc.

This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Small Air-cooled PEM Fuel Cells market

### **Detailed Segmentation:**

Each section contains quantitative market data including market by value (US\$ Millions), volume (production, consumption) & (MW) and average price (US\$/KW) by manufacturer, by Type, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

Global Small Air-cooled PEM Fuel Cells Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

#### Global Small Air-cooled PEM Fuel Cells Market, Segmentation by Type:

Open Air-cooled

Closed Air-cooled

#### Global Small Air-cooled PEM Fuel Cells Market, Segmentation by Power:

0W-500W

501W-1000W

1001W-5000W

5001W-10000W

#### Global Small Air-cooled PEM Fuel Cells Market, Segmentation by Bipolar Plate:

Graphite Bipolar Plate

Metal Bipolar Plate

#### Global Small Air-cooled PEM Fuel Cells Market, Segmentation by Application:

Portable Power Supply

Two-wheeled Vehicles, Courier Trucks and Tricycles

Forklifts

Drones, AGVs and Robots

Golf Carts, Sightseeing Vehicles and Other

#### Companies Profiled:

Plug Power

Intelligent Energy

Ballard Power Systems

Horizon Fuel Cell Technologies (Qingneng)

Spectronik

Doosan Corporation

Enoah

Pearl Hydrogen

HiTS

Hydrogen Craft

H-Rise

Sinosynergy

Shanghai Hydrogen Propulsion Technology

Anliu Technology

Heshun Electric

Panxingtech

Troowin

Youon

**Key Questions Answered:**

1. How big is the global Small Air-cooled PEM Fuel Cells market?
2. What is the demand of the global Small Air-cooled PEM Fuel Cells market?
3. What is the year over year growth of the global Small Air-cooled PEM Fuel Cells market?
4. What is the production and production value of the global Small Air-cooled PEM Fuel Cells market?
5. Who are the key producers in the global Small Air-cooled PEM Fuel Cells market?
6. What are the growth factors driving the market demand?

## Contents

### 1 SUPPLY SUMMARY

- 1.1 Small Air-cooled PEM Fuel Cells Introduction
- 1.2 World Small Air-cooled PEM Fuel Cells Supply & Forecast
  - 1.2.1 World Small Air-cooled PEM Fuel Cells Production Value (2021 & 2025 & 2032)
  - 1.2.2 World Small Air-cooled PEM Fuel Cells Production (2021-2032)
  - 1.2.3 World Small Air-cooled PEM Fuel Cells Pricing Trends (2021-2032)
- 1.3 World Small Air-cooled PEM Fuel Cells Production by Region (Based on Production Site)
  - 1.3.1 World Small Air-cooled PEM Fuel Cells Production Value by Region (2021-2032)
  - 1.3.2 World Small Air-cooled PEM Fuel Cells Production by Region (2021-2032)
  - 1.3.3 World Small Air-cooled PEM Fuel Cells Average Price by Region (2021-2032)
  - 1.3.4 North America Small Air-cooled PEM Fuel Cells Production (2021-2032)
  - 1.3.5 Europe Small Air-cooled PEM Fuel Cells Production (2021-2032)
  - 1.3.6 China Small Air-cooled PEM Fuel Cells Production (2021-2032)
  - 1.3.7 Japan Small Air-cooled PEM Fuel Cells Production (2021-2032)
- 1.4 Market Drivers, Restraints and Trends
  - 1.4.1 Small Air-cooled PEM Fuel Cells Market Drivers
  - 1.4.2 Factors Affecting Demand
  - 1.4.3 Small Air-cooled PEM Fuel Cells Major Market Trends

### 2 DEMAND SUMMARY

- 2.1 World Small Air-cooled PEM Fuel Cells Demand (2021-2032)
- 2.2 World Small Air-cooled PEM Fuel Cells Consumption by Region
  - 2.2.1 World Small Air-cooled PEM Fuel Cells Consumption by Region (2021-2026)
  - 2.2.2 World Small Air-cooled PEM Fuel Cells Consumption Forecast by Region (2027-2032)
- 2.3 United States Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.4 China Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.5 Europe Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.6 Japan Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.7 South Korea Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.8 ASEAN Small Air-cooled PEM Fuel Cells Consumption (2021-2032)
- 2.9 India Small Air-cooled PEM Fuel Cells Consumption (2021-2032)

### 3 WORLD MANUFACTURERS COMPETITIVE ANALYSIS

- 3.1 World Small Air-cooled PEM Fuel Cells Production Value by Manufacturer (2021-2026)
- 3.2 World Small Air-cooled PEM Fuel Cells Production by Manufacturer (2021-2026)
- 3.3 World Small Air-cooled PEM Fuel Cells Average Price by Manufacturer (2021-2026)
- 3.4 Small Air-cooled PEM Fuel Cells Company Evaluation Quadrant
- 3.5 Industry Rank and Concentration Rate (CR)
  - 3.5.1 Global Small Air-cooled PEM Fuel Cells Industry Rank of Major Manufacturers
  - 3.5.2 Global Concentration Ratios (CR4) for Small Air-cooled PEM Fuel Cells in 2025
  - 3.5.3 Global Concentration Ratios (CR8) for Small Air-cooled PEM Fuel Cells in 2025
- 3.6 Small Air-cooled PEM Fuel Cells Market: Overall Company Footprint Analysis
  - 3.6.1 Small Air-cooled PEM Fuel Cells Market: Region Footprint
  - 3.6.2 Small Air-cooled PEM Fuel Cells Market: Company Product Type Footprint
  - 3.6.3 Small Air-cooled PEM Fuel Cells Market: Company Product Application Footprint
- 3.7 Competitive Environment
  - 3.7.1 Historical Structure of the Industry
  - 3.7.2 Barriers of Market Entry
  - 3.7.3 Factors of Competition
- 3.8 New Entrant and Capacity Expansion Plans
- 3.9 Mergers, Acquisition, Agreements, and Collaborations

## **4 UNITED STATES VS CHINA VS REST OF THE WORLD**

- 4.1 United States VS China: Small Air-cooled PEM Fuel Cells Production Value Comparison
  - 4.1.1 United States VS China: Small Air-cooled PEM Fuel Cells Production Value Comparison (2021 & 2025 & 2032)
  - 4.1.2 United States VS China: Small Air-cooled PEM Fuel Cells Production Value Market Share Comparison (2021 & 2025 & 2032)
- 4.2 United States VS China: Small Air-cooled PEM Fuel Cells Production Comparison
  - 4.2.1 United States VS China: Small Air-cooled PEM Fuel Cells Production Comparison (2021 & 2025 & 2032)
  - 4.2.2 United States VS China: Small Air-cooled PEM Fuel Cells Production Market Share Comparison (2021 & 2025 & 2032)
- 4.3 United States VS China: Small Air-cooled PEM Fuel Cells Consumption Comparison
  - 4.3.1 United States VS China: Small Air-cooled PEM Fuel Cells Consumption Comparison (2021 & 2025 & 2032)
  - 4.3.2 United States VS China: Small Air-cooled PEM Fuel Cells Consumption Market

## Share Comparison (2021 & 2025 & 2032)

### 4.4 United States Based Small Air-cooled PEM Fuel Cells Manufacturers and Market Share, 2021-2026

#### 4.4.1 United States Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (States, Country)

#### 4.4.2 United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value (2021-2026)

#### 4.4.3 United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production (2021-2026)

### 4.5 China Based Small Air-cooled PEM Fuel Cells Manufacturers and Market Share

#### 4.5.1 China Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (Province, Country)

#### 4.5.2 China Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value (2021-2026)

#### 4.5.3 China Based Manufacturers Small Air-cooled PEM Fuel Cells Production (2021-2026)

### 4.6 Rest of World Based Small Air-cooled PEM Fuel Cells Manufacturers and Market Share, 2021-2026

#### 4.6.1 Rest of World Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (State, Country)

#### 4.6.2 Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value (2021-2026)

#### 4.6.3 Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production (2021-2026)

## 5 MARKET ANALYSIS BY TYPE

### 5.1 World Small Air-cooled PEM Fuel Cells Market Size Overview by Type: 2021 VS 2025 VS 2032

### 5.2 Segment Introduction by Type

#### 5.2.1 Open Air-cooled

#### 5.2.2 Closed Air-cooled

### 5.3 Market Segment by Type

#### 5.3.1 World Small Air-cooled PEM Fuel Cells Production by Type (2021-2032)

#### 5.3.2 World Small Air-cooled PEM Fuel Cells Production Value by Type (2021-2032)

#### 5.3.3 World Small Air-cooled PEM Fuel Cells Average Price by Type (2021-2032)

## 6 MARKET ANALYSIS BY POWER

6.1 World Small Air-cooled PEM Fuel Cells Market Size Overview by Power: 2021 VS 2025 VS 2032

6.2 Segment Introduction by Power

6.2.1 0W-500W

6.2.2 501W-1000W

6.2.3 1001W-5000W

6.2.4 5001W-10000W

6.3 Market Segment by Power

6.3.1 World Small Air-cooled PEM Fuel Cells Production by Power (2021-2032)

6.3.2 World Small Air-cooled PEM Fuel Cells Production Value by Power (2021-2032)

6.3.3 World Small Air-cooled PEM Fuel Cells Average Price by Power (2021-2032)

## **7 MARKET ANALYSIS BY BIPOLAR PLATE**

7.1 World Small Air-cooled PEM Fuel Cells Market Size Overview by Bipolar Plate: 2021 VS 2025 VS 2032

7.2 Segment Introduction by Bipolar Plate

7.2.1 Graphite Bipolar Plate

7.2.2 Metal Bipolar Plate

7.3 Market Segment by Bipolar Plate

7.3.1 World Small Air-cooled PEM Fuel Cells Production by Bipolar Plate (2021-2032)

7.3.2 World Small Air-cooled PEM Fuel Cells Production Value by Bipolar Plate (2021-2032)

7.3.3 World Small Air-cooled PEM Fuel Cells Average Price by Bipolar Plate (2021-2032)

## **8 MARKET ANALYSIS BY APPLICATION**

8.1 World Small Air-cooled PEM Fuel Cells Market Size Overview by Application: 2021 VS 2025 VS 2032

8.2 Segment Introduction by Application

8.2.1 Portable Power Supply

8.2.2 Two-wheeled Vehicles, Courier Trucks and Tricycles

8.2.3 Forklifts

8.2.4 Drones, AGVs and Robots

8.2.5 Golf Carts, Sightseeing Vehicles and Other

8.3 Market Segment by Application

8.3.1 World Small Air-cooled PEM Fuel Cells Production by Application (2021-2032)

8.3.2 World Small Air-cooled PEM Fuel Cells Production Value by Application

(2021-2032)

8.3.3 World Small Air-cooled PEM Fuel Cells Average Price by Application

(2021-2032)

## **9 COMPANY PROFILES**

### **9.1 Plug Power**

9.1.1 Plug Power Details

9.1.2 Plug Power Major Business

9.1.3 Plug Power Small Air-cooled PEM Fuel Cells Product and Services

9.1.4 Plug Power Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.1.5 Plug Power Recent Developments/Updates

9.1.6 Plug Power Competitive Strengths & Weaknesses

### **9.2 Intelligent Energy**

9.2.1 Intelligent Energy Details

9.2.2 Intelligent Energy Major Business

9.2.3 Intelligent Energy Small Air-cooled PEM Fuel Cells Product and Services

9.2.4 Intelligent Energy Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.2.5 Intelligent Energy Recent Developments/Updates

9.2.6 Intelligent Energy Competitive Strengths & Weaknesses

### **9.3 Ballard Power Systems**

9.3.1 Ballard Power Systems Details

9.3.2 Ballard Power Systems Major Business

9.3.3 Ballard Power Systems Small Air-cooled PEM Fuel Cells Product and Services

9.3.4 Ballard Power Systems Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.3.5 Ballard Power Systems Recent Developments/Updates

9.3.6 Ballard Power Systems Competitive Strengths & Weaknesses

### **9.4 Horizon Fuel Cell Technologies (Qingneng)**

9.4.1 Horizon Fuel Cell Technologies (Qingneng) Details

9.4.2 Horizon Fuel Cell Technologies (Qingneng) Major Business

9.4.3 Horizon Fuel Cell Technologies (Qingneng) Small Air-cooled PEM Fuel Cells Product and Services

9.4.4 Horizon Fuel Cell Technologies (Qingneng) Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.4.5 Horizon Fuel Cell Technologies (Qingneng) Recent Developments/Updates

9.4.6 Horizon Fuel Cell Technologies (Qingneng) Competitive Strengths &

## Weaknesses

### 9.5 Spectronik

9.5.1 Spectronik Details

9.5.2 Spectronik Major Business

9.5.3 Spectronik Small Air-cooled PEM Fuel Cells Product and Services

9.5.4 Spectronik Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.5.5 Spectronik Recent Developments/Updates

9.5.6 Spectronik Competitive Strengths & Weaknesses

### 9.6 Doosan Corporation

9.6.1 Doosan Corporation Details

9.6.2 Doosan Corporation Major Business

9.6.3 Doosan Corporation Small Air-cooled PEM Fuel Cells Product and Services

9.6.4 Doosan Corporation Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.6.5 Doosan Corporation Recent Developments/Updates

9.6.6 Doosan Corporation Competitive Strengths & Weaknesses

### 9.7 Enoah

9.7.1 Enoah Details

9.7.2 Enoah Major Business

9.7.3 Enoah Small Air-cooled PEM Fuel Cells Product and Services

9.7.4 Enoah Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.7.5 Enoah Recent Developments/Updates

9.7.6 Enoah Competitive Strengths & Weaknesses

### 9.8 Pearl Hydrogen

9.8.1 Pearl Hydrogen Details

9.8.2 Pearl Hydrogen Major Business

9.8.3 Pearl Hydrogen Small Air-cooled PEM Fuel Cells Product and Services

9.8.4 Pearl Hydrogen Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

9.8.5 Pearl Hydrogen Recent Developments/Updates

9.8.6 Pearl Hydrogen Competitive Strengths & Weaknesses

### 9.9 HiTS

9.9.1 HiTS Details

9.9.2 HiTS Major Business

9.9.3 HiTS Small Air-cooled PEM Fuel Cells Product and Services

9.9.4 HiTS Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)

- 9.9.5 HiTS Recent Developments/Updates
- 9.9.6 HiTS Competitive Strengths & Weaknesses
- 9.10 Hydrogen Craft
  - 9.10.1 Hydrogen Craft Details
  - 9.10.2 Hydrogen Craft Major Business
  - 9.10.3 Hydrogen Craft Small Air-cooled PEM Fuel Cells Product and Services
  - 9.10.4 Hydrogen Craft Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.10.5 Hydrogen Craft Recent Developments/Updates
  - 9.10.6 Hydrogen Craft Competitive Strengths & Weaknesses
- 9.11 H-Rise
  - 9.11.1 H-Rise Details
  - 9.11.2 H-Rise Major Business
  - 9.11.3 H-Rise Small Air-cooled PEM Fuel Cells Product and Services
  - 9.11.4 H-Rise Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.11.5 H-Rise Recent Developments/Updates
  - 9.11.6 H-Rise Competitive Strengths & Weaknesses
- 9.12 Sinosynergy
  - 9.12.1 Sinosynergy Details
  - 9.12.2 Sinosynergy Major Business
  - 9.12.3 Sinosynergy Small Air-cooled PEM Fuel Cells Product and Services
  - 9.12.4 Sinosynergy Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.12.5 Sinosynergy Recent Developments/Updates
  - 9.12.6 Sinosynergy Competitive Strengths & Weaknesses
- 9.13 Shanghai Hydrogen Propulsion Technology
  - 9.13.1 Shanghai Hydrogen Propulsion Technology Details
  - 9.13.2 Shanghai Hydrogen Propulsion Technology Major Business
  - 9.13.3 Shanghai Hydrogen Propulsion Technology Small Air-cooled PEM Fuel Cells Product and Services
  - 9.13.4 Shanghai Hydrogen Propulsion Technology Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.13.5 Shanghai Hydrogen Propulsion Technology Recent Developments/Updates
  - 9.13.6 Shanghai Hydrogen Propulsion Technology Competitive Strengths & Weaknesses
- 9.14 Anliu Technology
  - 9.14.1 Anliu Technology Details
  - 9.14.2 Anliu Technology Major Business

- 9.14.3 Anliu Technology Small Air-cooled PEM Fuel Cells Product and Services
- 9.14.4 Anliu Technology Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
- 9.14.5 Anliu Technology Recent Developments/Updates
- 9.14.6 Anliu Technology Competitive Strengths & Weaknesses
- 9.15 Heshun Electric
  - 9.15.1 Heshun Electric Details
  - 9.15.2 Heshun Electric Major Business
  - 9.15.3 Heshun Electric Small Air-cooled PEM Fuel Cells Product and Services
  - 9.15.4 Heshun Electric Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.15.5 Heshun Electric Recent Developments/Updates
  - 9.15.6 Heshun Electric Competitive Strengths & Weaknesses
- 9.16 Panxingtech
  - 9.16.1 Panxingtech Details
  - 9.16.2 Panxingtech Major Business
  - 9.16.3 Panxingtech Small Air-cooled PEM Fuel Cells Product and Services
  - 9.16.4 Panxingtech Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.16.5 Panxingtech Recent Developments/Updates
  - 9.16.6 Panxingtech Competitive Strengths & Weaknesses
- 9.17 Troowin
  - 9.17.1 Troowin Details
  - 9.17.2 Troowin Major Business
  - 9.17.3 Troowin Small Air-cooled PEM Fuel Cells Product and Services
  - 9.17.4 Troowin Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.17.5 Troowin Recent Developments/Updates
  - 9.17.6 Troowin Competitive Strengths & Weaknesses
- 9.18 Youon
  - 9.18.1 Youon Details
  - 9.18.2 Youon Major Business
  - 9.18.3 Youon Small Air-cooled PEM Fuel Cells Product and Services
  - 9.18.4 Youon Small Air-cooled PEM Fuel Cells Production, Price, Value, Gross Margin and Market Share (2021-2026)
  - 9.18.5 Youon Recent Developments/Updates
  - 9.18.6 Youon Competitive Strengths & Weaknesses

## **10 INDUSTRY CHAIN ANALYSIS**

- 10.1 Small Air-cooled PEM Fuel Cells Industry Chain
- 10.2 Small Air-cooled PEM Fuel Cells Upstream Analysis
  - 10.2.1 Small Air-cooled PEM Fuel Cells Core Raw Materials
  - 10.2.2 Main Manufacturers of Small Air-cooled PEM Fuel Cells Core Raw Materials
- 10.3 Midstream Analysis
- 10.4 Downstream Analysis
- 10.5 Small Air-cooled PEM Fuel Cells Production Mode
- 10.6 Small Air-cooled PEM Fuel Cells Procurement Model
- 10.7 Small Air-cooled PEM Fuel Cells Industry Sales Model and Sales Channels
  - 10.7.1 Small Air-cooled PEM Fuel Cells Sales Model
  - 10.7.2 Small Air-cooled PEM Fuel Cells Typical Distributors

## **11 RESEARCH FINDINGS AND CONCLUSION**

## **12 APPENDIX**

- 12.1 Methodology
- 12.2 Research Process and Data Source
- 12.3 Disclaimer

## List Of Tables

### LIST OF TABLES

Table 1. World Small Air-cooled PEM Fuel Cells Production Value by Region (2021, 2025 and 2032) & (USD Million)

Table 2. World Small Air-cooled PEM Fuel Cells Production Value by Region (2021-2026) & (USD Million)

Table 3. World Small Air-cooled PEM Fuel Cells Production Value by Region (2027-2032) & (USD Million)

Table 4. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Region (2021-2026)

Table 5. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Region (2027-2032)

Table 6. World Small Air-cooled PEM Fuel Cells Production by Region (2021-2026) & (MW)

Table 7. World Small Air-cooled PEM Fuel Cells Production by Region (2027-2032) & (MW)

Table 8. World Small Air-cooled PEM Fuel Cells Production Market Share by Region (2021-2026)

Table 9. World Small Air-cooled PEM Fuel Cells Production Market Share by Region (2027-2032)

Table 10. World Small Air-cooled PEM Fuel Cells Average Price by Region (2021-2026) & (US\$/KW)

Table 11. World Small Air-cooled PEM Fuel Cells Average Price by Region (2027-2032) & (US\$/KW)

Table 12. Small Air-cooled PEM Fuel Cells Major Market Trends

Table 13. World Small Air-cooled PEM Fuel Cells Consumption Growth Rate Forecast by Region (2021 & 2025 & 2032) & (MW)

Table 14. World Small Air-cooled PEM Fuel Cells Consumption by Region (2021-2026) & (MW)

Table 15. World Small Air-cooled PEM Fuel Cells Consumption Forecast by Region (2027-2032) & (MW)

Table 16. World Small Air-cooled PEM Fuel Cells Production Value by Manufacturer (2021-2026) & (USD Million)

Table 17. Production Value Market Share of Key Small Air-cooled PEM Fuel Cells Producers in 2025

Table 18. World Small Air-cooled PEM Fuel Cells Production by Manufacturer (2021-2026) & (MW)

Table 19. Production Market Share of Key Small Air-cooled PEM Fuel Cells Producers in 2025

Table 20. World Small Air-cooled PEM Fuel Cells Average Price by Manufacturer (2021-2026) & (US\$/KW)

Table 21. Global Small Air-cooled PEM Fuel Cells Company Evaluation Quadrant

Table 22. World Small Air-cooled PEM Fuel Cells Industry Rank of Major Manufacturers, Based on Production Value in 2025

Table 23. Head Office and Small Air-cooled PEM Fuel Cells Production Site of Key Manufacturer

Table 24. Small Air-cooled PEM Fuel Cells Market: Company Product Type Footprint

Table 25. Small Air-cooled PEM Fuel Cells Market: Company Product Application Footprint

Table 26. Small Air-cooled PEM Fuel Cells Competitive Factors

Table 27. Small Air-cooled PEM Fuel Cells New Entrant and Capacity Expansion Plans

Table 28. Small Air-cooled PEM Fuel Cells Mergers & Acquisitions Activity

Table 29. United States VS China Small Air-cooled PEM Fuel Cells Production Value Comparison, (2021 & 2025 & 2032) & (USD Million)

Table 30. United States VS China Small Air-cooled PEM Fuel Cells Production Comparison, (2021 & 2025 & 2032) & (MW)

Table 31. United States VS China Small Air-cooled PEM Fuel Cells Consumption Comparison, (2021 & 2025 & 2032) & (MW)

Table 32. United States Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (States, Country)

Table 33. United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value, (2021-2026) & (USD Million)

Table 34. United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value Market Share (2021-2026)

Table 35. United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production (2021-2026) & (MW)

Table 36. United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share (2021-2026)

Table 37. China Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (Province, Country)

Table 38. China Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value, (2021-2026) & (USD Million)

Table 39. China Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value Market Share (2021-2026)

Table 40. China Based Manufacturers Small Air-cooled PEM Fuel Cells Production, (2021-2026) & (MW)

Table 41. China Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share (2021-2026)

Table 42. Rest of World Based Small Air-cooled PEM Fuel Cells Manufacturers, Headquarters and Production Site (State, Country)

Table 43. Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value, (2021-2026) & (USD Million)

Table 44. Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production Value Market Share (2021-2026)

Table 45. Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production, (2021-2026) & (MW)

Table 46. Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share (2021-2026)

Table 47. World Small Air-cooled PEM Fuel Cells Production Value by Type, (USD Million), 2021 & 2025 & 2032

Table 48. World Small Air-cooled PEM Fuel Cells Production by Type (2021-2026) & (MW)

Table 49. World Small Air-cooled PEM Fuel Cells Production by Type (2027-2032) & (MW)

Table 50. World Small Air-cooled PEM Fuel Cells Production Value by Type (2021-2026) & (USD Million)

Table 51. World Small Air-cooled PEM Fuel Cells Production Value by Type (2027-2032) & (USD Million)

Table 52. World Small Air-cooled PEM Fuel Cells Average Price by Type (2021-2026) & (US\$/KW)

Table 53. World Small Air-cooled PEM Fuel Cells Average Price by Type (2027-2032) & (US\$/KW)

Table 54. World Small Air-cooled PEM Fuel Cells Production Value by Power, (USD Million), 2021 & 2025 & 2032

Table 55. World Small Air-cooled PEM Fuel Cells Production by Power (2021-2026) & (MW)

Table 56. World Small Air-cooled PEM Fuel Cells Production by Power (2027-2032) & (MW)

Table 57. World Small Air-cooled PEM Fuel Cells Production Value by Power (2021-2026) & (USD Million)

Table 58. World Small Air-cooled PEM Fuel Cells Production Value by Power (2027-2032) & (USD Million)

Table 59. World Small Air-cooled PEM Fuel Cells Average Price by Power (2021-2026) & (US\$/KW)

Table 60. World Small Air-cooled PEM Fuel Cells Average Price by Power (2027-2032)

& (US\$/KW)

Table 61. World Small Air-cooled PEM Fuel Cells Production Value by Bipolar Plate, (USD Million), 2021 & 2025 & 2032

Table 62. World Small Air-cooled PEM Fuel Cells Production by Bipolar Plate (2021-2026) & (MW)

Table 63. World Small Air-cooled PEM Fuel Cells Production by Bipolar Plate (2027-2032) & (MW)

Table 64. World Small Air-cooled PEM Fuel Cells Production Value by Bipolar Plate (2021-2026) & (USD Million)

Table 65. World Small Air-cooled PEM Fuel Cells Production Value by Bipolar Plate (2027-2032) & (USD Million)

Table 66. World Small Air-cooled PEM Fuel Cells Average Price by Bipolar Plate (2021-2026) & (US\$/KW)

Table 67. World Small Air-cooled PEM Fuel Cells Average Price by Bipolar Plate (2027-2032) & (US\$/KW)

Table 68. World Small Air-cooled PEM Fuel Cells Production Value by Application, (USD Million), 2021 & 2025 & 2032

Table 69. World Small Air-cooled PEM Fuel Cells Production by Application (2021-2026) & (MW)

Table 70. World Small Air-cooled PEM Fuel Cells Production by Application (2027-2032) & (MW)

Table 71. World Small Air-cooled PEM Fuel Cells Production Value by Application (2021-2026) & (USD Million)

Table 72. World Small Air-cooled PEM Fuel Cells Production Value by Application (2027-2032) & (USD Million)

Table 73. World Small Air-cooled PEM Fuel Cells Average Price by Application (2021-2026) & (US\$/KW)

Table 74. World Small Air-cooled PEM Fuel Cells Average Price by Application (2027-2032) & (US\$/KW)

Table 75. Plug Power Basic Information, Manufacturing Base and Competitors

Table 76. Plug Power Major Business

Table 77. Plug Power Small Air-cooled PEM Fuel Cells Product and Services

Table 78. Plug Power Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 79. Plug Power Recent Developments/Updates

Table 80. Plug Power Competitive Strengths & Weaknesses

Table 81. Intelligent Energy Basic Information, Manufacturing Base and Competitors

Table 82. Intelligent Energy Major Business

Table 83. Intelligent Energy Small Air-cooled PEM Fuel Cells Product and Services

Table 84. Intelligent Energy Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 85. Intelligent Energy Recent Developments/Updates

Table 86. Intelligent Energy Competitive Strengths & Weaknesses

Table 87. Ballard Power Systems Basic Information, Manufacturing Base and Competitors

Table 88. Ballard Power Systems Major Business

Table 89. Ballard Power Systems Small Air-cooled PEM Fuel Cells Product and Services

Table 90. Ballard Power Systems Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 91. Ballard Power Systems Recent Developments/Updates

Table 92. Ballard Power Systems Competitive Strengths & Weaknesses

Table 93. Horizon Fuel Cell Technologies (Qingneng) Basic Information, Manufacturing Base and Competitors

Table 94. Horizon Fuel Cell Technologies (Qingneng) Major Business

Table 95. Horizon Fuel Cell Technologies (Qingneng) Small Air-cooled PEM Fuel Cells Product and Services

Table 96. Horizon Fuel Cell Technologies (Qingneng) Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 97. Horizon Fuel Cell Technologies (Qingneng) Recent Developments/Updates

Table 98. Horizon Fuel Cell Technologies (Qingneng) Competitive Strengths & Weaknesses

Table 99. Spectronik Basic Information, Manufacturing Base and Competitors

Table 100. Spectronik Major Business

Table 101. Spectronik Small Air-cooled PEM Fuel Cells Product and Services

Table 102. Spectronik Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 103. Spectronik Recent Developments/Updates

Table 104. Spectronik Competitive Strengths & Weaknesses

Table 105. Doosan Corporation Basic Information, Manufacturing Base and Competitors

Table 106. Doosan Corporation Major Business

Table 107. Doosan Corporation Small Air-cooled PEM Fuel Cells Product and Services

Table 108. Doosan Corporation Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 109. Doosan Corporation Recent Developments/Updates

Table 110. Doosan Corporation Competitive Strengths & Weaknesses

Table 111. Enoah Basic Information, Manufacturing Base and Competitors

Table 112. Enoah Major Business

Table 113. Enoah Small Air-cooled PEM Fuel Cells Product and Services

Table 114. Enoah Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 115. Enoah Recent Developments/Updates

Table 116. Enoah Competitive Strengths & Weaknesses

Table 117. Pearl Hydrogen Basic Information, Manufacturing Base and Competitors

Table 118. Pearl Hydrogen Major Business

Table 119. Pearl Hydrogen Small Air-cooled PEM Fuel Cells Product and Services

Table 120. Pearl Hydrogen Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 121. Pearl Hydrogen Recent Developments/Updates

Table 122. Pearl Hydrogen Competitive Strengths & Weaknesses

Table 123. HiTS Basic Information, Manufacturing Base and Competitors

Table 124. HiTS Major Business

Table 125. HiTS Small Air-cooled PEM Fuel Cells Product and Services

Table 126. HiTS Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 127. HiTS Recent Developments/Updates

Table 128. HiTS Competitive Strengths & Weaknesses

Table 129. Hydrogen Craft Basic Information, Manufacturing Base and Competitors

Table 130. Hydrogen Craft Major Business

Table 131. Hydrogen Craft Small Air-cooled PEM Fuel Cells Product and Services

Table 132. Hydrogen Craft Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 133. Hydrogen Craft Recent Developments/Updates

Table 134. Hydrogen Craft Competitive Strengths & Weaknesses

Table 135. H-Rise Basic Information, Manufacturing Base and Competitors

Table 136. H-Rise Major Business

Table 137. H-Rise Small Air-cooled PEM Fuel Cells Product and Services

Table 138. H-Rise Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW),

Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 139. H-Rise Recent Developments/Updates

Table 140. H-Rise Competitive Strengths & Weaknesses

Table 141. Sinosynergy Basic Information, Manufacturing Base and Competitors

Table 142. Sinosynergy Major Business

Table 143. Sinosynergy Small Air-cooled PEM Fuel Cells Product and Services

Table 144. Sinosynergy Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 145. Sinosynergy Recent Developments/Updates

Table 146. Sinosynergy Competitive Strengths & Weaknesses

Table 147. Shanghai Hydrogen Propulsion Technology Basic Information, Manufacturing Base and Competitors

Table 148. Shanghai Hydrogen Propulsion Technology Major Business

Table 149. Shanghai Hydrogen Propulsion Technology Small Air-cooled PEM Fuel Cells Product and Services

Table 150. Shanghai Hydrogen Propulsion Technology Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 151. Shanghai Hydrogen Propulsion Technology Recent Developments/Updates

Table 152. Shanghai Hydrogen Propulsion Technology Competitive Strengths & Weaknesses

Table 153. Anliu Technology Basic Information, Manufacturing Base and Competitors

Table 154. Anliu Technology Major Business

Table 155. Anliu Technology Small Air-cooled PEM Fuel Cells Product and Services

Table 156. Anliu Technology Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 157. Anliu Technology Recent Developments/Updates

Table 158. Anliu Technology Competitive Strengths & Weaknesses

Table 159. Heshun Electric Basic Information, Manufacturing Base and Competitors

Table 160. Heshun Electric Major Business

Table 161. Heshun Electric Small Air-cooled PEM Fuel Cells Product and Services

Table 162. Heshun Electric Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 163. Heshun Electric Recent Developments/Updates

Table 164. Heshun Electric Competitive Strengths & Weaknesses

Table 165. Panxingtech Basic Information, Manufacturing Base and Competitors

Table 166. Panxingtech Major Business

Table 167. Panxingtech Small Air-cooled PEM Fuel Cells Product and Services

Table 168. Panxingtech Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 169. Panxingtech Recent Developments/Updates

Table 170. Panxingtech Competitive Strengths & Weaknesses

Table 171. Troowin Basic Information, Manufacturing Base and Competitors

Table 172. Troowin Major Business

Table 173. Troowin Small Air-cooled PEM Fuel Cells Product and Services

Table 174. Troowin Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 175. Troowin Recent Developments/Updates

Table 176. Troowin Competitive Strengths & Weaknesses

Table 177. Youon Basic Information, Manufacturing Base and Competitors

Table 178. Youon Major Business

Table 179. Youon Small Air-cooled PEM Fuel Cells Product and Services

Table 180. Youon Small Air-cooled PEM Fuel Cells Production (MW), Price (US\$/KW), Production Value (USD Million), Gross Margin and Market Share (2021-2026)

Table 181. Youon Recent Developments/Updates

Table 182. Youon Competitive Strengths & Weaknesses

Table 183. Global Key Players of Small Air-cooled PEM Fuel Cells Upstream (Raw Materials)

Table 184. Global Small Air-cooled PEM Fuel Cells Typical Customers

Table 185. Small Air-cooled PEM Fuel Cells Typical Distributors

## List Of Figures

### LIST OF FIGURES

- Figure 1. Small Air-cooled PEM Fuel Cells Picture
- Figure 2. World Small Air-cooled PEM Fuel Cells Production Value: 2021 & 2025 & 2032, (USD Million)
- Figure 3. World Small Air-cooled PEM Fuel Cells Production Value and Forecast (2021-2032) & (USD Million)
- Figure 4. World Small Air-cooled PEM Fuel Cells Production (2021-2032) & (MW)
- Figure 5. World Small Air-cooled PEM Fuel Cells Average Price (2021-2032) & (US\$/KW)
- Figure 6. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Region (2021-2032)
- Figure 7. World Small Air-cooled PEM Fuel Cells Production Market Share by Region (2021-2032)
- Figure 8. North America Small Air-cooled PEM Fuel Cells Production (2021-2032) & (MW)
- Figure 9. Europe Small Air-cooled PEM Fuel Cells Production (2021-2032) & (MW)
- Figure 10. China Small Air-cooled PEM Fuel Cells Production (2021-2032) & (MW)
- Figure 11. Japan Small Air-cooled PEM Fuel Cells Production (2021-2032) & (MW)
- Figure 12. Small Air-cooled PEM Fuel Cells Market Drivers
- Figure 13. Factors Affecting Demand
- Figure 14. World Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 15. World Small Air-cooled PEM Fuel Cells Consumption Market Share by Region (2021-2032)
- Figure 16. United States Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 17. China Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 18. Europe Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 19. Japan Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 20. South Korea Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 21. ASEAN Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 22. India Small Air-cooled PEM Fuel Cells Consumption (2021-2032) & (MW)
- Figure 23. Producer Shipments of Small Air-cooled PEM Fuel Cells by Manufacturer Revenue (\$MM) and Market Share (%): 2025
- Figure 24. Global Four-firm Concentration Ratios (CR4) for Small Air-cooled PEM Fuel Cells Markets in 2025

Figure 25. Global Four-firm Concentration Ratios (CR8) for Small Air-cooled PEM Fuel Cells Markets in 2025

Figure 26. United States VS China: Small Air-cooled PEM Fuel Cells Production Value Market Share Comparison (2021 & 2025 & 2032)

Figure 27. United States VS China: Small Air-cooled PEM Fuel Cells Production Market Share Comparison (2021 & 2025 & 2032)

Figure 28. United States VS China: Small Air-cooled PEM Fuel Cells Consumption Market Share Comparison (2021 & 2025 & 2032)

Figure 29. United States Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share 2025

Figure 30. China Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share 2025

Figure 31. Rest of World Based Manufacturers Small Air-cooled PEM Fuel Cells Production Market Share 2025

Figure 32. World Small Air-cooled PEM Fuel Cells Production Value by Type, (USD Million), 2021 & 2025 & 2032

Figure 33. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Type in 2025

Figure 34. Open Air-cooled

Figure 35. Closed Air-cooled

Figure 36. World Small Air-cooled PEM Fuel Cells Production Market Share by Type (2021-2032)

Figure 37. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Type (2021-2032)

Figure 38. World Small Air-cooled PEM Fuel Cells Average Price by Type (2021-2032) & (US\$/KW)

Figure 39. World Small Air-cooled PEM Fuel Cells Production Value by Power, (USD Million), 2021 & 2025 & 2032

Figure 40. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Power in 2025

Figure 41. 0W-500W

Figure 42. 501W-1000W

Figure 43. 1001W-5000W

Figure 44. 5001W-10000W

Figure 45. World Small Air-cooled PEM Fuel Cells Production Market Share by Power (2021-2032)

Figure 46. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Power (2021-2032)

Figure 47. World Small Air-cooled PEM Fuel Cells Average Price by Power (2021-2032)

& (US\$/KW)

Figure 48. World Small Air-cooled PEM Fuel Cells Production Value by Bipolar Plate, (USD Million), 2021 & 2025 & 2032

Figure 49. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Bipolar Plate in 2025

Figure 50. Graphite Bipolar Plate

Figure 51. Metal Bipolar Plate

Figure 52. World Small Air-cooled PEM Fuel Cells Production Market Share by Bipolar Plate (2021-2032)

Figure 53. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Bipolar Plate (2021-2032)

Figure 54. World Small Air-cooled PEM Fuel Cells Average Price by Bipolar Plate (2021-2032) & (US\$/KW)

Figure 55. World Small Air-cooled PEM Fuel Cells Production Value by Application, (USD Million), 2021 & 2025 & 2032

Figure 56. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Application in 2025

Figure 57. Portable Power Supply

Figure 58. Two-wheeled Vehicles, Courier Trucks and Tricycles

Figure 59. Forklifts

Figure 60. Drones, AGVs and Robots

Figure 61. Golf Carts, Sightseeing Vehicles and Other

Figure 62. World Small Air-cooled PEM Fuel Cells Production Market Share by Application (2021-2032)

Figure 63. World Small Air-cooled PEM Fuel Cells Production Value Market Share by Application (2021-2032)

Figure 64. World Small Air-cooled PEM Fuel Cells Average Price by Application (2021-2032) & (US\$/KW)

Figure 65. Small Air-cooled PEM Fuel Cells Industry Chain

Figure 66. Small Air-cooled PEM Fuel Cells Procurement Model

Figure 67. Small Air-cooled PEM Fuel Cells Sales Model

Figure 68. Small Air-cooled PEM Fuel Cells Sales Channels, Direct Sales, and Distribution

Figure 69. Methodology

Figure 70. Research Process and Data Source

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