

## Islamic finance: A promising form of financing in infrastructure's projects

### A proposal for a solar energy station financed by islamic sukuk

**BENBEKHTI Seyf Eddine<sup>1</sup>, BOULILA Hadjer<sup>2</sup>, BOUTELDJA Abdelnacer<sup>3</sup>**

<sup>1</sup>University of AbouBekr Belkaid Tlemcen, ([bensifou3@gmail.com](mailto:bensifou3@gmail.com))

<sup>2</sup>University of AbouBekr Belkaid Tlemcen, ([b.hadjer94@gmail.com](mailto:b.hadjer94@gmail.com))

<sup>3</sup>University of AbouBekr Belkaid Tlemcen, ([bouteldja\\_nacer@yahoo.fr](mailto:bouteldja_nacer@yahoo.fr))

**Received:** 15/09/2018

**Accepted:** 08/12/2018

**Published:** 23/01/2019

#### **Abstract:**

The aim of this study is to highlight the effective role of Islamic Sukuk in financing infrastructure projects especially renewable energy projects, by examining the possibility of financing a “Solar Energy Station” in Algeria. The reason behind choosing this subject is the importance of renewable energy in the preservation of the environment and the climate on a hand, and in building a green economy from another hand. Thus, This project will take a place in the Algerian Sahara with a capacity of 4050 MW, and will be divided into four allocations. So, this paper will present a proposal for a solar farm at the Wilaya of Adrar with the capacity of 1350 MW financed with Islamic Sukuk.

As a result, the Algerian enormous potential for renewable energy and the nature of the Algerian community that believe in Shariah-compliant, this project would be a successful alternative for gas and oil, especially after the recent oil crisis and would certainly reduce the pressure on government budget as well.

**Keywords:** Islamic sukuk, renewable energy, solar farm, infrastructure financing.

**JEL Classification:** E62, R42, H74, H76, G12

---

<sup>1</sup> **Corresponding author:** Benbekhti Seyf Eddine, **e-mail:** [bensifou3@gmail.com](mailto:bensifou3@gmail.com).

ملخص:

تهدف هذه الدراسة إلى تسليط الضوء على الدور الفعال للصكوك الإسلامية في تمويل مشاريع البنية التحتية وخاصة مشاريع الطاقة المتجددة، وذلك من خلال دراسة إمكانية تمويل "محطة للطاقة الشمسية" في الجزائر. السبب وراء اختيار هذا الموضوع هو أهمية الطاقة المتجددة في الحفاظ على البيئة والمناخ من جهة، وفي بناء الاقتصاد الأخضر من جهة أخرى، وسيأخذ هذا المشروع مكاناً في الصحراء الجزائرية بسعة 4050 ميغاوات، وسيتم تقسيمه إلى أربعة حصص. وبالتالي سنقدم من خلال هذه الورقة اقتراحاً لمحطة للطاقة الشمسية في ولاية أدرار بسعة 1350 ميغا واط بتمويل من خلال الصكوك الإسلامية. ونتيجة لذلك، فإن القدرة الجزائرية الهائلة على الطاقة المتجددة وطابع المجتمع الجزائري الإسلامي الذي يؤمن المعاملات المالية الموافقة للشريعة الإسلامية، هذا المشروع سيكون بديلاً ناجحاً للغاز والنفط، خصوصاً بعد أزمة النفط الأخيرة وبالتأكيد سيقبل من الضغط على ميزانية الحكومة كذلك.

**كلمات مفتاحية:** الصكوك الإسلامية، الطاقات المتجددة، محطة الطاقة الشمسية، تمويل البنية التحتية

## Introduction:

Islamic finance became more popular and widely used especially after the global financial crisis (2008), where it turns out to be one of the most important financial instruments in the world in both Muslim and non-Muslim countries, due to its advantages “Flexible, easy to issue and trade, low risk” that are suitable for investors, businessmen and governments.

Therefore, Islamic Sukuk recently contributed in financing many infrastructure and public projects –which is considered as the backbone and the lifeline of all economic (Handayani, 2017, p. 116), social and environmental activities – without any burden on the government budget. It also became often used in the repayment of the federal and the public debt and in covering the government deficit.

However, Due to the big importance of the infrastructures and renewable energy projects, as a pillar of the development of any economy, and because of the lack of funding resources, several case studies have been

put forward to analyze and sometime propose initiatives and models of financing these projects. Starting with (Bobinaite, 2014, p. 260) who discussed the cost and the financing aspect of community renewable energy “solar and wind energy” through tax and feed-in-tariffs in Denmark, where they showed that PV projects have several advantages then wind energy. and according to (Tabet, 2017, p. 14) renewable energy initiatives have also been taken by developing economies. Some of which have taken noticeable efforts towards solar initiatives summarized as follow: Revolving Fund and Senior Debt in Thailand, credit line for subordinated debt in Macedonia, Contingent project development grants in Philippine. Finally, (Tabet, 2017), (Hafez, 2017) and (Ghoddusi, 2015) have focused on the mechanism of financing solar farms and solar rooftops using Islamic Sukuk, also called green sukuk.

Consequently, this paper is the first initiative in Algeria which aims to present a proposal for financing an Algerian Solar Energy Station project by Islamic sukuk, using a descriptive and analytical approach. This approach is based on the collection of data from the Ministry of Energy and Mines, the data analysis and its interpretation to achieve a potential structure, a plan and a schedule for the full framework for the Islamic financing from the beginning to the end of the project.

- **One sentence question:**

In the light of what have been discussed, this study aims to answer the following question: *How can the Islamic financial industry (through Islamic Sukuk) contribute to the growth of the Algerian economy - if implemented - by financing a solar energy station?*

- **Hypothesis:**

- ✓ Islamic finance is an effective financial solution to solve the government budget problems;
- ✓ Islamic finance is efficient in financing renewable energy projects and as a conclusion it helps to achieve sustainable development.

## 1- Sukuk and scope of understanding:

### 1.1- meaning:

Sukūk (plural of sakk), frequently referred to as “Islamic Bonds”, are certificates each of which represents the holder’s proportional undivided ownership right in tangible assets, or pool of predominantly tangible assets, or a business venture(IFSB, 2009).

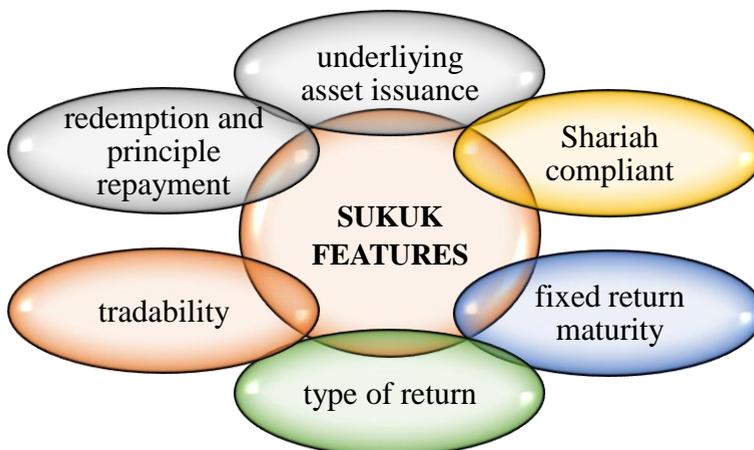
These Islamic Sukuk are derived into: Mudarabah, Musharakah, Ijara, murabaha, Istisnaa, Ijarah, Wakalah, Al musaqa and hyprid sukuk (AAOIFI, 2016).

### 1.2- features:

Sukuk gain their features from the adoption of the principles of Islamic law, *Shariahin* all Sukuk functions and transactions.(Afshar, 2013) described these features as freedom from *Shariah* prohibitions, such as those involved with interest (*Riba*), *Gharar* and harmful activities e.g. beverages, pork, prohibited drugs, gambling, pornography and weapons.

Broadly, the Sukuk features have six categories, as shown in the figure below:

**Figure.1** The features of Islamic sukuk



Source: by the authors

According to Mohammed (Alswaidan, 2017, p. 55) these features are:

- **Underlying asset backing.** This is one of the main differences between Sukuk and conventional bonds, and serves to secure the role of Islamic finance in servicing the financial needs of the real economy.
- **Shariah compliance.** This has made Sukuk widely accepted among Muslim investors around the world, which convince them that all financial operations are “Halal” and fit the Islamic principles and law.
- **Fixed term maturity.** This estimates the expected return within a specific period, and is particularly suited for the role of Sukuk in project financing.
- **Type of return.** Sukuk are classified as a long term investment with fixed return but due to their profit and loss sharing policy, they have flexible returns based on the profitability generated from the attached asset of the Sukuk. In addition, risk and return in Sukuk is customized based on Sukuk structures, since Sukuk have a different risk profile depending on their structures.
- **Tradability.** Sukuk are also tradable throughout the stock market like conventional bonds. However, this depends on the type of Sukuk.
- **Redemption and principal repayment.** Sukuk have greater security in due to being always attached to an asset.

### 1.3- **Sukuk El Musharakah** (the proposed sukuk for financing the solar farm)

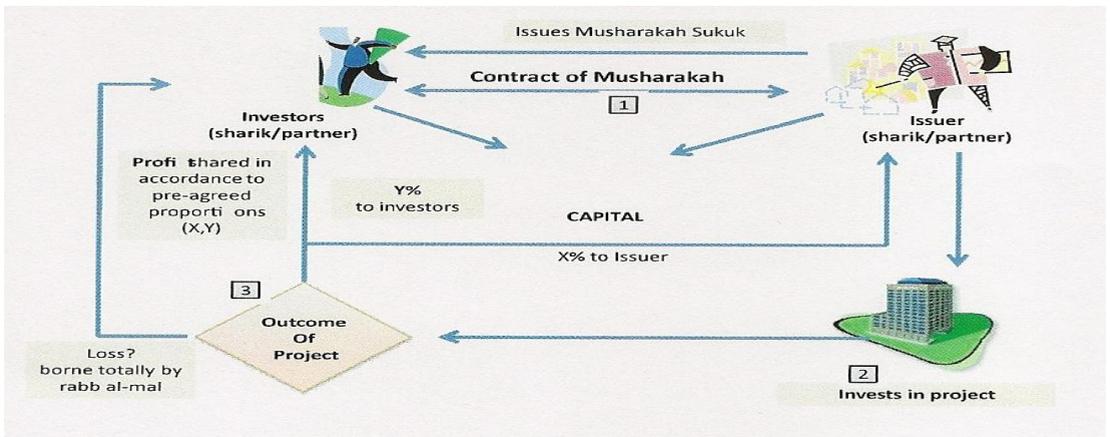
According to (Yusoff, 2005, p. 34) Sukuk Al-Musharakah are documents of equal value issued with aims of using mobilized funds for establishing a new project or improve and developing an existing one or financing a business activity on the basis of one of the partnership contracts. The certificates holders become the owners of the project or the asset of the activity as per their respective shares. This Musharakah certificates can be treated as negotiable instruments and can be bought and sold in the secondary market (Abdullah, 2014, p. 918). In addition, Musharaka sukuk are divided into two types: **Shirkah al-milk** (co-ownership) and **Shirkahal’aqd** (contractual partnership where two or more persons may continue to carry on business on the condition that capital and profit will be

shared among them.)

- **Sukuk El Musharakah structure**

In sukuk el Musharakah the issuer and investors will both contribute to the capital of the project. This project is managed generally by the issuer and sometimes by a third party. Otherwise, the transactions can also be structured with all investors contributing capital in this project and the issuer pointing the issuer as their representative to manage the musharakah. However, this partnership can also be classified as an investment agency sukuk Figure 03 will explain briefly how Sukuk Musharakah works.

**Figure 3.** Sukuk el Musharakah structure.



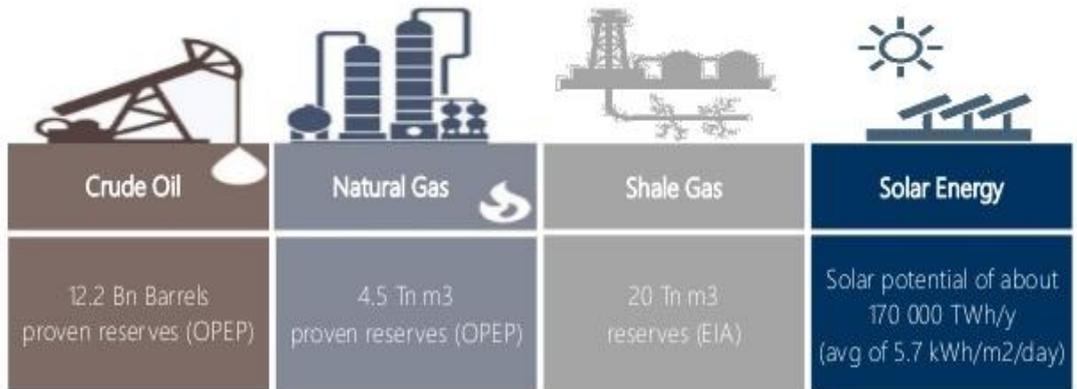
Source: NEWHORIZAN- global perspective on Islamic banking and insurance (2015)

## 2- The solar energy in Algeria:

### 2.1- Solar energy potential in Algeria:

Algeria is a leader in the world of energy and in energy markets. It is the largest natural gas producer in Africa and has the third largest oil reserves in Africa. Natural Gas in Algeria provides 95% of the power generated. Gas make less than 40% if export earnings and crude and refined oil make 55.5% amounting to over 95% of export earnings and over 30% of the country’s GDP (EIA. 2016).

**Figure 4.** Algeria energy resources

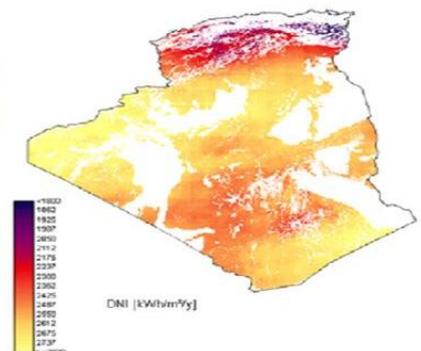


**Source:** Algeria-UK Investment Forum (May 2016)

In addition, a study conducted by the German space agency showed that the Algerian desert is the largest reservoir of solar energy in the world. Other studies show that six hours of the desert sun over half a million square kilometers, is enough to store electricity for the consumption of families in the European Union For a full year. (Energy, 2016). Additionally to another study, which indicates that the South of Algeria is capable of providing energy for all countries over the world according to the standard of “energy security”, up to 4 times.

**Figure 5.** Renewable energy potential in Algeria (by region).

Regions	Coastal	highlands	Sahara
Area (%)	4	10	86
Average duration of sunshine (hours / year)	2650	3000	3500
Average energy received (kWh/m2/year)	1700	1900	2650

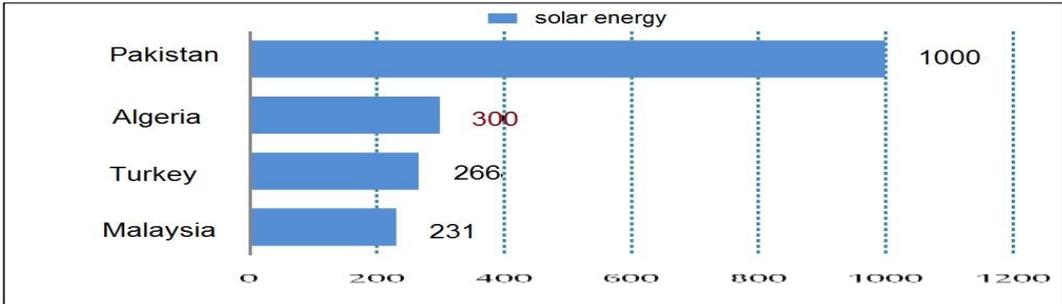


**Source:** Arab union of electricity.

**2.2- Solar energy production and private sector initiatives:**

Algeria first introduced solar energy, in 1988, into the Southern project. Algeria started preparing larger cities, like Skikda and Oran, with the adequate equipment to improve the potential of solar energy as all (Hadji, 2016 May, p. 19).

**Figure 6.** The generation of electricity from insolation.



**Source:** by the authors

From figure 05 we can notice that Algeria has generated electricity in 2015 for about 300 MW as it occupied the second rank after the State of Pakistan, whose capacity to generate electricity from solar energy is 1000 MW. Which means that Algeria’s electricity production by solar technology is still very small? This has led researchers to call Algeria a sleeping giant of solar energy, while many foreign investors have expressed their desire to invest in Algeria in this field.

Moreover, According to the minister of energy and mines “Mr. Qaitouni”, about 400 MWh of electricity have been completed through renewable energies, stressing that the renewable power stations, which currently exist in 22 states, operate with Algerian expertise. The minister added that SONATRACH is contributing to this ambitious program at the level of the industrial sites of the hydrocarbons sector which will provide the country about \$ 2 billion by 2040 and a capacity of solar energy up to 1.3 GW to cover 80% of the needs of oil sites.

**Table 3.** The Algerian energy market.

The company	Year	Features
<b>DESRTEC</b> German company	2011 (collaboration with Sonalgaz)	The collaboration aimed at generating 100GW by 2050 at a cost of about US \$ 424.5 billion (€400 billion). The project was thoroughly studied and planned, and various connections were established between Algeria and European countries including Spain and Italy. However, by mid-2015, the project was abandoned.
<b>CONDOR</b>	2014	- The company completed its 950 million Algeria Dinar (US \$8.62 million) worth of solar PV factory with the capacity of 50 MW per year. - By the end of 2015, the company signed the first Private IPP Solar PV project in the country, with a 2 MW PV solar farm that is yet to be developed (PVTech, 13th October 2015).
<b>Renewable Energy Partner (REP)</b>	2013	- The company has established two projects of total 50MW by 2016, aiming at installing 200MW in the next five years (The National, 19th March 2016). Similar to Condor, REP has not provided details about its financing.

Source: by the authors from Tabet (2017)

### 3- Islamic sukuk funding proposal to a solar farm in Algeria :

Islamic sukuk used in funding investments in infrastructure will lead to the activation of the partnership between the public and private sectors (PPP) as governments seek to adopt partnership systems in which all sectors of society contribute to the direction, management and operation of projects and business development (Ismail, 2013, p. 10). Thus, in this proposal, we seek to suggest an initiative to finance a solar farm in Algeria depending on Sukuk el Musharaka.

### **3.1- The presentation of the solar farm project in Algeria and its compatibility with Islamic Finance:**

- **The Identification of the region and its economic features:**

The solar farm will take place at the Wilaya of Adrar, which is located in the south-west of Algeria. It has an area of 44,372 km. The reason behind choosing this region is due to its economic resources. It is considered the largest agricultural source in Algeria (agence national de développement l'investissement, 2013). In addition, Algeria has launched huge projects in Adrar, including the construction of the first petrochemical station in the continent and 8 glass factories without forgetting its charming tourist elements all this will lead to rapid demand on electricity.

Finally, this Wilaya has recently reinforced several energy projects, with three new power stations with a total capacity of 33 MW, led by Algeria's largest power plant with a capacity of 20 MW and costing the state treasury 38 billion DZD.

- **Parties to the process of sukuk issuance:**

It is divided into two parties as follow:

**a- The original parties which are directly involved in the process of the sukuk issuance, and include:**

❖ **The Originator or Founder of the Sukuk:**

The originator: is the owner of the assets that sukuk will be issued on their base, which aims to acquire liquidity to be used to finance its various activities through the collection of its own assets under the regulations of the securities' commission. In addition, the originator may be a company, an individual or a government, a central bank, a business, a finance company, a real estate company, an airline, etc., whether from the private, public or charitable sectors (Tabet, 2017, p. 86). However, in the proposal we choose **Condor** in the production of electric power from the solar panels, where the director of the institution Boudrbala Mouloud said that the complex of Condor has reached an advanced stage of investment in the production of solar energy using solar panels and assumed a relationship between the electricity company (Sonatrach) and Condor Complex. This

will give it the responsibility to set up a SPV based on trust between the partners, through which the liquidity and cash flows of the project will pass through, so that they will be assembled and directed according to the agreement.

**Special purpose vehicle (SPV):** the SPV is considered to assume legal ownership) of the underlying asset used in sukuk or securitization for the benefit of the beneficiary (whose interest or right is recognized by the court of equity). And as such a split is thereby caused to the concept of ownership as a result of which the beneficiary is not empowered to take or assumed all rights as an established owner of the asset as is required by Shariah law (Islamic law of finance, 2011). **SPV** then, have the role of Issuing or securitizing instruments through the purchase of sukuk assets from the issuing company to carry out the issuance process (structured securitization), or the issuing agent of the company established on the basis of the agency contract to invest simple securitization (Feng, 2009, p. 1112).

**Sukuk holders/ Investors:** are the entity that wishes to buy the Sukuk offered for subscription with a view to redemption of its principal, in addition to obtaining the proceeds from these Sukuk after the end of the investment activity. Sukuk holders may be conventional or Islamic banks, local or global financial institutions, governments, individuals, etc. The institution may have an untapped liquidity that it wishes to invest in legitimate financing instruments where investors acquire solar systems by owning sukuk and receive an agreed percentage of profits and the value of sukuk at the maturity of Islamic sukuk (Afshar, 2013, p. 50).

**Government:** The Sonatrach Corporation is the government and public sector entity of the proposed project. This institution provides the land to the developer (Condor) and we propose through this model the sharing of production costs. This method reduces the initial investment capital while preserving land ownership. The Sonatrach will receive the agreed profit rate not to enter Sunlagaz's treasury but will be allocated for the purchase of assets (solar panels on sukuk holders). As Sukuk maturity, the ownership of the solar panels will be transferred to Sunlagaz. To pay for SPV, the country is estimated to have the government's FiT tariff of \$ 0.16

(PVMagazine, 2014) with the state providing additional guarantee and support for this model through the development of a legal system to protect sukuk owners.

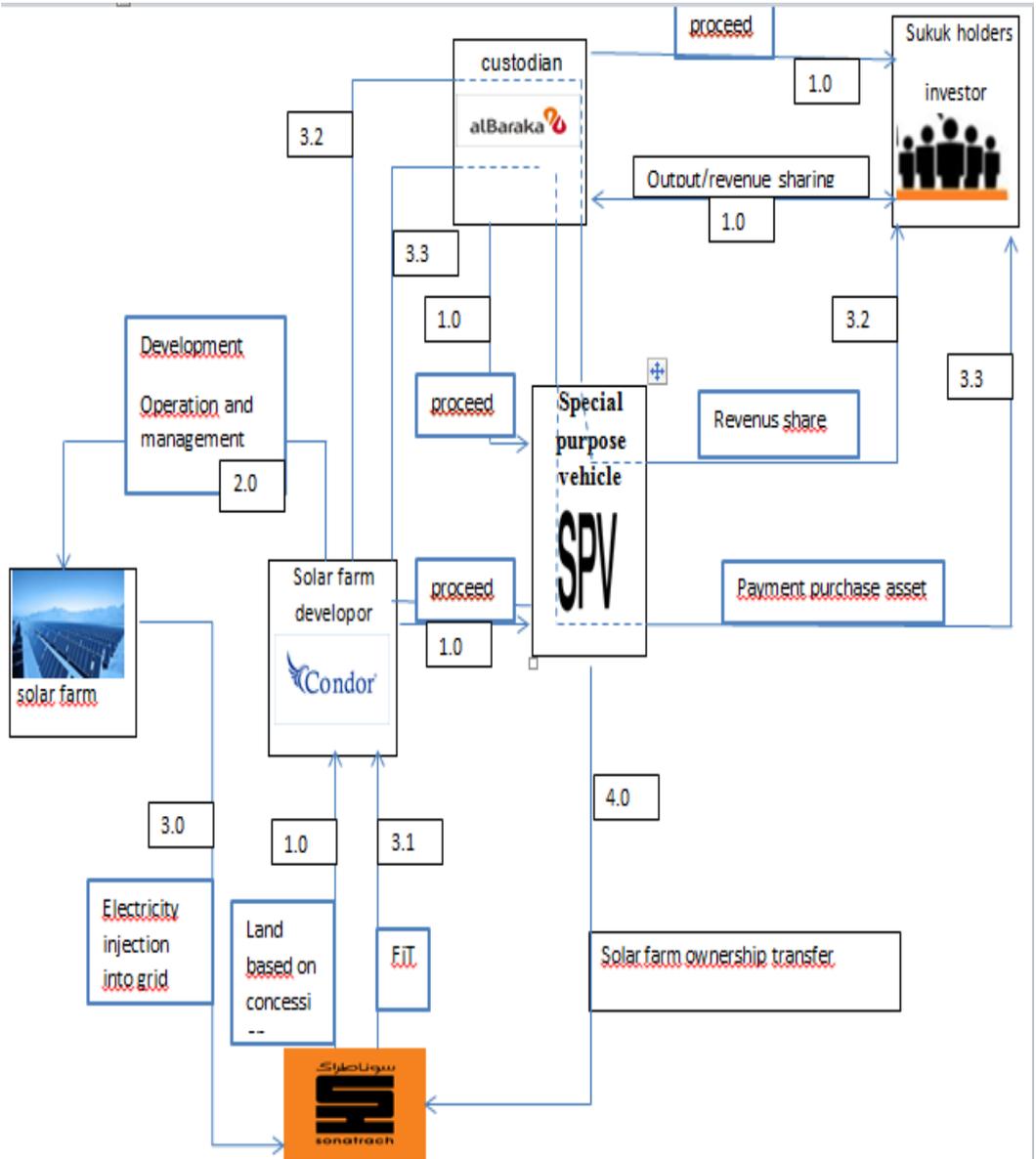
b- **The assistant parties of the sukuk issuance:** It is agreed with them to perform special services for the process of issuance.

- **The trustee/ registrar:** is an intermediary whose mission is to protect the interests of the Sukuk holders, and to supervise the developer and its compliance with the conditions governing this process according to the Prospectus. It also maintains documents and guarantees. The presence of the trustee may be associated with the first arrangements for the Sukuk, and may be determined by the prospectus, and terminated by the return of the sukuk holders.
- **The Shari'a Supervisory Board:** it is one of the most important parties which assist in the process of securitization, in view of the role it plays in controlling the process of securitization, giving the issued instruments a legal form. in addition to its role in observing and providing the requirements of the Shariah provisions in studying the structure of the issue and its documents, the contracts regulating the relations between the parties. The Supervisory Board shall review all the activities and processes to be entered into, in order to determine the legality of the legalization process
- **Global rating agencies or Credit Rating Agency:**  
The laws which organize the process of sukuk issuance require that the assets must take a credit rating certificate by specialized international companies. This function is to determine the ability of the company to fulfill its obligations towards the sukuk holders, the creditworthiness of the issuances offered, the guarantees and determination of the fair price, As well as to evaluate the efficiency, credibility and credibility of the issuer in the activity of participation, and to protect the sukuk holders. Standard and Poor's, Fitch, Moody's and Islamic rating agencies are currently offering Islamic Quality Rating Service (IIRA)

in Bahrain and the Malaysian Classification Agency (RAM) to provide the international characterization of Sukuk, International markets.

- **Investment Manager:** Investment Manager, is appointed by the issuer or the issuing manager, and is advertised in the prospectus
- **Issuance Agent:** Represents the Issuer in the Release and takes the necessary action from Payment of amortization installments and accrued returns and announced in the prospectus
- **Issuance Manager:** The entity that handles the rights of sukuk holders and the supervision of the execution of the issue for a specific fee, and is announced in the prospectus.
- **Underwriters:** Under the prospectus, he undertakes to subscribe the unsubscribed sukuk and pay the rights of sukuk holders after they have been collected. This is very important for the model because the sukuk should be attractive in the market. It is advisable to be a Shariah-compliant financial institution, considering the nature of Algerian investors who avoid riba-based banks and the importance of buying unsold bonds in order to provide the developer of the solar power station with sufficient funds to complete the project.

**Figure 7.** Solar Output Sharing Sukuk flow



**Source:** by the authors

**Table 4.** Proposed Model Mechanism

<b>1.0</b>	<b>The land was given by the sonatrach to the développeur "condor" to take a place for the solar farm and produce energy.</b>
<b>1.0 Flow of proceeds and Solar Output Sharing Sukuk issuance.</b>	Making and explaining the contact between the participating parties in the issuance structure and the project of the solar energy which are sonatrach (government), the developer (condor as à Private). In addition, it clarify the obtained percentages of revenue for each partner. Where the custodian and the SVP will issue sukuk and buy it to the investors (sukuk holders) who will own the PV, And than the revenues will be converted to the developer to set the solar farm in.
<b>2.0 solarfarm construction</b>	When the developer will get the needed Money to put up the solar farm, it starts in pursuing the project which needs about 12 year of maintenance
<b>3.0 - 3.1 -3.3 Distribution of revenue to Sukuk holders:</b>	<b>Once production starts and electricity is passed on to the grid, Sonelgaz (the energy buyer/payer) starts paying the amounts due from the solar energy produced/sold (on pre-contracted FiT basis) to the developer.</b>
<b>4.0 Transfer of Solar farm Property to Sonatrach</b>	Amortization of the Sukuk and transfer of ownership of the solar panels is the last step of this process. Upon maturity of Sukuk the ownership of the solar panels is passed on to the government as represented by Sonatrach.

**Source:** by the authors

#### ***4.2- Calculating installments, amortization schedule and Sukuk return distribution***

In this proposed project, we will follow the approach adopted by tabet 2017, where we will assume through this model the participation of the public sector (Sonatrach), the private sector (condor complex) and sukuk holders (owners of solar panels) according to the following ratios: 40%, 9% 51%, respectively. In addition, the project needs to be built in a period from

one to three years. Nevertheless, in this proposal, and to simplify the idea we will assume that the production of solar energy will begin immediately in the first year of installation, and determine the quality of the instruments used in the project. That means that Sonatrach will own the project at the end of the Sukuk maturity and the N period proposed is 12 years old.

Sonatrach will play two roles in the project as a partner granting the land to the developer and as a purchaser of solar energy. Where, Sonatrach will buy all the energy produced and pay it through the feed in Tarif, which the government intends to issue at 0.16 usd / kwh. The sum will be paid to the developer through a SVP company who would distribute this value according to the agreed percentages. Whereby 9% will be paid to the developer (Condor), 51% will be distributed as return to the sukuk holders and 40% to Sonatrach not to its treasury but will be used to buy solar panels from sukuk holders Periodic payments.

In order to provide some data on the installation of a solar power plant, we have collected information from articles in specialized fields of renewable energy, Internet sites, the Renewable Energy Fund site in Algeria and the economic feasibility of some similar projects in foreign countries.

The main components and features of our proposed project are:

- 1 - The period of amortization of the Islamic Sukuk and its maturity is of 12 years, while the life of the solar energy farm is up to 30 years;
- 2 – the Solar farm capacity is about 1350 MW, and will require 3857143 solar panel, where we will use the solar panels with a capacity of 350 w/PV;
- 3 - The cost of setting up a solar Farm with a capacity of 100 MW is about 211 million dollars (pv magazine, 2018), so the cost the solar farm with the capacity of 1350 mw, that Algeria intends to launch will cost about 2848500000 USD;
- 4 -The benchmark of solar farms area needed is 3 Acres per MW (Ong, Campbell et al. 2013), The solar farm needs the capacity of energy to a large area, up to 4050 acres;
- 5 - Production of a solar panel of 350W is about 670kw / h (pwwatts, 2018)

and by multiplying this value in the number of solar panels we get the total capacity of the solar power station and about 2584285810 kw / h during the year;

6 - The FiT which Sonatrach would pay is an average of US \$ 0.16 / kWh is assumed fixed throughout the period (PVMagazine, 2014). This gives a gross revenue of \$ 376272013.9.

**Table 5.** Model Cash Flows Estimation (US/\$)

	1	2	3	4	5	6	7	8	9	10	11	12	total
<b>Investements<uluk< b=""></uluk<></b>	2848500000												2848500000
<b>Revenu</b>	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	413 485 729,60	4 961 828 755,20
<b>yearly payment to Sukuk holders</b>	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	376272013,9	451526467
<b>Share to Sukuk holders (51%) of gross revenue</b>	210 877 722,10	199300121,7	194338292,9	17798863,7	161259434,5	144720005,4	128180576,2	111641147	95 101 717,81	78562288,62	62022859,44	45483430,26	1 609 286 459,60
<b>Part of share to Sonelgaz 40% (paid to Sukuk holders for asset buying)</b>	165 394 291,84	176971892,3	181933721	198473150,2	215012579,4	231552008,6	248091437,8	264630866,9	281 170 296,13	297709725,3	314249154,5	330788583,7	2 905 977 707,63
<b>Share to developer 09%</b>	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	37213715,66	446564588

Source: by the authors

The results in Table 05 are calculated as follow: revenues were divided into percentages and only 51% will go to the sukuk holders as their return, the Rate of Return of Sukuk holders is computed by the following formula:

$$r = 0.51 * \text{energy produced} * \text{KWh price at the grid}/\text{initial investment}$$

$$r = 0.51 * 2584285810 * 0.16 \$ / 2848500000$$

$$r=0.074 \quad r = 7.4 \%$$

In addition, table 05 shows the ratio of annual flows, the distribution of Sukuk yield and the purchase of Sonatrach solar panels from sukuk holders. It is worth mentioning here that the amount of money that Sonatrach will use to purchase the panels will be added to his return each year in the purchase of solar panels, and thus the process will continue to the end of the sukuk maturity period and extinguish it. Sonatrach will finally be the owner of the project, where it can enter into a new contract as the owner of the project with the developer for the maintenance of the solar system.

**Table 6.**Sukuk holders’ revenue and sale/purchase Schedule of PV Solar Panels to sonatrach

	payment	Value of Solarasset	Revenue Share	Price of Panels Sold	end value
1	376272013,9	2848500000	210 877 722,10	165 394 291,84	2683105708
2	376272013,9	2 683 105 708,16	199300121,7	176971892,3	2506133816
3	376272013,9	2 506 133 815,89	194338292,9	181933721	2324200095
4	376272013,9	2 324 200 094,87	177798863,7	198473150,2	2125726945
5	376272013,9	2 125 726 944,66	161259434,5	215012579,4	1910714365
6	376272013,9	1 910 714 365,27	144720005,4	231552008,6	1679162357
7	376272013,9	1 679 162 356,69	128180576,2	248091437,8	1431070919
8	376272013,9	1 431 070 918,93	111641147	264630866,9	1166440052
9	376272013,9	1 166 440 051,99	95101717,81	281170296,1	868730326,7
10	376272013,9	868 730 326,68	78562288,62	297709725,3	571020601,4
11	376272013,9	571 020 601,36	62022859,44	314249154,5	330788583,7
12	376272013,9	330 788 583,68	45483430,26	330788583,7	0

**Source:** by the authors

An important point to note is Investors' capital redemption. Since there will be a transfer of ownership at maturity to sonatrach, it would take its share of revenue as payment to Sukuk holders for purchasing their share in the solar farm.

### **Conclusion and policy implications**

The world has recently known a strategic shift in energy from sources to the adoption of renewable energy. This puts Algeria in front of the inevitability of preparing for the possible alternatives for the post-oil period. Where, the interest in renewable energy is for its importance in preserving the environment and the climate. However, the government is struggling with the funding problem that could be fixed by the exploitation of Islamic finance through Islamic sukuk, which has great potential to finance renewable energy projects in Algeria.

This is because the benefits of Islamic sukuk, the features of these kind of projects as the low costs due to the development of the field of energy and renewable. In addition, the returns of this investment are fixed as energy prices are stable and not affected by the fluctuations of international markets. All this made us believe that Algeria is a sleeping giant in the field of renewable energies and Islamic Banking. If there is political will, Algeria will soon become the capital of renewable energy and a global Islamic financial center.

### **Results and recommendations**

#### **• Results:**

- 1 - Achieving a project of this size and similar projects in renewable energy can increase the Algerian economic performance and reduce the pressure on the electricity companies in Algeria.
- 2 – This project will maintain jobs in the installation and maintenance of the solar farm, the isolation of desert villages and achieve comprehensive local development in the desert of Algeria, where 86% as the energy engine for all industries and projects.
- 3- Islamic finance is the most important alternative to traditional financing in covering the budget deficit and reducing the deficit gap in

Algeria. It will also contribute to the investment of funds outside the banking system, estimated at billions of dollars due to fear of the interest system.

- 4- Islamic instruments are one of the tools of Islamic engineering and have great potential in building the infrastructure which is the backbone of the economy especially the sustainable energy projects.
- 5 - The contribution of all sectors of society from the public sector through private partnerships (ppp) in the direction, management, operation and development of projects by exploiting Algeria's enormous alternative energy potential.

- **Recommendations**

- 1- Encouraging investment in the renewable energy sector and taking advantage of the international expertise and experience in this field.
- 2 - Training competencies and frames in renewable energy technology and in the field of Islamic banking, which has made itself a name and position in the world as the fastest growing financial system in the world.
- 3 - The development of a framework and legal legislation that defines how and how to deal with instruments while providing security and protection to users of instruments.
- 4 - Exploitation of renewable energy as an alternative to the sector of oil and gas and the conversion of the desert of Algeria to the cities and villages of tourism and industrial exploitation of Islamic instruments in the construction of infrastructure, roads, airports, etc., to promote the Algerian economy.

**References:**

- Abdullah, A. A. (2014). Risk in funding infrastructure projects through sukuk or Islamic bonds. *International Review of Management and Business Research*, 3(2).

- Afshar, T. A. (2013). Compare and contrast Sukuk (Islamic Bonds) with conventional bonds, are they compatible? *Journal of Global Business Management*, 9(1), 44.
- Ahmed, E. R. (2014). Islamic sukuk: Pricing mechanism and rating. *Journal of Asian Scientific Research*, 4(11).
- Alswaidan, M. W. (2017). *An investigation of Sukuk structure risk*. Doctoral dissertation, University of Portsmouth.
- Bobinaite, V. &. (2014). Financing instruments and channels for the increasing production and consumption of renewable energy: Lithuanian case. *Renewable and Sustainable Energy Reviews*, 38.
- Energy, A. M. (2016, january). *Renewable energies and energy efficiency*. Consulté le 06 28, 2018, sur Algeria: Ministry of Energy: [http://www.energy.gov.dz/francais/uploads/2016/Projets\\_du\\_Secteur/Programme\\_En\\_R\\_2016/Plaquette\\_PNEREE\\_2016\\_En.pdf](http://www.energy.gov.dz/francais/uploads/2016/Projets_du_Secteur/Programme_En_R_2016/Plaquette_PNEREE_2016_En.pdf)."
- Feng, M. G. (2009). Special purpose vehicles: Empirical evidence on determinants and earnings management. *The Accounting Review*, 84(6).
- Ghoddusi, H. &. (2015). Islamic finance and the energy sector. Available at SSRN: <https://ssrn.com/abstract=2565812> or <http://dx.doi.org/10.2139/ssrn.2565812>.
- Hadji, L. (2016 May). How is 100% Renewable Energy Possible for Algeria by 2030? *global energy network institute*, PP 16-24.
- Hafez, A. Z.-M. (2017). Tilt and azimuth angles in solar energy applications. *Renewable and Sustainable Energy Reviews*, 77, 147-168.
- Handayani, D. &. (2017). Sukuk Negara as Financing Strategy for Renewable Energy Infrastructure: Case Study of Muara Laboh Geothermal Power Project. *International Journal of Energy Economics and Policy*, 7(4).
- IFSB. (2009). *CAPITAL ADEQUACY REQUIREMENTS FOR SUKŪK*, ISLAMIC FINANCIAL SERVICES BOARD.
- Ismail, A. G. (2013). *Public Private Partnerships: Lesson from Sukuk*. Saudi Arabia.

- Morea, D. &. (2017). An innovative model for the sustainability of investments in the wind energy sector: The use of green sukuk in an Italian case study. *International Journal of Energy Economics and Policy*, 7(2) 55-57.
- PVMagazine. (2014, April 29). *Algeria launches feed-in tariff*. Consulté le 06 15, 2018, sur pv magazine: [https://www.pv-magazine.com/2014/04/29/algeria-launches-feed-in-tariff\\_100014932/](https://www.pv-magazine.com/2014/04/29/algeria-launches-feed-in-tariff_100014932/)
- pvwatts. (2018). *SOLAR RESOURCE DATA*. Consulté le 06 15, 2018, sur pvwatts: <https://pvwatts.nrel.gov/pvwatts.php>
- Saripudin, K. N. (2012). Case study on Sukuk musharakah issued in Malaysia. *Middle-East Journal of Scientific Research*, 12(2).
- Sovacool, B. K. (2013). Expanding renewable energy access with pro-poor public private partnerships in the developing world. *Energy Strategy Reviews*, 1(3).
- Tabet, I. N. (2017). *Developing Islamic Financial Products for Financing Solar Energy with a Special Reference to Qatar and Algeria*. Qatar: Hamad Bin Khalifa University.
- Wilson, R. (2008). Innovation in the structuring of Islamic sukuk securities. *Humanomics*, 24(3).
- Yusoff, R. &. (2005). An econometric analysis of conventional and Islamic bank deposits in Malaysia. *Review of Islamic Economics*, 9(1).