



# JORDAN

## ENERGY PROJECTS



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## INTRODUCTION

Energy remains one of Jordan's top challenges. The Kingdom has almost no indigenous energy resources. It imports some 96% of the energy it consumes mostly at global market prices. Population increases, industrial development and a growing economy have also led to a rise in annual demand for power of around 5.5%-6.5%. This almost complete reliance on foreign oil imports consumes a significant amount of the country's GDP (about 18% in 2014).

Although Jordan had always relied on external sources to satisfy the majority of its energy needs, the unprecedented developments in the energy sector witnessed during the last decade have exposed the Kingdom's vulnerability to disruptions in energy supplies. This has been compounded by unfavourable regional conditions in terms of instability and insecurity, according to Oxford Business News.

Before 2003, Jordan used to rely overwhelmingly on oil imported from Iraq at discounted prices. Due to the war on Iraq that took place in 2003 and to the associated toppling of the Iraqi regime, Jordan had to resort elsewhere to meet its energy needs.

Two important developments took place at the time:

- The development of the National Energy Strategy, which aimed at utilising domestic sources of energy, and,
- The signing of a natural gas import agreement with Egypt to supply the country with an affordable source of energy, mainly for electricity generation, which entailed supplying Jordan with its needs to generate electricity and distribute it domestically at affordable prices.

The deal signed with Egypt provided Jordan with large quantities of natural gas at discounted prices. In 2010, more than 6 years after the signing of the agreement, natural gas imports, which generated 80 % of Jordan's electricity, began to decline drastically until they were almost completely halted in 2014 as a result of the continuous bombing of the Arab gas pipeline. All these factors left Jordan struggling to meet its energy requirements and forced it to turn to expensive oil imports.

Throughout the period between 2003 and 2010, Jordan did not take any concrete steps to implement any part of the National Energy Strategy. Rising energy prices had a double negative effect on the Jordanian economy. One major impact was on the public sector, while the second was on the private sector. This spurred the Kingdom to invest in alternative energy projects to quell the growing pressure on a national budget officials have called unsustainable. Consequently, the government made the sector on the top of its priorities by crafting a balanced

## **Jordan – Energy Projects - 2017**

program that encourages the development of cost-efficient renewable energy and fossil-fuel power projects. This energy policy is guided by several major strategic plans:

Jordan's Vision, 2025, the government's ambitious economic plan, pays close attention to the energy sector by seeking to raise the proportion of energy consumption met from local supplies from 2% to almost 40% within the next decade, particularly oil shale, encouraging energy conservation and awareness, generating electricity from nuclear energy, and promoting the development of renewable energy projects. The government also hopes to boost the share of renewables from 1.5% to 11% by 2025, while aiming to see nuclear power contribute 15% over the same period.

Moreover, the main guidelines included the implementation of a subsidy removal plan, eliminating all subsidies for oil products; the adoption of the country's first National Energy Efficiency Action Plan (NEEAP); the implementation of net-metering and wheeling schemes, and the formulation of minimum energy performance standards for household appliances.

Energy development is also guided by the Master Strategy of the Energy Sector of Jordan (National Energy Strategy) updated in 2007 to include renewable energy targets. Running until 2020, the plan forecasts \$18 billion of new private and public investment in domestic power projects to boost domestic energy generation to 40% by 2020. The plan is notable for its emphasis on private investment in the energy sector and includes a variety of incentives for potential investors, including a 100% exemption from income tax for 10 years.

This drive to bolster local energy production is now gaining pace as Jordan moves to forge new public and private partnerships for a number of wide-ranging projects that will help it diversify its power mix and help create a sustainable energy future.

## **WASTE TO ENERGY PROJECTS**

Waste-to-energy is getting increasing attention in Jordan because of the cheap and abundant availability of a wide range of biomass feedstock, including municipal solid waste, sewage, industrial waste, etc. In terms of quantity per capita and constituents, the waste generated in Jordan is comparable to most semi-industrialized nations (about 0.95 kg/day). The total generation of municipal waste in Jordan is estimated at 2 million tons per year.

Another major waste resource in Jordan is in the form of industrial organic waste from vegetable markets and slaughterhouses, agro-industries, olive mills, animal manure, etc.

### **GHABAWI LANDFILL GAZ TO ENERGY PROJECT**

**Client**

Greater Amman Municipality (GAM)

**Developer**

Unnamed Chinese Company

**Description**

Generation of electricity by burning methane from Al Ghabawi solid waste landfill, the first of its kind project in Jordan. The generated electricity will be used to power the landfill, while the remainder will be sent back to the national grid.

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**Financing**

\$13 million senior loan, to be co-financed by a \$5 million loan funded by the Green Energy Special Fund (“GESF”) administered by the European Bank.

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**Value**

\$30.2 million of which a \$10 million contribution from Greater Amman Municipality (GAM)

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**Status**

In progress on the projects’ second phase (the drilling of wells to collect methane). The facility will start burning methane by end 2017. GAM will soon begin implementing the third phase during which the municipality will install generators and integrated systems for generating electricity by burning methane.

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Upon completion of the 3<sup>rd</sup> phase, 5 MW per hour is expected to be generated by late 2018.

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**Comments**

Stretching over 3000 m<sup>2</sup>, the landfill serves the capital and central region where 2.800 tons of municipal waste is dumped every day.

**IRBID WASTE TO ENERGY PROJECT**

**Client**

Ministry of Energy and Mineral Resources (MEMR)

**Description**

To carry out a waste-to-energy project in Irbid Governorate under a Build, Own, Operate and Transfer basis. The plant will be located near Al Ekaider landfill and will have a capacity of 1000 tons per day.

The initial facility would consist of two incineration trains with an option to add a third train at a later stage, depending on the developments in the waste sector, including any changes in the volumes and composition of waste.

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**Financing**

Unknown

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**Value**

Unknown

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**Status**

The Ministry has invited expression of interest to carry out the project. The last date for EOI documents submission was June 20 2017.

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**Comments**

The district of Irbid currently receives 1,250 tons per day of municipal solid waste.

The project company will operate the facility for 25 years.

## OIL SHALE PROJECTS

Oil shale deposits in Jordan underlie more than 60% of the Kingdom's territory and are estimated at 70 billion tons; which would make Jordan the 4th richest country in the world in terms of oil shale deposits. The most significant deposits are located in west-central Jordan. Jordanian oil shale is considered to be of very high quality. The majority of the deposits are believed to be shallow, making them suitable for open-cast mining.

The government has adopted a Commercial Legal Framework and an Environmental Legal Framework within the contracts with the investing companies to govern and control oil shale exploitation projects with the help of the relevant international consultancy firms.

It is currently adopting a three-track approach to handle oil shale resource exploitation which includes In Situ for the deep Oil Shale to produce oil, Surface Retorting for the mined Oil Shale to produce oil, and Direct Burning of Oil Shale for Electricity Generation.

### **OIL SHALE-FIRED POWER PLANT**

**Client**

Jordan's National Electric Power Company (NEPCO)

**Developer**

Attarat Power Co (APCO) – Affiliated to Estonian-owned Enefit

**Description**

Construction of a 554 MW (gross)/470 MW (net) oil shale fired mine mouth power station plant, 100 km south east of Amman, at the Attarat Um Ghudrun oil shale deposit.

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**Financing**

APCO has announced a financial closure (\$1.6 billion) for the construction of the plant with a consortium of Chinese banks

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**Value**

\$2.1 billion

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**Status**

Construction is slated to start soon with completion expected mid-2020. When completed, it will be one of the largest power plants in Jordan and the largest oil shale- fired power plant in the world after Enefit's power plant in Estonia.

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## **Jordan – Energy Projects - 2017**

### **Comments**

Jordan has signed 8 memoranda of understanding, in addition to several agreements, with companies to explore shale.

The project was initially agreed in 2014 but has faced delays and discord over the price proposed to sell electricity from the plant and connect it to the national grid.

China's Guangdong Power Engineering Corp will lead the engineering, procurement and construction of the plant under a turnkey contract. The firm has reached a 30 year power purchase agreement with NEPCO.

In 2010, Jordan Oil Shale Energy Company (JOSE), a former sister company of APCO, signed an Oil Shale Surface Retort Concession Agreement with the government of Jordan, giving it exploration and oil production rights for 40 years. JOSE recently relinquished approximately 31 km<sup>2</sup> of land to the government. This land has formed the basis of a lease from the government to APCO for the site on which the power station and the mine will be developed. The term of the lease is coterminous with the power purchase agreement with NEPCO.



## GREEN ENERGY PROJECTS

Jordan's green energy sector has witnessed great momentum in recent years, with about 1.335 MW of solar and wind projects currently being implemented. It has attracted world-renowned companies to invest in such projects in the Kingdom. Jordan ranks second in the region for creating a favorable environment for renewable energy and energy efficiency investments, surpassed only by Morocco in renewables and Tunisia in energy efficiency, according to local media reports.

These developments are in line with a national strategy aimed at raising the share of renewables in the energy mix to 10-11% by 2020, equivalent to a generating capacity of some 1.600 MW from renewables. The plan was recently updated, which reflects the success the government has had in implementing many of its parts. For example, original targets called for 600 MW of solar energy to come on line by 2020 but rapid progress in solar development has led local authorities to increase this target to 1000 MW. In that regard, some experts, including the Director of the renewable energy department of Ministry of Energy and Mineral Resources believe that the contribution of renewables might actually reach as high as 15 to 20%.

Jordan developed a legislative environment that attracts investment in the field of renewable energy mainly on solar and wind powers. These reforms enabled public and private institutions as well as households and trade and industry sectors to rely on renewable energy systems for their consumption needs and reduce their electricity bills.

A major turning point came in 2012 with the introduction of the Renewable Energy and Energy Efficiency Law, the first of its kind in the region, followed by amendments in 2014. With this law, "Direct Proposal Submission" of renewable energy projects to the Ministry of Energy and Mineral Resources (MEMR) was allowed, where investors, or developers, had the opportunity to develop renewable grid-connected electricity production projects and bypass a previously complex bidding process and negotiate directly with the Minister of Energy.

There are four paths for renewable projects in Jordan:

- The Direct Proposals Schemes carried out under rounds of competitive bidding through MEMR,
- The Competitive Bidding Process,
- EPC Turn-Key projects,
- Small-Scale Renewable Energy Schemes (net metering and wheeling).

## **Jordan – Energy Projects - 2017**

In 2014 and under the first round of tendering, the ministry signed 12 deals with private companies to generate 200 MW. Four more companies were selected in a second-round tender to develop 50 MW of solar capacity each. Also, Jordan's first utility-scale wind project of 117 MW, run by Jordan Wind Project Company, recently started operation in Tafileh and will account for some 5% of the country's electricity generation.

In this second round of national renewable energy Independent Power Producer (IPP) tenders, a consortium clinched a deal to provide a combined capacity of 200 MW in power plants and sell electricity at record low tariffs of around \$0.06 per kWh.

A total of 34 companies have recently qualified for the third round of Jordan's renewable energy projects which includes four solar and two wind projects. It is expected that prices are lower in this round than the previous two partly due to falling renewable energy technology costs. The companies were chosen from a list of 70 domestic and international firms that expressed an interest in the latest tender round.

Another major achievement central to the country's efforts, the Green Corridor, which will be established in the southern region of the Kingdom, is among major schemes aimed at increasing Jordan's ability to absorb the loads generated by new renewable energy capacity stemming from wind and solar. The upgrades involve the construction of two new transmission lines – a 400-KV, 150-km line and a 132-KV, 51-km line – as well as upgrades to three existing 132-KV lines stretching 100 km each. Furthermore, a new 1200-MVA electricity substation will be constructed in northern Ma'an, while the stations at Qatraneh and Queen Alia International Airport will also be expanded, according to Oxford Business News. The grid's capacity currently stands at 3,600 megawatts.

Meanwhile, smaller-scale solar electricity generation is also expanding at a rapid pace in Jordan. Following the 2012 Renewable Energy Law, households and businesses have been allowed to generate 100 % of their electricity consumption through their own solar panels and sell excess output back to the grid. This has led to the installation of around 25 MW of capacity over the last year. In addition, a vast window of opportunity to generate distributed electricity for individual, commercial or industrial use exists under the net-metering and/or the wheeling schemes.

The renewable energy contribution to the overall power generation is expected to reach 20% by 2020. It currently ranges from 3-4%. In fact, Jordan hopes and aims, with the multiple renewable energy projects underway, to generate about 20% of the Kingdom's power needs by 2020 and to become a net exporter of energy by 2030. It will also increase its solar energy target by more than 65% by 2020.

## **PV/ SOLAR/WHEELING PROJECTS**

The Green Corridor investments are specifically designed to reinforce the nation’s electricity network in the deserts in the center of the country, which are ideal for the use of solar generators.

Solar power is seen as a sustainable option for Jordan’s long-term energy security, as the country boasts about 330 sunny days per year.

The majority of the solar photovoltaic (PV) farms currently under construction, totaling around 200 MW, are located in and around the Ma’an region, whereas the majority of consumption stems from the capital Amman. Ma’an is close to the 52.5 MW solar PV Shams Ma’an power plant under construction. When completed later this year, it will be the largest solar PV facility in the country.

### **34 MW WHEELING SOLAR PROJECT**

#### **Developer**

The Project company to be owned by the Off Takers.

Alcazar Energy SPV will own the solar assets through an SPV and will lease them to the Project Company. Alcazar was formed in February 2014 as an independent developer and power producer focused on renewable energy across the Middle East, Turkey, and Africa region, with an emphasis on solar PV and onshore wind technologies. Alcazar’s sponsors comprise IFC, AMC (IFC’s Fund Management Business), Alcazar Renewable Energy, the renewable energy investment arm of Dubai-based Alcazar Capital, Mubadala Infrastructure Partners, and Dash Ventures, a Amman-based venture capital fund.

#### **Description**

Construction of a 34 MW PV plant to be located in the north of Jordan - Single axis tracking / polycrystalline technology - pursuant to the Wheeling Regulations in Jordan.

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#### **Financing**

Wheeling term sheet was entered with 4 of the largest banks in Jordan.

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#### **Value**

Unknown

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#### **Status**

Expected financial close: Q 3 2017  
The project is in the late development stage

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**Comments**

Jordan’s Wheeling program allows for offsite PV projects to supply electricity to the grid, with the kWh generated being deducted off of a business electricity bill.

The Wheeling program has opened up the market to larger size projects because most of the large commercial businesses are inside large vertical buildings in the cities, and therefore, there isn’t enough roof space to cover their energy needs.

Sustainability NGO EDAMA recently slammed a proposed increase in wheeling charges of up to 400 % as an unjustifiable move that aims to obstruct renewable energy projects. The government is currently considering hiking wheeling charges from 1.1 piasters to 4.5 piasters, in a move that some fear could dampen investment in the budding sector.

**AL SAFAWI SOLAR PV PROJECT**

**Client**

Ministry of Energy and Mineral Resources (MEMR)

**Developer**

Al Safawi for Green Energy PSC, incorporated in Jordan for the sole purpose of developing, constructing and operating the Project. The company is 70% owned by Abdul Latif Jameel Group (ALJ), through its holding of Fotowatio Renewable Ventures (FRV), and 30% owned by Arabia Trading & Consulting Company LTD (ATC).

**Description**

Construction of a 51 MW solar photovoltaic plant located in Safawi Area, 150 km east of Amman, Jordan.

The key components of the project are the power arrays which are composed of PV panels which convert solar energy into electricity. Throughout the site, the total number of PV Panels will be just over 201,000.

**Project Phases**

- Planning and construction Phase (February 2018 – November 2018): This phase includes preparation of a detailed design for the project, planning and transportation of the various project components to the site (e.g. PV modules), and onsite preparation activities for installation of the PV arrays and various other components. Site preparation activities could include excavations, grading, and land clearing activities.
  
- Operations Phase (2018 - approximately 2038): This phase involves operation and maintenance of the PV Power Arrays and all the various electrical equipment. This includes,

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for example, regular PV module cleaning to prevent dust build-up which could affect their performance. The operation phase also includes commissioning tests which involves standard electrical tests for electrical infrastructure as well as the panels, and inspection of routine civil engineering quality records.

- Decommissioning phase (to be determined): The lifetime of the PV plant is 20 years, after which the plant is decommissioned and the panels are dismantled.

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<b><u>Financing</u></b>	Up to \$70 million senior secured loan split equally between an European Bank for Reconstruction and Development (EBRD): A-loan and a Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO): B-loan
<b><u>Value</u></b>	\$93 million

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### **Comments**

The project is part of the government's second round of direct proposals for solar energy.

## **AL QUWEIRA SOLAR PLANT**

### **Client**

Ministry of Energy and Mineral Resources (MEMR)

### **Description**

The project involves the construction of a photovoltaic power plant with a capacity of 103 MW.

### **EPC Contractor**

Abu Dhabi-based Enviromena Power Systems with Spanish engineering firm TSK Group

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<b><u>Financing</u></b>	The project is being funded by MEMR through a grant from the Abu Dhabi Fund for Development
<b><u>Value</u></b>	\$128 million

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### **Comments**

The Quweira project was tendered separately and not together with the rest of the large-scale solar PV projects in Jordan's first or second round for PV plants. This is because the Quweira project is owned by the state, forming a separate form of remuneration scheme for PV plants in Jordan.

With the competitive biddings of the first and second rounds, Jordan’s government awarded projects that are solely owned by private investors. The Quweira project, though, is state-owned, suggesting a separate EPC scheme where the government awards the EPC contractor but then also owns the project. The rationale behind the EPC scheme is that these projects are funded through foreign donations, hence financing is considered to come via public money and, therefore, the tender of the project should not be left totally to the market.

## **SOUTH AMMAN SOLAR POWER PROJECT**

### **Client**

Ministry of Energy & Mineral Resources (MEMR)

### **Description**

Design, delivery, construction and commissioning of a PV power plant with a total capacity of at least 30 MWp with operation and maintenance for 3 years following commissioning at Al-Jizeh District, 8 km south of Queen Alia Airport in south Amman. The facility will be interconnected to the 33 KV substation to be built by NEPCO to connect the 132 kV transmission line to 1.5-2 km northwest of the location.

<b><u>Financing</u></b>	Grant from the KfW
<b><u>Value</u></b>	Unknown
<b><u>Status</u></b>	The tender was floated at the beginning of August The deadline for submission of bids is 4 September 2017.

## **200 MW BAYNOUNA SOLAR ENERGY PROJECT**

### **Client**

National Electric Power Company (NEPCO)

### **Developer**

Baynouna Solar Energy Company (BSEC), a wholly-owned subsidiary of Masdar, Abu Dhabi’s renewable energy company.

The project consists of a Power Purchase Agreement (PPA) between Masdar and National Electric Power Company;

**Description**

Located east of Amman, Baynouna is the largest single solar energy project currently under development in Jordan. The 200 MW photovoltaic facility will supply the annual power needs of 110,000 homes and will displace an estimated 360,000 tons of CO2 each year. The project will generate 563.3 GWh of electricity equivalent of 3% of the annual energy consumption of Jordan.

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<b><u>Financing</u></b>	Masdar is the majority shareholder of the project
<b><u>Value</u></b>	\$260 million
	Masdar has selected International Finance Corporation (IFC), a member of the World Bank, to oversee the funding of the plant.
<b><u>Status</u></b>	The project is in advanced stage of development It is expected to be completed in first quarter of 2018

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**Comments**

Upon completion, this plant will bolster Jordan’s energy independence by replacing 1.4 billion liters of imported crude oil with clean energy.

The project follows the inauguration of the 117 MW Tafileh wind farm, in which Masdar has a 31% stake.

**61.3 MW RISHA SOLAR ENERGY PROJECT**

**Client**

The National Electric Power Company (NEPCO)

**Developer**

ACWA Power, on board as investor as well as developer

**Description**

Development, financing, construction, ownership and operation of a new 61.3 MWp solar energy project in Risha, eastern Jordan. Once completed, the project will save 79,000 metric tons of CO2 and deliver electricity to 12,000 households.

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<b><u>Financing</u></b>	The European Bank for Reconstruction and Development (EBRD) is considering providing a
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senior secured limited recourse loan, up to €23.5 million for the project.

The German Development Bank and Arab Bank will provide the remaining amount for the project.

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**Value** \$69 million

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**Status** The signing ceremony of the power purchase agreement took place in March 2017. The project is expected to be completed in 2019

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**Comments**

With Risha PV, ACWA Power’s portfolio in Jordan now expands to eight assets with an aggregate capacity of 1,665 MW representing almost 40% of the total installed capacity of electricity in the kingdom.

## **2.6 MW KING’S ACADEMY SOLAR POWER PLANT**

**Client**

The King’s Academy

**Developer**

ACWA Power

**Description**

Construction of a 2.6 MWp solar photovoltaic plant to be located in the King’s Academy campus. The plant will offset the equivalent of 2,300 metric tons of CO2 and power the equivalent of 350 households.

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**Financing** ACWA Power

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**Value** \$4 million

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**Status** The memorandum of understanding was signed in March 2017. The plant will be operational by the spring of 2018.

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## **FRV AL MAFRAQ SOLAR PV PROJECTS**

### **Client**

Fotowatio Renewable Ventures (FRV), part of Abdul Latif Jameel Energy (Saudi Arabia)

### **Description**

Construction of two PV projects in northern Jordan. The plants, standing at a combined 133.4MW, will be located in the Mafraq region. The wind park will have 27 turbines of the model V126 3.3MW by Denmark's Vestas Wind Systems.

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### **Financing**

Mafraq I, the first FRV project in Jordan, received a financing package from the International Finance Corporation (IFC), the Dutch Development Bank (FMO) and the Europe Arab Bank.

Meanwhile, Mafraq II has received financial support from the European Bank for Reconstruction and Development (EBRD) and the Society for the Promotion and Participation for Economic Cooperation (PROPARCO).

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### **Value**

Unknown

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### **Status**

FRV has closed \$180 million of financing for two PV projects

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### **Comments**

Upon project completion, nearly 80,000 homes would be powered in the country.

## **60.3 MWp MAFRAQ SOLAR PV PROJECT**

### **Client**

“National Electric Power Company” (NEPCO)

### **Developer**

ACWA Power International (Kingdom of Saudi Arabia)

### **Description**

Construction of a 60.3 MWp solar PV plant to be located in Mafraq Development Area (50 km north-east of Amman). The project is part of a 150 MWac Solar Complex and will result in c. 1.5 million Tons of CO2 saved over 20 years, equivalent to 79,000 tons of CO2 per year.

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The project will deliver Solar Energy at a low tariff, over a 20 year Power Purchase Agreement with NEPCO

<b><u>Financing</u></b>	The Financial Agreements comprise an A loan of \$27 million from the European Bank for Reconstruction and Development (EBRD) and a B loan of the same amount from the Netherlands Development Finance Company (FMO)
<b><u>Value</u></b>	Unknown
<b><u>Status</u></b>	Under construction

### **Comments**

EBRD: in 2012, EBRD approved the creation of a €1 billion special fund to launch investments in the four SEMED countries (Jordan, Egypt, Morocco, and Tunisia). Since then, EBRD invested €4.8 billion in more than 120 projects in the region.

## **WIND PROJECTS**

### **45 MW SHOBAK WIND PROJECT**

#### **Client**

“National Electric Power Company” (NEPCO)

#### **Developer**

Shobak Wind Energy PSC incorporated in Jordan

#### **Description**

Constructing and operating a Greenfield wind power plant with a capacity of 45 MW, located in Shobak municipality, approximately 46 km northwest of Ma'an, and 210 km south of Amman, in southern Jordan. The project involves the installation of thirteen (13) Vestas V136 wind turbine generators (WTGs), each rated at 3.45 MW, giving a total project capacity of 45 MW, and will be constructed under a full scope EPC contract.

<b><u>Financing</u></b>	The European Bank for Reconstruction and Development (EBRD) and other potential lenders are
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considering entering into a financing agreement with Shobak Wind Energy PSC

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**Value**

Unknown

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**Status**

The project signed the Power Purchase Agreement (PPA) with the state-owned transmission company, NEPCO, in September 2016 and an Environmental and Social Impact Assessment (ESIA) is being prepared by Eco Consult of Jordan and is expected to be finished in September 2017.

The Project's site permit was granted by the Ministry of Environment on 14 December 2016, allowing the project to start the ESIA process.

The Project is expected to reach the financial close (FC) under the PPA with the National Electric Power Company (NEPCO) by the end of December 2017, while the first disbursement is expected to take place in the first quarter of 2018.

Construction is likely to last approximately 22 months.

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**Comments**

The original developer of the Project was an American power plant developer and owner, Hecate Energy LLC (Hecate). In 2016, Alcazar Energy Partners (Alcazar) acquired 90% of the economic interest in the project, Hecate remaining a 10% shareholder (together the Sponsors).

## **82 MW AL-RAJEF WIND FARM PROJECT**

**Client**

National Electric Power Company (NEPCO)

**Owner**

Alcazar

**Developer**

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Green Watts Renewable Energy (GWRE), a special purpose vehicle incorporated in Jordan for the sole purpose of developing, constructing and operating the Project. It is 100% owned by Alcazar Energy Partners.

### **Description**

Development of an 82 MW onshore wind farm, 1600 above sea level in the Ma'an Governorate, south of Amman. The project will produce electricity for approximately 60,000 local households in Jordan.

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### **Financing**

The project is funded through 75% debt and 25% equity. The European Bank for Reconstruction and Development (EBRD) approved a \$68m loan to GWRE for the construction.

Proparco, a financial institution based in France and a subsidiary of AFD Group provided \$50m project financing for the project.

A \$19m loan will later be provided by the German Development Bank (DEG)

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### **Value**

\$184.6 million

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### **Status**

Project is at an advanced stage of construction. It is scheduled to be fully operational by October 2018

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### **Comments**

The project will sell all its power under a long-term power purchase agreement to the Jordanian National Electricity Power Company.

## **89.1 MW FUJEIJ WIND FARM**

### **Client**

Ministry of Energy & Mineral Resources (MEMR)

### **Developer**

Korea Electric Power Corp.” (KEPCO), South Korea's state-controlled electric utility company), under a deal to Build, fully Own and Operate a wind power plant.

### **Description**

The project consists of building an 89.1 MW wind farm in the Fujeij area, some 150 km south of Amman.

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<b><u>Financing</u></b>	The funding includes a \$6 million direct loan by the Export-Import Bank of Korea (K-Exim) and a \$52 million K-Exim covered facility provided by Mizuho Bank Ltd and Sumitomo Mitsui Banking Corp Europe Ltd. Also, equity bridge facilities of a combined \$81 million are being funded by the commercial banks.
<b><u>Value</u></b>	\$510 million for the BOO deal. The facility will cost about \$180 million
<b><u>Status</u></b>	Construction started February 2017 and completion is expected by October 2018

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**Comments**

KEPCO has become the first Korean company to sign an agreement to sell electricity from a new and renewable energy plant in a Middle Eastern country. KEPCO will be responsible for the construction and operation of the wind farm and selling of electricity generated from the plant to Jordan. The agreement also includes a power purchase agreement (PPA) that outlines the details of the utility company operating the plant and selling the power generated to Jordan. The build, own and operate arrangement gives KEPCO complete control over all aspects of the project.

KEPCO will be able to operate the plant for 20 years and expects to make some \$26 million annually by selling the power it generates.

**NEW TAFILEH WIND PLANT (1)**

**Developer**

“Korea Southern Power Company Ltd.” & “Daelim Energy Company Ltd.”

**Description**

Construction of a 50 MW wind plant to be located in Tafileh, some 180 km southwest of Amman.

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<b><u>Financing</u></b>	“International Finance Corporation” & “Islamic Development Bank”
<b><u>Value</u></b>	\$110 million

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<b><u>Status</u></b>	The construction of the plant is scheduled to start in 2017 and will be connected to the grid by 2019.
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## **NEW TAFILEH WIND PLANT (2)**

### **Developer**

About Energy, a unit owned by Saudi Arabia’s “Xenel Industries”

### **Description**

Construction of a 50 MW wind power plant in Tafileh.

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<b><u>Financing</u></b>	“Islamic Development Bank” & “International Finance Corporation”
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<b><u>Value</u></b>	Approximately \$100 million
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<b><u>Status</u></b>	Construction will be completed by 2019
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### **Comments**

Another wind farm Tafileh, a 117 MW facility, the first commercial utility-scale wind power project in the Middle East, was inaugurated and became operational in December 2015.

The \$287 million project was developed by Jordan Wind Project Company, a co-development partnership between InfraMed (50%), Masdar (31%) and EP Global Energy (19%).

Tafila was the first wind power project to be developed under Jordan’s Renewable and Energy Efficiency Law passed in 2010.

## **OTHER RELATED PROJECTS**

### **GREEN CORRIDOR PROJECT**

#### **Client**

National Electric Power Company (NEPCO)

**Description**

The project, be established in the southern region, is a multi-component program to reinforce Jordan's high voltage electricity backbone network for integration of more renewable generation capacity and to improve reliability of supply. It consists of two new transmission lines (400 kV/150 km and 132 kV/51 km), upgrading three existing lines (132 kV/100 km) and construction of one new 400/132 kV, 1200 MVA electricity substation.

This project comprises three phases:

- The first phase includes building a new sub-station in Maan (220 km south Amman) and was awarded to a Saudi company),
- The second phase includes providing and installing converters at the Maan sub-station, and was awarded to an affiliate to an international company,
- The third phase will include installing connections between Maan sub-station and the Qatraneh sub station (cost and developer unknown).

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<b><u>Financing</u></b>	The “European Investment Bank” has extended a \$72 million loan, while the “French Development Agency” provided a \$54.9 million soft loan and NEPCO contributed with \$12.6 million, in addition to an EU grant of \$20.2 million offered under the “Neighborhood Investment Facility”
<b><u>Value</u></b>	\$172 million
<b><u>Status</u></b>	Tender procedures were completed Works for phase 1 and 2 started Tenders related to the third phase are expected to be floated this year

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## NUCLEAR PROJECTS

### Overview

“The Jordanian government is continuously working on boosting efforts to benefit from local resources to generate energy and to further depend on renewable energy resources to create a variety in power resources and increase their contribution to the overall energy mix.

In order to become a nuclear nation, the government is aware that this project has to be implemented in partnership with the private sector and with international financial support, to avoid any additional burdens on the Treasury. In this regard, Jordan has had to sign numerous agreements and memoranda of understanding and create new relations with countries throughout the world such as the United States, the United Kingdom, Canada, France, Japan, China, Russia, Spain, South Korea, Argentina, Romania, and Turkey. Jordan has also signed the Treaty on the Non-Proliferation of Nuclear Weapons, which promotes peaceful uses of nuclear energy.

Jordan's Committee for Nuclear Strategy, set up in 2007, set out a program for nuclear power to provide 30% of electricity by 2030, and to provide for exports. The nuclear law was modified in 2007 to establish the Jordan Atomic Energy Commission (JAEC) and the Jordan Nuclear Regulatory Commission (JNRC), including radiation protection and environmental roles.

In mid-2008, an agreement between JAEC and Atomic Energy of Canada Ltd (AECL) with SNC-Lavalin was to conduct a three-year feasibility study on building an AECL 740 MWe Enhanced Candu-6 reactor using natural uranium fuel, for power and desalination.

In December 2008, JAEC signed a memorandum of understanding with Korea Electric Power Corp to carry out site selection and feasibility study on nuclear power and desalination projects.”

In 2009, JAEC tasked with Tractebel Engineering with the siting study for the country's first nuclear power plant to allow for the Site Characterization work to go forward in advance of the plant technology selection.

“Also in 2009, JAEC signed an agreement with Worley Parsons for the pre-construction phase of a nuclear power plant with two 1000 MWe-class reactors. The firm carried out technology selection – preparing the tender and evaluating bidders, as well as assisting in fuel cycle engineering and waste management plans for the plant. JAEC then evaluated seven offers from at least four reactor vendors, and in May 2010, three vendors and designs were short-listed, the Atmeal from Areva-MHI, the AECL EC6, and the AES-92 from Atomstroyexport.



## **Jordan – Energy Projects - 2017**

In 2013, JAEC announced that Rosatom's reactor export subsidiary AtomStroyExport (ASE) would be the supplier of two AES-92 nuclear units, while Rusatom Overseas will be strategic partner and effectively the operator of the plant through a joint venture. Rusatom Overseas will contribute 49.9% of the project's \$10 billion cost, with the state-owned Jordan Nuclear Power Co (JNPC) being responsible for the controlling 50.1%.

In 2014, JAEC signed a project development agreement with Rusatom Overseas, with a view to final construction contract within two years. An intergovernmental agreement was signed in 2015, outlining responsibilities for stage 1 of the project, including setting up the JNPC project company.

In 2016, Rosatom said that a feasibility study for the project would be completed in 2017. Target date for operation of the first unit is 2023, with the second one 2024-25. The two will contribute 48% of Jordan's electricity and enable exports to Syria and Iraq. A financial adviser to assist the project is also to be announced.”\*

*\* Source: the overview of the history of nuclear development in Jordan obtained from the website of the World Nuclear Organization.*

## **JORDAN RESEARCH & TRAINING REACTOR (JRTR)**

### **Client**

Government of Jordan  
Jordan Atomic Energy Commission (JAEC)

### **Description**

Construction of a 5 MW first research and training reactor in Irbid, upgradable to 10 MW,  
Located at Irbid's Jordan University for Science and Technology

Design: passive cooling

Reactor type: open pool

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### **Financing**

30% jointly financed by Jordan and Russia.  
Remainder sought from other international investors

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### **Value**

Unknown - Part of 10\$ billion nuclear power plant project

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### **Status**

Tests were successfully completed at the facility which was inaugurated in December 2016

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**Comments**

The reactor, part of the Kingdom’s fledgling multi-billion-dollar nuclear energy program, will enhance nuclear infrastructure in Jordan to be a focal point in the region as a nuclear research hub and a center for the development of human resources.

**JORDAN NUCLEAR POWER PLANT**  
**(2 Nuclear Reactors of 1000 MG each)**

**Client**

Government of Jordan / Jordan Atomic Energy Commission (JAEC)

**Developer**

JNPC (Project Developer and Future owner)  
Rosatom, (Russia)

**Description**

Construction, on a build-own-operate basis, by 2022, of two reactors of 1000 MW. Under the deal, the government will own 50.1% of the project, while Russia’s Rosatom will own 49.9% of the project.

The project will supply about 40% of Jordan’s electricity needs by 2025 – 2026.

**Project phases**

Phase I: Pre-investment/development phase:

1. Conducting the required site characterization and environmental impact assessment for the site
2. Preparing and finalizing the bankable feasibility study with the investor/operator and investors for the project along with all other required studies
3. Finalizing all project agreements and contracts
4. Securing financing for the project and finalizing all phase II related project agreements

Phase II: Investment/implementation phase

1. Technical design and development including engineering survey
2. Power plant construction
3. Power plant commissioning and operation

**Site suitability and characterization**

Awarded to Tractebel Engineering - Belgium

**General contractor**

AtomStroyExport (ASE)

## Jordan – Energy Projects - 2017

### **Electricity off-taker**

National Electric Power Company (NEPCO)

### **Fuel Supplier/Cycle**

TVEL – Fuel Company of Rosatom

### **Operation/Operator**

Rosenrgoatom – a subsidiary of Rosatom

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<b><u>Financing</u></b>	<p>30% (\$ 1.5 billion) of the project will be financed equally by Jordan and Russia; a majority of which will go for the building of the plant.</p> <p>The remainder will be sought from other international investors</p>
<b><u>Value</u></b>	<p>\$10 billion.</p>
<b><u>Status</u></b>	<p>The following services are currently being sought:</p> <ul style="list-style-type: none"><li>Cooling system optimization</li><li>Siting &amp; EIA</li><li>Electricity market research</li><li>Grid study</li><li>Project development consulting services</li><li>Equipment suppliers selection</li></ul> <p>▪Tenders have been floated for supply of turbines and electrical systems - bids are expected from Chinese, Czech, Japanese and American companies.</p>

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**Comments**

The Kingdom's central region is home to 40,000 metric tons of uranium, which has enough yellow cake to supply Jordan for 150 years.

**Uranium mineralization**

Three general areas of uranium mineralization have been discovered in Jordan:

- Central Jordan (CJ): Surficial deposits ( $\leq 4$  m deep), medium-grade U with localized high-grade areas ( $> 1.000$  ppm). Subsurface deposits ( $\leq 30$  m deep, average depth 9 m), low-grade U. Jordanian-French Uranium Mining Company estimated that 28.500 MT of U<sub>3</sub>O<sub>8</sub> is in CJ. Current ongoing audit work suggests the uranium grade and tonnage in the surficial deposits has been underestimated by a minimum of a factor of two.
- Al-Hasa: 30.000 MT of U<sub>3</sub>O<sub>8</sub> discovered in Qataraneh Phosphate (QP). Medium-grade U ( $> 175$  ppm). Work needed for efficient extraction. Low, but significant P.
- South Jordan (SJ): Low-grade ( $\approx 60 \rightarrow 75$  ppm average) in Phosphoric Rocks. 100.000 MT of U<sub>3</sub>O<sub>8</sub> estimated. Long-term mineable strategic reserves.

## OIL & GAS PROJECTS

### ACWA POWER ZARQA CCGT PROJECT

**Client**

National Electric Power Company (NEPCO)

**Developer**

ACWA POWER

**Operational and Maintenance Company**

Central Electrical Generating Company (CEGCO)

**Environmental Consultant**

5 Capitals Environmental and Management Consulting (U.A.E)

**Description**

To build, design own and operate a 485 MW gas-fired plant within the existing landholding of the Hussein Thermal Power Station located in the Zarqa Industrial zone. The facility is expected to produce a gross average of 3,200 GW hours of power a year, serving about 620,000 individual residential customers annually and adding about 150 MW to the national grid.

The project will replace the now obsolete 351 MW Hussein Thermal Power Station (HTPS).

The project will comprise one power block, consisting of the following units:

- Three Gas Turbine Generators (GTG)
- Three Heat Recovery Steam Generators (HRSG)
- One Steam Turbine Generator (STG)

The Zarqa Project output will be entirely sold to NEPCO under a 25-year PPA.

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**Financing**

World Bank Group members International Finance Corporation (IFC) and Multilateral Investment Guarantee Agency (MIGA) have agreed to support the project.

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**Value**

\$485 million

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**Status**

The scheme is due for commissioning in May 2018

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**Comments**

The project will replace base load power and provide additional capacity aiding Jordan in maintaining a stable electricity network

**IRAQ-JORDAN OIL PIPELINE**

**Client**

“State Company for Oil Projects” (Iraq) & the Ministry of Energy and Mineral Resources (MEMR).

**Description**

To build a pipeline which will pump one million barrels of oil a day from Basra on the Arabian Gulf to Aqaba Port, and around 258 million cubic feet of gas. The pipeline will provide Jordan with 150.000 barrels of oil a day, while the rest will be exported through Aqaba, generating an estimated \$3 billion a year in revenues for Jordan.

The planned pipeline will have capacity to ship 2.25 million barrels per day (bpd) and will have a parallel gas pipeline.

The new pipeline project offers an alternative to the Kirkuk–Ceyhan pipeline.

The tender process will be organized by the Iraqi authorities.

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<b><u>Financing</u></b>	Undecided
<b><u>Value</u></b>	Estimates vary a lot but, according to a study by the Iraqi Government, the project should cost \$5 to 7 billion. Others sources state that the project would cost \$18 billion.
<b><u>Status</u></b>	<p>The much delayed Iraq-Jordan pipeline project may finally get underway in 2017. Iraq’s State Company for Oil Projects, better known as SCOP, officially called for bids end of 2016 for the pipeline’s first stage. This phase includes the engineering, procurement, construction and financing of oil and gas pipelines linking the Basra fields to a connecting energy station near the city of Najaf.</p> <p>The initial section of the Basra-Aqaba pipeline was planned to pass through the Haditha pumping station in Anbar province, but the presence of Islamic State</p>

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militants in the desert area forced the oil ministry to change plans. The pipeline will still pass through Anbar, but it will not go as far north as Haditha. By limiting the first stage to Najaf, the ministry is also delaying construction in Anbar itself.

Iraq's State Company for Oil Projects has indicated that it has received a bid from a Jordanian-Chinese consortium ("China Petroleum Pipeline" (CPP) and the private company "Mass Global") to build and operate the pipeline.

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### **Comments**

The project is strategically important to Baghdad, providing an alternative export route to the main Persian Gulf oil terminals, but foundered in 2014 due to security concerns in the west of the country.

Iraq is the second-largest crude oil exporter in the Organization of Petroleum Exporting countries (OPEC) after Saudi Arabia and holds the world's fifth-largest proved crude oil reserves according to Energy Information Administration (EIA).

## **JORDAN PETROLEUM REFINERY EXPANSION**

### **Client**

Jordan Petroleum Refinery Company Ltd. (JRPC)

### **Description**

The project involves the expansion of an oil refinery to increase processing capacity from the existing 70.000 barrels per day (bpd) to 12.000 bpd and will allow JRPC to upgrade the quality of its product to meet Euro V emissions specifications.

The project includes the construction of processing units, distribution units, storage facilities, and the installation of related equipment and machinery.

One of its main objectives is to stop producing high sulfur fuel oil. It will also help meet rising demand on fuel that is witnessing a 3% increase every year.

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### **Financing**

In June 2014, Ernst and Young (E&Y) was appointed as financial advisor to develop a financial model for the project.

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## Jordan – Energy Projects - 2017

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	JPRC is in the process of securing funds.
<b><u>Value</u></b>	\$1.6 billion
<b><u>Status</u></b>	<p>The feasibility study on the project was completed in 2014.</p> <p>Construction is expected to start Q3 2018</p> <p>JPCR recently signed agreements with 2 U.S. oil companies specialized in oil refineries' design. They pertain to licensing activities, designs, equipment, assisting factors and services with costs exceeding \$115 million. .</p>

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### **Comments**

The Jordan Petroleum Refinery Company, Ltd. (JPRC) is the sole oil refining company of Jordan, publicly traded on the Amman Stock Exchange, with headquarters in the capital of Amman, and a refinery in Zarqa, 35 kilometers east of Amman. The company manufactures a variety of fuels and refinery derivatives, and wholly owns a subsidiary oil marketing company. Moreover, JPRC operates a lube oil blending facility, three LPG bottling stations and LPG storage facilities in Amman, Zarqa and Irbid. The company also owns and operates an oil terminal and storage facilities in the port city of Aqaba.



## CONCLUSION

Regionally, Jordan remains a haven of stability for business interests and serves as a business hub in the region. The kingdom has strong, cooperative relations with its neighbors and the wider international business community.

Although the energy sector has faced significant challenges in the recent past, promising developments in the renewables, nuclear and oil shale segments, should see the country's energy bill decrease considerably in the coming years, paving the way for long-term energy self-sufficiency and offerings attractive new opportunities for investors who are monitoring the rising renewable energy sector in Jordan with increased interest.

Jordan is thus set to become a regional energy hub, especially in the renewable energy segment. Its geo-political position from political and technical vantage points, contribute to its capacity for both generation and energy transmission.

International companies see a great opportunity in tapping into Jordan's renewable energy sector due to the following advantages:

- Jordan lies within the solar belt of the world: It is ideal for PV and CPV as well as CSP generation,
- 7 MPS: above world average speed needed for wind energy,
- The country has a favorable legislative framework

Opportunities therefore abound for Belgian companies active in the renewable energy sector, with needs ranging from technology to equipment to consultancy services. The market is open for supply of photovoltaic cells and panels, wind turbines and blades, generators, support structures, and energy software management. It is best however to include financing in your approach, especially if you are eying the market as a developer.

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**World Bank**

**World Nuclear Organization**

**Websites of developers involved in projects**

**Zawya**

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