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Energy transition in Algeria between renewable and non-renewable alternatives Solar energy and shale gaz as a sample

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Abstract: This paper aims to show out the importance of energy transition in Algeria through the compalsory of exploying its alternative energy potentials as far as solar energy and shale gas are concerned that may lighten demande on traditional resources and ensure affording energy. Moreover, it aims also to expose the algerian potentials in solar energy and shale gas resources and, hence, motivating their exploitation. The achievements of study focus on the compalsory of energy transition in Algeria which has to be taken among energy strategies oft he government, and energy mesures must be adopted in accordance with nowadays circumstances in Algeria and in the world. It could also explain the actual orientation towards investments in these resources in Algeria.

Keywords: Energy transition, Solar energy, shale gaz, Algeria.

JEL classifications codes: Q3 ; Q4.

Introduction:

It has become certain that fossil energy resources isthesubject ofdepletion sooner or later, not to mention the environmental problems theymay cause, due to the excessive exploitation of these resources, which has accelerated the search for alternative energy resources.Whether they are renewable resources or non-renewable resources, they can contribute to reducing the demand for fossil resources, and are sufficient to secure energy supplies, whether at the global or local level.

The question of the study:

Through this research paper, we will try to highlight the importance of the energy transition in Algeria, and present the reality and prospects of solar energy and shale gas in Algeria, and we will try to study the following problem:

What is the extent of Algeria's orientation towards exploiting solar energy and shale gas as a mechanism to achieve the energetic transition?

The Objectif of the study: The aim of the study is:

- Extracting the reality and prospects for the development of solar energy and shale gas energy, in order to preserve traditional energy resources and reduce thedemand for them.

Standing on Algeria's potential of solar energy and shale gas and the need to exploit these two sources

- Clarifying the role and theimportance of solar energy and shale gas as two resources of alternative energy.

- Highlighting the importance of the energetic transition in securing energy supplies and meeting the continuous and growing demand for energy.

The importance of the study:

The importance of this study lies in an attempt to answer the problem at hand, and highlight the advantages that Algeria obtains, as a result of

exploiting its resources of solar energy and shale gas, in order to ensure the achievement of the energetic transition, especially since Algeria has great potential with regard to solar energy and shale gas, as lies The importance of the study in clarifying the extent of Algeria's orientation towards investing in new and renewable energies.

1- What is the energetic transformation: Before discussing the concept of energetic transition, its causes and the most important areas that must be focused on, we decided to stop at the concept of energy and the need to rationalize its consumption as a prerequisite for achieving the energetic transition.

1-1- Energy and the rationalization of its consumption:

a. TheEnergy.

The word energy is the literal translation of Energy in modern European languages, and it is derived from the ancient Greek word Energos or Energeia, which is composed of two syllables, En, meaning in or within, and Ergos, meaning activity, and thus the word means within it activity, or that something contains On effort or work, while energy resources are the sources that have a system capable of producing work (Ruhban, 2011, p. 367).

b. Rationalization of energyconsumption.

• The concept of rationalizing energy consumption.

Energy conservation is a set of procedures and technologies that lead to a reduction in energy consumption without compromising the comfort or productivity of individuals and the use of energy when it is really needed (Tayyib, 2018, p. 36).

The rationalization of energy consumption also means the rational use and the reduction of waste in the consumption of energy in its various types, provided that the rationalization of energy consumption in practice is a set of procedures that must be followed to reduce waste in energy systems

in its various stages, starting from power conversion stations and ending with energy-consuming devices (www.marefa .org, 2014).

Advantages of energy saving.

The rationalization of energy consumption has become an inevitable necessity, because of its benefits, the most important of which are (Al-Khatib, 1989, p. 263):

- Gaining more time and providing the opportunity to develop alternative resources of energy, as experts' studies indicate that people need a period of time ranging between 10-25 years to develop alternative and effective resources of energy, especially in the field of nuclear fission.

- Reducing environmental pollution, that latter is considered one of the main problems facing energy resources. There is no doubt that the exploitation and development of alternative and renewable resources, and the reduction of exploitation of fossil energy resources, contribute to reducing the volume of the pollution problem.

- Reducing the dependence of energy-importing countries on their imports from other exporting countries. Rationalizing energy consumption contributes to save huge sum of money that energy-importing countries pay for their imports.

The rationalization of energy consumption also contributes to (Tayyib, 2018, p. 37):

- The optimal path for economic development, with the consequent provision of natural resources required for investigation to increase the productive capacity of the economy.

- Strengthening the competitiveness of the country's economy, as improving the efficiency of energy used in economic activities means reducing the cost of producing goods and services.

- Sustainable development of national wealth resources through therational use, including the continuity of their supply for present and future generations.

- Preserving the environment by reducing emissions of air pollutants and greenhouse gases.

In addition to the advantages mentionedabove, the transformation of the global energy system entails important economic benefits, the most important of which are (IRENA, 2018, p. 7):

- Although the additional costs of transformation may exceed $1.7 trillion annually in 2050, the savings achieved through lower levels of pollution and improved environmental performance will exceed those costs.

- The Renewable Energy Roadmap indicates that these savings will reach $6 trillion in that year.

- The energetic transition contributes to improve the economic and social performance of energy worldwide, compared to the current energy system, in addition to raising the standard of living.

- The energetic transition leads to the increase of agross domestic product in 2050, as the shift in the energy situation encourages economic activities, and it is also possible to increase growth within the framework of the currently approved system, and the cumulative profit resulting from the increase in gross domestic product will exceed, by the year 2050, 50 trillion dollars.

1-2- Energetic transition, its causes and fields.

a - Energetic transition.

The energetic transition is the transition from an energy system that focuses on traditional energy, to an energy mix with the least environmental damage, with a focus on relying on the exploitation of renewable energies (lajal, 2020, p. 163).

The energetic transition is also considered important in terms of protecting the environment, as it means moving from an energy system that relies on exploiting depleted resources, to an energy system that focuses mainly on inexhaustible resources, which basically means the need to search for alternatives of depleted resources (Tayyib, 2018, pg. 32).

The energetic transition is a set of procedures and methods that enables the transition from dependence on a group of energy resources, toother energy resources that are capable of achieving the goals and plans drawn up in the energy field, and have the advantage of abundance and achieving the greatest benefits with lowest costs.

b- The reasons for the energetic transition.

Energetic transition has become a necessary necessity, which must be taken into account when preparing energy policies, given its effective role in securing energy supplies, and among the main reasons that imposed the inevitability of transition, we can summarize them as follows (Al-Wahhab, page 494):

• Climate change: The development of the global economy has contributed to the growing demand for fossil energies to meet the needs of industry. Ecosystem, impact on global climate.

• Increasing economic growth: the global economy has witnessed significant growth over the past decades, which contributed to the continuous increase in demand for energy resources, which resulted in a depletion of depleted energy resources.

• Fluctuation of oil prices: the sudden change in oil prices and their instability is one of the reasons that led to the search foranalternative and competitive energy resources in terms of prices.

• Growing environmental awareness: environmental issues are no longer national issues that preoccupy the official authorities only, but have become a societal issue linked to humans, due to the increase in protests

and demands to reconsider energy strategies, rationalize the consumption of fossil energies, and move towards environmentally friendly resources.

• Meet the global demand for energy and reduce pressure on conventional energies.

C - Areas of energetic transition.

According to the International Renewable Energy Agency report, there are six areas to focus on (IRENA, 2018, p. 10):

• Benefit from the synergies between energy efficiency and renewable energy, as this aspect should be at the top of the list of priorities when preparing energy programs, because the combined effect of these two factors is sufficient to meet the need of eliminating carbon emissions related to energy by 2050 in a cost-effective manner.

• Planning for an electricity sector in which renewable sources account for a large share of energy production, as the transformation of the energy system requires a fundamental shift in the way ofenergy systems are understood and operated, and this in turn requires the development of long-term plans for the energy system.

• Increasing the use of electricity in the sectors of transport, construction and industry, as regulations for planning, urban construction and other policies must be integrated.

• Nurturing innovation across the system. Just as the development of new technologies played a fundamental role in the advancement of renewable energy in the past, it is necessary to continue technical innovation in the future to achieve the desired transformation in the energy system.

• Aligning economic and social structures and investments with the transformation process, as there is an urgent need for an integrated and comprehensive approach by aligning the economic and social system with

the requirements of the transformation process, and achieving the transformation in the energy system requireslarge investments.

• Ensure equitable distribution of the costs and benefits of the transition, as the required transformation can only be achieved through a collaborative process involving the whole of society, and to generate such effective participation, the costs and benefits of the transition of the energy system must be shared.

2- Alternative energy sources (solar energy and shale gas

There are many and varied resources of alternative energy, which can replace fossil energies, or at least secure energy supplies. Theseresources are divided in terms of the criterion of renewable into alternative renewable resources, and alternative non-renewable resources, and in line with our study we will focus on solar energy as an alternative energy Renewable, and shale gas as a non-renewable alternative energy.

2-1- Renewable alternative energy sources (solar energy).

Before addressing the concept of solar energy, it is better to refer to the concept of renewable energy, which is energy derived from permanent sources automatically and periodically, and which is not exhausted by its frequent use, as it is permanent energy from nature (Hawaf, 2015, p. 302).

a. The concept of solar energy.

It is the light emitted and the heat generated by the sun that man has harnessed for his benefit since ancient times using a range of constantly evolving technologies, and the presence of most renewable energy sources is attributed to solar radiation. It is important here to mention that only a small part of solar energy has been used. available in our lives (Al-Aradi, 2012, p. 23).

Solar energy can also be defined as energy obtained from sunlight, and light from the sun may be used to generate electric power, provide buildings with heating and cooling, and heat water. Solar energy has been used for thousands of years (Salman, 2011, p. 135).

b. The importance of solar energy.

Its importance is mainly that it is a free commodity, which anyone can exploit for free, and it is inexhaustible, in addition to its spread and expansion to any place, and it is considered one of the environmentally clean energy sources (Khudair, 2007, p. 120).

Almost all renewable resources of energy derive their strength from the sun, and are also characterized by abundance almost everywhere at different hours of solar brightness in different regions of the world. Solar energy is also a necessary requirement for sustainable economic and social development, as it contributes to provide and secure energy supplies. Solar energy is the most important energy resource that can play an important role in reducing the emission of harmful gases to the environment, when compared to other energy resources, it is a clean energy that does not resultany pollution in all forms of use, whether in its first form or when it is converted into an electrical or mechanicalform, how important should it be emphasized not only in protecting the environment, which is a necessity to achieve sustainable development, but rather that using it to generate electricity and desalination of water is indispensable (Al-Raouf, 2013, p. 1151).

c. Advantages of utilizing solar energy.

There are many advantages that accompany the exploitation of solar energy, the most important of which are (Khudair, 2007, p. 120):

• Non-contribute to polluting the environment, this is a problem facing modern man, and it seems as if it is out of his control and threatens his life and civilization.

• It is considered an inexhaustible renewable resource at no cost, which facilitates the possibility of establishing sustainable projects that rely on solar energy.

• It is not asubject of political control, international or local systems that limit the extent of expansion in the exploitation of any amount of it.

• Availability and spread in almost all places, so that projects can be established anywhere near population centers, industrial areas, or any other place, including isolated areas, and this does not require means of transportation or delivery.

• The conversion of solar energy into other forms of energy does not depend on the strength of solar radiation emitted to the surface of Earth, as solar energy can be used regardless of its concentration, and it can also be used directly or indirectly from the sun.

• The conversion of solar energy and its exploitation in the production of other forms of energy does not require the use of high technology, and does not have any negative impact on workers in this field.

a. Difficulties in exploiting solar energy.

There are a number of difficulties and obstacles that stand in the way of exploiting solar energy, the most important of which is (Al-Raouf, 2013, p. 1160):

• Absence or weakness of local legislation, as legislation is required to encourage sustainable energy systems.

• Pollution, which is one of the biggest problems that face thosewho work in the field of exploiting solar energy, which is represented here in the presence of dust and attempts to maintain used devices from it. Many studies have confirmed that more than 50% of the effectiveness of solar energy is wasted in the absence of maintenance of devices receiving rays sun for a month.

• Technical and environmental obstacles, which are mainly represented in the lack of productivity of new technologies, and the lack of companies specialized in operation, maintenance and control of product quality in many countries.

• Energy pricing policy, as the energy pricing policy followed in many countries represents an obstacle to the development of renewable energy, especially solar energy, due to the support granted to energy resources for various social and economic considerations.

• Absence or weakness of economic incentive systems and standard specifications

• Difficulties related to financing, as the issue of financing solar power plants is an important matter, and many developing countries suffer from financing problems.

2-2- Non-renewable alternative energy sources (shale gas).

a. Definition of shale gas.

It is a gas that is generated inside shale rocks that contain oil by heat and pressure. It remains imprisoned inside the cavities of those hard rocks that do not allow its penetration. Shale gas is found in depths of up to three kilometers, where it is deposited into the rocks. The locations of other energy sources such as oil and natural gas (Sabrina, 2022, p. 428).

Shale gas is also known as a type of natural gas that is alternative and complementary at the same time to the uses of traditional gas, as it is formed inside rocks, and these rocks are called slate rocks that contain shale gas and shale oil, and slate rocks contain a large proportion of hydrocarbon and organic materials (Faiza, 2021, p. 124).

As is the case with natural gas, shale gas is in dry states and in other cases in the form of liquids (Ahmed, 2016, p. 108).

b. Advantages and Obstacles of shale gas exploitation.

The exploitation and production of shale gas as an alternative energy resource has aseveral advantages, and this does not negate the existence of obstacles to the exploitation of shale gas, and perhaps the most important advantages and obstacles to its exploitation are the following (WEC, 2010, page 6):

- **Advantages of shale gas exploitation.**

- Increasing important resources of natural gas to the list of necessary global resources.

- A shorter time for the first production process compared to conventional gas.

- Use of cleaner energy resources.

- Extensive use of new drilling technologies.

- Increasing the safety of supply to gas importing countries.

- **Obstacles to exploitation of shale gas.**

- Fear of costs and obtaining funding sources.

- Doubts about the environment's inability to absorb drilling and production technologies.

- Low and unclear decline in reserves, that causes a problem in estimation.

- The existence of a class that originally opposes the exploitation of this energy resource.

3- Exploiting solar energy and shale gas in Algeria as a mechanism to achieve the energetic transition.

The exploitation of alternative resources of energy, whether at the global or local level, is one of the biggest challenges that face energy strategies. Algeria is one of the countries that have attached great importance to the exploitation of its resources of alternative energy, especially solar energy and shale gas.

3-1- Exploitation of solar energy in Algeria.

In this element, we discuss the potential of solar energy in Algeria, the reality of the exploitation of solar energy in Algeria.

a. Solar energy potential in Algeria.

Algeria has one of the most important solar capacities in the world, as the duration of solar radiation exceeds 2000 hours annually over the entire national territory, and reaches 3900 hours in the high plateaus and the desert. The average energy obtained per day on a horizontal area is 5 kilowatt-hours per 1 square meter, equivalent to 1700 kilowatts. h/m2 per year in the north, and 2263 kWh/m2 per year in the south (TAEC, 2014, p.16).

Perhaps the most important elements of solar energy in Algeria are the following (Tequasht, 2012, p. 146):

• Algeria is available on a vast desert area exposed to the sun during most days of the year, and the sun extends for more than 2000 hours a year.

• The Algerian Sahara is one of the largest in the world, andit is characterized by intense heat, especially in summer.

• The solar energy that Algeria possesses can give it even the opportunity to export this type of energy to other countries, due to the vastness of Algeria and its continued exposure to high amounts of light and electromagnetic radiation from the sun.

• Algeria has small, scattered village complexes, where the rural population is estimated at 40% of the total population, and it may not be possible for practical or economic reasons to connect these villages and rural areas sometimes to the main electricity grid, so the logical solution in this case is the exploitation of solar energy in these remote communities.

• The many ways in which solar energy can be exploited effectively in Algeria, can be classified into three main categories: thermal applications, electricity production, and chemical processes.

Numerous feasibility studies in several countries, including Algeria, have proven that the capital invested in solar energy can be recovered within a period of three to five years, after which the

implementing agency of solar energy projects will be able to obtain clean, low-cost energy.The following table shows the potential of solar energy:

Table 1: The potential solar energy in Algeria.

Regions	Sahel	High plateaus	Sahara
Area%	4	10	6
Average duration of sun exposure (hours per year)	2650	3000	3500
Possible average energy (kWh/m3 per year)	1700	1900	26250

Source : Nations Unies, Commission économique pour l'Afrique, Bureau pour l'Afrique du Nord, Le secteur des énergies renouvelables en Afrique du Nord, 2012

So; solar potential in Algeria is the most important in the Mediterranean basin (mines, 2017, p. 13):

- 169,440 terawatt hours per year.

- 500 times the Algerian consumption of electricity.

- 60 times the consumption of fifteen European countries (estimated 3000 TWh per year).

b. The reality of the exploitation of solar energy in Algeria.

What distinguishes the energy balance in Algeria is the reliance on fossil energies, where there are great potentials of oil and natural gas. Algeria is one of the most oil and natural gas producing countries, however, it has also a great solar potential, as it benefits from more than 3000 hours of sunshineper year, so Algeria has the potential to become a major player in the renewable energy sector, however, at present, the country is barely exploiting this potential and it is at the crossroads of developing a future solar energy system.

Algeria has committed under the Paris Agreement to reduce greenhouse gas emissions by 7% by 2030, compared to the business-as-

usual scenario, through international support, and Algeria can reduce its greenhouse gas emissions by 22% by 2030, however, despite its Algeria has formulated ambitious targets for renewable energy, and established a regulatory framework for the deployment of renewable energy technologies. The current share of renewable energy sources in the total energy mix is still small, and the Corona pandemic has highlighted the risk that Algeria will be affected by global oil and gas market prices. Energy transformation plans in Algeria, but this crisis could be the necessary impetus for fundamental change and ultimately giving priority to clean energy investments in Algeria, although this will depend on the efforts and willingness of key decision makers in the country (befaff, 2021, p. 16).

In 2009, Algeriahaddeveloped a solar power plant to compete with the energy produced in the rest of the world, as it was expected that the hybrid would achieve 5 percent of the national generation capacity at the end of 2015, which was not achieved in reality, and despite that, Algeria has a suitable opportunity to export energy to Italy and the rest of European countries, according to the Ministry of Energy and Mines, and Algeria possesses a huge sunny area with huge potential to exploit it, and it also has the necessary human and financial resources, and it does not lack anything, but rather it is able to compete with other countries (Hunter, 2009, p. 55).

It should be notice that a group of villages with about a thousand dwellings were supplied with electricity through solar energy in the states of the Great South before 2004, according to the former Minister of Energy and Mines, Chakib Khalil at the time, and according to the Ministry of Energy and Mines, there was a program that was implemented in the year 2004, where Another 16 villages comprising about 600 dwellings were supplied, and studies are under way to generalize the use of renewable energies in all isolated and remote locations from the electrical grid (Al-Hawadith, 2004).Some other projects have also been embodied, such as (Muhammad, p. 148):

- Electrification of 16 villages with solar energy in the south (2006-2009)

- Establishment of a solar power station to produce electricity in HassiRmel.

- Supplying the Naftal service station in Staoueli with solar energy.

- High conservation projects for the development of the steppes.

In general, renewable sources accounted for 1% (mostly solar sources) of the country's electricity generation mix, in 2018, and solar energy accounted for 84% of the total electricity generated from renewable sources, while hydroelectric power accounted for 15%, and wind energy accounted for 1% (Pfaff 2021, p. 19).

3-2- Exploitation of shale gas in Algeria.

In this element, we discuss the potential of shale gas in Algeria, the reality of shale gas exploitation.

a. Algeria's shale gas potential.

Algeria hasa great potential of shale gas (707 trillion cubic feet, about 19,796 billion m3), and most of it is located in the desert, far from water sources. Despite this, many international oil companies have expressed their will to carry out exploration operations in the places concerned, and in light of some decline in Its share in the liquefied gas export markets, as well as its production from conventional oil reserves reaching a stage of stability, as it has been reported that the government will ease the tax system in order to attract foreign investors, and the vision will become clear about the extent and speed of Algeria in developing its production of shale gas after the initial exploration of the wells proves attractive. rockformations, and after the government approves its policies to attract foreign investors (La Rouge, 2013, p. 26).

According to the Algerian News Agency in February 2014, Algeria’s position in the list of the ten countries that possesses the most shale gas

reserves, according to the unanimous agreement of organizations and bodies specialized in this field, which confirmed that Algeria possesses important basins of this energy source, which may encourage investment in these New gas resources. (Kawan, 2016, p. 260).The following table shows the most important shale gas basins in Algeria:

Table 2: The most important shale gas basins in Algeria.

N°	Basin	Reserves
1	Mouidir	around 19800 trillion cubic meters
2	Ahanat	
3	Berkan	
4	Timimoune	
5	Regane	
6	Tindouf	

Source: Prepared by the autor, based on: www.alhayat.com/Articles/2533615

Through the above table, it is clear that Algeria's reserves of shale gas are estimated at about 19,800 trillion cubic meters, distributed over 06 basins in the Sahara, and thus it ranks third in the world.

b. The reality of shale gas exploitation in Algeria.

Since the beginning of the new millennium, crude oil prices have witnessed a remarkable increase that reached record numbers, which prompted a number of oil producers, especially in the United States, to turn to shale gas to exploit it, and to develop the technology necessary for that, to reduce costs as much as possible, and thus achieve the highest amount of profits. Since 2008, shale oil production in the United States has witnessed a remarkable rise before it achieved a big boom since the beginning of 2011, which reached its peak with the beginning of 2015, in what was called the “shale oil revolution, taking advantage of the remarkable rise in oil prices in global markets, which reached Record limits exceeded $100 per barrel, which led to an increase in the production of the United States,

the largest global oil consumer, from about 5 million barrels per day in 2011 to more than 9 million barrels per day in 2015, which significantly reduced its oil imports, and pushed Many people have talked about the possibility of achieving oil independence for the United States, and even more than that, turning it into a global resource, especially with the approval of Congress on the decision of President Barack Obama's administration to cancel the ban on exporting American oil abroad, which has been in effect since 1975 (Al-Koukhi,2017, pg 4).

The green light was given to the government to start exploiting the country's reserves of shale gas without harming the environment, and according to the data, the first indications had highlighted significant national capabilities of shale gas, in terms of the quantities that could be extracted. Confirmation of the commercial capacity of these resources calls for a program that includes at least 11 wells, and extends between 7 and 13 years. In 2011, Sonatrach achieved its first wells of shale gas in the Ahnant Basin located south of Ain Salah, and it was found that there are promising possibilities (Kawan, 2016, pg. 262).

For his part, Youssef Yousfi, the former Algerian Minister of Energy and Mines, highlighted the vital importance of energy security, stressing that the exploitation of unconventional hydrocarbons (including shale gas) put the United States on the right path, adding that Algeria had discussed with the American side the dangers resulting from the exploitation of shale gas. And the precautions that must be taken in the production process, and he stressed that the exploitation of unconventional fuels is not more polluting than other resources, and he added, that what is written about the dangers of pollution resulting from the exploitation of shale gas is exaggerated and it is vital for us to exploit all possible resources in order to achieve energy security (Ahmed, 2016, p. 119).

Ait Al-Hussein, the former minister of energy and head of the Nalchik office for energy consulting, based in Switzerland, revealed, in an interview he made on the Internet to the international complex "CWC", which supervises the organization of energy meetings based in London, that

Algeria has Means of converting shale gas into oil, according to the American experience that has achieved great results, but it should only do so in the long term, and he explained that achieving such a goal requires transforming the technology of international petroleum companies and providing an appropriate framework for investment (Ahmed, 2016, p. 120).

4- Algeria'senergy transformation strategy.

Due to the factor of depletion of fossil energy resources, Algeriahad decided to develop a national strategy for energy efficiency in order to ensure a balance of supply and demand and to preserve the national reserves of hydrocarbons. consumption (APRUE) in a future study on the final demand for energy in Algeria, which revealed the presence of an economic energy capacity of more than 10 million tons of oil equivalent in the horizons of 2030, based on the scenarios approach for its exploitation and the preparation of a strategy in this field, in addition to that, the total energy economy is more than 90 One million tons of oil equivalent in the horizons of 2030, exceeding the total national production of gaseous materials for the year 2011 (natural gas and liquefied propane gas), and this reflects the critical importance of implementing the national program for energy efficiency (TAEC, 2014, p. 28).

Now we will stop at the National Program for Energy Control (2007-2030), and the content of this program, as follows:

4-1- The National Program for Energy Control (2007 - 2030).

Law 09-99 of July 28, 1999 relating to the control of energy defines the conditions and means of framing the implementation of the national policy for the rationalization of energy consumption, and to achieve this policy relied on (TAEC, 2014, p. 28):

- National Agency for the Development and Rationalization of Energy Consumption (APRUE).

The National Fund for Energy Control (FNME).

- National Program for Energy Efficiency PNME

- The Intersectoral Committee for the Rationalization of Energy Consumption (CIME).

The National Program for the Rationalization of Energy Consumption (PNME) was determined by the Executive Decree of 2004, and approved by the government, whereby the APRUE Agency is responsible for the implementation of this program, under the auspices of the Ministry of Energy and Mines, through which (Kawan, 2016, p. 223):

- Determining the framework and horizons of energy conservation.

- Evaluation of energy control capabilities.

- Possible achievements in the short, medium and long terms

In general, the financing of energy efficiency depends on the National Fund for Energy Control (FNME) through various appropriate financing mechanisms, especially:

- Subsidies.
- Subsidized loan.
- Tax loan.
- Encouraging grants

The National Program for Energy Efficiency (PNME) was determined according to the type of energy materials (petroleum materials, electricity), the fields of use (lighting, heating), as well as the different fields of use (industry, agriculture...).

The state directed its actions and strategy by assigning the active sectors, the residential sector, services, local communities, the industrial sector, as well as transportation, to achieve the following (TAEC, 2014, p. 29):

- Informing and educating the consumer of the importance of energy control.

- Formation and training of engineers of industrial establishments in the fields of energy management and conducting energy audits.

- Conducting comprehensive and sectoral studies to assess the possibility of saving energy.

- Conducting field studies and developing new forms of energy and efficient technologies.

- Carrying out energy checks in industrial units with high energy consumption (especially with regard to units manufacturing building materials).

- Studying the areas of distribution of energy consumption and its various uses.

- Inclusion of energy-efficient standards in new buildings, machines and devices powered by energy.

- Education and training of users in the field of energy economy.

- Establishing a national strategy for energy efficiency based on a national program for energy control.

- Granting financial, tax and customs concessions for businesses and projects that contribute to development and energy efficiency.

- Developing a bank of statistical data on energy in order to complete knowledge of the national energy consumption system.

- Organizing, activating and coordinating the implementation of energy management programs and activities.

4-2- The content of the national program for the rationalization of energy consumption.

The content of the national program for the rationalization of energy consumption can be summarized in (Kawan, 2016, p. 225):

- In the year 2030, and based on the "Let it do it" scenario (the business-as-usual scenario), energy consumption in these five sectors (industry, housing, services, transportation and agriculture) will reach about 66.42 million tons of oil equivalent (equivalent to an annual growth rate). average of 4.7% between 2011 and 2030.

- On the other hand, if there is a political will to control energy (revenue scenario / base scenario), the consumption of the latter will not exceed 56.4% million tons of oil equivalent, i.e. a decrease in growth by 15% compared to the "Let it do" scenario (the business scenario as usual), which is equivalent to an average annual growth rate of 3.8% between 2011 and 2030.

The forward-looking work also allowed the establishment of an energy control policy and the development of actions in the long term (2030) expressed in medium and short term programs centered on the National Program for Energy Control, as follows (TAEC, 2014, p. 32):

a- In the short term (2011-2013).

Realistic and ambitious projects were launched in the first phase of the National Program for Energy Efficiency, and it was expected that they would rise in the coming stages. That period (2011-2013) enabled, through the various government measures relied upon, to set a framework for applying energy efficiency, raising the capacity to control energy, and determining Its objectives and the various projects to be adopted in this context, in order to achieve the following:

- Thermal insulation for about 11,000 homes.

- Installation of 4000 cubic meters of solar water heater.

- Distribution of 750 thousand economic lamps and 50 thousand sodium lamps.

- Conversion of about 12,000 cars running on liquefied petroleum gas.

b- The plan for the medium term (2020).

- **Buildings (houses and services).**

- Thermal insulation for about 11,000 new homes and 20,000 for existing buildings.

- Installing 150,000 cubic meters of solar water heater.

- Distributing 10 million economical lamps and preventing the marketing of incandescent lamps in 2020.

- Replacing all existing mercury lamps for public lighting with high-pressure sodium lamps.

- **Industry.**

- Mandatory implementation of audit recommendations.

- Incorporation of high-level effective technology.

- **Transport.**

- Converting 20% of the car park to liquefied petroleum gas as fuel.

- The use of buses running on compressed natural gas in major cities**.**

c- The long-term plan (2030).

The forward-looking study of the final energy demands in the horizons of 2030 (according to a scenario that I let do the "business-as-usual" scenario and the revenue scenario "the base scenario") extended over the long term, in order to emphasize the importance of taking action at the global level, through:

- Strengthening legal systems around energy control.

- Upgrading the local production of industries that are active in the field of energy efficiency (economical lamp, solar water heater, thermal insulation materials).

- Develop control measures on energy efficiency.

- Prohibition of energy-intensive technologies such as:

- Lamps with high energy consumption, starting from 2020.

- Home electrical appliances according to the energy consumption notation system.

Conclusion:

Although there are large proven reserves of solar energy and shale gas in Algeria, there are manytechnical problems, especially in the field of shale gas exploitation (its proximity to urban areas and lack of technical skills), which make the exploitation of these reserves expensive, unless you benefit from experiences. in the field of international exploitation and production,

Also, realizing the results of the exploitation and production of solar energy and shale gas in Algeria, and its effects on the production of natural gas and oil, requires a long time, in addition to many concerns and warnings, which would affect the future of shale gas exploitation in Algeria, in light of the positions denouncing the exploitation of gas. Shale, in addition to the high costs of shale gas production compared to natural gas production, and Algeria will inevitably face great challenges in the field of costs resulting from the shift towards the exploitation of solar energy and shale gas, given that the economic returns will be weak at first, and thus Algeria should, like the leading countries In the field of energy transition, giving time and patience to control technologies and acquire the necessary techniques and expertise that would contribute to reaching the commercial stage

Through our study, we reached the following results:

- Considering Algeria's potential in the field of alternative energy, it hasa great potential, especially in the field of solar energy and shale gas.

- Despite the existence of large reserves of solar energy and shale gas in Algeria, and the possibility of exploiting them, it will not significantly reduce its dependence on the exploitation of natural gas and oil.

- The exploitation of solar energy in Algeria has not developed rapidly and is likely to continue at the same pace in the coming years.

- The fear of the environmental impacts resulting from the operations used in the framework of shale gas exploitation (especially from the popular side) will affect the trend towards starting exploitation.

- The exploitation of proven shale gas in Algeria, together with the existing natural gas infrastructure, supports the possibility of increasing the export of natural gas.

- Satisfactory results have not been achieved in the field of solar energy and shale gas production in Algeria, especially from a commercial point of view.

Among the most important recommendations and suggestions that we came out with:

- Perhaps the first step in any aspiration and direction towards the future in the field of energy lies in the rational use of energy resources, including the search for alternative energy sources in the form of solar energy and shale gas.

- The Algerian government should increase spending on research and development and provide information in the field of energy, and support spending through partnership relations, at the local and international levels.

- The need to start research and exploitation operations, using the latest technologies and methods used, which would be more efficient from an economic and ecological point of view (to benefit from successful experiences).

- The need to increase research and development in the field of shale gas exploitation techniques, taking into account the latest technologies used, especially the American experience, and benefiting from its expertise, provided that this is indicated on the basis of mutual benefit.

- Encourage scientific exchange and scientific advice between Algeria and the leading countries in the field of energetic transition, by holding seminars and periodic meetings, and updating studies in the field of exploitation of solar energy and shale gas in Algeria.

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