منتدى الاستراتيجيات الأردني
JORDAN STRATEGY FORUM

The Energy Sector

Jordan's Economic Vision Roadmap

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The Jordan Strategy Forum (JSF) is a not-for-profit organization, which represents a group of Jordanian private sector companies that are active in corporate and social responsibility (CSR) and in promoting Jordan's economic growth. JSF's members are active private sector institutions, who demonstrate a genuine will to be part of a dialogue on economic and social issues that concern Jordanian citizens. The Jordan Strategy Forum promotes a strong Jordanian private sector that is profitable, employs Jordanians, pays taxes and supports comprehensive economic growth in Jordan.

The JSF also offers a rare opportunity and space for the private sector to have evidence-based debate with the public sector and decision-makers with the aim to increase awareness, strengthening the future of the Jordanian economy and applying best practices.

For more information about the Jordan Strategy Forum, please visit our website at www.jsf.org or contact us via email at info@jsf.org. Please visit our Facebook page at Facebook.com/JordanStrategyForumJSF or our Twitter account @JSFJordan for continuous updates aboutJordan Strategy Forum.

#JSFJo
@JSFJordan
/JordanStrategyForumJSF
Jordan Strategy Forum

Amman, Jordan
T: +962 6 566 6476
F: +962 6 566 6376

This is an expert opinion report based on discussions and focus group meetings held by the Jordan Strategy Forum (JSF). The overall objective of this effort is to analyze different sectors (14) of the Jordanian economy and their respective challenges, and come-up with practical solutions and initiatives to enhance their competitiveness. Throughout this exercise, the JSF facilitated the focus group meetings, and supported the work-stream managers with any needed research and logistics.

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Non- Conventional Energy Work Stream:

Work Stream Manager:

1. Dr. Maher Matalka

Work Stream Members: (In Alphabetical Order)

2. Dr. Ahmad Salaimeh
3. Mr. Basil Marji
4. Mr. Hanna Zaghloul
5. Mr. Khalil Abu Al-Rubb
6. H.E. Ms. Kholoud Mahasneh
7. Mr. Omar Abu Eid
8. Ms. Rania Hindawi
9. Mr. Shukri Halabi

Conventional Energy Work Stream:

Work Stream Manager:

1. Ms. Rania Hindawi

Work Stream Members: (In Alphabetical Order)

2. Eng. Abed Al Fatah Daradkeh
3. H.E. Mr. Abed Al Karim Alawin
4. Dr. Ahmad Hiasat
5. Eng. Hassan Abdullah
6. Dr. Issa Al Alem
7. H.E. Dr. Khaled Shraideh
8. Mr. Mohammad Khasawneh
9. Eng. Reem Hamdan
10. Mr. Sami Bustami
11. Mr. Tamim Suyyagh

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1. Introduction

Without energy, nothing can come into being and nothing can exist. For every living being, energy is very essential. Most importantly, energy is essential for the day-to-day activities of humankind.

Economic growth is inextricably linked to energy. As energy is tied to the economy, the need for reliable and affordable energy is fundamental as it supports expanding industries, modern agriculture, increased trade and improved transportation. These blocks help nations create better lives.

In light of the limited primary sources, Jordan highly depends on imported energy, mainly oil and natural gas; about (91%) of the energy was imported in 2019, with a total approximate cost of 2.429 Billion JD which equivalent to 8% of the GDP. Naturally, this bill creates a burden on the economy, especially on its foreign currency in addition to increasing the future risk of exposure to global and volatile energy prices.

The Government issued laws, policies, and programs to enhance the contribution of the local energy sources, like renewable energy (solar energy and wind power), as well as the local primary energy sources such as Oil Shale. It is also worth noting that the Strategy of the Energy sector aims to increase the contribution of renewable energy to the total energy mix to around 50% of the installed electricity capacity and oil shale to 15% by 2030.

Electricity prices are very high in Jordan when compared to the neighbouring countries. Indeed, it is considered as an obstacle and one of the most serious challenges to the competitiveness of investing sectors. The government has adopted several policies and regulations to help reduce electricity prices such as net metering and wheeling regulations that enable consumers to produce their own renewable energy projects to cover their own consumption of electricity. However, these policies faced limitations related to the Grid capacity.

2. Performance of the Sector in the Past 5 Years & COVID-19 Impact

Electricity

Since the past decade, electricity demand in Jordan has considerably grown due to economic growth and the increase in population, taking into consideration the influx of refugees. Based on the National Electricity Company's (NEPCO) annual reports, the installed generation capacity has grown from 2000 MW in 2005 to more than 5000 MW by the end of 2020 (**Conventional**: 4000MW and **Renewable**: 1424MW).

In 2011, the disruption of the gas line from Egypt led the Government of Jordan (GoJ) to substitute natural gas with heavy fuel and diesel at substantially higher prices. Accordingly, the National Electric Power Company (NEPCO) did not pass the excessive costs to consumers through reflective tariff increases. Thus, accumulating a total debt of JD 5.5 billion between 2011-2014.

The Natural gas needed for electricity generation is imported; mainly Liquefied Natural Gas (LNG) through the FSRU in Aqaba in the year 2018. In 2019, 10% of it was imported from Egypt through the Arab Gas Pipeline. By the end of 2019, Jordan started receiving Noble Natural Gas from the Mediterranean. According to the terms of the deal, Jordan should receive about 220 Cubic Feet (CF) annually which represents about 60% of the estimated 350 CF total annual consumption. The deal covers 15 years and is based on a flexible price formula linked to crude oil prices.

Moreover, the contribution of conventional energy (Natural Gas) in the electricity generated constitutes 80% of the total electricity generated in Jordan in 2020. On the other hand, renewable energy constitutes only 20%.

The project of generating electricity from oil shale with a capacity of is (470) MW was expected to be completed in the second half of 2020. The project targets the local oil shale solely with Chinese and Malaysian financing and utilizing technology from Estonia. It is useful to note that the project is considered to be the largest in Jordan with an estimated cost of USD 2.2 billion. In December 2020, the Minister of Energy and Mineral Resources announced that NEPCO and the government have initiated arbitration proceedings against the Attarat Power Company (APCO). The project commissioning was delayed due to the onslaught of COVID-19 and several additional issues.

The electric interconnection positively impacts the stability of the electric system, economies, energy exchange, and openness to the world. Within this context, it is useful to

mention that Jordan has an electric interconnection line with Egypt and provides Palestine with electricity. There have also been several attempts at the regional level with Iraq and Saudi Arabia regarding the Gulf interconnection system, were memorandums of understanding were signed. In 2021, the Ministers of energy of Jordan, Syria and Lebanon agreed on an action plan and a timeline to restart the Jordan-Syria power line. In addition, they also agreed on moving forward with all technical studies and the agreements needed to put the project into gear. As for the discussions in 2021, they revolved around supplying Lebanon with about 150 megawatts of electricity from Jordan through Syria between midnight and dawn, and 250 megawatts during other times.

Oil and Gas exploration

Jordan has no developed oil fields, and announced six areas for exploration; the areas are Sarhan, Dead Sea, northern highlands, Azraq, Jafer and west Safawi.

In terms of Gas, Jordan is increasing its efforts in the Risha field to double its production. However, this will only be able to supply 5% of the consumed gas in Jordan even with doubled production, as Jordan's need is about 350 million Cubic Feet per day.

The priority for the government and NPC is to prove the Gas and Oil reserves and to have a figure for the Proven Gas Reserves according to the Petroleum industry standards.

Regarding Oil Shale, there is only one company left working on Oil Shale Retorting Project. This company is operating under a concession agreement for surface retorting.

Downstream Petroleum Sector

Jordan developed and implemented a plan for restructuring and liberalizing the downstream petroleum sector in order to guarantee the security of oil supply of Jordan, and to promote competition in the downstream petroleum market. The plan followed the expiry of Jordan Petroleum Refinery's (JPRC) concession agreement in 2008, which had granted JPRC exclusive rights to refine crude oil, trade, and market petroleum products in Jordan. The plan included the establishment of the Jordan Oil Terminals Company (JOTC) as an independent open-access storage provider, in addition to licensing three Oil Marketing companies (OMCs) for importing, trading, and marketing petroleum products while the role of refining remains with Jordan Petroleum Refinery Company (JPRC).

JPRC is in the process of upgrading its capacity through the fourth Expansion project, the objective of this project is to increase the capacity of the Refinery from 70,000 barrels per day to 120,000 barrels per day, thus increasing the supply of local market demand to around 90%. In addition to converting all the current and expected heavy fuel oil produced to more valuable products (Gasoline, Jet fuel, and Diesel) with the goal to improve the

margin of the Refinery, in addition to improving the quality of products to meet Euro5 emission requirements.

Founded in 2017, Jordan Oil Terminals Company (JOTC) the storage provider, wholly owned by the Government of Jordan. Through its terminals and operations, JOTC serves the Government of Jordan, along with several LPG companies and oil marketing companies (OMCs), with high HSSEQ standards. It owns and operates the following Terminals:

- Aqaba Oil and LPG Terminal (106 thousand MT)
- Amman Strategic Terminal for Petroleum Products (360 thousand MT)
- Aqaba Heavy Fuel Oil Terminal (195 thousand MT)

Three Oil Marketing Companies (OMCs); Total, Manaseer, and Jopetrol. Its responsibility is to import the country has needs of oil products and supply it to Gas stations and costumers.

The final step in the restructuring and liberalizing of the downstream petroleum sector is to liberalize the prices of the oil products, which hasn't been reached yet.

The LPG sector was liberalized since 2008 but still needs a regulatory framework that regulates its activities in order to enable investments in this sector.

The three leaders of Jordan, Egypt and Iraq has created a secretariat in April 2020 to follow up progress in the regional (Basra (Iraq) - Aqaba (Jordan) pipeline project and to set a road map for implementation. This is a very ambitious project with an estimated cost of USD 5 Billion that aims at carrying crude oil from Basra to Aqaba and later to Egypt.

COVID-19 impact

COVID-19 is not only a global pandemic and public health crisis; it has also severely affected the global economy and financial markets. Significant reductions in income, a rise in unemployment, and disruptions in the transportation, service, and manufacturing industries are among the consequences of the disease mitigation measures that have been implemented in many countries.

Many measures such as quarantine, social distancing and lockdown have been set to mitigate the coronavirus infection. The COVID-19 pandemic has caused profound influences for many industries and the energy industry is naturally not immune in the influences. According to statistic and projection data from the International Energy Agency (IEA), the shock to energy demand in 2020 is set to be the largest in the last 70 years.

For Jordan, the effect of the COVID-19 on the energy sector has not been studied comprehensively but primarily, COVID-19 has caused great challenges to the energy industry as it has impacts on energy demand and consumption. In general, the overall energy demand declined in all sectors but increased in the domestic sector.

Oil products demand reduced significantly due to the halt of the commercial sector and transportation, and the decrease of 75% of the demand of the industrial sector.

Electricity demand reduced significantly during the lockdown to around 68% of the normal demand for the same period of the year 2019, electricity billing was suspended during the lockdown, which affected negatively the cash flow of the distribution companies and NEPCO.

The decline of electricity demand posed greater pressure on NEPCO due to its obligations under the PPAs signed with the IPPs.

Delay of the commissioning of Attarat Power project and some renewable energy projects and this delay was in the benefit of NEPCO as per NEPCO annual report.

3. Stakeholders' Mapping for the Sector: Linkages & Overlaps

Stakeholders of the sector are as follows:

The Ministry of Energy and Mineral Resources (MEMR): is responsible for ensuring a secure and sustainable energy supply for Jordan and planning and policy making in relation to wide range of energy issues including electricity. MEMR has been responsible for the development of legislations in the energy sector.

The Energy and Mineral Recourses Commission (EMRC): the sector's regulator, is responsible for regulating and monitoring the energy sector, natural resources, minerals, radio and nuclear work in the Kingdom; including petroleum, petroleum products, oil shale, coal, natural gas, liquefied natural gas, biofuels, generation, transmission, distribution and supply of electricity, renewable energy, radiation protection, safety and nuclear security.

Jordan Atomic Energy Commission (JAEC): is responsible for the transfer, develop and promote the peaceful uses of nuclear energy and the Jordan nuclear program.

Electricity sector: Electricity sector in Jordan has three sub-sectors; the generation, the transmission, and the distribution.

Generation: Power is produced by a state owned company (SAMRA) working alongside 4 independent generators IPPs and the RE generation projects.

Transmission: National Electric Power Company (NEPCO) a government owned company is the sole electricity Transmission Company, the Sole Buyer of all electricity produced in Jordan and Bulk supplier of electricity, System operator, Owner and Operator of the Transmission Network, and the fuel Buyer as it is responsible for procuring the fuel for Generators.

Distribution sector: is responsible for distributing electricity to final consumers (Residential, Industrial, Water pumping and Agriculture, Services, Commercial, and Street lighting) and consists of three privately owned companies which provide distribution services in the country. The distribution companies purchase electricity from NEPCO and sell it to end users at regulated tariffs. The distribution grids feed 99.9% of the population.

Petroleum upstream and downstream sector

Jordan Petroleum Refinery Company (JPRC): a public shareholding company

Jordan Oil Terminals Company (JOTC): the storage provider a government owned private shareholding company

Three Oil Marketing Companies (OMCs): Total, Manaseer, and Jopetrol. Their responsibility is to import the country's needs of oil products and supply it to Gas stations and costumers.

Central LPJ Distribution Companies: companies responsible for distribution of bulk LPG to customers.

National Petroleum Company (NPC): is a public shareholding company. The Jordanian Government is the largest shareholder. The main objective of NPC is to explore for oil and gas in addition to other related activities.

4. SWOT Analysis

Strengths	Weaknesses
1. Mature regulatory framework to build upon. 2. Existing IPP models in conventional energy and RE in which to build upon for further private sector investment. 3. Reliable power and fuel infrastructure, and abundant natural resources (wind, solar, and fossil fuels). 4. Strong human resources and experience 5. Geopolitical position.	1. Regulations and regulatory oversight/policies do not meet current and future requirements for energy transition and target attainment, and lack of M&E&V and progress on strategies (updating existing regulations, and create new for new areas). 2. Dominance of flawed single buyer model/fiscal policy as a driver for energy policy, tariff structure, and investmen.t 3. Lack of long term cost benefit analysis decision making and awareness of green economy. 4. Power infrastructure constraints due to size of the grid, min interconnectivity and impact on resilience. 5. Minimal private sector involvement in planning and organization.
Opportunities	**Threats**
1. Availability of funding and incentives (and carbon markets) for climate mitigation projects and solutions and implementation of the green growth strategy and action plan. 2. Fast pace of technology development and reduction of costs including (digitalization/DSM, RE, storage, e-mobility, and hydrogen, WTE, EE). 3. Leadership role in energy transition and export of talent, VC and HR/R&D to the region to participate. 4. Linkages with mining and other industries for Green molecules and green products. Positive enforcement of Jordan as a green economy. 5. By going green, the competitiveness of business is there - resource efficiency, and reduced cost is a main outcome. 6. Support the attainment of other challenges including transport, environment, industry, water. Converting challenges into opportunities.	1. No change in mindset and being left behind. 2. Continued lack of connectivity with surrounding markets and political uncertainty. 3. Disruption in imported energy supplies. 4. Lack of available funding for non-green projects.

5. Strategic Objectives:

Strategic Objectives
1. Develop a blueprint for energy transition which includes regulatory and resource planning to reach 60% of primary energy mix by 2050.
2. Decrease pollutions and increase energy efficiency through implementation of the EE action plan, electrification, smart grids, clean fuels and other mitigation measures.
3. Electricity/energy sector regulatory reform to enable market competition, promote private sector investment and job creation, and adoption enabling technologies.
4. Enhance Technology / knowledge transfer, development and innovation in the sector.
5. Investment promotion and project development in promising fields of development (such as hydrogen, Waste to Energy, EV networks, and other Green Economy projects).

6. Initiatives (projects)

Initiative (1): Energy Water Nexus
Strategic Objective 1: Develop a blueprint for energy transition which includes regulatory and resource planning to reach 60% of primary energy mix by 2050.
Short Description: Integrating energy / water / agriculture sectors to enhance energy use and benefits across both sectors.
Expected Outcome: 1) Security of supply. 2) Grid balancing and energy storage/DSM. 3) Reduce costs and deficit (opex and capex) including cost of energy, water losses, maintenance costs (for existing and future assets).
Initiative Owner: Ministry of Energy, Ministry of Water, Ministry of Agriculture

Initiative (2): Resiliency and Competitiveness of Gas and Electricity Supply.
Strategic Objective 1: Develop a blueprint for energy transition which includes regulatory and resource planning to reach 60% of primary energy mix by 2050.
Short Description: Security of gas and electricity infrastructure, cross boundary trade, liberal markets and new energy sources through the establishment of: **1)** Interconnections - power and gas. **2)** LNG import terminals. **3)** Renewable and new fuels.
Expected Outcome: **1)** Security of supply. **2)** Increased penetration of RE **3)** Export and geopolitical stability.
Initiative Owner: Ministry of Energy

Initiative (3): Smart Grids for Smart People
Strategic Objective 2: Decrease pollutions and increase energy efficiency through implementation of the EE action plan, electrification, smart grids, clean fuels and other mitigation measures.
Short Description: Increased energy efficiency through the drive towards electrification which is enabled by digitalization, EV adoption, demand site management of industries and the water sector, adoption of behind and in front of the meter storage, development of resilient grids, and a natural gas grid.
Expected Outcome: **1.** Reduction in energy costs and imports. **2.** Improved competitiveness of industries. **3.** Reduction in emissions and pollution.
Initiative Owner: Ministry of Energy, NEPCO, Distribution Company, EMRC

Initiative (4): Sector reform
Strategic Objective 3: Electricity/energy sector regulatory reform to enable market competition; promote private sector investment and job creation, and adoption enabling technologies.
Short Description: Reform, strengthening of legislative framework and sector actors for improved competitiveness and private sector participation in transmission, generation, distribution, fossil fuels, RE, and new energies.
Expected Outcome: **1)** Improved competitiveness and resiliency. **2)** Increase use of domestic resources. **3)** Promotion of investment and job creation.
Initiative Owner: Ministry of Energy, EMRC

Initiative (5): Creating bridges
Strategic Objective 4: Enhance Technology / knowledge transfer, development and innovation
Short Description: Invest in the education of energy sciences, with an emphasis on timely subjects, and create bridges with international research organizations (both public and private) in order to position Jordanian talent early in the energy transition process through adoption of early and relevant curricula and pilot and research projects.
Expected Outcome: **1)** Increased awareness on energy transition economy. **2)** Job creation. **3)** Sector competitiveness.
Initiative Owner: Ministry of Education, Ministry of Higher Education, Universities, Think Tanks and Research Centers (Public & Private)

Initiative (6): Packaging and unlocking opportunities.
Strategic Objective 5: Investment promotion and project development in promising fields of development (such as hydrogen, Waste to Energy, EV networks, and other Green Economy projects)
Short Description: Identifying, packaging and enabling (through regulatory reform and incentives) of proven and economical technology solutions to enable the energy transition process.
Expected Outcome: **1.** Improved competitiveness. **2.** Investment creation and job creation. **3.** Reduced emissions and pollution.
Initiative Owner: Ministry of Energy, EMRC, All Stakeholders in the Energy Sector

Initiative (7): Jordan Petroleum Refinery Expansion Project
Strategic Objective 6: Investment promotion and project development in promising fields of development (such as hydrogen, Waste to Energy, EV networks, and other Green Economy projects)
Short Description: The fourth expansion project of the Jordan Petroleum Refinery Company is one of the largest investment projects at a level that supports the wheel of the national economy and contributes to comprehensive development, which will positively reflect its outcomes on the Kingdom and on the local community in particular. The refinery facilities are located in the Hashemite District in Al-Zarqa governorate.
Expected Outcome: **1.** Estimated employment in the project will range from (6500-5000) people. **2.** Production of oil derivatives conforming to the latest European specifications. **3.** Reducing emissions in and around the refinery. **4.** Converting heavy crude oil (Bottom of the Barrel) into high-value products such as gasoline, jet fuel and diesel. **5.** Enhancing the energy security of the Kingdom in terms of providing more oil derivatives to the local market or for export to neighboring markets.
Initiative Owner: JPRC

Initiative (8): Investing in Small Modular Reactors (SMR)
Strategic Objective 7: Investment promotion and project development in promising fields of development (such as hydrogen, Waste to Energy, EV networks, and other Green Economy projects).
Short Description: Small modular reactors (SMRs) are advanced nuclear reactors that have a power capacity of up to 300 MW (e) per unit, which is about one-third of the generating capacity of traditional nuclear power reactors. SMRs, which can produce a large amount of low-carbon electricity.
Expected Outcome: This initiative seeks to attain more diversity in Jordan's energy mix through generating electricity and solving the problems of fresh water shortage by integrating nuclear energy and renewable energy within a hybrid system.
Initiative Owner: Jordan Atomic Energy Commission (JAEC), NEPCO, Ministry of Water

7. General Recommendations

During the discussions of the work stream members, one major question was asked: Is there any opportunity for this effort to be read and implemented or is it going to stay in the drawers?

Setting a strategy is not a challenge by itself but achieving successful strategy implementation remains a continuing challenge, that's why the recommendation is to have a body that is responsible for assuring that the strategy (not only the energy strategy but all sectors strategies) is well structured with a sound and clear strategic vision and well implemented through adequate and competent leadership and human resources with continuous monitoring and control. This will secure the strategy from alternate changes because of governments' changes and assures the stability of the implementation plan.

Restructuring and reform of the energy sector had started very early but it never completed and all restructuring processes were stopped and tangled in the middle, that lead to block the sector's new investments, and as the world is moving towards electrification, the reform of the electricity sector is a priority. This shall start by restructuring of NEPCO, reviewing the single buyer model and the distribution licenses, setting new principles and alternatives for the power purchase agreements. The unbundling of the electricity activities will result in creating new activities for new investments.

Diversification of the energy resources is important, but prioritize the diversification of the energy mix to include domestic energy resources especially renewables is more important. However, increasing the use of renewable energy comes with its own attendant challenges on the electricity systems, such as intermittency and variability. Energy storage must therefore become important in power system management and the energy strategy.

Oil Shale is rich of valuable minerals that is important for deferent industries, that's why it is important to develop a mechanism to market and promote oil Shale among construction and Cement industries, as three out of four concessions for retorting was terminated by the parliament.

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