

Energy transition policies and prospects in Algeria: towards more rationalization and sustainable environmental growth



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Abstract:

Investing in renewable energy is one of the most important pillars of modern economic trends of governments, at the local and global levels, as achieving comprehensive development has become based on clean energy and comprehensive environmental security standards, which is the goal and aim of every country, This can only be achieved through good investment in energy sources and energy services, especially under the current circumstances.

In this article, we try to focus on the basic concepts of investing in renewable energy, in addition to reviewing global investments and the risks associated with them, in addition to strategies for moving towards these energies to compete with traditional energy, and presenting the most important policies and projects related to investment in this field.

Keywords: Renewable energy; Rationalization of policies; Environmental growth; Sustainability; strategic vision.

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Introduction :

sustainable production and consumption patterns, reducing the costs of environmental degradation and making an effective comparison between economic feasibility and environmental impacts. feasibility of any development activity. However, Energy is considered one of the most important elements of human life and an important tribute to development. Its absence means poverty and backwardness, so if it is available, the necessary mechanisms must be put in place for its proper exploitation with continuous rationalization, as it assumes leadership in achieving the social, economic and environmental dimensions related to sustainable development. This is also indicated by international conventions, in which the link between investment and the environment is considered one of the main issues in achieving, the problem is not only related to resources, but also to policies and technology.

The countries of the world in general, and the industrialized countries in particular, are striving today to meet and secure their energy needs, by exploiting modern technology in order to shift towards renewable energies, and make them a strategic option in the near and distant future. So, Governments work has now become more cautious in the field of public policies, such that comprehensive development decision-making requires more activation of rationality and control of various resources.

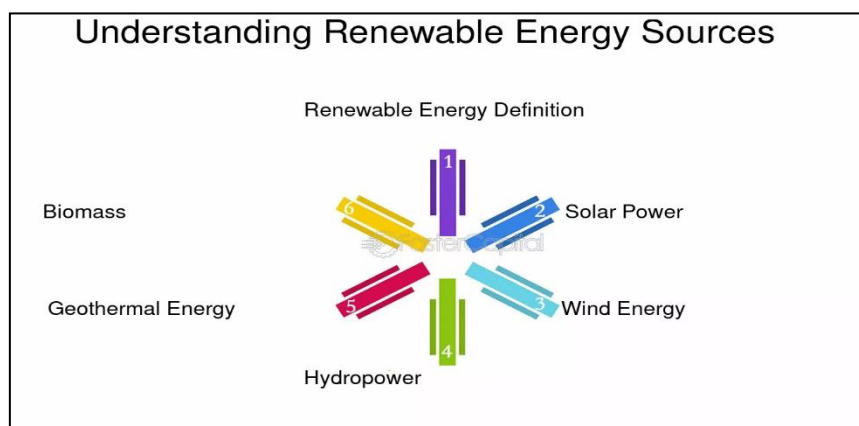
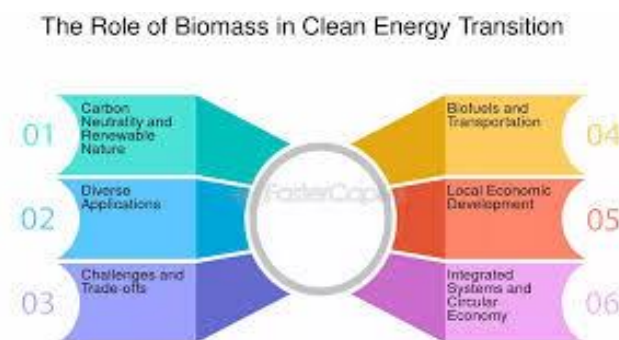
The analysis shows that Algeria has already taken the first steps towards the transition to renewable energies. According to the Middle East and North Africa model, Algeria can be classified as entering the "renewables launch" phase. However, fossil fuels still play a significant role in the Algerian energy sector and the economy as a whole. To support the launch of renewable energies, strong support is needed at all levels. Only then can the framework conditions be created to encourage participation and attract investment from the private sector. To this end, a long-term energy strategy should be developed that takes into account the potential of renewable energy to support the effective transformation of Algeria's energy supply and enable a smooth transition towards environmentally sustainable growth. Therefore, the problem of the study revolves around: **To what extent can public policies and government decisions be directed and rationalized within the axes of energy transition to ensure sustainable environmental development in Algeria?**

-Methodological approach: We relied in this study on a set of theoretical approaches, including: the developmental approach, the environmental approach, the analytical approach, the public policy approach, and the environmental sustainability approach.

1. Basic concepts and foundations: energy transition, sustainability, environmental growth, and policy rationalization:

a. Energy transition concept:

The concept of energy transition shows the degree of dependence of a particular economy, on the use of renewable energy sources with integrated economic feasibility; where a set of indicators are combined and used that reflect the link between the economic, social and environmental dimensions in the service of comprehensive and integrated sustainable development indicators. (Maryam, Nawal, 2015, p. 04), and considering energy transition as the basis for the development process: This is done by making the economic competition of all companies producing energy resources move towards the optimal and effective exploitation of energy resources, and enabling the exploitation of renewable energies as an alternative to fossil energies, in addition to improving the environment and providing new job opportunities. As shown in the following figures:



Energy Innovation How to Innovate and Transition to Renewable and Clean Energy Sources

Energy transition is a key element in today's environmental transformations, as it refers to the shift from the current energy system to a cleaner energy mix; based on renewable resources in countries, and the energy transition provides the gradual replacement of traditional energy with renewable energy sources. (Tayeb, p. 38).

The energy transition is the transition from traditional (fossil) energies to the renewable energy industry, which is characterized by its abundance and sustainability, to preserve the environment and the future needs of generations, without compromising the energy requirements of current generations. (Hasnawi, p. 07). This definition distinguishes itself by linking energy transition to sustainable development, through environmental conservation and rational consumption to preserve the future needs of future generations.

The energy transition also means moving from a system of energy production and consumption based on non-renewable fossil energy to another model of energy, characterized by lower carbon intensity and increasing proportions of renewable energy. The characteristics of energy transition vary from one country to another according to the energy mix, economic and technological capabilities, and policies followed. It is a difficult and long process of change linked to political decisions, economic and environmental reality, the quality of governance and management, the prevailing societal culture, and the transformations in fossil and alternative energy markets. Therefore, we find the World Energy Council believes that the energy transformation must combine three basic dimensions despite the contradiction between them, which are: (Rosho, p. 131)

- ✓ Energy security to achieve more efficient energy provision for current and future generations.
- ✓ Equity in providing energy to all peoples of the world, especially emerging countries, at reasonable prices.
- ✓ Permanent preservation of the environment and biodiversity through energy efficiency and development of good utilization of renewable energies.

The energy transition is an influential element in the environmental transition, as it refers to the transition from the current energy system (the use of non-renewable resources) to an energy mix, based primarily on renewable resources. This implies the development of alternatives to fossil fuels, which are time-bound and non-renewable (depletable) resources, in addition to some types of fission fuels (radioactive materials such as uranium and plutonium). The energy transition also stipulates the gradual replacement of conventional energy with renewable energy sources. (Hanish, p. 41)

Energy transition also means moving from a certain model of energy production and consumption to a more efficient and effective model of energy

consumption over time. This pattern depends on the provision of each country's own energy sources in order to maintain a balance in the environment. (Maqri, p. 72)

It is a system of energy production and consumption based on non-renewable fossil energy to an energy mix with less carbon intensity and in the case of moving to the use of new energy sources. (Al-Eid, p. 372)

b. The concept of environmental sustainability:

The environment is an effective economic resource in providing raw materials, and energy for production processes and competitiveness worldwide, and its outputs return to the environment in the form of waste, which causes the depletion of the resources of future generations. (Saeedani, p. 142) Therefore, environmental security as a concept within economic effectiveness is dependent on preserving the biosphere locally and globally; it is a basic factor on which human activity depends. " (Momen, p. 123)

The relationship between environmental sustainability and the transformation in the field of renewable energy lies in the fact that reducing carbon dioxide emissions resulting from the global use of fossil fuels such as coal, oil and gas affects environmental sustainability, which leads to an increase in demand for renewable energy technology globally, which is one of the indicators of the effectiveness of managing environmental systems and achieving sustainable development.

We conclude from the previous concepts that the relationship between renewable energy, and environmental sustainability, is through the exploitation of renewable energy that reduces dangerous emissions, that pollute the environment and achieves environmental balance, and preserves the ecosystem. Also, the relationship between renewable energy and environmental sustainability, is through rationalizing energy consumption by developing renewable energies and energy efficiency.

We also conclude through the economic requirements for sustainable development that focus on excessive individual consumption of natural resources, especially in industrialized countries, and is keen on the rational and optimal use of natural resources and changing consumption patterns that threaten biodiversity and addressing global pollution problems.

The United Nations and non-governmental environmental and development organizations, based on the recognition of the need to achieve integration between development and the environment, in order to ensure the sustainability of the development process, call for providing the economic and social development needs of current generations, while preserving the environment and taking into account the right of future generations to development. (Nasr al-Din, p. 05)

c. The concept of rationalizing energy policies:

Valuing and rationalizing energy policy management are an economic and environmental necessity at the local and global levels, as rationalizing energy requires a set of measures and technologies that lead to reducing energy consumption without compromising the comfort and needs of individuals and the optimal exploitation of fossil energy sources. (Tayeb, p. 37)

Accordingly, rationalizing energy policies within sustainable development paths is based on, the rational use of national resources, increasing returns and efficiency of use, and at the same time preserving the environment by reducing emissions that pollute the environment.

What we conclude is that environmental sustainability is linked to rationalization of energy policies, through the transition to the renewable and clean energy industry, to preserve the environment on the one hand, and ensure the future needs of subsequent generations, while achieving current requirements in energy use. Rationalization of energy policies is a mechanism that achieves sustainable development.

Energy expert Andrea Prontera defines energy policy, as "a set of targeted interventions and effective actions undertaken by relevant stakeholders in the coal, electricity, oil and gas, nuclear and renewable energy sectors, with the aim of improving energy efficiency in terms of supply and consumption." All the previous definitions we have discussed about energy transition, environmental sustainability and rationalization of energy policies are at the heart of achieving what is called energy security; which the International Energy Agency has defined as "the continued stability of acceptable and reasonable prices while continuing to address environmental issues." (Adjjal, p. 165)

2. The importance of switching to clean energy at the present time: for sustainable environmental security in the world:

Various countries around the world, seek to provide and secure their energy needs, by exploiting modern and advanced technologies in order to shift towards renewable energies, as they are sustainable and available energies, and are considered clean energies compared to traditional energies; and have worked to develop the necessary policies, to develop and encourage investment in renewable energies. This has motivated countries of the world and decision-makers, to invest in clean energy, which will bring the desired benefit to the national economy, benefit all people, and sustainable development for society as a whole.

a. Motivations for the shift towards clean energy in the world:

There are three main incentives that motivate countries to shift towards renewable energy, which are:

- **Energy Security:** Most economic and environmental forecasts indicate a decrease in oil and gas reserves as a vital traditional source, in addition to the current increase in global energy consumption, which will lead to the disappearance of this source of energy. Therefore, it is necessary to think now about finding other alternative sources.
- **Growing concern about climate change:** Renewable energies contribute to securing countries' energy needs, while governments seek to reduce the risks of global warming; as the amount of greenhouse gases, such as carbon dioxide and methane, increases in the thin atmosphere surrounding the Earth (the amount of gases leads to an increase in temperature). Many researchers believe that this increase in temperature portends negative and perhaps catastrophic consequences, and that the present time is appropriate to address this imbalance by using carbon-free renewable energies.
- **Cost of renewable energy:** It has been declining for several decades, and the cost of certain types of renewable energy is expected to continue to decline, due to improvements in renewable energy production technologies (Hanish, pages 46-47)

b. Energy transition strategies and their relationship to sustainable development:

It can be summarized in three steps: (Tayeb, pages 38-39)

- **Optimal energy consumption:** This is achieved by working to rationalize heating sources, through insulating buildings and developing and improving heating methods; and developing multiple means of transportation through the optimal selection of vehicles with alternative and clean energy in response to sustainability requirements, reducing the consumption of materials produced from fossil fuels, and achieving the use of electricity in all areas of use, in industrial and electrical processes, and in homes.

This would preserve the environment by using clean energy and reducing pollution caused by traditional energy.

- **The main driver of development processes:** This is what makes the economic competition of energy producing companies work on the optimal and effective exploitation of alternative energy resources, continuously, such as renewable energy, in addition to providing new job opportunities; which achieves the social dimension of sustainable development.
- **Planning for the energy transition process:** This process involves integrating all energy stakeholders, according to pre-prepared plans and programmes that aim to provide all energy needs without compromising the environment and the rights of current and future generations.

Energy transition policies can be considered as clear strategies, as they play an effective role in achieving energy supply security, especially in light of

international developments such as: the change in the prices of traditional energies and their negative effects on the environment, in addition to the problem of their depletion, through: (Hasnawi, p. 09)

- The gradual and phased use of renewable energies as a permanent alternative to traditional energies in the field of electricity generation, through the process of converting wind and solar energy for ease of exploitation and the availability of the technology used and necessary for this;
- Encouraging international organizations for this type of initiative (transition towards renewable energies) by providing subsidies and consultations;
- Working to organize and create markets for renewable energy products and accompany energy transformation processes, which contributes to marketing these products and reducing their cost, and thus the ability to compete with traditional energies;
- Traditional energies (especially oil) are experiencing a series of fluctuations, whether due to increased production costs or speculation that occurs in their markets, which allows the emergence of renewable energies as a strategic alternative;
- The rapid transfer of energy transition technology at all levels contributes to reducing its price, and thus enabling all countries to acquire it, which tips the cost in favor of renewable energies in terms of costs;
- Opening research centers and laboratories to study the transition processes towards renewable energies with methods of abandoning traditional energies, which contributes to creating a scientific revolution in the field of renewable energies and thus becomes a popular industry in the near future. This contributes to meeting various current and future energy needs as it is renewable and characterized by sustainability. (Hanish, pages 50-51)

It can be said that there is a close relationship between energy and the goals of sustainable development, that preserve natural environmental resources and manage energy in a sustainable manner, meaning that the shift to clean energy achieves sustainable environmental security.

c. Clean energy stakes in the world:

In light of environmental restrictions, concerns about environmental damage, and concerns about the depletion of basic energy sources, most notably oil and natural gas, interest in clean energy is increasing in many countries of the world, especially with the technological development in the field of renewable energy.

Various countries around the world are trying to provide and secure their energy needs by exploiting modern and advanced technologies with the aim of

shifting towards renewable energies, as they are characterized by sustainability and availability, and are considered clean energies compared to traditional energies.. (Al-Dawri, 2024)

The increasing use of energy resources carries more outputs for the environment than its capacity to absorb, such as the phenomenon of global warming, which has become one of the global issues due to the serious repercussions that threaten the future of humanity and the environment alike and cause human and economic environmental damage.

The process of preserving energy resources and managing them efficiently and effectively is considered one of the most important criteria related to achieving sustainable development; as ensuring continuity and environmental sustainability requires rationalization towards clean, inexhaustible energies in their various forms, and relying on local energy sources for all countries, which represent a safe source of supply that does not run out and does not harm the environment.

Clean energy plays an important role in avoiding environmental threats and climate change, by preserving water resources and reducing carbon dioxide emissions that pollute the environment. (Bukhoush, 2022-2023, p. 80)

All this, Makes the world in front of a challenge to search for new clean alternatives to energy, that achieve the principle of sustainable development; that is, the rational and sensible consumption of energy for current generations while preserving the right of future generations to energy and preserving the environment by achieving sustainable environmental growth.

3. Energy transition policies in Algeria: from traditional to clean energy towards sustainable environmental security:

a. Energy transition as a strategic approach towards clean energy in Algeria:

Algeria is one of the largest oil producers in Africa. Algeria contributes energy resources to finance investment projects, maintain and restore infrastructure, and are usually directed to meet public spending needs. Algeria is also characterized by high solar brightness, moderate to high wind speeds, and a large capacity to exploit hydroelectric power and quantities of bioenergy. (Idris, 2019, p. 43)

Adopting clean renewable energy as a strategic option aims to change the pattern and structure of production and consumption, and represents an important step in research and embodying economic efficiency, preserving resources and maximizing outputs. Therefore, Algeria seeks to implement an energy transformation program to produce 22 gigawatts of electricity from renewable energy sources at a growth rate of 40% by 2030, with 10 gigawatts allocated for export, thus contributing 27% of the production capacity, Achieving these goals requires effective investment policies and the allocation of total investments amounting to 86.55 billion euros. (Nasreddine, p. 448)

Exploiting the available energies of resources requires providing the necessary infrastructure and supporting the basic technical structures to develop renewable energies in Algeria, as a basic condition for achieving the energy transition and reducing the link with oil and gas; which played a negative role and hindered development diversity in Algeria, as it experienced a significant delay compared to the achieved international level, especially with the decline in prices in global markets in recent years and the pressures of the Covid-19 pandemic, which accelerated the revival of the energy transition policy.

Algeria has also prepared a strategy for the necessity of rationalizing energy consumption, which means optimal use and reducing waste in energy consumption of all kinds. In this context, Algeria has adopted a strategy that will develop energy efficiency through several approaches, including thermal insulation of homes and solar water heaters, and the integration of renewable energies for environmental defense to reduce emitted gases. (Nasreddine, p. 448).

We can also mention the motives for energy transition in Algeria as follows: (Al-Eid, page 372)

- The challenge of depleting oil reserves is the main driver for the shift to renewable and clean energy, in addition to the high costs of extracting oil and exploring new wells.
- The challenge of energy price fluctuations in the global market, such as crude oil prices, which fell sharply in 2020 (due to the Corona virus incident).
- The challenge of declining global demand for oil; and the move towards renewable energy, in which many European countries have achieved success, especially Germany.
- The challenge of increasing local demand and consumption of energy; as Algeria relies on fossil fuels to meet local energy demand, which is supported by the government.
- The increase in electricity consumption in Algeria, which reached about 55 terawatt hours in 2016, and is expected to exceed 142 terawatt hours by 2027. (Al-Eid, page 373)

Thus, Algeria is facing the inevitability of moving towards generating electricity from renewable energies in order to relieve pressure on fossil energies.

b. Energy Policy in Algeria: An Introduction to Ensuring Sustainable Environmental Security in Algeria:

Some studies indicate that oil will decline in the coming years, as a result of the depletion of its fields in many regions of the world; which has made countries search for alternative sources to ensure their economic and energy security after the disappearance of oil; In this context, Algeria is considered one of the countries

concerned with developing renewable energies in order to help compensate for a significant portion of traditional fuel energy with clean and non-exhaustible energy.

Therefore, the set of challenges imposed by energy security in the future require the development of an energy strategy that ensures covering the increasing energy needs; and among the renewable energies in Algeria is solar energy, considering that Algeria receives more than 3000 hours of sunlight, which can be effectively exploited, using technology, into thermal energy or electrical energy. (Adjjal, p. 172).

Integrating renewable energies into the national energy diversity is a major challenge, in order to preserve fossil resources, due to the components of the National Renewable Energy Program 2011-2020, as these energies constitute the core of the energy and economic policies pursued by Algeria; through the development of solar and wind energy on a large scale, ... bioenergy (valorization of waste recovery) and the capacity of the renewable energy program required to be implemented to meet the needs of the national market during the period 2015-2030 is estimated at about 22,000 megawatts. (Adjjal, p. 173)

Algeria recorded a rate of 61% in terms of the efficiency and effectiveness of the energy system, while as for the index of the degree of readiness for a safe and sustainable energy transition, it achieved a rate of 37% in 2020 compared to 36% in 2019, and Algeria ranked fifth in Africa, sixth in the Arab world, and eighty-third in the world. (Zanaki, p. 179)

The rational exploitation of clean energy resources can eliminate environmental problems resulting from traditional energy resources and achieves the social and economic dimension to ensure sustainable development.

The energy policy in Algeria, in light of preserving the environment, attaches great importance to protecting the environment through:

- Promoting and developing the use of less polluting energies;
- Promoting the energy economy and using natural gas;
- Purifying and rehabilitating polluted areas.

As for the energy policy to achieve sustainable development, Algeria has introduced a law that promotes the use of renewable energies within the framework of achieving sustainable development based on preserving the right of future generations to exploit energy. (Bukhoush, 2022-2023, p. 105).

c. Legal and practical measures for energy transition in Algeria to ensure sustainable environmental security:

The energy diversity policy pursued by Algeria has led it to establish a set of legal mechanisms to promote renewable energies; by enacting several decrees and decisions that we summarize in: (Yebo, p. 252)

Law 98-11: which includes the guiding law and the five-year program on scientific research and technological development, which has a section on renewable energies, their sources, investment in them and their promotion in a way that helps in their exploitation.

Law 99-09 related to energy control, whereby Articles 4 and 7 thereof included clean energies and work to integrate and exploit them in the economic sector.

Law 01-20 related to regional planning, sustainable development and environmental protection from pollution and global warming.

Law No. 04-09: Relating to the promotion of renewable energies and their sources, forms and methods of dealing with them. Accordingly, the energy transition is achieved in two steps: (Tahtah, p. 172)

- Rationalizing energy consumption and making consumption methods more efficient.
- Represented in increasing the rates of reliance on renewable energies in the composition of energy sources

Within the framework of developments taking place at the local and international levels in terms of exploiting renewable energies, Algeria has developed a future strategy aimed at reducing traditional consumption and finding an alternative from clean energy sources.

According to the current government formation, Presidential Decree No. 20-163 of June 23, 2020, appointing government members, a specialized ministry was created, namely the Ministry of Energy Transition and Renewable Energy. (Zanaki, p. 176).

Practical measures for energy transition in Algeria:

Rationalization and rational consumption are the most important elements of the energy control program. A set of measures must be taken to reduce consumption, the most important of which are:

- ✓ **Energy pricing policy:** Price is the main aspect of consumption; Algeria relies on subsidizing energy prices, whether used as fuel, electricity, natural gas, etc., as Algeria is an energy country par excellence that contains huge reserves of diverse natural resources. This subsidy has caused consumption to rise at high rates, especially recently, which prompted decision-makers to change the pricing policy for energy of all kinds; for two reasons: the first is related to the decline in state revenues as a result of the decline in fuel prices, and the second reason is an attempt to change the irrational consumption pattern. (Raziqa, page 09)
- ✓ **Tax, fiscal and financing policy:** It is considered one of the tools that encourages the trend towards energy control consumption through:

-Reducing customs duties on tools and machines with high energy efficiency.

-Tax discrimination between intensive and economical energy consumption, where 09% tax was imposed on the consumption of electricity and natural gas for the first bracket, estimated at 125 kilowatt-hours of electricity, and 120 thermal units of natural gas, and 19% value-added tax was imposed on the other brackets.

As for the financial aspect, the National Agency for the Development and Rationalization of Energy Consumption provided support for converting cars to the GPL/C system estimated at 50%, and also provided support of 45% for users of solar water heating devices. (Raziqa, page 09).

✓ **Guidance on energy rationalization:** To rationalize energy consumption, it is necessary to change consumer behavior as it is the important link in rationalization, so both the National Agency for the Development and Rationalization of Energy Consumption (aprue) and Sonelgaz Company sought to conduct rationalization awareness campaigns to change citizens'* behavior towards energy use. (Raziqa, page 10).

Algeria adopted an ambitious energy transition program in 2011, with the aim of increasing the integration of renewable energy sources in electricity production by 27% by 2030, so that the percentage of local electricity consumption from renewable energy will reach 40%, with a total volume of 22 thousand megawatts. In 2019, the government announced the revival of planning to reach a ceiling of 22 thousand megawatts of clean energy in 2027 (Salah El-Din, p. 445). The World Renewable Energy Report 2021 indicates that the world has achieved very satisfactory results despite the effects of the Covid-19 pandemic, and more than 256 gigawatts have been added, bringing the global production capacity to 2,838 gigawatts of renewable energy, including 0.5 gigawatts in Algeria, the third African country.

Conclusion:

Energy policy is a major concern of the development process, and for this reason Algeria, like other countries, seeks to rationalize and direct public policies by adopting an effective clean energy policy that contributes to ensuring sustainable environmental security. Energy sustainability is one of the aspects of environmental sustainability that aims to provide renewable and clean energy sources that replace traditional sources that cause pollution and climate change.

* This is done by using posters and media campaigns on radio and television, such as the campaign to set the air conditioning at 25 degrees Celsius, the campaign to use energy-saving lamps, and the campaign to turn off the lights when leaving the room, in addition to including environmental awareness in national education programmes and others.

Algeria has also adopted a program within the axes of energy transition and transition to new alternatives through energy security, economic growth, and environmental protection to ensure the sustainability of its energy resources. Although Algeria relies on oil and gas as a major contributor to the national energy mix, it is trying to further rationalize the clean energy system, especially in light of the requirements of sustainable development.

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