

Algerian Energy Policy after 2020

Comparative SWOT Analysis for Promoting Renewable Energy and Shale Gas: Priorities, Opportunities and Challenges

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مقارنة بتحليل SWOT لترقية الطاقة المتجددة والغاز الصخري: الأولويات والفرص والتحديات

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Abstract :

The aim of this study is to examine the challenges and opportunities available in the field of new energies in Algeria, whether renewable energies or shale gas as an unconventional source of energy, these two energy fields are new in terms of investment and management in the country, which posed legislative, technological and financial challenges. Algeria has approved a program for energy transition aimed at promoting the use of renewable energies, in order to avoid energy deficit. Therefore, according to the current "laissez-faire", by 2030, the country may become unable to export, and then to an energy-importing country by 2040. Although the exploitation of shale gas in Algeria remains a matter governed by environmental, technical and financial challenges, it represents an important bet for the country to enhance its energy position. A comparative SWOT analysis framework was applied to find out the opportunities and challenges when exploiting renewable energy and shale gas, or when comparing these two sources in terms of economic and energy importance. The energy transition and exploiting different types of energy sources is no longer optional for Algeria, as the internal changes related to the decline in the national reserves of oil and gas and the increase in domestic demand. As well as external variables have pressed the Algerian decision-maker to respond to these changes. But it seems that what been achieved so far in energy programs is very modest.

Keywords: Energy transition, energy production scenario, renewable energy, shale gas, Algeria.

Jel Classification : O13, Q20, Q42, Q48, R11.

ملخص:

الهدف من هذا العمل هو دراسة التحديات والفرص المتاحة في مجال الطاقات الجديدة في الجزائر، سواء الطاقات المتجددة أو الغاز الصخري، كحقلان جديان للطاقة من حيث الاستثمار والإدارة في البلاد ما يفرض تحديات تشريعية وتكنولوجية ومالية. وقد وافقت الجزائر على برنامج الانتقال الطاقوي الذي يهدف إلى تعزيز استخدام الطاقات المتجددة، لتجنب العجز الطاقوي. لذلك وفقاً لـ "سياسة عدم التدخل"، وبحلول عام 2030، قد تصبح الجزائر غير قادرة على التصدير وحتى مستوردة للطاقة بحلول 2040. على الرغم من أن استغلال الغاز الصخري لا يزال أمراً تحكمه البيئة والتقنية والمال، لكنه يمثل رهاناً مهماً لتعزيز مكانة الجزائر في مجال الطاقة. المقارنة بتحليل SWOT تمت لمعرفة الفرص والتحديات باستغلال الطاقة المتجددة والغاز الصخري، أو عند مقارنة هذين المصدرين من حيث الأهمية الاقتصادية والطاقوية. لم يعد انتقال الطاقة واستغلال مصادر مختلفة للطاقة اختيارياً للجزائر، حيث ارتبطت التغيرات الداخلية بانخفاض الاحتياطي من النفط والغاز وزيادة الطلب المحلي. فضلاً عن المتغيرات الخارجية ضغطت على صانع القرار الجزائري للاستجابة لها. لكن يبدو أن ما تم تحقيقه حتى الآن في تنفيذ برامج الطاقة المتجددة متواضع للغاية.

الكلمات المفتاحية: الانتقال الطاقوي؛ سيناريو إنتاج الطاقة؛ الطاقة المتجددة؛ الغاز الصخري؛ الجزائر.

الترميز الاقتصادي (JEL) : O13؛ Q20؛ Q42؛ Q48؛ R11؛

I- Introduction :

Algeria is suffering from a sharp decline in energy production from its fossil sources of oil and gas, in exchange for the growth of the domestic demand for gas and petroleum products by an estimated rate of 7% annually, which reduces the opportunities of exporting these energy sources to international markets.

On this basis, Algeria has approved a program for energy transition¹ aimed at promoting the use of renewable energies, in order to avoid energy deficit. Therefore, according to the current laissez-faire scenario in terms of production and consumption, by 2030, the country may become unable to export, and then to an energy-importing country by 2040.

Algeria has made some amendments to its hydrocarbon law in 2013² to open the way for exploiting unconventional energy resources. Algeria holds the third largest recoverable shale gas reserves after China and Argentina.

The exploitation of shale gas in Algeria remains a matter governed by environmental, technical and financial challenges, but it represents an important bet for the country to enhance its energy and economic position.

The research purpose:

The aim of this paper is to examine the challenges and opportunities available in the field of new energies in Algeria, whether renewable energies or shale gas as an unconventional source of energy, these two energy fields are new in terms of investment and management in the country, which posed legislative, technological and financial challenges.

Being aware of these factors surrounding the exploitation of these energies, both negatively and positively, helps the government make appropriate policies, and allows the business sector to explore investment opportunities in this area.

Methods:

This study applies a SWOT analysis framework for comparative analysis to find out the various opportunities and challenges when exploiting renewable energy sources and shale gas, or when comparing these two sources in terms of economic and energy importance.

The framework of SWOT originally invented for business and marketing analysis has been broadly adopted in other research fields, including energy management. In general, the SWOT framework is composed of internal and external assessments.

II - Algerian Economy and the Dependency on Oil and Gas:

Algeria has the tenth-largest proven reserves of natural gas in the world, and it is the sixth-largest gas exporter and has the third largest proven reserves of shale gas in the world; it also ranks sixteenth in the proven oil reserves, which is estimated at 12.2 billion barrels (Oil & Gas Journal, 2017).

Algeria has enormous renewable energy (RE) potential. It has a high solar potential, with over 3000 hours of sunshine per year. However, fossil fuels remain the main source of electricity generation. Algeria is considered to be one of the most energy-consuming countries, with the contribution of fossil fuels in electricity generation at more than 98.75% in 2016 (Bouznit, Pablo-Romero, & Sánchez-Braza, 2020).

These important reserves of energy of various types: traditional, renewable and even non-conventional (shale gas), put Algeria under a terrible dependency on hydrocarbons as it's the main pillar of its revenues, financial budgets and economic activities. Moreover, 95% of Algeria's foreign currency incomes come from hydrocarbons which contribute about 40% of the gross domestic product (Heba, 2019).

1. Renewable Energy and Energy Efficiency Program, (Algeria, March 2011).

2. Law No.13-01 of 20 February 2013 amending Hydrocarbons Law No. 05-07 of 28 April 2005

Algeria exports around 540 thousand barrels of oil per day, out of its total production of about 1.1 million barrels per day. Crude oil and natural gas production has gradually declined in recent years. This is mainly due to the delay in completion of projects, difficulty in attracting investment partners, technical problems as well as the bureaucracy.

The shock of falling oil prices in 2014 weakened the country's revenues and adversely affected the trade balance and foreign exchange reserves. The budget deficit increased from 1.4% of GDP in 2013 to 15.7% of this total in 2016 (World Bank, 2016). While the total reserves fell from \$ 194 billion in 2013 to an estimated of \$ 108 billion in 2016, and it will decline by the end of December 2020 to 51.6 billion dollars¹.

Securing energy as a humanitarian need and a source of economic activity as well as being a tributary to the Algerian economy is vital to protect the rights of future generations, but successive Algerian governments could not succeed during the six decades to get rid of dependency on fuel revenues. However, all the government projects and social policies depended almost entirely on the energy sector; despite not possible being in commercial quantities within 25 years according to some estimates.

Since the dramatic decline in oil and gas prices in mid-2014, the vulnerability of the national economy has been once again confirmed. This is due to its high correlation with uncertain and unpredictable hydrocarbon revenues in the medium and long-terms. However, the exploitation of hydrocarbons itself is being questioned in regards to the "energy security" in the future (FCE, 2016).

III - Algeria's challenges in producing and exporting natural gas:

Algeria's proven oil reserves are estimated at 12.2 billion barrels and 4500 billion cubic meters of natural gas (Oil & Gas Journal, 2017). These estimates of gas reserves, which are confirmed by many international institutions, no longer seems to be true, as the government announced that only confirmed conventional gas reserves amount is 2745 billion cubic meters (Aissaoui, 2016). It is an extremely important and serious issue, as the revision of the estimates reduced the proven gas reserves by about 40%, and the reserve to the production indicator (P/R) is at its lowest in 33 years.

Algeria's gas sector is expected to face major challenges in the medium and long term. The growth of national consumption of natural gas and the decline in the productivity of fields (**Figure-1**), where domestic consumption of natural gas recorded 45.5 billion cubic meters in 2018, an increase of 8.6% over 2017 (Ministère de L'énergie, 2019). Therefore, according to the current scenario, national consumption of natural gas will jump to about 67 billion cubic meters by 2030, equivalent to about 73% of national production.

Natural gas is the main source of electricity generation in Algeria. During the past ten years, the national demand for electricity recorded an increased growth of 7% annually; this is due to the population growth on the one hand and the economic growth on the other.

According to the latest estimates by the World Bank Group, 99% of Algeria's population had access to electricity, with approximately 100% and 98% respectively in urban and rural areas. Although in 2016, extensive and serving, almost the entire population, Algeria's transmission and distribution systems have had relatively high losses at 15.9% (BMI, 2017).

At the external level: Algerian competitiveness of natural gas decreased because of the entry of new players to the European market, which led to a number of countries having to reduce their imports of Algerian gas and some of them, such as Italy, to review the contracts and prices.

Algerian natural gas exports to Europe have been under pressures because of the cheaper Russian supplies and the global abundance of liquefied gas. European customers have significantly

1. A statement of Algerian Finance Minister, *Lukal, Mohamed* before the Finance and Budget Committee of the Algerian Parliament on October 20, 2019.

reduced the demand for natural gas coming from Algeria, which led to a decrease in the level of the expected sales by about 25% in the last year (Slimani & Dezem, 2019).

IV - Energy Transition Program in Algeria 2011-2030:

The term “energy transition” emerged in Germany in the 1980s by researcher Florentin Krause (Morris & Pehnt, 2012) who was opposed to the use of nuclear energy. This concept is known as a shift in the existing model of energy production and consumption based on renewable energies to a new model that is more sustainable and considerate of the environment.

The energy transition is a necessity dictated by several factors, one of them is the rate fluctuations of oil prices, the increasing national demand for energy in population growth, as well as the declining in the production and in the proven oil and gas reserves. Moreover, this transition is dictated by the future global shift towards renewable energies due to “energy security” and “climate change”, which require a reduction on the dependence of fossil fuels.

In 2011, Algeria approved an Energy Transition policy, called the "National Program for Renewable Energy and Energy Efficiency 2011 - 2030". This program aims to expand the use of renewable energies in generating electricity to reduce the dependence on natural gas as a dominant source in electric power generation. Then in 2015, this program modified, but it kept on its broad objectives.

In its 2020 plan, the government made some adjustments on the energy transition program, through an action plan until 2035 aiming to increase the capacity of renewable energy exploitation to produce 4000 megawatts by 2024, and 15 000 megawatts by 2035. This will allow saving nearly 240 billion m3 of natural gas¹.

The process of energy transition means to shift from a national model of energy production and consumption to another model. According to a comprehensive vision, we can summarize the main objectives of the energy transition process as following:

- Diversifying the resources of the national economy.
- Conservation of fossil energy resources.
- Diversify energy sources and reduce the dependency to fossil energy resources, both oil and gas.
- Protect the environment and contribute to the international efforts to reduce CO2 emissions.

Renewable energies program aims to achieve a mix of energy in the production of electricity in which the contribution of renewable energies is about 27%. By 2030 about 40% of the total electricity production allocated to domestic consumption comes from renewable energies (**Figure-2**), i.e. establishing a capacity equivalent to 22000 megawatts from which about 10 thousand megawatts will be exported, and the rest will direct to local consumption (the Ministry of Energy, 2016).

What has been achieved so far?

Algeria currently produces about 400 megawatts of renewable energy sources, and it has 22 solar plants, including hybrid gas and solar plants together. According to the government plan, in 2020 the production level is supposed to be around 4,500 megawatts, which means the achievement was less than 10% of the target in the lifespan.

It seems clear that achieving 22000 megawatts by 2030 is a distant goal. Indeed, the government is talking today to produce about 15000 megawatts by 2035. Before that, public officials estimated production to reach 6000 megawatts by 2027, which is a significant decline. The last goal isn't easy as well, if we consider that it requires, on the average, to build 120 stations with a capacity of 50 megawatts per station, i.e. 10 stations annually. However, this rate can't be reached according to the current conditions. This is due to bureaucratic rules, the financial deficit that defined by the National

1 .Algeria Press Service (APS), Feb 25th, 2020.

Electricity Company SONEGAS, and the absence of a strong and specialized private sector, that's capable of providing a qualitative and quantitative addition to the sector (Lachemot, 2019).

V - Shale Gas : the alternative of the alternative!

1. Estimated reserves of shale gas:

The US Energy Information Administration (EIA) estimates that Algeria has 20000 Bcm of technically recoverable shale gas resources (EIA, 2015). However, the National Agency for the Valorisation of Hydrocarbon Resources «ALNAFT» affiliated to the Ministry of Energy estimates that Algerian non-conventional at 9818 trillion cubic feet of shale gas and 1194 billion barrels of shale oil. These unconventional reserves recorded a jump of about 30% for gas, and 25% for oil comparing to estimates in 2013 (Hocini, 2019).

These estimates make Algeria shift from fourth to third place in the global classification of reserves in shale-gas after Argentina and China (**Table-1**) and in the seventh place in terms of oil reserves.

In October 2017, Algeria began reviving the shale gas exploitation project in the southern areas, after breezed in 2015 due to the popular and political protests against the project, claiming its environmental risks.

In October 2018, the national oil company "SONATRACH" signed the first contract to exploit shale oil and gas with the British "BP" and the Norwegian "EQUINOR" companies in the south-western desert, specifically in the Tademaït Plateau.

2. SWOT Analysis for Renewable energies and Shale Gas:

SWOT analysis: Also, Called SWOT matrix is a *strategic planning* tool (Mintzberg & Quinn, 1996) that is used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a business venture. In this paper the SWOT Analysis is applied to compare the internal and external conditions and also all the encouraging and discouraging variables for the exploitation of renewable energies and shale gas in Algeria as mentioned below:

SWOT for RE and Shale Gas

	RENEWABLES ENERGIES	SHALE GAS
Strengths	Algeria holds one of the highest solar potential in the world.	Algeria has the third largest technically recoverable shale gas globally.
	Limitless: Renewable energy won't run out	The organic-rich average thickness of the shale reservoirs in Algeria evidences the possibility of many years of extraction
	Clear national targets	
	Desert areas are available to build renewable energy projects	More than 95 % of the country's shale gas fields are located in the Sahara Desert
	Availability for regional electricity transfer	
		The country has considerable expertise in the field of gas exploitation
		The readiness of the infrastructure, gas supply networks and power plants to receive shale-gas within the technical system itself

	Revenues due to high prices of oil and gas could have two positive impacts: brand renewable energy more competitive; and use it, partially, to enticement renewable energy projects (IRENA, 2014).	
	Environmental friendly technology	Environmentally-friendly when compared to other fossil energy, not when it relates to renewable energy.
	Potential resource for development	Potential resource for development
		A network of pipeline infrastructure is available to move hydrocarbons, including shale gas, from production point to not just domestic refineries but also for export to Southern Europe (Azubuike, Songi , & Irowaris, 2018).
Weaknesses	The grid is weak and needs more enhancements.	
	Needs to adopt dynamic incentive mechanisms, e.g., Feed-in-Tariff and renewable portfolio standards.	
	RE Technologies requires large amounts of investments for the installation of renewable plants.	
	Lack of technical and managerial expertise in this field.	The absence of vital technology: does not have the requisite technological capacity to carry out shale gas extraction unless partnering with IOCs (Azubuike, Songi , & Irowaris, 2018, p.6).
	Lack of institutes and universities specialized in renewable energies.	
	Lack of renewable energy funds to support developing renewable energy projects.	
	Subsidization of fossil fuel impedes the growth of renewable energy.	
	The absence of national obligations for using solar applications, e.g., SWHs and Photovoltaic, in selected sectors.	
	The absence of attractive mechanisms to promote micro-finance.	
	Renewable energy has not been sufficiently incorporated into the educational systems and not promoted sufficiently in Mass Media.	

	Few local financial institutions are currently engaged in financing renewable energy projects.	
		Water challenge: At the global level, concern over water use, treatment, and pollution in hydraulic fracking operations caused widespread controversy.
		Possible environmental risks: environmental concerns over its extraction include the production of huge amounts of wastewater and the potential to trigger earthquakes.
		Funding challenge: might it will call for IOCs with capital and know-how to develop its shale gas.
Opportunities	Decreasing prices of renewable energy technologies could add recognized capacities each year.	
	Use Photovoltaic systems to power streets, advertising and remote areas.	
	Create new investment opportunities and partnerships with international institutions and companies	Attraction of foreign investments.
	Increasing the awareness of RE in society and policy makers.	
	Provide electricity to off-grid regions In remote desert places.	Meet the local demand for natural gas.
		The large shale potential may become an increasingly important component of the country's gas exports to Europe in the future (Nahkle, 2015).
		Could bring a new income stream and facilitate economic growth.
	Create new job opportunities.	Create new job opportunities.
Threats	The institutions that implement the renewable energy program are institutions working in the field of traditional energy (Sonatrach and Sonelgaz).	
	Social unrest: In January 2015, demonstrations broke out in the main square of Ain Salah, and spread in a three month to other towns in the area, including Tamanrasset, Adrar, and Ouargla (Boersma, Vandendriessche, & Leber, 2015).	
	The decay in oil prices and its impact on the competitiveness of renewable energy	
	The discovery of new sources of energy that could threaten the future of renewable energy.	

Dispersion of R&D efforts.

Return to dependency on fossil energy again instead of diversifying the economy.

The negative impact on the national program to develop renewable energies.

VI - Conclusion:

In the last five years, it seems that the Algerian decision-maker in the energy sector has become dispersed between going to exploit renewable energies with the speed and the required method, or towards exploiting the shale gas in which he has sufficient experience in and ready infrastructure. The issue is not to choose either the RE or Shale Gas, as each source has potential opportunities and challenges.

This paper revealed that each of the renewable energies and shale gas has enormous potential and also great challenges facing the process of their exploitation. Both sources are very important for the national economy in terms of increasing the country's revenues, securing the energy needed for different sectors, creating jobs, diversification of investments and technology transfer.

The energy transition and exploiting different types of energy sources (conventional, unconventional, renewable energy) is no longer optional for Algeria, as the internal changes related to the decline in the national reserves of oil and gas and the increase in domestic demand for energy. As well as external variables, especially the global shift towards renewable energies, have pressed the Algerian decision-maker to respond to these changes. But it seems that what has been achieved so far in implementing renewable energy programs are very modest.

In the past few months, the government has taken some important measures to end the state of hesitation in choosing between energy sources, and to accelerate the implementation of the energy transition program, and this is through the following:

- ♦ Creation of a Ministry of Energy Transition and Renewable Energies: this is the first time there has been a ministry dedicated to promoting RE and ensuring the implementation of the energy transition program¹;
- ♦ Separating mines from the Ministry of Energy, this makes the efforts of the concerned ministry focus on the main activities in conventional and unconventional energy;
- ♦ The creation of the 'Commissariat' (commissionership) for Renewable Energies and Energy Efficiency² will make it possible to face the obstacles and difficulties hampering the implementation, on the ground, of the national program in this area;
- ♦ Creation of the National High School for Renewable Energies, Environment and Sustainable Development (June 2020), which is responsible for ensuring high training, scientific research and technological development in the fields and divisions of renewable energies, the environment and sustainable development, especially electrical engineering;
- ♦ The new Hydrocarbon law³ aims to make Algeria more competitive by easing taxes, simplifying license procedures and shortening the agreement timeframe;
- ♦ In February 2013, amendments to the 2005 Hydrocarbon Law were introduced with the aim of boosting exploration and development and exploiting non-conventional resources⁴.

Despite the controversy over shale gas exploitation, the official view is that environmental risks and societal concerns are exaggerated, due to the low risks of exploiting their unconventional energy resources on the environment, for several reasons including: the wells are distant from the urban population⁵ and the groundwater is distant from the geological resources of these sources.

1. Jun 23, 2020, <https://www.radioalgerie.dz/news/ar/article/20200623/195282.html>

2. Nov 15, 2019, <http://www.aps.dz/en/economy/31825-yassaa-installed-as-commissioner-for-renewable-energy>

3. Law No. 19-13 of 11 December 2019

4. Law No. 13-01 of 20 February 2013

5 President Abdelmadjid Tebboune' statement to the National Press on jan 22, 2020

-Appendices :

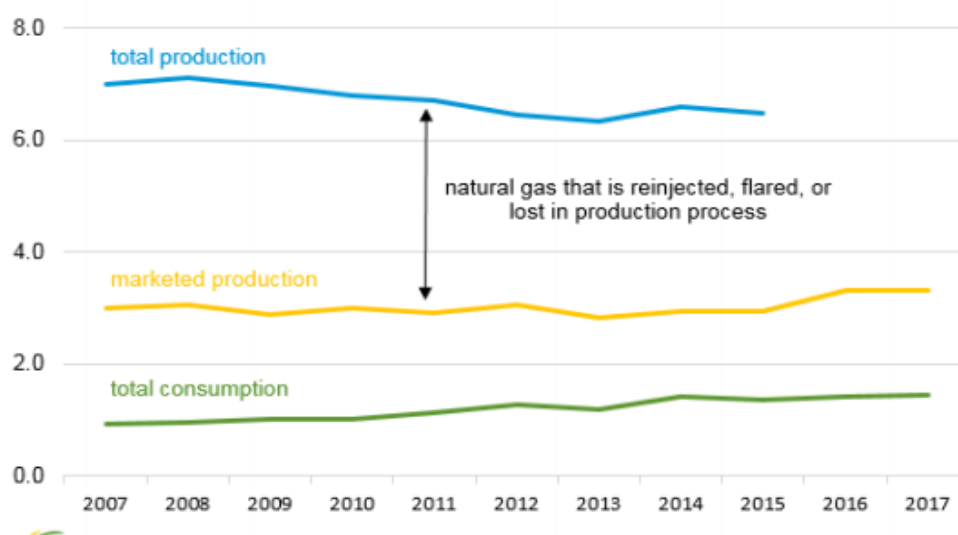
Table 1: top 10 countries with Technically Recoverable Shale gas

Rank	Country	Shale gas (trillion cubic feet)
1	China	1,115
2	Argentina	802
3	Algeria	707
4	U.S. ¹	665 (1,161)
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
World Total		7,299 (7,795)

¹ EIA estimates used for ranking order. ARI estimates in parentheses.

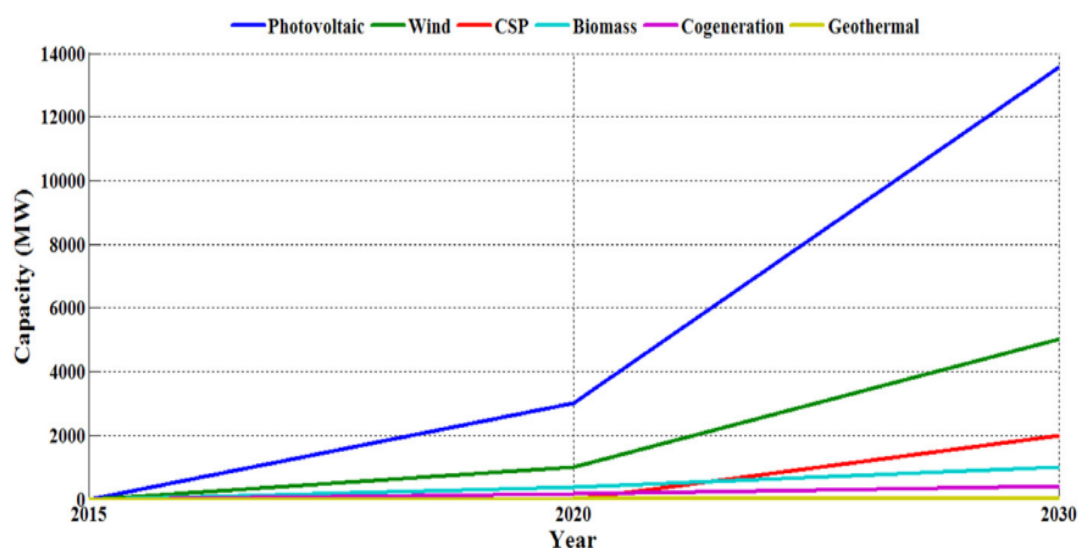
Source: Technically Recoverable Shale Oil and Shale Gas Resources, U.S. Energy Information Administration report. 2013, p:10

Figure-1: Natural gas production and consumption in Algeria (Trillion cubic feet)



Source: Cedigaz Statistical Database: U.S. Energy Information Administration

Figure-2: Installed RE capacity and RE targets for the electricity production of the Algerian national RE and energy efficiency program (2015–2030).



Source: Renewable Energy and Energy Efficiency Development Program, the Ministry of Energy

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