Market analysis for sustainable energy suppliers with regulation restrictions

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ABSTRACT

The purpose of this research is to explain the policy model even for the development of renewable energy sources in the country. This article examines the factors affecting the renewable energy market and the development methods of these resources based on the grounded theory. The information of this research has been collected using joint interviews with the managers and experts of the clean energy technologies development headquarters. Considering that renewable energy sources play an important role in the country's energy supply, data analysis is implemented in three different stages including open coding, selective coding, and central coding. This analysis will lead to appropriate development policies in the renewable energy sector. In this regard, it has been tried to look at the renewable energy market as a cause-and-effect market based on the goals set in the mentioned documents of the country and identify the background and intervening factors in this regard. Finally, a paradigmatic model of a suitable policy for renewable energy sources will be presented.

Introduction

According to the definition of renewable energy, these resources are stable and continuously available in nature, and it is possible to achieve their sustainable use without worrying about replacing them. The main source of these resources is the sun, which appears in the forms of wind energy, solar energy, biomass energy, hydroelectric energy, etc. One of the most important features of renewable energy sources is the availability of these sources, which makes them distributed in different types in all countries of the world. One of the most important features of renewable energy is its cleanness, high availability, high sustainability, and reduction of pollution. Therefore, in recent years, renewable energy sources have been seriously proposed as alternative sources for fossil fuels (Chien, 2022). Meanwhile, all countries are trying to create appropriate policies to support and encourage the development of renewable energy sources. In recent years, in parallel with increasing pollution on the part of fossil fuels and climate changes and increasing demand for energy, the popularity of renewable energy sources and the necessity for maximum exploitation of these sources have increased. Fig. 1 shows the portion of the energy produced in 2018 in the United States.

According to the national renewable energy development document, the characteristic capacity of energy from renewable sources should be injected into the grid every year in different countries. Unfortunately, despite the very high climate potentials that exist in most countries, renewable energy sources have not been properly exploited (Aghmiuni, Siyal, Wang, & Duan, 2020). Statistical information and data indicate that the development of renewables has not been done according to the capacity of countries and specific goals in their documents and policies (Dabbous & Tarhini, 2021). Therefore, it seems necessary and important to take a new look at the policy category in the field of renewable energy in the market so that as much as possible the social, economic, or cultural benefits of these resources can be used. In recent years, researchers have conducted appropriate studies on different parts of these sources, most of which have been carried out in universities and research institutes, and research centers (Zhu, Mu, & Liang, 2022). The studies conducted in the field of renewable energy sources are in the technical and economic part, which were conducted by electrical engineers and energy departments in universities. In this regard, a number of researches have been based on a technical point of view, which mainly focuses on the structure and design and how to exploit renewable energy sources in electricity systems and smart cities. This group of studies has attributed countless benefits to renewable energy sources, which are mainly due to the reduction of fossil fuel consumption and as a result, the reduction of emissions and the improvement of the voltage level, and the reduction of harmonics (Navon, Kulbekov, Dolev, Yehuda, & Levron, 2020). The second group is the researchers who have looked
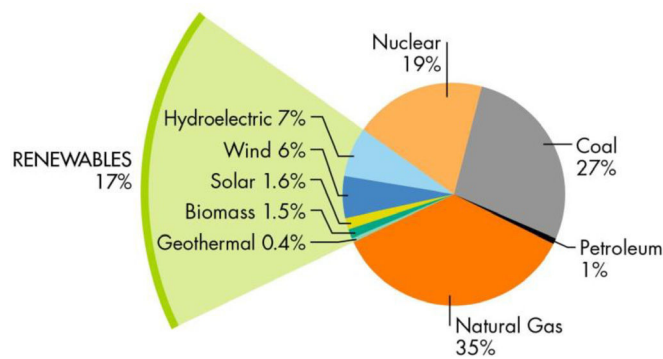
Fig. 1. Energy usage in the United States in 2018: Compare the renewable energy source's position among all other sources of energy.

at this issue from an economic point of view and believe that the existence of renewable energy resources will bring costs for the owners in the beginning, but in the long term, the return on investment will compensate for these costs and after that, The profit from renewable energy sources will be more than fossil sources. In addition, from the point of view of macro policy, in many remote places, it is possible to create a suitable electrification project, without the high costs of buying a transformer and installing electric towers and high voltage transmission lines, and suitable social welfare can be created through these resources. It should be noted that these researchers did not stop at the economic point of view, but also considered the costs of reducing pollution and its effects on human health. The third and last group of us are researchers who have dealt with the management and policies of renewable energy sources and have tried to do appropriate work to encourage and encourage people to use renewable energy sources in various industries (Greer, 2022). One of the specific policies in the field of reforming the price of energy carriers, which leads to the creation of a competitive environment for renewable energies (Shen, Chou, & Lin, 2011). In other words, to encourage the use of renewable energy, the price of energy carriers should be increased to a suitable extent to provide economic justification for resources (Baris & Kucukali, 2012). In addition, it has been shown in recent research that the replacement of renewable sources to provide a part of the energy needed by society can have positive short-term and medium-term economic effects with different contributions. This research emphasizes the consequences of renewable energy development policies. Based on this, it is tried to identify and introduce the most important approaches in this field by using the research method of interviews with government managers and politicians.

Limitations of laws and policies of renewable development

In general, the linear process of the market policy includes the transformation of the political vision of governments into programs and actions that can cause changes in the short, medium, and long term. Considering that the target system is a social platform, therefore, the environment is highly variable and includes high uncertainty and conflict of interests (Shen, Lin, Li, & Yuan, 2010). With this definition, policy refers to a set of purposeful actions that are followed by a person or several people to investigate and solve a concern. Of course, the adopted policies must be consistent with the predefined goals and the available tools. In general, policymaking can be divided into three stages: formulation and regulation of policy, implementation of policy, and evaluation of policy. In this regard, the energy policy in the electricity market can include a framework of written and unwritten rules and regulations that have been created over many years (Boeters & Koornneef, 2011). Therefore, energy policies in most countries are towards sustainable energy and efforts to reduce pollution caused by fossil fuels. How much capacity each

country faces in exploiting renewable energy sources depends on the climatic and economic conditions of that country. One of the basic definitions in energy policies is related to the energy portfolio, which specifies the percentage of participation of different energy carriers in a year (Argentiero, Bollino, Micheli, & Zopounidis, 2018). Therefore, policies in the energy sector should be such that the development of different renewable energies is considered a basic issue. Of course, due to the intersection of these policies with the social and economic policies of governments, it is necessary to make decisions in the macro sector. Also, solutions should be developed to integrate the policies and create a connection between the policies of the different electrical sectors of heating and cooling, transportation and development (Yuksel, & Kaygusuz, 2011). Certainly, regardless of the obstacles and problems on the way, it is not possible to realize these policies in the long term. In economic theories, it is necessary for governments to intervene in the energy market and solve problems during failures and failures. The three major failure factors in the renewable energy market include the following:

- monopolistic competition,
- foreign effects,
- Information asymmetry.

The factor of monopolistic competition is a situation where energy supply costs by a company are lower than competing companies and practically the entire market is monopolized by one company. The second factor is one of the most common factors that provide a good justification for government intervention in energy markets. Finally, the third factor returns to a situation where access to knowledge and information is uneven and unbalanced, and therefore the market is controlled by a number of competitors (Aste, Buzzetti, Caputo, & Del Pero, 2018).

Research methodology

As mentioned before, this research tries to collect and analyze data and then theorize using the ground theory. Therefore, unlike other methods that start from a theory and examine its correctness or incorrectness, this method tries to reach a basic theory by using people's experiences and views. Here, in the beginning, a suitable formulation of people's ideas has been made, and in the end, we try to reach a conclusion with a research method and in the form of a systematic procedural chain. Therefore, in this method, the research never starts with a theory to be proved later (Verma & Kumar, 2013). Rather, the first step was to create a study course to show everything that is appropriate and related to it. Therefore, considering that this method exists in the environment and system, it is expected to provide a better explanation of the existing conditions. The approaches examined here are the systematic approach, which includes the following three basic steps:

- open coding,
- central coding, and
- selective coding.

Therefore, this research is qualitative research and the method used is grounded theory, and the approach used is an inductive approach based on data collection from semi-structured interviews.

The statistical population of the research

This research is based on the statistical population consisting of a large number of experts and those who have the name of thought and experience in the field of renewable energy policies in the electricity market. For this purpose, help was taken from three different organizations to conduct the research with semi-structured interviews. The first organization is a supra-organizational organization that uses its policies

Table 1
The extracted codes and concepts.

Items	Concepts	Extracted codes
Climatic necessities	environmental factors	environmental concerns, greenhouse gasses, climate change, residue, public demand, taxes
Energy supply	balance of production and consumption	security of the energy portfolio, energy supply, increase in energy demand, the future of the country, the increasing importance of energy, the geopolitical position of the country
Development of the energy market	development of renewable energies on	market, the development of the market, the management of the market, the public and private players of the market, the indebtedness of the government, international cooperation and culture, promotion
Factors that create the basis for the development of renewable energies	potentials of renewable energy resources and access to their	dependence on fossil resources, sanctions, and international political conditions. energy prices, energy subsidies, economic stability, exchange rate fluctuations
The consequence of the development of renewable energies	preservation of underground resources	increase of security, diversification of the commodity basket, the export of fossil resources, sustainable rural development, energy security, the reduction of losses, the stability of the network, the advancement of the network, job opportunities, business development

from all the policies of other renewable energy development organizations. The second organization is an organization that has appropriate knowledge and experience based on its activities in the field of renewable energy. Finally, the last and third organization is electricity production companies that manage and exploit renewable energy sources. Here we will collect data from twenty managers and experts of these organizations through semi-structured interviews and various questions. The selected sampling method is the chain referral method, the sample size is determined during the interview. Eighty-five percent of the interviewees were men and the remaining percent were women. Also, seventy-one percent of the people are managers and the rest are experts or senior experts. All the studied people have at least a bachelor's degree and at least ten years of experience (Casisi, De Nardi, Pinamonti, & Reini, 2015). All these interviews have been recorded and analyzed and then implemented. Based on the aforementioned three-step coding, all collected information is continuously reviewed and refined. Also, several similar data gathered around a concept are studied as an inductive process. During the study, the interview text is continuously referred to and this process continues until we reach the theoretical saturation stage. In the end, all the interviews were identified as one hundred primary codes and after refining, they were divided into about twenty different sections.

Validity of the research findings

In order to inform and ensure the results obtained from this research, despite reaching theoretical saturation in the interviews, the interview process is still continued so that the information is valid. Also, some of the initial coding and research results were randomly shared with some of the interviewees to provide comments and review, modify and confirm the process and extract obtained. Also, to check the reliability of the tests, three interviews were selected as a sample and each of them was coded again in a short period of one week. In each of the interviews, the codes that are similar to each other in two-time intervals are identified with the title of agreement and the codes that are not similar are identified with the title of non-agreement. Based on the normal distribution function and appropriate reliability, ninety percent is considered as the reliability of the test.

Considering that the accepted criterion in qualitative research is sixty percent, therefore the results of this test, which is ninety percent, are accepted. Also, in the research process, we have tried to ask one of our subject matter experts to evaluate the results as a collaborator in the research. This problem is very necessary and suitable for calculating the reliability of repeatability.

The researcher randomly selects and codes the number of three interviews and examines the percentage of agreement between the codings. Therefore, the percentage of eighty-two has been considered for the coding done. Therefore, the reproducibility of this research is also confirmed.

Findings of the research

The data and information collected during the interview from the experts in question, at this stage will be analyzed. By using the processes of open coding, selective coding, and central coding, it is tried to formulate the development path of renewable energies in the energy market based on the concepts of macro policies. The results of coding are shown in Table 1 number one:
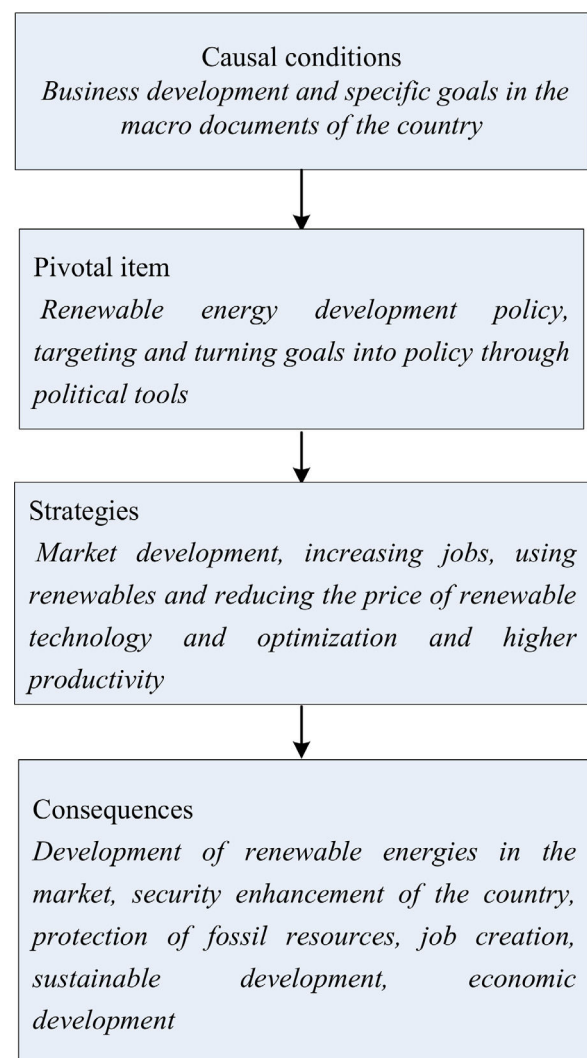

Fig. 2. Paradigm model of renewable energy development policy according to the rules and regulations of our market.

Axial coding: After open coding, it is time to perform axial coding. Axial coding is a series of procedures that try to find links between items and discuss and analyze information in a new way. At this stage, one of the items is considered as the central item and is placed in the center of the processes under review. Then all other items and causal conditions and strategies are related to it. The result of this part, in addition to determining the above items, is drawing a paradigm model of renewable energy development policy in the destination country. Fig. 2 shows the paradigm model of renewable energy development policy according to the rules and regulations of our market.

Conclusion

This research examines the effects of sustainable and renewable energy sources in the energy market and the methods of developing the laws required for their development in countries. The main focus is on the impact of laws on the development of renewable energy sources, and finally, it has tried to show appropriate policies that have a supportive and encouraging aspect. All information contained in this research is based on interviews with managers and experts in the field of sustainable energy. The results of the research show that the existing solutions to support renewable energy sources as much as possible can be adjusted in the form of general and macro policies. Also, by identifying the cause and effect relationships between these policies, the influencing factors between each of them can be determined and appropriate prioritization regarding possible strategies and consequences can be formulated. This proposed model includes goal setting for the development of renewable energy and converting energy development goals to policies. Certainly, in this field, the first step is to conduct research and collect statistical and field data. Trustee organizations in the field of renewable energy can gradually affect the country's general policies by applying development policies. These findings indicate that the current drivers in the country are fundamentally different from international developments, and therefore the limitations and potentials in the renewable energy market should be considered. Meanwhile, the existing limitation in the fossil energy sector is not the only limitation, but the existing pollution can also be considered as a basic limitation in the meantime for the development of renewable resources.

Declaration of Competing Interest

We know of no conflict of interested associated with this publication, and there has been no significant financial support for this work that could have influenced its outcome. As corresponding author, I confirm that the manuscript has been read and approved for submission by all the names authors.

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