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Energy security and diversification of energy resources are imperative for building a new model of development in Algeria

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Abstract

This research highlights the growing importance of energy security and diversification of energy resources as an economic and strategic imperative, given the intense competition Algeria faces in exporting its gas and petroleum products. Some experts predict the economic depletion of Algeria's energy resources before their natural depletion due to emerging variables Consequently, Algeria is currently obligated to establish a new development model that relies on strategic alternatives for the sustainable utilization of its energy resources to meet the needs of development and the current generation without compromising the interests of future generations. The research also emphasizes the need to adopt a new development model based on diversifying energy resources and focusing on energy security strategies to achieve increased well-being for the society and genuine development in Algeria.

Keywords: Energy security**;** energy resource diversification**;** fossil fuels**;** new development model**;** Algeria

Introduction

Energy has become the outstanding challenge facing most countries of the world, and this challenge lies in managing and meeting energy demand at appropriate prices and in a sustainable manner. Energy security is one of the most important challenges facing countries. Statistics have shown that more than 60% of known natural gas reserves are concentrated in only four countries, and more than 80% of global oil reserves are located in nine countries (The Regional Centre for Renewable Energy and Energy Efficiency, 2017, p. 01). In addition, the depletion of fossil fuel sources from most countries has increased the scale of the challenge. On the other hand, higher prices for renewable energy technologies in electricity production compared to traditional technologies give an economic dimension to this challenge, if States seek to exploit renewable energy sources.

It is therefore imperative that developing countries, including Algeria, face this challenge through an integrated system of integrated planning of their various energy sources in order to reach the most appropriate energy mix and to make the most of the multiple sources.

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Algeria has therefore shown great interest in the exploitation of renewable energy sources. It has included the use of renewable energy technologies among its strategic objectives in order to meet domestic energy demand and diversify its energy sources. In addition, it has the potential to export surplus energy to neighbouring countries through regional and international initiatives aimed at expanding renewable energy projects for development and quality of life in Algeria.

I.1. The problem of research

Through this research paper, we will address the issue of energy security and diversification of energy resources in the light of the current challenges facing our world, particularly as a result of the decline in oil prices and their negative effects on development, on the one hand, and the preservation of energy resources for development, on the other.

We have therefore tried to study the following problem: can the issue of energy security and diversification of energy resources be treated as an imperative for building a new model of development in Algeria?

I.2. Objectives of the research

Through this study, we aim to try to adopt a new model of development in Algeria. This will be achieved only through the diversification of energy resources, as well as through attention to the strategy of energy security in order to achieve the growing well-being of the members of society in order to achieve real development.

I.3. The importance of research

The importance of the study stems from our attempt to answer the problem we are going to pose, which will highlight the aspects and dimensions of energy security and the diversification of energy sources in Algeria. As a new attempt to highlight the added value that Algeria can gain by building a new model of development for real economic development.

I.4. Search methodology

In order to put an end to the various aspirations of this research, the methods used in economic studies in general have been used. The descriptive and analytical methods have been used mostly in different areas of study, with a view to understanding and understanding the features of the topic.

I.5. Research structure:

In order to respond to the problems involved and to achieve the objectives to be achieved, it is divided into the following:

II- Energy sources and their importance in the Algerian economy

Algeria ' s energy sector faces many challenges as a result of its fall in the oil trap, which has been Algeria &apos' s primary energy resource for decades. Oil prices have fluctuated since the summer of 2014, which has severely affected Algeria &apos' s economy, which depends

mainly on the fuel sector (97 per cent of export revenues represent 35 per cent of gross domestic product and 60 per cent of State budget revenues); on the other hand, oil is facing the problem of depletion, which has reached many countries of the world, including Algeria (Rahmani and Khani, 2017, p. 43). The remaining amounts of oil would be sufficient for the next 21 years. (British Petroleum (BP), 2017)

National energy demand is increasingly known for increasing population and living standards. In 2015, Algeria had a population of 40 million and its energy consumption was estimated at 58 million tons equivalent to oil, i.e. 1.45 tons equivalent to oil per capita per year.

In 2030, energy per capita is expected to reach 2 tons equivalent to oil, with a population of 50 million with an estimated energy consumption of 100 million tons equivalent to oil. (Rahmani and Khani, 2017, page 04)

II.1. Development of oil production and consumption in Algeria:

Oil production plays a pivotal role in Algeria, where it constitutes an important proportion of the world ' s energy supply.

Algeria is one of the most important countries to finance the European market, particularly the world market, with this strategic article. (Monnef, 2006, p. 3. 27)

Table 1 Developments in petroleum production and consumption in Algeria during the period 2014-2021

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Oil production and consumption of the world ' s total (2021)**
Production (thousands of barrels per day)	1589	1558	1577	1540	1511	1487	1330	1353	%1.5
Consumption (thousands of barrels per day)	401	425	412	408	416	431	385	403	%0.4

Source : British Petroleum (BP), (2022), Statistical Review Of World Energy, 71st Edition, London, pp 15, 20.

We note from the table that oil production has fluctuated from 2014 to 2021 where it reached 135,000 barrels per day. One of the most important reasons for this apparent decline is the beginning of oil depletion, in addition to the global economic crisis that has spread to the energy market. Oil production in Algeria accounts for 1.5 per cent of world production.

Moreover, this decline explains Algeria ' s adoption of an energy policy based on the development of various mechanisms to exploit the potential of renewable energy sources by intensifying partnerships at the international level.

The table also shows the evolution of oil consumption in Algeria during the period 2014-2021. Oil consumption fluctuated slightly between the rise and the decline, but in 2019 the highest scale was 431,000 barrels per day, due to the Corona crisis

II.2. Evolution of natural gas production and consumption in Algeria

Given Algeria ' s strategic position, given that it has significant potential from the natural gas reserve at the global and Arab levels in general, this translates into the evolution of levels of production of this strategic substance to meet domestic and global demand.

Commercial gas is the primary indicator of its contribution to the global energy supply, but this does not cloud the importance of following up on the development of raw production in order to be able to identify the use efficiency of natural gas as a declining strategic resource.

Table 2 Developments in natural gas production and consumption in Algeria from 2014 to 2021

Unit: billion cubic metres

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Natural gas production and consumption in the world (2021)**
Production	80.2	81.4	91.4	93.0	93.8	87.0	81.5	100.8	%2.5
Consumption	36.1	37.9	38.6	39.5	43.4	45.1	43.6	45.8	%1.1

Source : British Petroleum (BP), (2022), Statistical Review Of World Energy, 71st Edition, London, pp 29, 30.

The table shows that the volume of natural gas production and consumption fluctuates in Algeria, where there is no clear policy of raising or reducing production, in contrast to the pace of global production, which has been steadily increasing over the last 10 years.

Natural gas production in Algeria accounts for 2.5 per cent of global production. In addition, we note that demand for and consumption of the resource continued to rise in 2021, reflecting the importance of this energy resource.

The Organization of Arab Petroleum Exporting Countries estimates for 2021 that Algeria ' s energy consumption rose from 1080.4 thousand barrels of oil equivalent per day in 2014 to 1489.7 thousand barrels of oil equivalent per day in 2021.

Despite the continuous increase in recent years, however, energy consumption in Algeria accounts for 0.4% of the world energy consumption balance. (The Organization of Arab Petroleum Exporting Countries, 2022, p. 2. 64)

Table 3 Total energy consumption in Algeria during the period (2014-2021) Unit: 1,000 barrels equivalent/day

Years	2014	2015	2016	2017	2018	2019	2020	2021
Total energy consumption	1080.4	1142.6	1127.7	1153.5	1233.3	1273.0	1262.0	1489.7

Source : -The Organization of Arab Petroleum Exporting Countries, Annual Statistical, Kuwait, 2017, P. 64.

-Fouad Ali Abdelrahman Al Daoud, Annual Statistical Report, Organization of Arab Petroleum Exporting Countries, Kuwait, 2022, p. 40.

III.Energy Security and its Challenges in Algeria

III.1. Concept and Requirements of Energy Security

It is difficult to arrive at a specific definition of energy security, given the different meanings of the concept among the exporting and importing countries of energy sources, as well as the differences between countries within each group.

However, in order to achieve energy security, cooperation among the producing and consuming countries is required, and the issue of energy must be addressed from an economic perspective—free from security considerations—so as to ensure that the energy sources of the importing countries are sufficient and safe, and that the producer States have control over their national energy sources. This enables them to achieve a better international and regional standing in parallel with their own energy sources. (Mohammed, 2014, p. 64)

The International Energy Agency defines energy security as: "The availability of energy sources without interruption at affordable prices; energy security has many aspects: long-term energy security deals primarily with timely investments to provide energy in line with economic developments and environmental needs.

On the other hand, short-term energy security focuses on the ability of the energy system to respond promptly to sudden changes in the balance between supply and demand." (International Energy Agency, 2017)

The achievement of energy security, both in the short term and in the long term, has become an imperative for all countries of the world, including Algeria, where energy is the cornerstone of human development. In order to achieve energy security, the following requirements must be met:

Technology: the current technology must be developed to produce and extract as much quantity of energy as necessary at the lowest cost, especially in the area of renewable energies such as solar, nuclear and shale gas.

Political will: in order to achieve energy security, careful programmes must be developed and continuously pursued, which can be realised only with political influence.

Investment: large amounts must be invested in energy of all kinds, especially in research and development, in order to achieve positive medium- and long-term results. (Deutch, 2004, p. 3. 06)

III.2. Energy security challenges for diversification of energy resources in Algeria

Algeria faces painful challenges that affect the very essence of its energy security and even its national security, resulting from a variety of factors. These challenges stem from its unilateral and absolute dependence on the hydrocarbon sector, on the one hand, and the serious threats to its energy security, which highlight the necessity of diversifying the national economy and finding alternatives to support the fossil fuel industry, on the other. Among the challenges that necessitate economic diversification are the following: (Rasol and Hydosi, 2017, pp. 226-227)

2.1. The challenge of volatility and low energy prices on the international market

The fall in prices on the international market recorded a downward decline from the $109 per barrel threshold in Janvi 2014, to a threshold of less than $30 per barrel in mid-Janvi 2016, which is larger than in 2008 because of the global financial crisis when the price per barrel of oil reached $37 in December 2008. This decline is due to the decline in global energy demand as a result of the slowdown in the economic growth rates of the major industrialized countries, as well as the abundance of excess energy supply, which exceeds 2 million barrels of oil. This is why American rock oil has entered the international market, and OPEC has decided not to reduce its production ceiling and keep it within 30 million barrels per day. Saudi Arabia ' s refusal to give up its market shares, in addition to improving energy efficiency in developed countries. All this made prices fall below $30 per barrel. This reality was therefore directly reflected in the energy security situation, which in turn was reflected in Algeria ' s export earnings from this resource, which declined by 9 per cent in 2014 and by 40 per cent at the end of 2015. The consequence of this decline is manifested in the Algerian trade deficit, necessitating the utilization of the revenue control fund. As of 2011, this fund contained more than $150 billion. At the end of 2015, the fund contained less than $45 billion, which will be paid into the exchange reserve. Economic security and even national security are seriously threatened by Algeria ' s strict and absolute dependence on the burnt-out sector.

2.2. The challenge of depletion of energy resources and declining national production

In this connection, a number of theories have been put forward that address the end of the oil age, as an exhaustible and non-renewble resource as it is, the most prominent of which is the theory of the geologist, Mario King Habert, about the heights of energy following a study conducted in 1956. He predicted that many countries would reach their highest energy production levels at specified dates. His conclusions came to be close to accurate, and Algeria was not exempt. The oil and gas production in Algeria reached its peak in 2007, where it has been declining at an annual rate of 2 to 3% since then. In 2007, it reached a record high of 233 million metric tons of oil equivalent, but decreased to 187 million metric tons of oil equivalent in 2012. On one hand, it should be noted that Algeria has not discovered any new major fields similar to Hassi Messaoud and Hassi R'mel for over four decades..

2.3. The challenge of increasing domestic consumption and associated price support

Energy consumption in Algeria ' s domestic market reached 1489.7 thousand barrels of equivalent oil per day in 2021, with a substantial increase expected as a result of the country ' s continued coverage and electricity and gas connectivity.

In addition to this challenge, another accompanying challenge is the state's support for energy prices in the domestic market, which accounts for 10% of the energy GDP.

IV. Renewable energies among the opportunities for their exploitation and the strengthening of the energy system for energy security in Algeria

IV.1. Utilization of renewable energy sources and their importance in the diversification of the energy system

By launching an ambitious programme for the development of renewable energies (ENR) and energy efficiency, Algeria is launching a renewable energy dynamic based on a strategy centred on the inexhaustible energies and their use for the diversification of energy sources and the preparation of tomorrow ' s Algeria.

Algeria is thus entering a new era of sustainable energy.

Table 4 Renewable Energy Generation Capacities in Algeria 2014-2021 Unit: Terrawat Hour

Years	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Renewable energy generation	0.1	0.1	0.3	0.5	0.6	0.6	0.7	**0.7**

Source : British Petroleum (BP), (2022), Statistical Review Of World Energy, 71st Edition, London, pp 44.

We note from the above table that the capacity for generating renewable energies in Algeria is constantly increasing, with an estimated 0.1 tw in 2014 and an increase of 0.7 tw in 2021, but that this increase remains very significant compared to Algeria ' s potential, whose renewable sources are diverse.

Table 5 Renewable energy generation capacity by type in Algeria, 2020-2021 Unit: Terrawat Hour

2021			**2020**			
Other renewable energies	Wind power	Solar energy	Other renewable energies	Wind power	Solar energy	**Power generation by type**
-	†	0.7	-	†	0.7	
0.7			0.7			**Total**

Source : British Petroleum (BP), (2022), Statistical Review Of World Energy, 71st Edition, London, pp 45

†: Less than 0.05

We note from the above table that renewable energy generation capabilities by type in Algeria during 2020 and 2021 do not change their values, regardless of the type of renewable energy.

Solar energy is the only energy that recorded 0.7 terawatt hours, while the rest of other renewable energies are barely contributing.

Thus, more than 10 years after the launch of the programme for the development of renewable energies and energy efficiency, which was endorsed by the Government in February 2011, new and urgent elements, both national and international, have emerged during the pilot phase and the technological test, requiring a review of the programme for the development of renewable energies and energy efficiency. Among these elements, mention should be made of: (Ministry of Energy, 2016, pp. 04-05)

Better knowledge of national capacities in renewable energies through studies conducted during this first phase, particularly solar and wind capacities;

Low cost of solar cell industries and wind power plants, which are becoming increasingly market-driven to form viable industries worthy of consideration (technology maturity, competitive costs...);

The cost of solar tech industries remain high and are associated with an immature technology, especially in terms of storage, as well as the very slow growth of their market.

Thus, the renewable energy program aims to establish renewable energy sources with a capacity of 22,000 megawatts by 2030 for the national market, while maintaining the option of export as a strategic objective, if market conditions allow. With the implementation of this new program, renewable energy and energy efficiency will be at the core of the energy and economic policies pursued by Algeria.

Thanks to this new programme, renewable energies and energy efficiency will be at the heart of Algeria ' s energy and economic policies.

So by 2030, 37% of existing capacity and 27% of electrical production directed at national consumption will be of renewable origin.

Through its renewable energy program, Algeria intends to position itself as an active player in solar and wind energy production, while integrating biomass, cogeneration, and geothermal heat. These energy sectors will serve as the driving force for sustainable economic development, promoting a new model of economic growth.

Since national capacities for renewable energies formed mainly solar energy, Algeria regarded such energy as an opportunity and a boost to economic and social development, particularly through the creation of wealth- and labour-generating industries.

At the same time, this does not preclude the launching of multiple wind energy projects and the implementation of biomass, geothermal and cogeneration projects.

Renewable energy projects for electricity production directed at the national market are carried out in two phases:

Phase I : 2015-2020: In this phase, it is estimated that 4000 MW energy will be implimented, between solar and wind, and 500 MW between biomass, cogeneration and geothermal.

Phase II : 2021-2030: Development of the North-Saharan electricity link (Adarar) which will enable the installation of major renewable power stations in the Ain Saleh, Adar, Timmon and Bashar regions, and their integration into the national energy system. At this time, solar heat may become economically viable.

Algeria ' s strategy in this area is to develop a genuine renewable energy industry with a programme of training and research, as well as to acquire the necessary expertise. In the near term, this will enable Algeria ' s national capacities to be exploited at all stages of development in these areas. The EnR programme will allow the national electricity market to create tens of thousands of direct and indirect jobs.

Electricity production is expected to reach 170 terawatts per courier in 2030. The integration of renewable energies into the energy mix is a major bet for preserving fossil resources, diversifying energy production branches and contributing to sustainable development.

All these considerations justify the integration of renewable energies into the long-term energy supply strategy, while at the same time giving an important role to energy efficiency.

Energy efficiency, if associated with the development of renewable energies, allows for the reduction of investments necessary to meet energy needs, through better control of consumption and the pace of demand growth.

Algeria, through its renewable energy programme, has embarked on the path of renewable energies to provide comprehensive and durable solutions to environmental challenges and to preserve fossil energy sources.

This programme includes large-scale solar cell and wind energy development. The introduction of solar thermal energy as well as biomass, cogeneration and geothermal branches will gradually take place.

The means and types of renewable energies will be installed according to the specifics of each region (Ministry of Energy 2016, page 09).

The desert region, in view of the importance of solar and wind capabilities in the region, to hybridize existing diesel stations and provide remote sites;

High Hills; for sun and wind exposure with availability of land;

Coastal zone, depending on the availability of the land basin and the utilization of renewable energies.

On the other hand, supplementary requirements in other areas of application are also part of the overall wind capacity of the programme, such as residential areas, farming, pumping, water resources, industry, public lighting and services.

Table 6 Accumulated capacities of the renewable energy programme, by type and stage, 2015-2030

	Phase I 2015-2020	Phase II 2020-2030	Total
Solar cells	3000	10757	(...)
Wind	1010	4000	5010
Solar heat	-	2000	2000
Co-generation	190	250	440
Biomass	360	640	1000
Geothermal	05	10	15
Total	**4525**	**17475**	**22000**

Source: Ministry of Energy, Renewable Energy and Energy Efficiency Development Programme, Algeria, 2016, p. 4.

For the export of green electricity to Europe, Algeria is preparing for partnerships as soon as conditions become available, with additional capacity.

IV.2. Focus supporting the work of the National Renewable Energy Programme

(Ministry of Energy, 2016, pp. 18 - 21)

2.1. Industrial capacity development: To accompany and make successful the renewable energy and energy efficiency programme, Algeria is considering strengthening the industrial fabric to be at the forefront of positive transformations, both industrial and technical, and energy and research. Algeria was also determined to invest in and develop locally all value-generating sectors.

a. Solar cells: For solar cells, the objective is to achieve public and private industrial units, in particular the construction of solar cell modelling plants in partnership to respond to a 13,500 MW programme by 2030.

Operations to strengthen engineering activity and to promote the development of the solar cell industry through the establishment of a partnership that will bring together the various players involved in the contribution of research centres.

On the other hand, it is anticipated that a national handling system will be developed for the manufacture of current transformers, batteries, electrical transformers, cables and other equipment that will enter the light cell power plant industry.

Algeria will also be able to acquire the capacity to prepare, supply and deliver by Algerian institutions.

It is also expected that the Centre for Certification of Equipment, especially for Renewable Electrical and Domestic Energy Plants, will be completed by the Sonelgas CREDEG branch (CREDEG) and the Centre for Research and Development of Electricity and Gas.

This period will be marked by the development of a network of national handling equipment manufacturers necessary to achieve this programme.

It is also expected to be characterized by full control of engineering activities and the provision and construction of static water desalination plants and units.

If conditions are present, it is planned during the same period not only to export electricity produced from renewable energy, but also to produce electricity from renewable energies.

b. Solar heat: During 2021-2030, the partnership is to be upgraded to carry out major projects that will be undertaken simultaneously with the processes of strengthening engineering capabilities, design, supply and delivery for the manufacture of equipment entering the solar thermal station by clean means.

c. Wind power: Efforts to establish a wind energy industry are planned to continue. It is also planned to design, supply and deliver wind power plants by clean means, as well as to control engineering, supply and wind space activities.

d. Thermal insulation: The purpose of this programme is to introduce energy efficiency properties into new and existing structures, developing the branches of thermal insulation industry, cover (walls, roofs) and dual blending using local materials (troop wool, glass wool, etc.).

e. Effective lighting: it is proposed to achieve the objectives set for the energy efficiency programme and to replace traditional (glow and mercury) lamps with effective lamps

Low consumption lamps (light binary valves and sodium lamps) with the aim of developing local industry in these branches.

The programme also aims to promote partnership for the exchange of experience and skills in these areas.

f. Solar heater: This programme aims to introduce solar heater into the housing and tertiary sectors to meet the heating needs of water and shops. It will also facilitate the development of a local industry with anticipated lower production costs and the dissemination of solar water heaters.

g. Electrical and household equipment: the energy profits expected from the implementation of the energy efficiency programme require the introduction of equipment and equipment (conditions, refrigerators, etc.).

Energy efficiency to the Algerian market has a clear impact on the balance of energy.

Through its policy of implementing this programme, the State aspires to upgrade the national industry of such equipment by accompanying manufacturers to develop this market with a view to achieving as many national industrial integration as possible.

2.2. Research and development:

Algeria encourages research to make the renewable energy program a tangible catalyst for developing a national industry that relies on various Algerian resources (human, material, scientific, etc.). (Ministry of Energy, 2016, pp. 24-25)

The role of research is crucial because it is an essential element in access to technologies and skills development.

For Algeria, rapid access to and use of technologies are particularly important in the area of solar cells, solar heat, lighting and thermal insulation.

Algeria also encourages cooperation with research centres for the development of innovative technologies and methods in the field of renewable energies. Universities, research centres, companies and various clients of this programme cooperate in its implementation and intervene during the various stages of the innovation chain. It thus values the country ' s capacities.

Indeed, the large-scale development of renewable energies and the problem of energy efficiency require a qualitative framework of human resources in the context of the objectives and aspirations of the renewable energies programme.

In addition to the research centres affiliated to companies, such as the Centre for Research and Development of Electricity and Gas of the Sunlagas complex, the energy sector includes an agency for the promotion and rationalization of energy use and a company affiliated with Sunlagas specializing in project delivery.

These bodies cooperate with research centres attached to the Ministry of Scientific Research, including the Centre for the Development of Renewable Energy of the Ministry of Higher Education and Scientific Research and the Centre for Research in the Technology of the Half Tankers in Energy of the Ministry of Higher Education and Scientific Research.

Thinking is based on research hubs that allow for the study of behaviours in the environment, where they have been installed, improved performance and facilitated the integration of renewable energies into the electrical system, whose networks must be operated in more active ways, thanks to Smart Grids technologies.(Smart Grids)

These technologies have a large number of tools and systems to run. New information and communication technologies will also intervene to improve energy flows and manage the disruption of renewable energies.

Since scientific cooperation is an essential part of the development of all research activities in the areas of renewable energies and energy efficiency, Algeria will encourage exchanges between companies and between various research centres.

2.3. Catalytic and fiscal measures

To better respond to the operational priorities of the Renewable Energy and Energy Efficiency Programme and to encourage private and corporate initiatives, legislative and regulatory amendments have been made.

This is to make sure that users, interveners and various investors benefit from a legislative and regulatory framework that allows for effective responses to challenges in the area of renewable energies and energy efficiency.

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In addition to the general framework governing investment development, which could open its own system of contracting renewable energies, the existing legal framework provided for direct and indirect reinforcement of renewable energies. There are incentive and promotion procedures provided for in the Act on Energy Control (financial, fiscal and customs concessions) for operations and projects that contribute to the improvement of energy efficiency and the upgrading of renewable energies. The National Energy Control Fund has been established to contribute to project financing. The aim of these actions is to encourage local products and provide profitable conditions, especially for the fiscal ones, for investors wishing to engage in various branches of renewable energies and energy efficiency.

2.4. Regulatory actions

Algeria ' s active policy in the implementation of the programme for the development of renewable energies and energy efficiency will be achieved through the granting of assistance to cover the additional costs resulting from the national electricity system. Accordingly, regulatory measures will frame the contribution of the State and regulate appropriate conditions and control mechanisms for the optimal use of public funds allocated to this programme. (Ministry of Energy, 2016, p. 29)

IV.3. Renewable energy projects in Algeria and their location within the framework of international development initiatives

3.1. Renewable energy projects in Algeria

Algeria has drawn up a series of plans and projects designed to exploit, develop and adopt renewable energies as an integral part of the national energy component.

Table 7 Renewable Energy Projects in Algeria

Project name	Project description	Type of energy	Project capacity	Year of operation	Project site
Wind farms projects	National Renewable Energy Programme	Wind power	5010 MW	2030-2015	Highlands and the South
Solar PV projects	National Renewable Energy Programme	Electrical power	13575 MW	2030-2015	Highlands and the South
Solar thermal station projects	National Renewable Energy Programme	Incentive solar energy	2000 MW	2030-2015	Highlands and the South
Geothermal projects	National Renewable Energy Programme	Geothermal energy	15 MW	2030-2015	Highlands and the South
Biomass projects	National Renewable Energy Programme	Biomass	1000 MW	2030-2015	Highlands and the South
Co-generation projects	National Renewable Energy Programme	Other renewable energies	400MW	2030-2015	Highlands and the South

Source: Regional Centre for Renewable Energy and Energy Efficiency, Manual on Renewable Energy and Energy Efficiency in the Arab States, League of Arab States, Egypt, 2015, p. 99.

3-2-. Algeria ' s position in the framework of international renewable energy initiatives

In the context of changes in the global energy market and increased demand, several initiatives have emerged, the most important of which are: (Pribesh and Ayad, 2014)

a. Mediterranean solar plan: this plan aims to build concentrated solar power plants and wind power plants, particularly in North Africa, namely in Morocco, Algeria, Libya, Tunisia, Jordan and Egypt. In this context, Algeria has signed a memorandum of understanding on a strategic energy partnership.

The memorandum, which was launched in 2008, contains all aspects of cooperation in the areas of traditional and renewable energies, as well as industry in the energy sector and the transfer of technology. It also addresses ensuring Europe ' s energy supply.

This memorandum is a new step in regional cooperation, the aim of which is to keep channels of communication open with the other side pending further realization of a genuine partnership.

b. The Clean Technology Fund (CTF) : project was established by the World Bank to provide concessional financing with a view to increasing clean technologies for electricity production through solar concentrates with various technologies. The World Bank has allocated $5.6 billion to support five countries to implement nine commercial power plants up to 2020 in Algeria, Egypt, Jordan, Morocco and Tunisia, as it has announced its future plans in this area, as well as two projects to link electricity between the European Union and the region.

IV.4. Procedures for transforming renewable energies to achieve energy security and diversification of energy resources in Algeria

The Secretary-General of the United Nations, Antonio Guterres, says, "The bright side is that the lifeline is right in front of our eyes," highlighting that renewable energy technologies such as wind and solar energy are readily available and, in most cases, are less expensive than coal and other fossil fuels. We now need to run it quickly and quickly. These include: (United Nations, 2023)

a. Making renewable energy technology a public benefit

For renewable energy technology to become a public benefit, i.e. accessible to all, it will be necessary to remove obstacles to knowledge sharing and the global transfer of technology, including intellectual property constraints.

Basic technologies, such as battery storage systems, allow energy to be stored from renewable energy sources, such as solar and wind energy, and released when needed by individuals, communities and companies. It helps to increase the flexibility of the energy system given its

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unique capacity to absorb, retain and re-emancipate electricity rapidly, depending on the International Renewable Energy Agency.

Furthermore, when combined with renewable generators, battery energy storage technologies can provide reliable and cheaper electricity in isolated networks and off-grid communities in remote areas.

b. Improved access to components and raw materials

Securing the supply of components as well as raw materials for renewable energy technologies is essential. The same is true for expanding the supply of these vital components and critical raw materials - minerals for wind turbines and electricity grids to electric vehicles.

This will require significant international coordination to expand and diversify manufacturing capacity globally. Moreover, greater investments are needed to ensure an equitable transition - particularly in skills training, research and innovation, and to provide incentives to build supply chains through sustainable practices that protect ecosystems.

c. Equal opportunities for renewable energy sources

While global cooperation and coordination are crucial, domestic policy frameworks must be urgently reformed to simplify and accelerate approvals for renewable energy projects and stimulate private sector investment.

Technologies, capacities and funds for the transition to renewable energy are available, but there must be policies in place to reduce market risks and stimulate investment in the sector - including by streamlining planning, approval and regulation processes and removing bottlenecks.

This may include the allocation of large-scale project space in private renewable energy zones. The share of renewable energy in electricity generation must be accelerated to 40 per cent by 2030, as announced in the Renewable Energy Programme.

Clear and strong policies, transparent processes, public support and the availability of modern energy transport systems are key to accelerating the uptake of wind and solar energy technologies.

d. Conversion of support from fossil fuels to renewable energy

Support for fossil fuels is one of the biggest financial barriers to the transition to renewable energy. According to the International Monetary Fund (IMF), about $5.9 trillion was spent on supporting the fossil fuel industry in 2020 alone, through explicit subsidies, tax exemptions, and health and environmental damage not accounted for in the cost of fossil fuels, which is close to $11 billion a day.

Support for fossil fuels is inefficient and unfair in developing countries, with the richest 20 per cent of the population benefiting from about half of the public resources spent on supporting fossil fuel consumption, according to the International Monetary Fund (IMF).

The shift of support from fossil fuels to renewable energy not only reduces emissions, but also contributes to sustainable economic growth, creating job opportunities, improved public health and greater equity, especially for the poorest and most vulnerable communities around the world.

e. Triple investments in renewable energy

At least $4 trillion a year must be invested in renewable energy until 2030 - especially in technology and infrastructure - to reach zero emissions by 2050.

This investment will not be as high as annual fossil fuel subsidies, and it will bear fruit. Reducing pollution and climate impact alone can provide the world with up to $4.2 trillion annually by 2030.

Financing was needed from Algeria and from all States to sustain financial systems, particularly multilateral development banks and public and private financial institutions, and they should direct their lending towards accelerating the transition to renewable energy.

Renewable energy sources are the only way to ensure real energy security, stable energy prices and sustainable employment creation."

IV.5. Strategy for promoting renewable energy as a new model for development in Algeria

There is an effective strategy that shows that renewable energy can compete with many traditional types of energy, especially in the electricity market. The main objective of the study of this strategy is to reduce the cost of future renewable energies, to stop wasteful traditional energies, to keep stock of them for future generations and to ensure a clean environment. This strategy, which has been implemented in most of the world ' s countries, is to implement four types of energy policies: (Nazar, 2015/16, pp. 170-171)

5.1. Mandatory policies: they are legal restrictions (or duties), and this type of policy consists of laws, regulations and governmental mandates.

5.2. Economic policies: This type covers a range of policies that can be summarized in two types:

a. Policies that stimulate the use of renewable energy: Among these are: financing and pricing policy, tax cuts and loans at low interest rates.

b. Policies that increase economic barriers to the use of fossil energy: Among these are: energy tax, climate change tax and carbon tax.

5.3. Research and development policies: This type of policy concerns the position and actions of the Government to support research on the development of renewable energy technologies, and in general research is only in the first stage of technological development of these policies, and to prove their economic benefits it takes time, which means that these policies are long-term.

5.4. Management policies and machinery operation: These policies cover a set of strategic decisions and new actions that have been introduced for efficient management and operation of energy industry mechanisms for the development and utilization of renewable energy technology.

Conclusion

On the basis of our study, energy is an essential pillar of development to move it forward. Energy issues have become one of the most important issues, given the higher demand for fossil energy than its production, as well as its severe pollution and destruction of the environment, which will place the world ' s countries in an energy crisis that could lead to the collapse of the world economy if alternative sources are not found.

In the light of this, it can be said that renewable energies are the alternative and complement to fossil energy.

They are not depleted in contrast to other fossil sources. Moreover, they are clean energy resource that do not affect the environment.

The need for them has become an urgent requirement for building a new model of development. They must be developed and used in the coming years in order to achieve real development.

Research results

After addressing the various aspects of the subject, we reached the following conclusions:

The current energy model is incompatible with the environment and does not meet the requirements of development, so efforts should be concetrated to build a model of development that is compatible with the achievement of economic development in Algeria;

Despite efforts to diversify energy sources and seek alternatives in order to reduce dependence on oil, the results are still limited and inadequate and the transition to renewable energy alternatives will therefore take time;

Despite the substantial investments and projects that have been and will be made in Algeria's renewable energies for development, they have not yet reached the level of succession of fossil sources and cannot succeed in the near term.

V.2. Research proposals:

Algeria has enormous potential for renewable energies, so all its sources must be exploited in order to maintain its energy security and be an active player in the future of the world energy market;

The Algerian Government must attach importance to, or at least ensure, the success of the programme for the development of renewable energies and energy efficiency and its implementation within the deadlines set for it in order to ensure the maintenance of sustainable energy security and thereby contribute to the building of a new model of development.

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