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Project Title: Preparing Guide to Using Fuel Cells with Stationary Applications

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Project Necessity:

Among all energy production methods, the only technology that is compatible with non-renewable and renewable fuels is fuel cell technology, as in many international documents, the fuel cell is considered as a renewable or clean source that has an environmental impact. It is very small. The fuel cell will undoubtedly be one of the top technologies in the coming years in the world and Iran, and the arrival of this technology from now in the form of simultaneous production of heat and electricity in home applications to large power generation systems as well as urban and public transportation. Give that a large market of energy will be allocated to this industry. Therefore, it is necessary to plan and target for the coming years and to prepare and compile technical and executive systems using criteria, standards and technical criteria for fuel cell systems. Due to the fact that fuel cell applications are divided into three main categories: resident, portable and transportation, so it is necessary to distinguish between requirements and specifications related to fuel cells. For this reason, according to the experts, the guide for using the fuel cell can be done in two phases, the first of which is related to stationary applications and the second is related to mobile applications (including launching and transportation).

The static applications of fuel cells are closely related to efficiency and energy management and power generation, transmission and distribution. Due to energy security issues, it is necessary to examine the use of static systems and its connection to the electricity grid. In this regard, it is necessary for consumers and economic actors to know that in order to use fuel cell static systems in their intended applications, it is necessary to pay attention to what points, criteria and standards, and how economic issues are considered in this regard so that they can Benefit from technology in the best way and with the highest efficiency and lowest cost. Therefore, it is necessary to prepare and compile technical, executive, design, installation and operation of fuel cell static units for consumers, manufacturers and activists in the field of fuel cell with static application in a coherent set. Therefore, it is necessary to first study the types of fuel cells and their history and technology. Examine and compile the various applications of this technology. Then identify the main and current technologies and why different countries are focused on specific applications or technologies of fuel cells. In order to achieve technical and non-technical requirements for products, it is necessary to first carefully examine the specifications of products on the market or products that are on the way to market. For each product, specifications are mentioned that indicate the performance of that product and in terms of different dimensions, studies can be done on them. For example, efficiency, carbon emissions, safety and cost can

be evaluated based on output parameters. Based on these specifications and previous documents published in different countries, it is possible to obtain the requirements of each country for the production of fuel cell products in static applications.

In a CHP system, standards are generally pre-formulated and explained that are not based on specific technology and are generally related to conventional systems based on rotating and mobile equipment, while in the case of fuel cell technology due to different technology and almost static Components These standards are not applicable in part, but in general the requirements of those standards need to be met. Therefore, it is necessary to extract the standards for each user in the subset of fuel cell static applications and to adapt its requirements for the fuel cell. Fuel cells have been used extensively around the world for a long time, and standards for them have long been in place. One of the most important of these standards, entitled "Fuel Cell Technologies - Static Power Generation Systems", was developed in 2012 by the International Standards Institute. This standard, under the name of IEC 62282-3-100 systems, has evaluated the static power generation of fuel cells in terms of safety and has explained the necessary standards and tests in this regard. Japan, which is one of the pioneers in the use of fuel cells in industry and its various applications from stationary to mobile, has also set and presented several standards for fuel cell power generation systems under the Japanese National Industrial Standard. JIS C 8841-1-3 examines standardization features for small SOFC power generation systems. This standard was developed and announced in Japan in 2011. In various parts of this standardization, general rules related to installation and safety issues up to performance reviews and tests have been considered.

Apart from what has been said, standards, criteria and standards have been developed over the years regarding fuel cell technologies in the world in order to achieve maximum durability and reliability of the system. Therefore, in addition to the general requirements for the application, the standards and technical requirements related to the fuel cell technologies themselves should be extracted and reviewed. On the other hand, previous documents compiled in the country are generally research-oriented or technological and do not enter the field of market and industrial and commercial use of fuel cells. Although it is mentioned in the document of the national strategy for the development of fuel cell technology, but no efforts have been made to formulate these cases and in the field of fuel cell, there is no standard and precise criteria for the commercial use of this technology in various applications. In addition, given that more than 10 years have passed since the drafting of the previous national document, it is necessary to review this issue and amend the document based on current realities and markets. Therefore, if the fuel cell system is to replace the previous systems used in static applications, it is necessary to review the relevant standards and adapt the technical and standardization requirements for the fuel cell systems used in this application. In addition, some laws, such as the guaranteed purchase of electricity in the country, are reviewed and new pricing is reviewed every year. However, due to the lack of familiarity with some technologies, these changes and policies are not accurate and motivational and sometimes cause a blow to that technology. Therefore, it is necessary to review and monitor these changes in the fuel cell economy in static applications and to examine its developments over the past years.

Project Goals:

- 1- Familiarity with fuel cell technology and its components
- 2- Familiarity with fuel cell static applications
- 3- Familiarity with algorithms and process methods in fuel cells
- 4- Codification of technical and executive requirements for design, installation and operation of fuel cells with stationary application

Abstract:

In this project, in the first step, the history of fuel cells and their application in the world was investigated. In the second step, international standards were collected and reviewed based on the common use between fuel cells and conventional systems, as well as standards for the design, manufacture, installation, commissioning, and maintenance of fuel cell systems. The third step of this project was dedicated to collecting and reviewing upstream documents and documents for the development of fuel cell technology in the country. In the final step, the technical guide required in the form of requirements for the design, installation and operation of safety devices for fuel cell systems with stationary use, requirements for gas supply and electronic systems required, requirements for control systems, network communication and battery intelligence Fuel's and finally other equipment requirements of fuel cell systems were extracted and compiled from reliable domestic and foreign sources.

Steps and Methodologies:

- 1- Studying and collecting specifications and technical and non-technical requirements of fuel cells with resident application in different countries of the world, preparing and compiling technical and executive specifications for designing, installing and operating various types of storage devices.
- 2- Reviewing the laws and technical documents on the requirements and specifications of previous similar systems in co-located applications with fuel cells in the country
- 3- Preparation and compilation of technical and executive specifications for design, installation and operation of fuel cells with stationary application
- 4- Preparing and compiling the required publication

Main Results (technical outputs, patents, papers, books, reports, etc.):

- 1- Technical report Technical and executive specifications of design, installation and operation of fuel cells with static application