

# 2018 Top 5 Protonic Ceramic Fuel Cell (PCFC) Players in North America, Europe, Asia-Pacific, South America, Middle East and Africa

https://marketpublishers.com/r/2C37A66C1EDEN.html

Date: June 2018

Pages: 148

Price: US\$ 4,960.00 (Single User License)

ID: 2C37A66C1EDEN

### **Abstracts**

The report requires updating with new data and is sent in 48 hours after order is placed.

A protonic ceramic fuel cell (PCFC) is a fuel cell based on a ceramic electrolyte material that exhibits high protonic conductivity at elevated temperatures.

PCFCs share the thermal and kinetic advantages of high temperature operation at 700 degrees Celsius with molten carbonate and solid oxide fuel cells, while exhibiting all of the intrinsic benefits of proton conduction in proton exchange membrane fuel cells (PEMFC) and phosphoric acid fuel cells (PAFC). The high operating temperature is necessary to achieve very high electrical fuel efficiency with hydrocarbon fuels. PCFCs can operate at high temperatures and electrochemically oxidize fossil fuels directly to the anode. This eliminates the intermediate step of producing hydrogen through the costly reforming process. Gaseous molecules of the hydrocarbon fuel are absorbed on the surface of the anode in the presence of water vapor, and hydrogen atoms are efficiently stripped off to be absorbed into the electrolyte, with carbon dioxide as the primary reaction product. PCFCs have a solid electrolyte, so that the membrane cannot dry out as with PEM fuel cells, and liquid cannot leak out as with PAFCs.

Among the major fuel cells types, Proton Exchange Membrane Fuel Cells (PEMFC) account for nearly 60% market share. Following Proton Exchange Membrane Fuel Cells (PEMFC), both Molten Carbonate Fuel Cells (MCFC) and Solid Oxide Fuel Cells (SOFC) account for more than 14% market share.

Protonic Ceramic Fuel Cells (PCMC) are similar to SOFCs in many ways. The major difference is that hydrogen moves through the ceramic electrolyte rather than oxygen. These fuel cells are much like a hybrid between a SOFC and a PEMFC. The major benefit of PCFCs is their ability to utilize a wide variety of fuel sources. Coal, wood, hydrocarbons, and even non-fossilized organic matter can all be used as fuel.



Now, Protonic Ceramic Fuel Cells (PCMC) technology are still under development as it is not mass produced. The Colorado School of Mines (Mines) and The Research Council of Norway are the main research institutes of Protonic Ceramic Fuel Cells (PCMC).

Over the next five years, LPI(LP Information) projects that Protonic Ceramic Fuel Cell (PCFC) will register a xx% CAGR in terms of revenue, reach US\$ xx million by 2023, from US\$ xx million in 2017.

This report studies the global market, especially in North America, Europe, Asia-Pacific, South America, Middle East and Africa, focuses on the top 5 players in each region, with sales, price, revenue and market share from 2013 to 2018, the top players:

Ballard
Toshiba
PLUG Power
FuelCell Energy
Hydrogenics
Doosan Fuel Cell
Horizon
Intelligent Energy
Hyster-Yale Group
Nedstack
Pearl Hydrogen
Sunrise Power

Market Segment by Regions, this report splits Global into several key Regions, with sales, revenue, market share of top players in these regions, from 2013 to 2018



(forecast), like
North America (United States, Canada and Mexico)
Asia-Pacific (China, Japan, Southeast Asia, India and Korea)
Europe (Germany, UK, France, Italy and Russia etc.)
South America (Brazil, Chile, Peru and Argentina)
Middle East and Africa (Egypt, South Africa, Saudi Arabia)
Split by Product Types, with sales, revenue, price, market share of each type, can be divided into
PEMFC
DMFC
PAFC
SOFC
MCFC
AFC
Split by applications, this report focuses on sales, market share and growth rate in each application, can be divided into
Portable
Stationary
Transport



### **Contents**

### 1 PROTONIC CERAMIC FUEL CELL (PCFC) MARKET OVERVIEW

- 1.1 Product Overview and Scope of Protonic Ceramic Fuel Cell (PCFC)
- 1.2 Protonic Ceramic Fuel Cell (PCFC) Segment by Types
- 1.2.1 Global Sales Market Share of Protonic Ceramic Fuel Cell (PCFC) by Types in 2017
  - **1.2.2 PEMFC** 
    - 1.2.2.1 Major Players of Type I
  - 1.2.3 DMFC
    - 1.2.3.1 Major Players of DMFC
  - 1.2.4 PAFC
  - 1.2.4.1 Major Players of PAFC
  - 1.2.5 SOFC
    - 1.2.5.1 Major Players of SOFC
  - 1.2.6 MCFC
    - 1.2.6.1 Major Players of MCFC
  - 1.2.7 AFC
    - 1.2.7.1 Major Players of AFC
- 1.3 Protonic Ceramic Fuel Cell (PCFC) Segment by Applications
  - 1.3.1 Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Applications in 2017
  - 1.3.2 Portable
  - 1.3.3 Stationary
  - 1.3.4 Transport
- 1.4 Protonic Ceramic Fuel Cell (PCFC) Market by Regions
  - 1.4.1 North America Status and Prospect (2013-2023)
- 1.4.1.1 North America Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)
  - 1.4.2 Asia-Pacific Status and Prospect (2013-2023)
- 1.4.2.1 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)
  - 1.4.3 Europe Status and Prospect (2013-2023)
- 1.4.3.1 Europe Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)
  - 1.4.4 South America Status and Prospect (2013-2023)
- 1.4.4.1 South America Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)
  - 1.4.5 Middle East and Africa Status and Prospect (2013-2023)



- 1.4.5.1 Middle East and Africa Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)
- 1.5 Global Market Size (Value) of Protonic Ceramic Fuel Cell (PCFC) (2013-2023)

### 2 GLOBAL PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE (VALUE) AND MARKET SHARE BY PLAYERS

- 2.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Players in 2016 and 2017
- 2.1.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales by Players in 2016 and 2017
- 2.1.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) by Players in 2016 and 2017
- 2.2 Global Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Players in 2016 and 2017
- 2.2.1 Global Protonic Ceramic Fuel Cell (PCFC) Revenue by Players in 2016 and 2017
- 2.2.2 Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) by Players in 2016 and 2017
- 2.3 Global Protonic Ceramic Fuel Cell (PCFC) Average Price by Players in 2016 and 2017
- 2.4 Global Protonic Ceramic Fuel Cell (PCFC) Manufacturing Base Distribution, Sales Area, Product Types by Players
- 2.4.1 Global Protonic Ceramic Fuel Cell (PCFC) Manufacturing Base Distribution and Sales Area by Players
  - 2.4.2 Players Protonic Ceramic Fuel Cell (PCFC) Product Types
- 2.5 Protonic Ceramic Fuel Cell (PCFC) Market Competitive Situation and Trends
  - 2.5.1 Protonic Ceramic Fuel Cell (PCFC) Market Concentration Rate
  - 2.5.2 Protonic Ceramic Fuel Cell (PCFC) Market Share of Top 3 and Top 5 Players
  - 2.5.3 Mergers & Acquisitions, Expansion

# 3 GLOBAL PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE (VALUE) BY REGIONS, TYPE AND APPLICATION (2013-2018)

- 3.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share by Regions (2013-2018)
- 3.1.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Regions (2013-2018)
- 3.1.2 Global Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Regions (2013-2018)



- 3.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 3.2.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
- 3.2.2 Global Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 3.2.3 Global Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
- 3.3 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
  - 3.3.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 3.3.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)
- 3.4 Global Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

# 4 NORTH AMERICA TOP 5 PLAYERS PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE AND PRICE

- 4.1 North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share in 2016 and 2017
- 4.1.1 North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share in 2016 and 2017
- 4.1.2 North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share in 2016 and 2017
- 4.2 North America Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 4.2.1 North America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
- 4.2.1.1 North America Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)
- 4.2.1.2 North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)
- 4.2.2 North America Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 4.2.2.1 North America Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)
- 4.2.2.2 North America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)
  - 4.2.3 North America Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)



- 4.3 North America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
- 4.3.1 North America Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 4.3.2 North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)
- 4.4 North America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Country (US, Canada and Mexico) (2013-2018)
  - 4.4.1 North America Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)
- 4.4.2 North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)
- 4.5 North America Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)

# 5 EUROPE TOP 5 PLAYERS PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE AND PRICE

- 5.1 Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share in 2016 and 2017
- 5.1.1 Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share in 2016 and 2017
- 5.1.2 Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share in 2016 and 2017
- 5.2 Europe Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 5.2.1 Europe Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
  - 5.2.1.1 Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)
- 5.2.1.2 Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)
- 5.2.2 Europe Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
  - 5.2.2.1 Europe Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)
- 5.2.2.2 Europe Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)
- 5.2.3 Europe Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
- 5.3 Europe Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
  - 5.3.1 Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 5.3.2 Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application



(2013-2018)

- 5.4 Europe Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Country (Germany, UK, France, Italy and Russia) (2013-2018)
- 5.4.1 Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)
- 5.4.2 Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)
- 5.5 Europe Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)

# 6 ASIA-PACIFIC TOP 5 PLAYERS PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE AND PRICE

- 6.1 Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share in 2016 and 2017
- 6.1.1 Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share in 2016 and 2017
- 6.1.2 Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share in 2016 and 2017
- 6.2 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 6.2.1 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
  - 6.2.1.1 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)
- 6.2.1.2 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)
- 6.2.2 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 6.2.3 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
- 6.3 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
- 6.3.1 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 6.3.2 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)
- 6.4 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Country (China, Japan, Southeast Asia, India, Korea and Australia) (2013-2018)
  - 6.4.1 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)
- 6.4.2 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)
- 6.5 Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)



# 7 SOUTH AMERICA TOP 5 PLAYERS PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE AND PRICE

- 7.1 South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share in 2016 and 2017
- 7.1.1 South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share in 2016 and 2017
- 7.1.2 South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share in 2016 and 2017
- 7.2 South America Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 7.2.1 South America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
- 7.2.1.1 South America Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)
- 7.2.1.2 South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)
- 7.2.2 South America Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 7.2.2.1 South America Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)
- 7.2.2.2 South America Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 7.2.3 South America Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
- 7.3 South America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
- 7.3.1 South America Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 7.3.2 South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)
- 7.4 South America Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Country (Brazil, Argentina, Chile and Peru) (2013-2018)
- 7.4.1 South America Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)
- 7.4.2 South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)
- 7.5 South America Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)



# 8 MIDDLE EAST & AFRICA TOP 5 PLAYERS PROTONIC CERAMIC FUEL CELL (PCFC) SALES, REVENUE AND PRICE

- 8.1 Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue and Market Share in 2016 and 2017
- 8.1.1 Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share in 2016 and 2017
- 8.1.2 Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share in 2016 and 2017
- 8.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Market Share and Price by Type (2013-2018)
- 8.2.1 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Type (2013-2018)
- 8.2.1.1 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)
- 8.2.1.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)
- 8.2.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue and Market Share by Type (2013-2018)
- 8.2.2.1 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)
- 8.2.2.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)
- 8.2.3 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
- 8.3 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Application (2013-2018)
- 8.3.1 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
- 8.3.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)
- 8.4 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share by Country (Egypt, Saudi Arabia, South Africa and Iran) (2013-2018)
- 8.4.1 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)
- 8.4.2 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)
- 8.5 Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)



### 9 GLOBAL PROTONIC CERAMIC FUEL CELL (PCFC) PLAYERS PROFILES/ANALYSIS

- 9.1 Ballard
- 9.1.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
- 9.1.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
  - 9.1.2.1 Product A
  - 9.1.2.2 Product B
- 9.1.3 Ballard Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.1.4 Main Business/Business Overview
  - 9.1.5 Ballard News
- 9.2 Toshiba
- 9.2.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
- 9.2.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
  - 9.2.2.1 Product A
  - 9.2.2.2 Product B
- 9.2.3 Toshiba Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.2.4 Main Business/Business Overview
  - 9.2.5 Toshiba News
- 9.3 PLUG Power
- 9.3.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
- 9.3.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
  - 9.3.2.1 Product A
  - 9.3.2.2 Product B
- 9.3.3 PLUG Power Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.3.4 Main Business/Business Overview
  - 9.3.5 PLUG Power News
- 9.4 FuelCell Energy
- 9.4.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.4.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification 9.4.2.1 Product A



- 9.4.2.2 Product B
- 9.4.3 FuelCell Energy Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.4.4 Main Business/Business Overview
  - 9.4.5 FuelCell Energy News
- 9.5 Hydrogenics
- 9.5.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.5.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
    - 9.5.2.1 Product A
    - 9.5.2.2 Product B
- 9.5.3 Hydrogenics Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.5.4 Main Business/Business Overview
  - 9.5.5 Hydrogenics News
- 9.6 Doosan Fuel Cell
- 9.6.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.6.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
    - 9.6.2.1 Product A
    - 9.6.2.2 Product B
- 9.6.3 Doosan Fuel Cell Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.6.4 Main Business/Business Overview
  - 9.6.5 Doosan Fuel Cell News
- 9.7 Horizon
- 9.7.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.7.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
    - 9.7.2.1 Product A
    - 9.7.2.2 Product B
- 9.7.3 Horizon Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.7.4 Main Business/Business Overview
  - 9.7.5 Horizon News
- 9.8 Intelligent Energy
- 9.8.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.8.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification



- 9.8.2.1 Product A
- 9.8.2.2 Product B
- 9.8.3 Intelligent Energy Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
- 9.8.4 Main Business/Business Overview
- 9.8.5 Intelligent Energy News
- 9.9 Hyster-Yale Group
- 9.9.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
  - 9.9.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
    - 9.9.2.1 Product A
    - 9.9.2.2 Product B
- 9.9.3 Hyster-Yale Group Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.9.4 Main Business/Business Overview
  - 9.9.5 Hyster-Yale Group News
- 9.10 Nedstack
- 9.10.1 Company Basic Information, Manufacturing Base, Sales Area and Its Competitors
- 9.10.2 Protonic Ceramic Fuel Cell (PCFC) Product Types, Application and Specification
  - 9.10.2.1 Product A
  - 9.10.2.2 Product B
- 9.10.3 Nedstack Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)
  - 9.10.4 Main Business/Business Overview
  - 9.10.5 Nedstack News
- 9.11 Pearl Hydrogen
- 9.12 Sunrise Power

# 10 GLOBAL PROTONIC CERAMIC FUEL CELL (PCFC) MARKET FORECAST (2018-2023)

- 10.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue Forecast (2018-2023)
- 10.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales, Consumption Forecast by Regions (2018-2023)
- 10.2.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Regions (2018-2023)
  - 10.2.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by



Regions (2018-2023)

- 10.3 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share Forecast by Type (2018-2023)
  - 10.3.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Type (2018-2023)
- 10.3.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by Type (2018-2023)
- 10.4 Global Protonic Ceramic Fuel Cell (PCFC) Sales and Market Share Forecast by Application (2018-2023)
- 10.4.1 Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Application (2018-2023)
- 10.4.2 Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by Application (2018-2023)
- 10.5 Protonic Ceramic Fuel Cell (PCFC) Price Forecast (2018-2023)

### 11 PROTONIC CERAMIC FUEL CELL (PCFC) MANUFACTURING COST ANALYSIS

- 11.1 Protonic Ceramic Fuel Cell (PCFC) Key Raw Materials Analysis
  - 11.1.1 Key Raw Materials
  - 11.1.2 Price Trend of Key Raw Materials
  - 11.1.3 Key Suppliers of Raw Materials
  - 11.1.4 Market Concentration Rate of Raw Materials
- 11.2 Proportion of Manufacturing Cost Structure
  - 11.2.1 Raw Materials
  - 11.2.2 Labor Cost
  - 11.2.3 Manufacturing Expenses
- 11.3 Manufacturing Process Analysis of Protonic Ceramic Fuel Cell (PCFC)

### 12 INDUSTRIAL CHAIN, SOURCING STRATEGY AND DOWNSTREAM BUYERS

- 12.1 Protonic Ceramic Fuel Cell (PCFC) Industrial Chain Analysis
- 12.2 Upstream Raw Materials Sourcing
- 12.3 Raw Materials Sources of Protonic Ceramic Fuel Cell (PCFC) Major Players in 2017
- 12.4 Downstream Buyers

### 13 MARKETING STRATEGY ANALYSIS, DISTRIBUTORS/TRADERS

- 13.1 Marketing Channel
  - 13.1.1 Direct Marketing



- 13.1.2 Indirect Marketing
- 13.1.3 Marketing Channel Development Trend
- 13.2 Market Positioning
  - 13.2.1 Pricing Strategy
  - 13.2.2 Brand Strategy
  - 13.2.3 Target Client
- 13.3 Distributors/Traders List

### 14 MARKET EFFECT FACTORS ANALYSIS

- 14.1 Technology Progress/Risk
  - 14.1.1 Substitutes Threat
  - 14.1.2 Technology Progress in Related Industry
- 14.2 Consumer Needs/Customer Preference Change
- 14.3 Economic/Political Environmental Change

### 15 RESEARCH FINDINGS AND CONCLUSION

### **16 APPENDIX**

- 16.1 Methodology
- 16.2 Data Source



### **List Of Tables**

#### LIST OF TABLES AND FIGURES

Figure Picture of Protonic Ceramic Fuel Cell (PCFC)

Table Product Specifications of Protonic Ceramic Fuel Cell (PCFC)

Figure Global Sales Market Share of Protonic Ceramic Fuel Cell (PCFC) by Types in 2017

Figure Product Picture of PEMFC

Table Major Players of PEMFC

Figure Product Picture of DMFC

Table Major Players of DMFC

Figure Product Picture of PAFC

Table Major Players of PAFC

Figure Product Picture of SOFC

Table Major Players of SOFC

Figure Product Picture of MCFC

Table Major Players of MCFC

Figure Product Picture of AFC

Table Major Players of AFC

Figure Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Applications in 2017 Table Applications of Protonic Ceramic Fuel Cell (PCFC)

Figure Stationary Examples

Figure Transport Examples

Figure North America Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Figure Middle East and Africa Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue (Million USD) and Growth Rate (2013-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales by Players in 2016 and 2017 Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) by Players in 2016 and 2017



Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Players in 2016

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Players in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue by Players in 2016 and 2017 Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) by Players in 2016 and 2017

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Players in 2016

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Players in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Average Price by Players in 2016 and 2017

Figure Global Protonic Ceramic Fuel Cell (PCFC) Average Price by Players in 2017 Table Global Protonic Ceramic Fuel Cell (PCFC) Manufacturing Base Distribution and Sales Area by Players

Table Players Protonic Ceramic Fuel Cell (PCFC) Product Types

Figure Protonic Ceramic Fuel Cell (PCFC) Market Share of Top 3 Players

Figure Protonic Ceramic Fuel Cell (PCFC) Market Share of Top 5 Players

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales by Regions (2013-2018)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Regions (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Regions (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Regions in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue by Regions (2013-2018) Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Regions (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Regions (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Regions in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type in 2017



Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018) Table Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application in 2017

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Table North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales in 2016 and 2017

Table North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) in 2016 and 2017

Figure North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2016

Figure North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2017

Table North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue in 2016 and 2017

Table North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) in 2016 and 2017

Figure North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2016

Figure North America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2017

Table North America Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018) Figure 2017 North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type

Table North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type



(2013-2018)

Table North America Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018) Figure North America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type in 2017

Table North America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure North America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Table North America Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018) Table North America Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)

Figure North America Protonic Ceramic Fuel Cell (PCFC) Sales by Application in 2017 Table North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Figure North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table North America Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018) Figure 2017 North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country

Table North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure North America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Table North America Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018) Table Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales in 2016 and 2017

Table Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) in 2016 and 2017

Figure Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2016 Figure Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2017 Table Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue in 2016 and 2017

Table Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) in 2016 and 2017

Figure Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2016

Figure Europe Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2017

Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)



Figure 2017 Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Table Europe Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018) Figure Europe Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type in 2017

Table Europe Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Table Europe Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)

Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application in 2017

Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018) Figure Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country in 2017

Table Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure Europe Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Table Europe Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)

Table Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales in 2016 and 2017

Table Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) in 2016 and 2017

Figure Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2016

Figure Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2017

Table Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue in 2016 and 2017

Table Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Market



Share (%) in 2016 and 2017

Figure Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2016

Figure Asia-Pacific Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2017

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018) Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type in 2017

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018) Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type in 2017

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)
Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)
Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Application in 2017
Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by
Application (2013-2018)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018) Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country in 2017

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Table Asia-Pacific Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)
Table South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales in 2016
and 2017

Table South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) in 2016 and 2017

Figure South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in



2016

Figure South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2017

Table South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue in 2016 and 2017

Table South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) in 2016 and 2017

Figure South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2016

Figure South America Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2017

Table South America Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018) Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales by Type in 2017 Table South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Table South America Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Revenue by Type in 2017 Table South America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Table South America Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018) Table South America Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales by Application in 2017 Table South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table South America Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018) Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales by Country in 2017 Table South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure South America Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Table South America Protonic Ceramic Fuel Cell (PCFC) Import & Export (2013-2018)



Table Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales in 2016 and 2017

Table Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Market Share (%) in 2016 and 2017

Figure Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2016

Figure Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Sales Share in 2017

Table Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue in 2016 and 2017

Table Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share (%) in 2016 and 2017

Figure Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2016

Figure Middle East & Africa Top 5 Players Protonic Ceramic Fuel Cell (PCFC) Revenue Share in 2017

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Type (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Type in 2017 Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Type (2013-2018)

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue by Type (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue by Type in 2017

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Revenue Market Share by Type (2013-2018)

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Price by Type (2013-2018)

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Application (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Application in 2017

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)



Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Application (2013-2018)

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Country (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales by Country in 2017

Table Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure Middle East & Africa Protonic Ceramic Fuel Cell (PCFC) Sales Market Share by Country (2013-2018)

Figure Ballard Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018)

Table Ballard Basic Information, Manufacturing Base, Sales Area and Its Competitors Table Ballard Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Ballard Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018)

Table Toshiba Basic Information, Manufacturing Base, Sales Area and Its Competitors Table Toshiba Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Toshiba Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table PLUG Power Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table PLUG Power Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure PLUG Power Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table FuelCell Energy Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table FuelCell Energy Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure FuelCell Energy Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table Hydrogenics Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table Hydrogenics Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Hydrogenics Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table Doosan Fuel Cell Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table Doosan Fuel Cell Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Doosan Fuel Cell Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018)



Table Horizon Basic Information, Manufacturing Base, Sales Area and Its Competitors Table Horizon Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Horizon Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018)
Table Intelligent Energy Basic Information, Manufacturing Base, Sales Area and Its
Competitors

Table Intelligent Energy Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Intelligent Energy Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table Hyster-Yale Group Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table Hyster-Yale Group Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Hyster-Yale Group Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018)

Table Nedstack Basic Information, Manufacturing Base, Sales Area and Its Competitors Table Nedstack Protonic Ceramic Fuel Cell (PCFC) Sales, Revenue, Price and Gross Margin (2013-2018)

Figure Nedstack Protonic Ceramic Fuel Cell (PCFC) Market Share (2013-2018) Table Pearl Hydrogen Basic Information, Manufacturing Base, Sales Area and Its Competitors

Table Sunrise Power Basic Information, Manufacturing Base, Sales Area and Its Competitors

Figure Global Protonic Ceramic Fuel Cell (PCFC) Sales and Growth Rate Forecast (2018-2023)

Figure Global Protonic Ceramic Fuel Cell (PCFC) Revenue and Growth Rate Forecast (2018-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Regions (2018-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by Regions (2018-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Type (2018-2023) Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by Type (2018-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Forecast by Application (2018-2023)

Table Global Protonic Ceramic Fuel Cell (PCFC) Sales Market Share Forecast by Application (2018-2023)

Table Sales Base and Market Concentration Rate of Raw Material



Figure Price Trend of Key Raw Materials

Table Key Suppliers of Raw Materials

Figure Manufacturing Cost Structure of Protonic Ceramic Fuel Cell (PCFC)

Figure Manufacturing Process Analysis of Protonic Ceramic Fuel Cell (PCFC)

Figure Protonic Ceramic Fuel Cell (PCFC) Industrial Chain Analysis

Table Raw Materials Sources of Protonic Ceramic Fuel Cell (PCFC) Major Players in 2017

Table Major Buyers of Protonic Ceramic Fuel Cell (PCFC)

Table Distributors/Traders List



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