

**The Ministry of Energy  
&  
Mineral Resources**

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**Annual Report  
2017**

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**Vision**

Achieving a secure sustainable supply of energy and optimal utilization of natural resources.

**Mission**

Setting and developing the appropriate policies and legislations to achieve secure sustainable supply of energy and the optimum utilization of natural resources complies with international best practices.

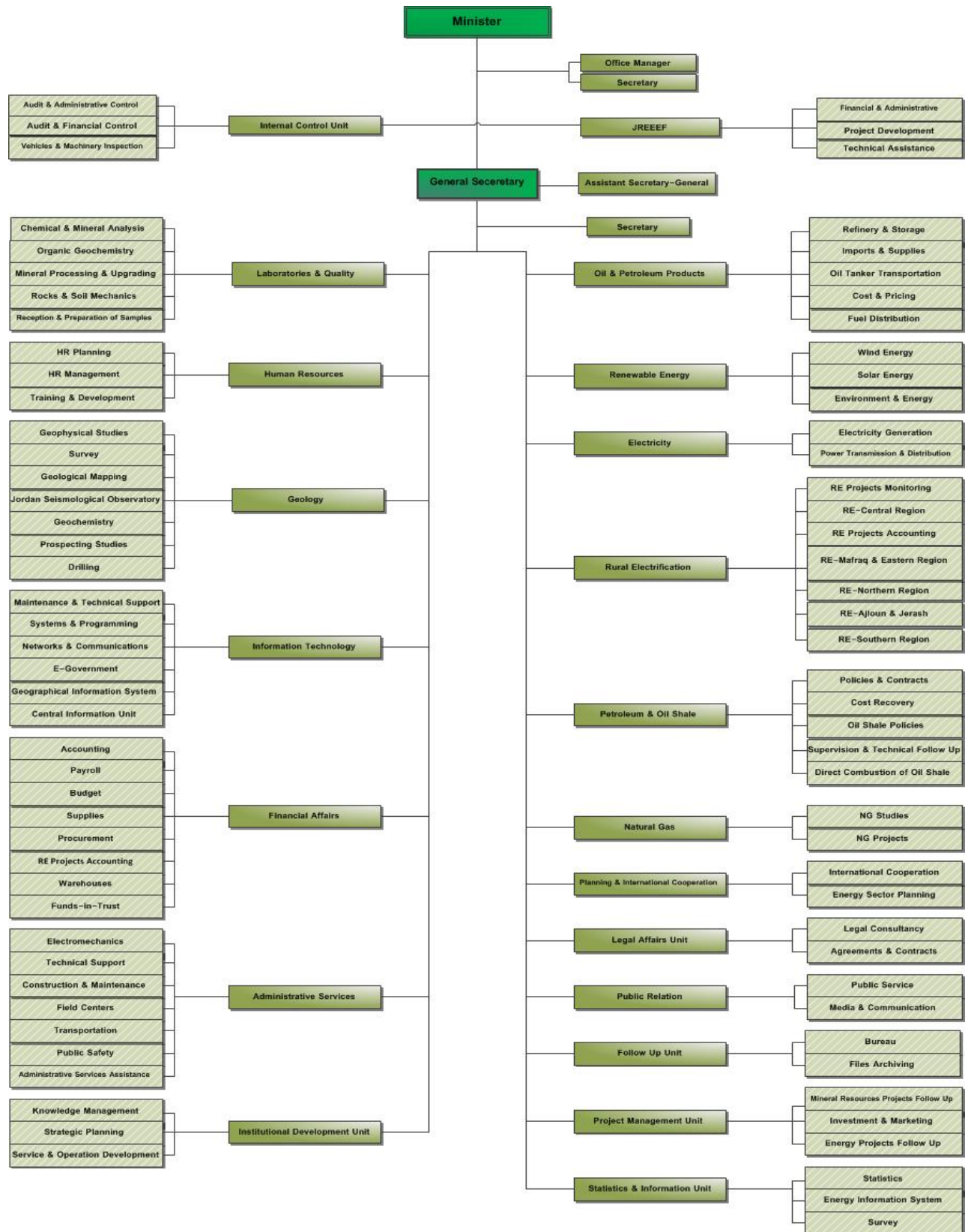
**Core Values**

- Teamwork Spirit.
- Loyalty and Affiliation.
- Integrity and Transparency.
- Excellence and Entrepreneurship.
- Knowledge Dissemination and Use.

**Strategic Objectives**

- Achieve a secure energy supply.
- Diversification of sources and types of energy.
- The development and utilization of conventional and renewable domestic energy sources, Oil Shale and Uranium.
- Transfer, localize, develop, sustain and improve the uses of the technology of nuclear energy.
- Increase energy efficiency in all sectors.
- Maximize the value added to utilize mineral ores.

# Organizational Structure



## Terms and Abbreviations

Unit	Definition
<b>b/day</b>	Barrel/day
<b>boe</b>	Barrel oil equivalent
<b>boe/day</b>	Barrel oil equivalent /day
<b>CF</b>	Cubic Feet
<b>GDP</b>	Gross Domestic Product
<b>GWh</b>	Gigawatt-hour = $10^9$ Watt-hour
<b>JD</b>	Jordan Dinar ( $10^3$ Fils)
<b>kg</b>	Kilograms
<b>kgoe</b>	Kilogram oil equivalent
<b>km</b>	Kilometer
<b>kt</b>	Thousand tons
<b>kV</b>	Kilovolt
<b>kW</b>	Kilowatt ( $10^3$ Watt)
<b>kWh</b>	Kilowatt-hour
<b>MVA</b>	Mega Volt Ampere
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt-hour ( $10^6$ Watt-hour)
<b>toe</b>	Ton oil equivalent

## Economy Statistics

Item	Population (Million)	Gross Domestic Product (GDP) at current prices (Million JD)	GDP per capita (JD)
Amount	10.1	28449	2830

Source: Department of Statistics

## Energy Statistics

Item	Amount
Energy Intensity (kgoe/US\$1000 Fixed Price)	299
Per capita energy consumption (kgoe)	996
Per capita electricity consumption (kWh)	1748
Electricity Generation (GWh)	20054
Electricity Consumption (GWh)	17574
Population access to electricity (% of Population)	100
Domestic energy production (crude oil and natural gas) (1000 toe)	83
Energy Imports (1000 toe)	10207
Primary Energy Consumption (1000 toe)	10009
Cost of Consumed Energy (billion JD)	2429
<b>The Cost of Consumed Energy</b>	
Exports (%)	45.8
Imports (%)	16.8
Gross Domestic Product (%)	8.5

## **Introduction**

The Ministry of Energy and Mineral Resources endeavors to secure sustainable supply of energy and optimal utilization of natural resources over setting and developing the appropriate policies, legislations and programs achieved to diversify sources of imported energy; boost energy indigenous sources, and scale up renewable energy and energy efficiency in various sectors.

## **Crude Oil and Oil Products**

A continuous approach towards securing the Kingdom need of crude oil and oil products was duly achieved by implementing all storage capacities projects for crude oil, oil products and liquefied petroleum gas in Aqaba anticipated to complete in 2018. Likewise, issue an additional Oil Marketing Companies Licenses through an expression of interest to introduce greater competition as part of the restructuring the oil sector plan in 21/12/2017.

A Memorandum of Understanding was signed with the marketing companies to start importing diesel in addition to importing the Kingdom needs of gasoline (octane 95).

The Ministry adhered to supervise all relevant work to petroleum prospecting and monitored the performance of signatory companies of MOUs and Production Sharing Agreements. The Ministry issued the Market Bulletin 2017 to promote open Hydrocarbon potentials, and providing data for investment purposes.

## **Oil Shale**

Start the first project of its kind for oil shale in Jordan and region by Attarat Power Company (APCO) consortium the Yudean Group (Yudean), YTL Power International Berhad (YTL) and Eesti Energia in the second quarter of 2017 to generate a capacity of 470 MW expected by 2020.

## **Natural Gas**

The Cabinet has approved to assign FAJR Company to implement the North Supply Project on BOOT basis. Furthermore, necessary measures were taken to study the possibility of supplying large industries with natural gas and a Master Gas Sales and Purchase Agreement was signed between NEPCO and FAJR; the main umbrella for natural gas sales agreements to be signed between FAJR and the LNG industries.

Further Gas Sale Agreements was signed between FAJR Company and Nuqul Group (Al-Sindian & Al-Keena) and with the United Iron and Steel Manufacturing Co PLC (Manaseer Steel).

## **Electricity**

Start the most efficient power plants in the electrical system by implementing a combined cycle gas project located in Zarqa. The contract was awarded to ACWA Power at an estimated cost of JD 325 million to generate a total capacity of 485 MW. Moreover, an



MOU was signed with the Kingdom of Saudi Arabia to start technical studies for the construction of an international electric transmission line between Jordan and Saudi Arabia. The project covers the future growth rates after 2024. Yet, some international companies have been qualified to submit bids for the Green Corridor project to increase the capacity of the national grid from 500–1450 MW and to absorb the loads generated by renewable energy projects to the South of the Kingdom.

### **Renewable Energy**

- Submit PV Direct Proposals Round III with a total capacity of 200 MW.
- Implement a photovoltaic project with a capacity of 103 MW in Qweirah/Aqaba.
- Implement electricity and reduce electricity consumption project in Za'tri Camp with a capacity of 13 MW.
- Submit an electricity tender to serve the communities hosting Syrian refugees with a capacity of 46–MWp (40 AC) in Southern Amman.
- Sign a Solar Energy Power Purchase Agreements with ACWA Power Company and the consortium of AES/Mitsui to generate a capacity of 50 MW in Risha region and 40 MW in East Amman respectively.

- Operate the second phase of wind project with a capacity of 14 MW in Ma'an.
- Sign Power purchase Agreements of Wind Energy Direct Proposals Round I with a total capacity of 330 MW Southern Jordan.
- Wind Energy Direct Proposals Round III for 100 MW of capacity.
- Announce an electricity and energy storage project with a capacity of 30 MW to store 60 MWh of electricity for two hours to be operated by end of 2019.
- The number of small-scale renewable energy schemes installation and connection to the grid for households, universities, commercial and industrial enterprises, government institutions, schools, mosques, churches, telecommunication companies, banks, CBOs, hospitals, farms, etc. sectors has reached a total of 153 MW of capacity.

### **Geology and Mining**

Supervise prospecting projects for gypsum and oil shale and carry on geochemical prospection projects for Rare Elements, Phosphogypsum, and Lithium.

Currently, Jordan Seismological Observatory endeavored to detect, monitor and record earthquakes. Jordan Seismological Observatory JSO stations have recorded 624 earthquake events in 2017; 105 local recorded in Jordan Rift Area, 238 regional and 281 distant seismic events.

## **Energy Institutions**

Given the importance of the overriding role played by energy sector in the socioeconomic aspects and its direct relationship to the political and economic issues; the Government has paid the sector a great attention to enhance energy efficiency and effectiveness.

### **1. The Ministry of Energy and Mineral Resources MEMR**

The Ministry has adopted a comprehensive planning process for the sector in terms of regulation, policies and implementation to achieve the tasks entrusted. The most important of which is to provide the required energy by all forms needed for the purposes of comprehensive development at the lowest possible cost and better quality; beside attracting the required capital needed to invest in energy sector such as generating electricity, producing oil products, and utilizing domestic energy resources particularly the renewable ones. Not to mention supplying villages, populations and Jordanian rural communities with electricity through rural electrification. However, the Ministry spares no effort to support studies to improve energy efficiency in various sectors and ensure loan guarantee for renewable energy and energy efficiency projects through Jordan Renewable Energy and Energy Efficiency Fund JREEEF.

### **2. Energy and Minerals Regulatory Commission EMRC**

Energy and Minerals Regulatory Commission is a governmental body that possess a legal personality with financial and administrative independence and is considered the legal successor of the Electricity Regulatory Commission (ERC) and the Jordan Nuclear Regulatory Commission (JNRC) and the Natural Resources Authority (NRA) in relation to its regulatory tasks according to the Restructuring of Institutions and Government Departments Law, No. 17/2014.

### **3. Electricity Institutions**

The institutions that is responsible for generating, transmitting and distributing electricity all over the Kingdom.

#### **3.1. National Electric Power Company NEPCO**

A public shareholding company owned by the government. NEPCO is deemed to be responsible for the construction, operation and maintenance of the transmission system inside Jordan. It is also responsible for the electric transmission system which connects the system with other neighboring countries systems besides securing power supply through the expansion of generating units either by private and/or public sector.

#### **3.2. Electricity Generating Companies**

##### **3.2.1. Central Electricity Generating Company CEGCO**

A public shareholding company founded in 1999 generates electricity and sells electricity in wholesale to the National Electric Power Company. The generating capacity of the company amounted almost to 1392 MW at the end of 2017.

### **3.2.2. Samra Electric Power Company SEPCO**

A private shareholding company founded in 2004 and whose shares are fully owned by the government. The company is responsible to generate electricity and sell it to NEPCO. The generating capacity of the company reached around 1129 MW at the end of 2017.

### **3.2.3. AES–Jordan. PSC**

Also known as Amman East Power Project, a private company owned by the American AES company and the Japanese MITSUI company founded in 2009. It generates and sells electricity to NEPCO. AES–Jordan. PSC owned the first private project to generate electricity in East Amman power plant/Al–Manakher inaugurated under the patronage of His Majesty King Abdulla II on 26/10/2009. The generating capacity of the company reached around 373 MW at the end of

2017.

#### **3.2.4. Qatraneh Electric Power Company**

A private company owned by the Korean KEPCO company and the Saudi XENEL company founded in 2010. The company generates and sells electricity to NEPCO. The generating capacity of the company amounted to around 373 MW at the end of 2017.

#### **3.2.5. Amman Asia Electric Power Company**

A private company established in 2014 by the Korean KEPCO Company and the Japanese Mitsubishi. The company generates and sells electricity to NEPCO. The generating capacity of the company amounted to around 570 MW at the end of 2017.

#### **3.2.6. AES LEVANT HOLDING B.V./JORDAN**

A private company established in 2014 by the Korean KEPCO Company and the Japanese Mitsubishi. The company generates and sells electricity to NEPCO. The generating capacity of the company amounted to around 240 MW at the end of 2017.

#### **3.2.7. Jordan Wind Project Company PSC, JWPC**

A co-development consortium between InfraMed 50%, Masdar 31% and EP Global Energy 19%.

JWPC produces a capacity of 117 MW in Tafilah. JWPC sells electricity to National Electricity Power Company NEPCO.

### **3.3. Electricity Distribution Companies**

#### **3.3.1. Jordan Electric Power Company JEPCO**

A 20-year licensed public shareholding company which was given license in 29.5.2014. JEPCO distributes electricity in Amman, Zarqa, Ma'daba and Balqa' governorates excluding Central Jordan Valley.

#### **3.3.2. Irbid District Electricity Company LTD IDECO**

A public shareholding company responsible for distributing electricity in Irbid, Mafrqa, Jerash and Ajloun governorates excluding Northern Jordan Valley and Eastern areas. The company has been granted a 25-year license in 2008.

#### **3.3.3. Electricity Distribution Company EDCO**

A public shareholding company responsible for distributing electricity outside the concession areas of JEPCO and IDECO; namely the Southern, Eastern and Jordan Valley areas. The company had been granted a 25-year license in 2008.

## **4. Petroleum, Gas, and Mineral Ores Institutions**

Institutions that carry out operations of prospecting oil, gas and mineral ores inside the Kingdom along with refining and selling crude oil and oil products.

#### **4.1. National Petroleum Company NPCO**

A public company owned by the government. NPCO prospects oil and gas in the concession area to the northeast of the Kingdom along with the Iraqi borders covering an area of 7000 square kilometers including Risha gas field within an area around 1500 square kilometers. The duration of the concession period lasts for 50 years from the date of entry into force in 1996.

#### **4.2. Jordan Petroleum Refinery Company JPRCO**

A public shareholding company responsible for refining, producing and distributing crude oil and oil products inside the Kingdom.

#### **4.3. Jordanian Egyptian Fajr for Natural Gas Transmission & Supply Co. Ltd**

A limited liability company, pursuant to the Jordanian Companies Law and License Agreement signed on 25.1.2004 by both Jordan Government represented by the Ministry of Energy and Mineral Resources and Jordanian Egyptian Fajr. It builds, operates and owns the gas pipeline from Aqaba to the north of Kingdom. Moreover, it collects the Egyptian natural gas in Aqaba



through the pipeline, transfers and sells it to the power plants and major industries.

#### **4.4. Gas Stations**

Stations owned by legal or natural persons concerns with selling fuel. The number of the stations operated in the region reached 547 stations at the end of 2017.

#### **4.5. LPG Agencies**

Agencies owned by legal or natural persons concerns with distributing gas cylinders. The number of working agencies reached 890 stations at the end of 2017.

#### **4.6. LPG Warehouses**

Warehouses owned by legal or natural persons distribute and transfer LPG cylinders from filling stations to warehouses and provide licensed distribution agencies. The number of warehouses has reached 131 warehouses at the end of 2017.

#### **4.7. Central LPG Distribution Companies**

Privately-held companies concerns with distributing LPG by tanks. The number of the companies reached 6 companies in 2017.

#### **4.8. Oil Products Marketing Companies**

Three privately-held companies concern with distributing oil products (gasoline, diesel, kerosene and jet fuel).

## **5. Jordan Atomic Energy Commission JAEC**

Jordan Atomic Energy Commission was established at the beginning of 2008. The work of the Atomic Energy Commission focuses on introducing the peaceful uses of nuclear energy and radiation to the Kingdom and developing its sustainable use to generate electricity, desalinate water and various applications of agriculture, medicine and industry purposes.

## **6. Jordan Bio-Gas Company Ltd.**

A joint-stock company owned by the CEGCO and Greater Amman Municipality GAM founded in 1998. The Company aims at converting organic waste into methane gas to generate electricity. The generating capacity reaches 3.5 MW.

## **Development of Oil and Natural Gas**

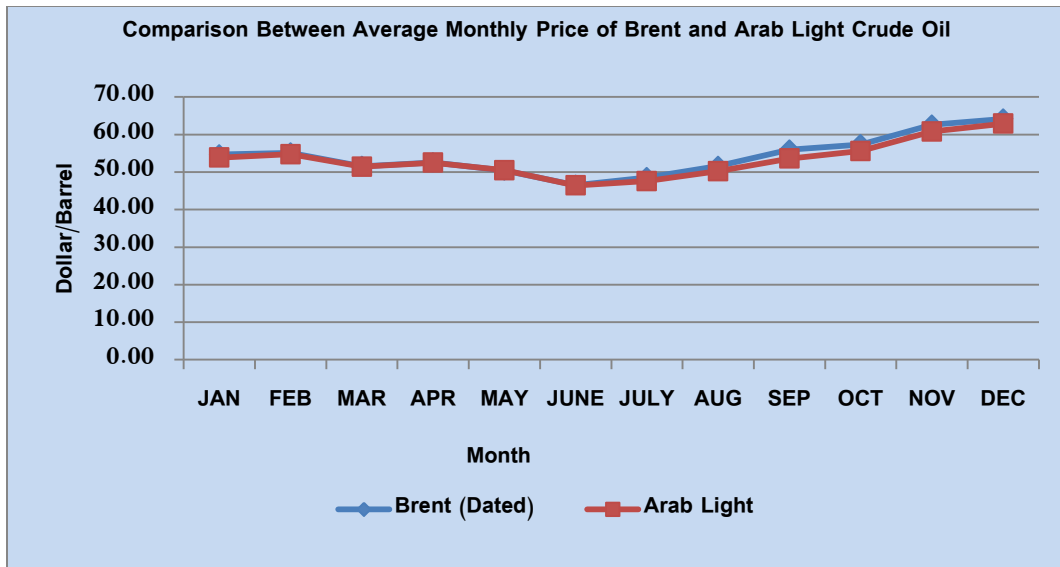
### **Arab and International Level**

The average daily world production of crude oil ranged around 96 million barrels in 2017 showing a growth of 14% comparing with 2016. However, the world's proven reserves in 2017 scored around 1488 billion barrels.

In the other hand, the Arab counterpart daily production of crude oil amounted to around 26 million barrels covering 31% of the global production.

However, the Arab's proven reserves of crude oil amounted to 716 billion barrels and represented 48% of global reserves for 2017.

Brent oil prices have fluctuated and reached the highest rates at 64 dollars/barrel in December. It hit the lowest rate at around 47 dollars/barrel in June. The following chart shows comparison of monthly average prices on Brent crude oil and Arab light imported by Jordan in 2017.



Source: Platte Bulletin

The world production of natural gas amounted to approximately 3786 billion cubic meters with a growth estimated to 2.3% comparing with 2016 while the world’s reserves reached 200 trillion cubic meters in 2017.

It is worth noting that the Arab States hit nearly 600 billion cubic meters of natural gas production representing 16% of the world production. Yet, the Arab States reserves of natural gas have reached nearly 56 trillion cubic meters representing 28% of the global reserves.

### Local Level

The local production of energy (crude oil, natural gas and renewable energy) reached around 582.1 thousand toe in 2017 representing

6% of Jordan total energy needs. Due to lack of energy sources, Jordan heavily depends on imports to fulfill the domestic energy needs. The imported quantities of crude oil and oil products reached to approximately 5.669 million toe, while no quantities of natural gas were imported from Egypt in 2017. However, LNG imported quantities by FSRU reached about 127 billion cubic feet while the total cost of crude oil and oil products, natural gas and coal imported by Jordan totally reached JD 2429 million in 2017 with an increase of 26% comparing with 2016.

The total demand for primary energy estimated to 10.09 million toe in 2017 with a rise of 4.1% while the total demand for final energy reached around 6.987 million toe with 5.1% of increase comparing with 2016 demand levels. Accordingly, the demand for oil products amounted to 5.082 million toe.

## **Energy Sources in Jordan**

Jordan local energy sources of oil and natural gas are inadequate despite the exerted efforts spent by the government to develop, search, or prospect other domestic resources through foreign companies associated with the government. Those companies have been given offered all required facilities and information provided by seismic studies and surveys.

Jordan has a huge amount of oil shale which exceeds 70 billion tons containing more than 7 billion tons of shale oil. Oil shale may be burned directly to generate electricity. Furthermore, ICP technology and surface retorting may be used to produce gas and shale oil.

In connection with the contribution of renewable energy resources to the total energy mix, the contribution does not exceed 6%. The Ministry of Energy and Mineral Resources has adopted an ambitious program to increase the contribution of renewables in the total energy mix to reach 10% by 2020.

All details related to domestic energy resources will be subsequently discussed while pointing out to the comprehensive strategy of the energy sector.

Table 1 shows the domestic production of crude oil and natural gas and their contribution to the overall energy consumed during 2013–2017 in the Kingdom.

**Table (1)– Domestic Production of Crude Oil and Natural Gas during 2013–2017**

Year	Crude Oil (kt)	Natural Gas (BCF)	Contribution of Domestic Production of Oil and Natural Gas to the Overall Energy Consumption (%)
2013	1.0	5.3	2.1
2014	0.8	4.6	3.0
2015	0.5	4.3	3.0
2016	0.4	4.1	5.0
2017	0.3	3.6	6.0

## Domestic Demand for Energy and Electricity

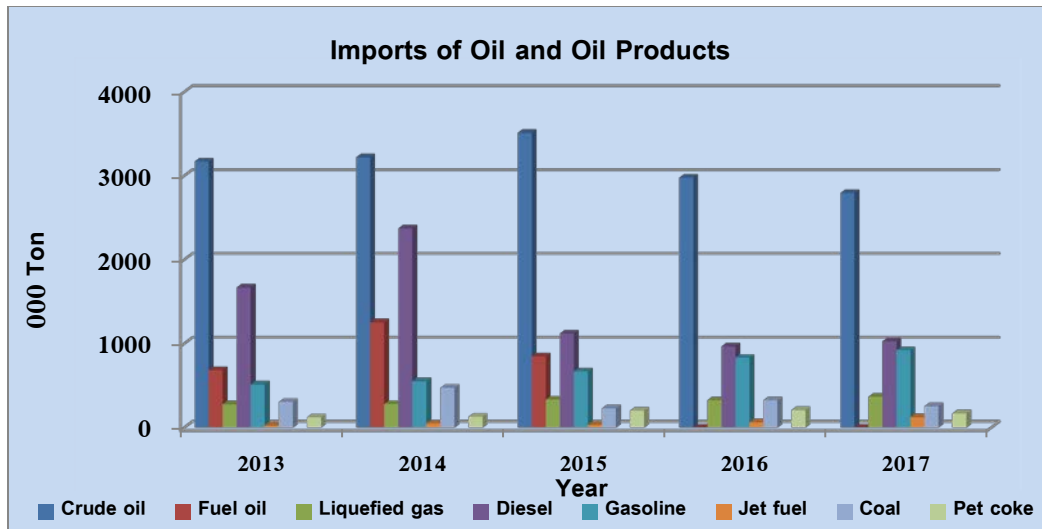
### 1. Crude Oil and Oil Products

The cost of crude oil and oil products imports in 2017 was estimated to JD 1734 million registering an increase of 30 % comparing with 2016.

Table 2 shows the quantity of crude oil and oil products imports during 2013–2017.

**Table 2–Imports of Crude Oil and Oil Products 2013–2017 (thousand ton)**

Year	Crude Oil	Fuel Oil	Liquefied Gas	Diesel	Gasoline	Jet Fuel	Coal	Vacuum Residuals	Pet Coke	Total
2013	3170	685	280	1670	515	27	306	23	123	6799
2014	3221	1255	282	2373	552	51	474	0	130	8338
2015	3513	848	335	1121	670	34	230	0	204	6955
2016	2978	0	327	967	832	64	327	0	210	5705
2017	2795	0	368	1029	923	125	255	0	170	5665



## 2. Natural Gas

No quantities of natural gas have been imported from Egypt in 2017. However, the quantities of liquefied natural gas (LNG) from floating gas vessels reached about 127 billion cubic feet.

## 3. Primary and Final Energy Consumption

The overall demand for primary energy in 2017 hit nearly 10.009 million toe with an increase 4.1 % comparing with 2016. Table 3 demonstrates the domestic demand for primary energy during 2013–2017.



**Table 3 – Primary Energy Consumption during 2013–2017 (Thousand toe)**

Year	Primary Energy						Total
	Crude Oil and Oil Products	Coal	Pet Coke	Natural Gas	Renewable Energy	Imported Electricity	
2013	6689	204	116	907	145	96	8157
2014	7479	332	88	301	152	109	8461
2015	6331	161	165	1944	160	183	8944
2016	5327	220	182	3389	412	84	9614
2017	5671	165	148	3510	515	13	10009

Table 4 shows final energy consumption and distribution to all economic sectors.

**Table 4 – Sector Distribution of Final Energy Consumption toe 2013–2017**

Year	Sector				Total
	Transport	Industry	Household	Others*	
2013	2734	924	1109	617	5384
2014	2558	1079	1152	718	5507
2015	2811	991	1272	754	5828
2016	3184	1064	1342	826	6416
2017	3431	938	1549	950	6868

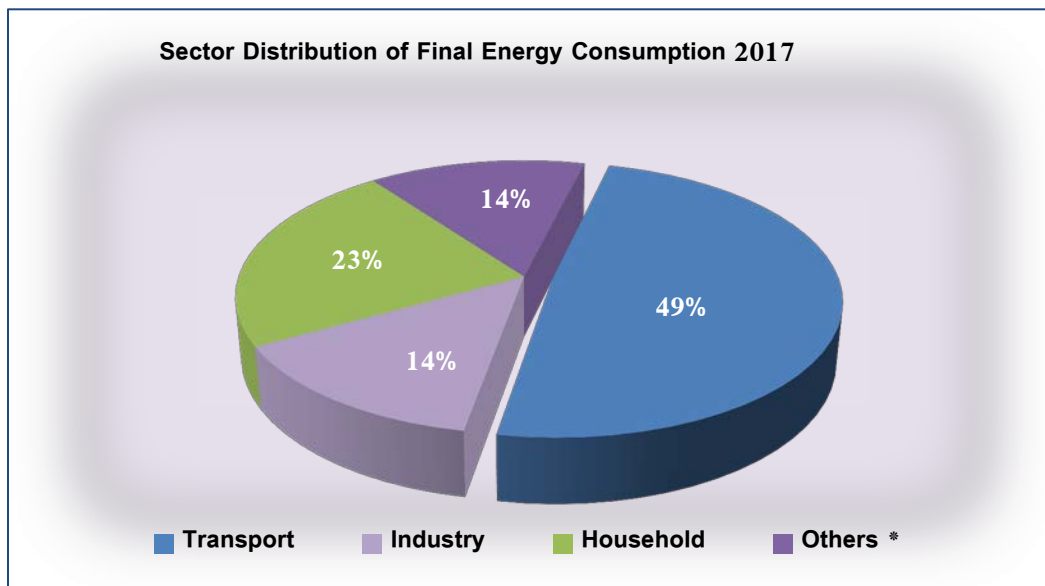
*\*Commercial, agricultural sectors along with street lights.*

Table 5 shows the percentages of sector distribution for final energy.

**Table 5 – Sector Distribution of Final Energy Consumption (%) 2013–2017**

Year	Sector %				Total
	Transport	Industry	Household	Others*	
2013	51	17	21	11	100
2014	46	20	21	13	100
2015	48	17	22	13	100
2016	48	16	20	16	100
2017	49	14	23	14	100

*\*Commercial and agricultural sectors along with street lights.*



*\*Commercial and agricultural sectors along with street lights.*

#### 4. Oil Products Consumption and Prices

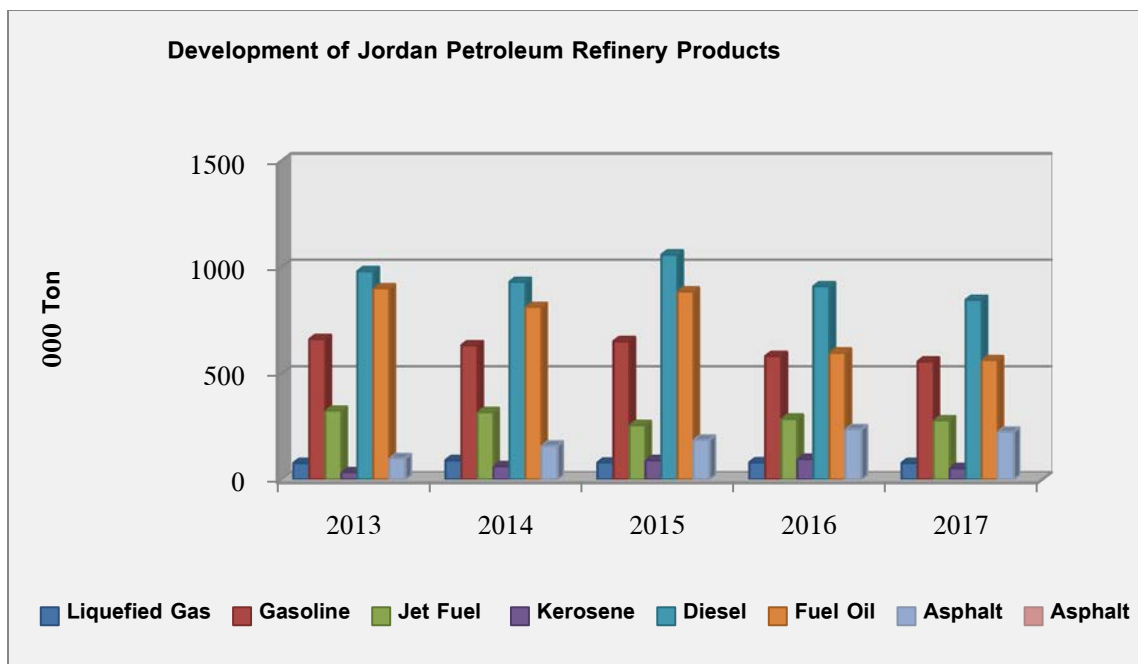
In general, the year 2017 witnessed an increase of around 0.5 %

in the consumption of oil products due to the decrease in demands of oil products used in electricity generation and large imported quantities of natural gas. The decrease of consumption amounted to 16.7 % and 18.5 % for fuel oil and kerosene respectively. The consumption of oil products has amounted to around 4936 thousand tons comparing with 4912 thousand tons in 2016.

Table 6 shows the development in the oil production during 2013–2017, while table 7 shows the development in the consumption of oil products for the same period.

**Table 6 –Development of Jordan Petroleum Refinery’s Production 2013–2017  
(Thousand Ton)**

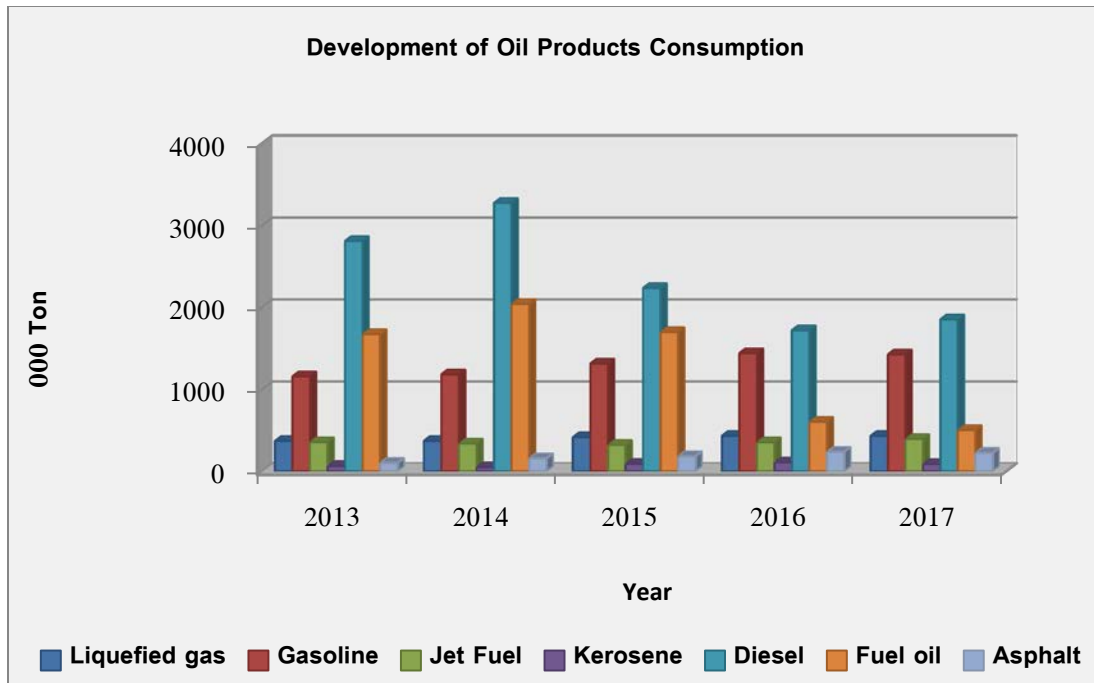
<b>Year</b>	<b>Liquefied Gas</b>	<b>Gasoline</b>	<b>Jet Fuel</b>	<b>Kerosene</b>	<b>Diesel</b>	<b>Fuel Oil</b>	<b>Asphalt</b>	<b>Total</b>
<b>2013</b>	78	663	325	34	980	900	101	3082
<b>2014</b>	91	634	318	63	930	812	160	3008
<b>2015</b>	80	653	257	91	1058	885	188	3212
<b>2016</b>	81	583	287	97	909	599	238	2794
<b>2017</b>	78	557	279	54	845	564	226	2603



**Table 7 –Development of Oil Products Consumption during 2013–2017 (Thousand Ton)**

Year	Liquefied Gas	Gasoline	Jet Fuel	Kerosene	Diesel	Fuel Oil	Asphalt	Total
<b>2013</b>	369	1161	357	63	2810	1679	104	6544
<b>2014</b>	371	1187	339	49	3274	2041	159	7420
<b>2015</b>	416	1319	321	91	2235	1705	185	6272
<b>2016</b>	433	1446	355	108	1726	606	238	4912
<b>2017</b>	431	1431	396	88	1859	505	226	4936
<b>Growth Rate %</b>	(0.5)	(1)	11.5	(18.5)	7.7	(16.7)	(5)	0.5

\* Brackets denote negative amounts.



In relation to oil products prices in 2017, a policy towards liberating oil products prices was reinstated starting from 14.11.2012 according to global pricing policy after a stop in early 2011. A monthly pricing formula was applied on most oil products. Table 8 demonstrates the prices of oil products announced locally in 2017.

**Table 8 – Local Prices of Oil Products**

2017													
Item	Unit	Jan.	Feb.	Mar.	Apr.	May	June	Jul	Aug.	Sept.	Oct.	Nov.	Dec.
Gasoline (90)	Fils/Litre	620.00	665.00	665.00	665.00	675.00	665.00	650.00	650.00	680.00	690.00	690.00	720.00
Gasoline (95)	Fils/Litre	810.00	880.00	880.00	880.00	890.00	890.00	865.00	865.00	895.00	910.00	910.00	945.00
Gasoline (98)	Fils/Litre				1030.0	1040.0	1040.0	1015.0	1015.0	1045.0	1060.0	1060.0	1095.0
Kerosene	Fils/Litre	465.00	480.00	480.00	480.00	490.00	480.00	465.00	480.00	495.00	520.00	520.00	540.00
Diesel	Fils/Litre	465.00	480.00	480.00	480.00	490.00	480.00	465.00	480.00	495.00	520.00	520.00	540.00
Diesel/Ship	Fils/Litre	470.00	480.00	485.00	480.00	495.00	485.00	465.00	480.00	495.00	520.00	520.00	540.00
Liquefied Gas 12.5kg	JD/Cylinder	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Liquefied Gas 50kg	JD/Cylinder	30.57	33.12	36.29	36.50	32.91	30.00	30.00	29.00	32.00	33.50	37.00	37.00
Liquefied Gas/Central Distribution/ Bulk	JD/ton	572.67	623.63	687.20	688.83	619.48	555.03	554.90	533.93	599.14	630.46	695.39	701.93
Natural Gas/Industry	JD/MBTU	6.620	6.726	6.880	7.060	6.590	6.512	6.032	5.912	5.860	5.985	7.036	6.933
Natural Gas/Risha	JD/MBTU						3.430	3.145	3.085	3.037	3.114	3.750	3.685
Fuel Oil/Industry	JD/ton	314.36	320.15	312.19	296.96	305.62	300.26	293.25	297.21	304.97	320.62	326.44	350.06
Fuel Oil/Electricity	JD/ton	223.52	229.40	231.67	220.71	220.63	212.02	195.22	201.98	216.47	234.99	240.20	262.88
Fuel Oil 1% Sulpher	JD/ton	349.67	355.47	347.50	332.28	340.93	335.57	328.57	332.52	340.28	355.93	361.75	385.38
Fuel Oil/Ships	JD/ton	314.36	320.15	312.19	296.96	305.62	300.26	293.25	297.21	304.97	320.62	326.44	350.06
Avtur/Local	Fils/Litre	373.00	378.00	383.00	363.00	367.00	353.00	337.00	350.00	367.00	390.00	391.00	419.00
Avtur/Foreign	Fils/Litre	378.00	383.00	388.00	368.00	372.00	358.00	342.00	355.00	372.00	395.00	396.00	424.00
Avtur/Charter	Fils/Litre	393.00	398.00	403.00	383.00	387.00	373.00	357.00	370.00	387.00	410.00	411.00	439.00
Asphalt	JD/ton	339.52	345.31	337.35	322.13	330.78	325.42	318.42	322.37	330.13	345.78	351.60	380.26

## **Electricity**

The demand for electricity had increased to reach 5% in 2017. The highest rate recorded by street lights, household and commercial sectors reached 15%, 8% respectively.

The overall amount of electricity imported via interconnection network with Egypt and Syria reached 51.3 GWh registering a decrease of 84% comparing to 2016. The Ministry of Energy and Mineral Resources and the National Electricity Power Company made several actions to meet the growing demand. The details of mentioned procedures will be described later on while viewing the comprehensive strategy for energy sector.

## **Electricity Generation and Consumption**

The amount of electricity generated in 2017 has reached 20760 GWh registering a growth of 7% comparing with 2016 while the electricity consumed for the same period reached 17574 GWh recording a growth of 5% approximately comparing with 2016.

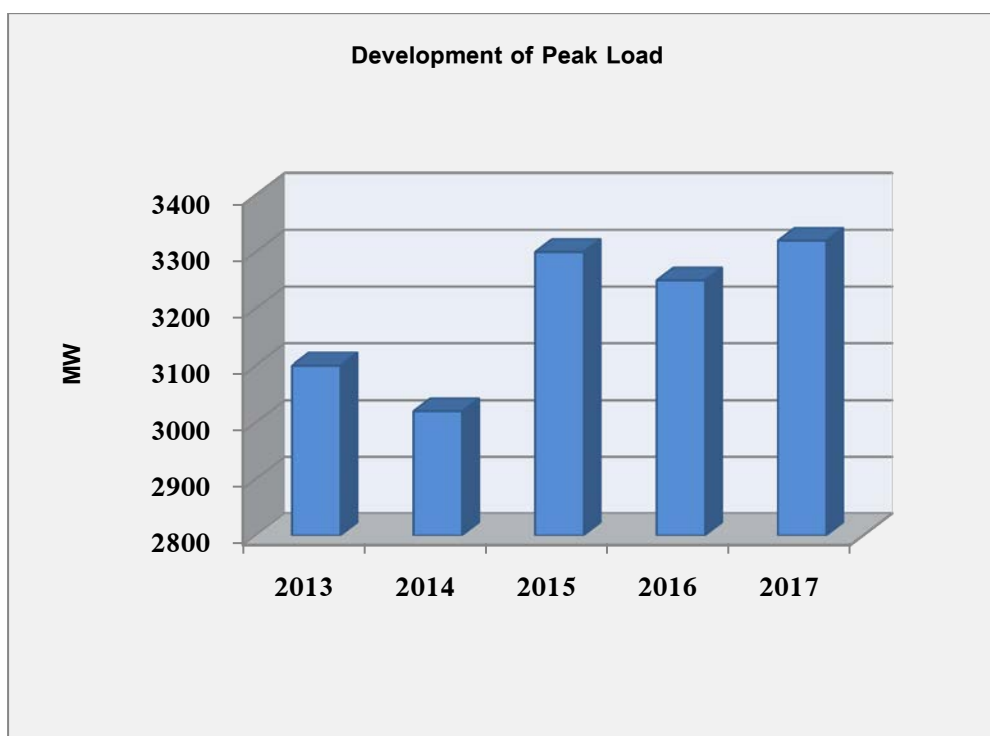
However, the peak load of the electricity system recorded 3320 MW in 2017 pointing an increase of 2 % compared with 2016.

Tables 9, 10 and 11 demonstrate the development of electricity production and consumption as well as the distribution of electricity consumption.

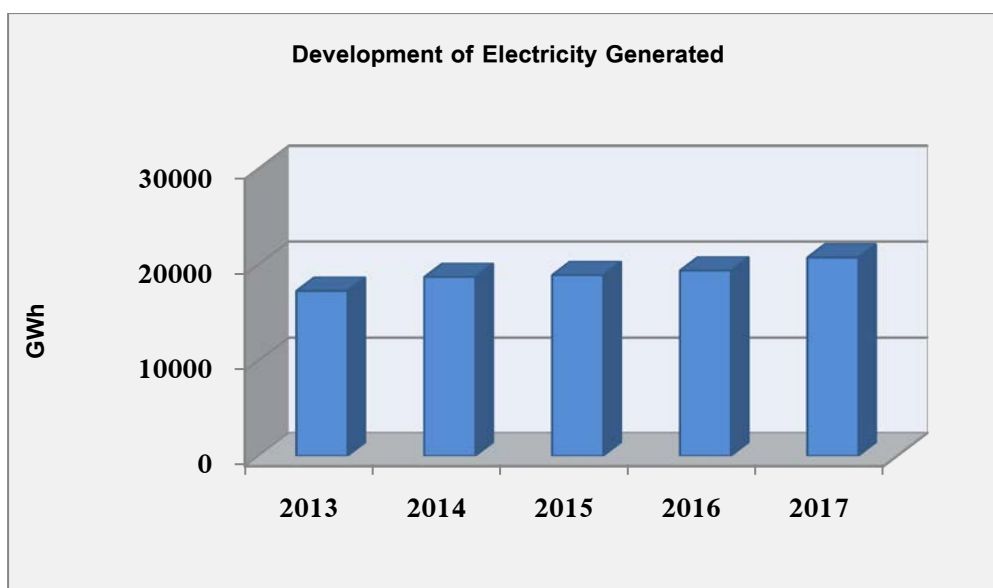
**Table 9 –Growth of Electricity Production and Peak Load 2013–2017**

Year	Peak Load MW	Growth Rate %	Electricity Generated GWh	Growth Rate %
2013	3100	7.6	17261	4.0
2014	3020	(2.5)	18704	8.4
2015	3300	9	18911	1
2016	3250	(1)	19390	2.5
2017	3320	2	20760	7

\* Brackets denote negative amounts.





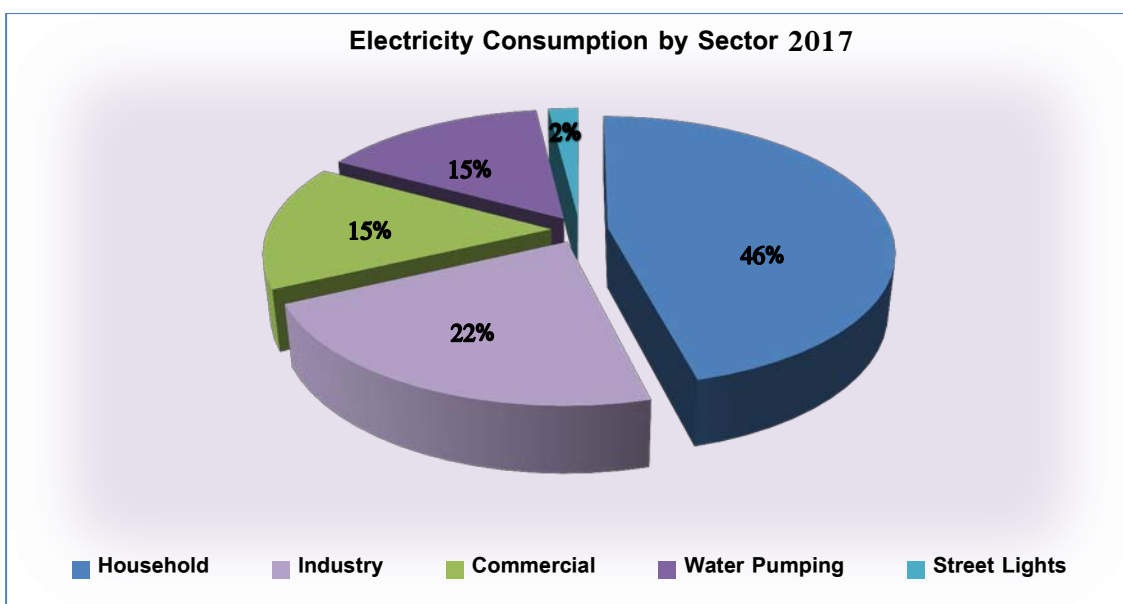


**Table10–Distribution of Electricity Consumption and Growth Rate 2013–2017 (GWh)**

Sector Year	Household	Industry	Commercial	Water Pumping	Street Lights	Total	Growth Rate %
2013	6265	3517	2415	2076	291	14564	2.0
2014	6580	3877	2358	2287	316	15418	5.9
2015	6938	4013	2460	2426	336	16173	5.0
2016	7448	3939	2447	2485	350	16669	3.0
2017	8076	3785	2654	2656	403	17574	5.0

**Table 11– Percentages of Sectorial Electricity Consumption 2013–2017**

Sector Year	Household	Industry	Commercial	Water Pumping	Street Lights	Total
2013	43	24	17	14	2	100
2014	43	25	15	15	2	100
2015	43	25	15	15	2	100
2016	45	23	15	15	2	100
2017	46	22	15	15	2	100



### Electricity Tariff

Electricity tariff sold to distribution Companies and main consumers by NEPCO on 31/12/2017.

No.	Company	Bulk Supply Tariff		
		Peak Load	Day Energy	Night Energy
		JD/kW/Month	Fils/kWh	
1	JEPCO	2.98	76.97	66.92
2	EDCO	2.98	72.46	62.39
3	IDECO	2.98	62.79	52.74
Large Industries				
4	Mining	2.98	237	170
5	Other	2.98	124	109

Table 13 below shows the electricity tariffs sold to consumers by distribution companies on 31/12/2017.

Retail Tariff/Category Fils/kWh/Month								
Category	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	
Fils	1-160	161-300	301-500	501-600	601-750	751-1000	>1000	
Household	33	72	86	114	158	188	256	
Domestic	42	92	109	145	169	190	256	
Flat Rate Tariff Fils/kWh								
1	TV & Broadcasting Stations						137	
2	Banks						285	
3	Water Pumping						94	
4	Streets Lighting						114	
5	Army Forces						146	
6	Port Corporation						159	
Sector		Flat Rate Tariff Fils/kWh	Peak Load JD/kW/Month	Day Energy Fils/kWh	Night Energy			
7	Agriculture	60	3.79	59	49			
8	Hotels	91	3.79	89	75			
9	Medium Industries		3.79	89	75			
Retail Tariff/Category Fils/kWh/Month								
Sector		1 <sup>st</sup>		2 <sup>nd</sup>				
		1-2000		>2000				
10	Commercial	120		175				
11	Telecommunication	230		273				
12 Small Industries		1-10000		>10000				
		71		81				
13	Agriculture/Commercial						120	
							60	

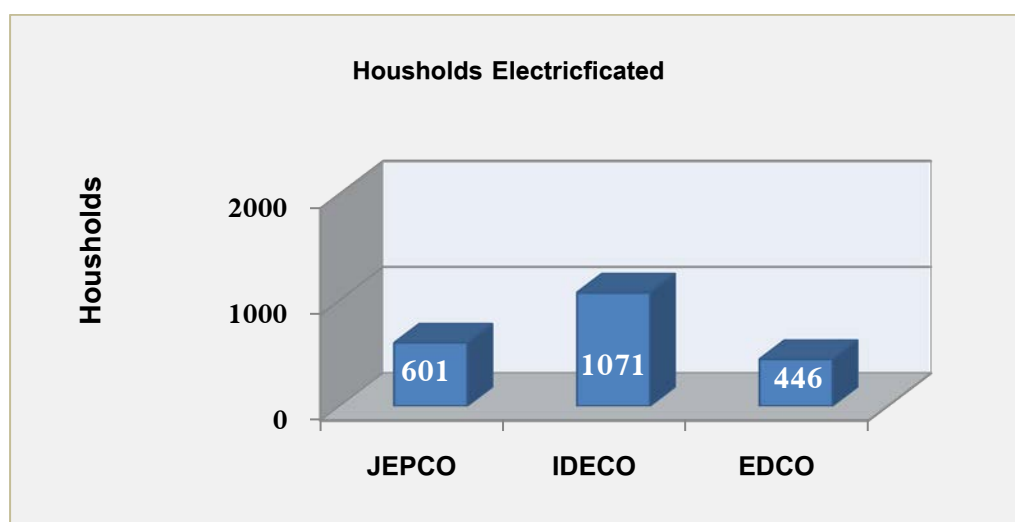
## Rural Electrification

The Ministry of Energy and Mineral Resources continued electrification to remote villages, rural communities and poor families in 2017. The total recorded requests for electrification reached 2985 requests at an estimated cost amounted to JD 14.667 million. Requests were handled as described in table 14, which also shows the cost for each category based on the total cost estimates required by all applications amounting to JD 14.667 million.

The figure below illustrates the number of houses electrified in 2017 recording 2644 households distributed by areas of the electricity distribution companies under concession.

**Table14–Classification of sites and costs**

No.	Item	Number	Million JD	Cost %
1	Implemented Sites	2118	6.504	41
2	Cancelled Sites	167	1.079	7
3	Rejected Sites	942	6.114	42
4	Approved Sites	2043	8.553	58



The Ministry likewise utilized off grid PV solar systems energy in rural areas and the remote Jordan Badia to produce electricity for population groups and artesian wells in such areas at a total cost of JD 869283.

Additionally, some projects acquired a Prime Ministry exception to connect electricity at the expense of rural Fils due to their contribution in developing local community, provide job opportunities, reduce poverty and unemployment and support the agricultural and tourism sectors,.

The total projects value amounted to JD 6137965 in 2017. The projects included the farms located in the Wadi Al Mujib–Mujib dam, CBOs, torrent watering farms in Mahis and agriculture units in southern areas, Zara water treatment pipeline in South Shoneh, the Royal Society for the Conservation of Nature in Ruwaished, armed forces, Caritas Jordan Association in Amman, schools, graveyards, sport Clubs, and landfill.

## **Significant Achievements**

The Ministry of Energy and Mineral Resources in cooperation with the energy stakeholders have incessantly implemented all the approaches and practices approved by the Action Plan arisen from the mutual vision of the Executive Development Program and the Comprehensive Energy Strategy for the year 2017 as summarized below:

### **Crude Oil and Oil Products**

#### **1. Projects**

To follow-up the projects of oil sector:

- Building storage capacities of crude oil and oil products estimated to 100 thousand tons in Aqaba to be expected by the second half of 2018.
- Building storage capacities of liquefied petroleum gas estimated to 6 thousand tons in Aqaba to be expected by the second half of 2018.
- Building 250–300 thousand tons strategic capacities of oil products and 8000 tons of LPG in the middle of the Kingdom to be expected by the second half of 2018.

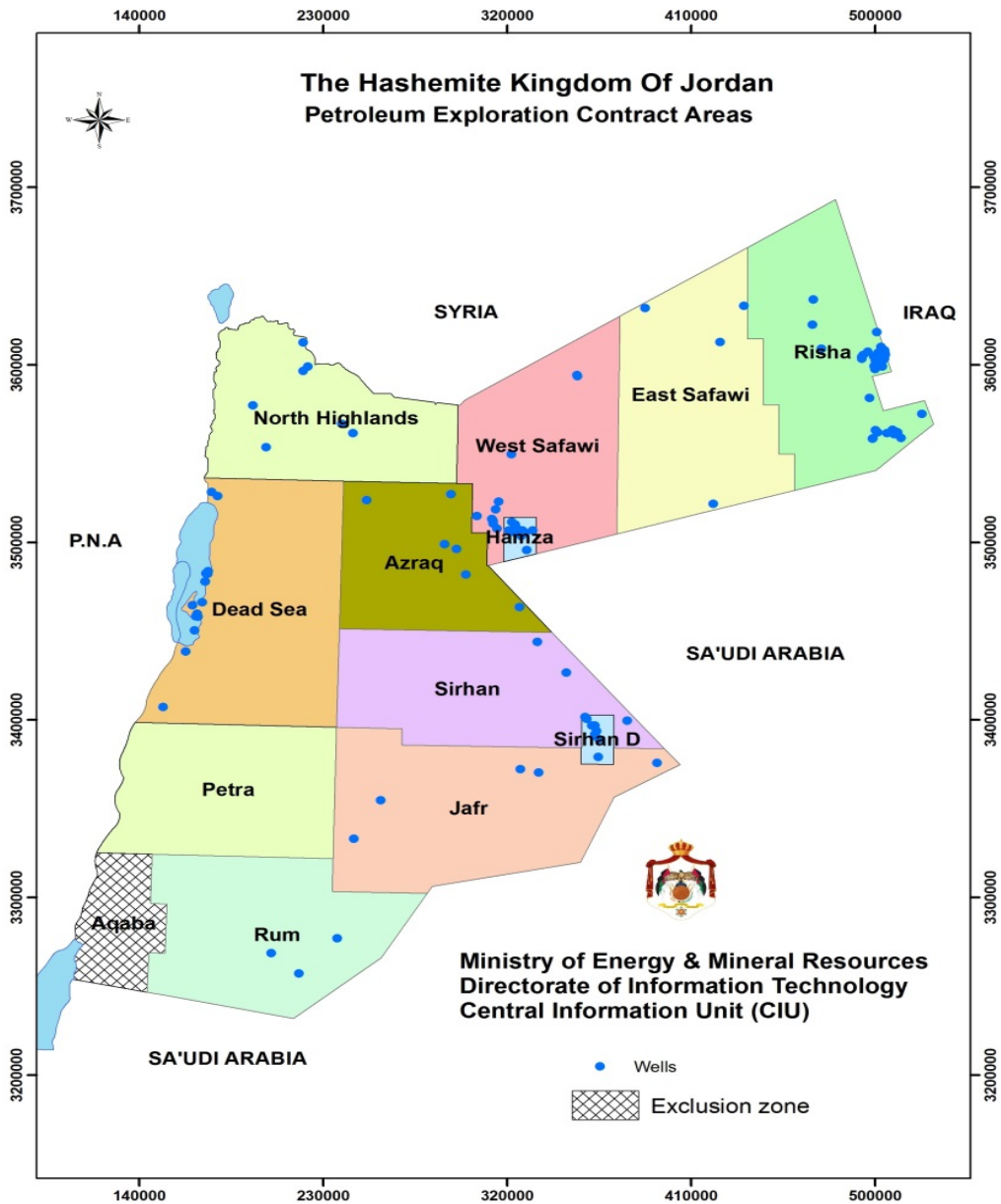
#### **2. Crude Oil and Oil Products**

- The Council of Ministries approves to issue additional Oil Marketing Companies Licenses through an expression of interest process to introduce greater competition as part of the restructuring the oil sector plan in 21/12/2017.
- The newly created Jordan Oil Terminal Company (JOTC) started providing the logistic storage and import handling services in 2016.

- Ongoing discussion to import Iraqi crude oil via Jordan territories.
- Upgrade Jordan Petroleum Refinery Company for the fourth expansion project.
- Study energy investor's requests to construct new refineries.
- Coordination with the Oil Marketing Companies to import the full amount of the deficit of the refinery diesel production adding to the overseas needs of the unleaded gasoline sales of 95-Octane from December 2016.
- Monitor and observe prices of crude oil and oil products data according to Platts' daily spot price assessment and required by the oil pricing committee to determine oil prices in local market besides preparing monthly pricing schedules for oil products and follow-up Jordan Petroleum Refinery Company financial statements and marketing companies' activities.

### **Current Status of Oil and Gas Explorations**

The Ministry of Energy and Mineral Resources MEMR supervises all prospecting and exploitation works of petroleum and natural gas blocks delimitations for oil and gas exploration in Jordan. MEMR also monitors the performance of signatory companies of MOUs and PSAs in 2017 to subdivide Jordan into twelve exploratory blocks in terms of the subsurface geological features performed in 2D and 3D seismic surveys as shown in the figure below:



## Petroleum Agreements

### - East Safawi-9459 km<sup>2</sup>

The Ministry follows-up a Production-Sharing Agreement alongside with the National Petroleum



Company already issued by a Special Law No. 14/2014 on 01/04/2014.

- **Hamza Oil Field**

The Ministry currently monitors Hamza oil field production and shipment to the Jordan Petroleum Refinery.

**Marketing Petroleum Regions**

The Ministry prepared promotion for open Hydrocarbon potentials by holding specialized conferences and workshops, issuing the Market Bulletin 2017, and providing data for investment purposes. The Ministry has also announced an expression of interest process to market six open areas for oil and gas exploration in Jordan through Ministry of Foreign Affairs and Expatriates, embassies, e-mail, fax, website, and the Petroleum Economist website for various companies of oil and gas as well as the official gazette and the Third Energy Summit 2017 organized by the Ministry in Amman.

The Ministry is currently evaluating the proposals submitted for the qualified companies.

The open blocks include:

1. Azraq.
2. Dead Sea.
3. El-Jafr.
4. Northern Highlands.
5. West Safawi.
6. As Sarhan.

## **Oil Shale**

The Ministry of Energy and Mineral Resources sets the general guidelines for oil shale exploitation in the Kingdom.

According to the National Energy Strategy, oil shale is projected to contribute 12% of the energy mix by 2020.

## **Oil Shale Development**

The investment agreements for the surface retorting for the mined oil shale represent the following:

### **- Memoranda of Understanding**

Exploration and preparation of a conceptual framework and an economic feasibility study for the signed MOUs includes:

- Global Oil Shale Holdings GOSH.
- Whitehorn Resources, Inc.
- Fushun Mining Group
- Al Qamar for Energy & Infrastructure Ltd.
- Qvesterre Energy Jordan Corporation.
- National Oil & Electricity from Oil Shale Company JOSECO.

### **- Concession Agreements**

Pre-development and post development for the signed concession agreements:

### **- Jordan Oil Shale Company JOSCO**

A company owned by a Dutch Shell signed a concession agreement in 2009 for 120 years and completed the first two phases. The company has constructed the Jordan

Field Experiment (JFE). Due to the decline in oil prices, the company has currently requested for phase extension and the Ministry is amending the concession agreement accordingly.

- **Karak International Oil Company KIO**

A British company with an expected investment of USD 1.9 billion working to secure funding required for the development phase. The company has signed an agreement amended in 2018 for the purpose of extending the pre-development phase for five years and a half due to the decline in oil prices.

- **Saudi Arabian Corp for Oil Shale SACOS**

A Saudi company with an approximate investment of USD 1.8 billion signed a concession agreement is currently working on the pre-development phase plan.

- **Jordan Oil Shale Energy Company**

A consortium of Estonian/Malaysian/Jordanian with an approximate investment of USD 4-6 billion signed a concession agreement and requested an extension for the current phase due to the decline in oil prices. The Ministry is now working officially to amend the concession agreement.

### **Oil Shale Direct Burning Power Projects**

The Attarat Power Company (APCO) consortium the Yudean Group (Yudean), YTL Power International Berhad (YTL) and Eesti Energia to start project implementation in the second quarter of 2017 expected by 2020 to generate a capacity of 470 MW. The project would be the first of its kind for oil shale in Jordan and region.

In accordance with the approved policy of the Council of Ministers to receive offers from companies interested in direct burning power projects through competitive biddings based on the power system needs in the Kingdom, nevertheless the Ministry has stopped receiving letters of interests for such projects.

### **The Renewable Energy**

Undoubtedly, Jordan has great potential sources of renewable energy, particularly solar and wind energy. Jordan is located within the Sunbelt where the intensity of direct solar radiation is 5–7 kWh/m<sup>2</sup> and wind speed in specific areas ranges between 7–9 m/s; the data is promising to generate electricity in Jordan. Based on the previously mentioned figures, the overall comprehensive strategy for energy sector aims at diversification of energy sources and reduction of reliance on energy imports and contributes with 20% of total energy mix by 2025.

#### **- Solar Energy**

- PV Direct Proposals Round II–sign energy purchase agreements to develop four PV proposals in terms of

tariff submitted by projects with a total capacity of 200 MW (50 MW each) in the development zones of El-Mafraq and Safawi/Azraq. The four agreements were signed and achieved the financial closure to be operated in 2018–2019.

- PV Direct Proposals Round III in 13/12/2016 with a total capacity of 200 MW. The Ministry has signed (31) MOUs on 17/8/2017 with the qualified companies to prepare the technical and financial proposals. The projects to be commercially operated by 2020.
- An implementation of a photovoltaic project with a capacity of 103 MW in Qweirah/Aqaba with the awarded consortium TSK/Enviromena under an Engineering, Procurement and Construction (EPC) contract and funded by UAE/Abu Dhabi Fund for Development. The project is currently in its final stages and it is expected to be commercially operated by the first quarter of 2018.
- Under the German Government grants, the German Development Bank (KfW) completed a solar energy plant awarded to Belectric Gulf Ltd to produce electricity and reduce electricity consumption in Za'tri Camp under an Engineering, Procurement and Construction (EPC) contract with a 13-MWp (10.8 AC). The project was linked and was commercially operated on 9/11/2017.

- Under the German Government grants, the German Development Bank (KfW) to finance a solar plant on wheeling system to produce electricity to serve the communities hosting Syrian refugees awarded to Belectric Gulf Ltd with a capacity of 46-MWp (40 AC) in Southern Amman. The project is likely to be linked and operated during the second quarter of 2019.
- Masdar, a clean energy developer based in Abu Dhabi, UAE, signed a Power Purchasing Agreement to build a solar power plant on 22/10/2016 with a capacity of 200 MW through direct proposals in Muwaqqar. The project has achieved financial closure and the project is due for commercial completion by 2019.
- A Power Purchase Agreement was signed with ACWA Power Company for electricity generation using solar energy with a capacity of 50 MW in Risha region through Direct Proposals on 26/3/2017. The project to be commercially operated in 2019.
- A Power Purchase Agreement was signed with the consortium of AES/Mitsui for electricity generation using solar energy with a capacity of 40 MW in East Amman through Direct Proposals on 26/4/2017. The project to be commercially operated in 2019.

- **Wind Energy**
  - Operate the first phase of wind project to generate electricity with a capacity of 66 MW on EPC contract basis in Ma'an on 22/9/2016 and operate the second phase to expand the project with a capacity of 14 MW expected on 30/8/2017. The project is funded by Kuwait Fund for Arab Economic Development.
  - Wind Energy Direct Proposals Round I–sign five Power purchase Agreements with five companies with a total capacity of 330 MW Southern Jordan. Two projects have achieved the financial closure. The operation is expected in 2018–2019.
  - Wind Energy Direct Proposals Round III– sign MOUs with (15) qualified companies to prepare technical and financial proposals for 100 MW of capacity. The project to be commercially operated in 2021.
- **Energy Storage Projects**
  - Direct Proposal– to announce an electricity and energy storage project with a capacity of 30 MW to store 60 MWh of electricity for two hours funded by the private sector on BOO basis. The list of the qualified companies was announced on 24/12/2017 and the project to be operated by end of 2019.
- **Small–Scale Renewable Energy Scheme**

The number of small–scale renewable energy schemes installation and connection to the grid for households, universities, commercial and industrial enterprises,

government institutions, schools, mosques, churches, telecommunication companies, banks, CBOs, hospitals, farms, etc. sectors has reached a total of 153 MW and a total of 48 MW of solar systems using instructions to the installation and regulations related to Photo Voltaic PV Systems for the power purchase agreement of electricity generated from renewable energy (net metering and wheeling systems) respectively. On the other hand, MEMR has succeeded to manage nine EU funded projects within REEED program. However, the projects has targeted wide range of CBOs aimed at spreading green energy use, CO2 emissions mitigation beside creating direct and indirect job opportunities to promote energy security and reduce energy imports expected to be completed by mid-2018.

### **Projects Summary in 2017**

- Conduct a feasible study to install renewable energy schemes in 20 schools and solar heaters systems in refugee hosting communities supported by the Norwegian Refugee Council. The project replication allows areas like Irbid and Jerash access to revenue potential from renewable energy schemes. The project has been fully implemented and many workshops have been held to raise awareness of energy management and energy efficiency mechanisms in the targeted schools.
- Indigenize renewable energy and energy efficiency technologies in buildings implemented by the Higher



Council for Science and Technology HCST to adopt energy efficiency and renewable energy policies. The project consists of four main activities (Ground heating and cooling system, power generation system using solar cells, thermal insulation system, and general maintenance) implemented in November 2017.

- Indigenize PV applications in Al Basheer and three government hospitals. The project to be implemented by Millennium Energy Industries Company MEI. Preliminary studies of three targeted hospitals were delivered in addition to Al Basheer Hospital. The company contracted with the National Energy Research Center NERC (a specialized technical authority) to review the project outputs. A tender for solar water heaters has been also submitted to cover the needs of hot water and improve boiler efficiency. The project is expected in April 2018.
- Sahara Forest Project kicked off the building process for the launch station to develop and sustain green communities by establishing clean energy station and provide energy and water solutions for outdoor cultivation and revegetation in Southern Jordan. A representative from EU was assigned to study the impact of the project on the aviation control system of the airport in Aqaba. The project consists of a desalination system for agriculture use, a cooling

system and solar cells to cover the project's energy needs. The project was completed in November 2017.

- Convert the Islamic Hospital into a green building using renewable energy schemes to generate electricity from solar PV system and energy wheeling regulations. The project is implemented by the Islamic Charity Center Society with a capacity estimated to around 2.2 MW and partially funded by the grant. The ICCS has also implemented a similar project with the same capacity. The project was completed in September 2017.
- Establish a factory and a laboratory in German Jordanian University GJU to produce biogas out of agricultural and food wastes in CBOs. The project is located in German Jordanian University farm due to environmental and logistical site convenience in a 25-year agreement. The lab was opened in December 2016 and it is expected to be completed in March 2018.
- Indigenize initiatives of renewable energy and energy efficiency schemes in government buildings by conducting feasible studies in cooperation with the University Cooperation/Italy at six sites affiliated with the National Center for Agricultural Research. All studies have been carried out.

The Ministry also striven to encourage citizens, the public sector, the private sector and other state agencies to support renewable energy projects and energy saving equipment by studying the applications submitted to the Ministry with regard to exemption from custom duties and eliminate the GST zero-rate to renewable energy and energy efficiency inputs by the committee on tax exemptions in accordance with the Article (3/A) of Regulation No. 13 of 2015. The studies, solar energy and energy efficiency applications of the buildings have been implemented in full to reach the volume of zero consumption of electricity of the grid.

### **Energy and Environment**

- The Ministry co-partnered the Ministry of Environment MOE membership in the National Committee for the Inventory of mercury and its compounds in the Kingdom.
- The Ministry co-partnered World Agriculture Organization, the Ministry of Planning and International Cooperation and relevant institutions in the steering committee of the solid waste transfer project in Za'tri camp, enhance the economic growth potential in Mafraq by developing private sector projects, besides improving livelihoods, environmental sustainability and green jobs.
- The Ministry co-partnered Greater Amman Municipality in a technical committee to study technical and financial proposal of generating electricity out of solid wastes using

latest technologies of direct burning in El-Ghabawi landfill. The project has been awarded to the Chinese CNTY Company at a cost of \$ 200 Million.

- The Ministry has participated in the bidding committee and the technical committee responsible for rehabilitation El-Akeder landfill to generate electricity out of solid wastes. The rehabilitation was launched at 30 MW of capacity and at an estimated cost of \$150 Million.
- The Ministry as a member in the environment assessment committee has submitted many project studies for projects in general and for power generation projects in particular to the Ministry of Environment.

#### **Jordan Renewable Energy and Energy Efficiency Fund JREEEF**

Jordan Renewable Energy and Energy Efficiency Fund–JREEEF in accordance with a comprehensive plan has implemented projects and programmes targeting various sectors in all governorates to accomplish objectives of the National Energy Strategy and the National Energy Efficiency Plan in partnership with international organizations, commercial banks, sector foundations and CBOs.

#### **JREEEF Programmes and Projects**

- **Residential**  
Solar cells, solar heaters and LED energy saving lamps programs all over the Kingdom.
- **Industry**  
Cooperate with Amman Chamber of Industry to introduce 21 factories for the first stage and 30 factories in the

second stage to support small-and medium-sized enterprises investing and improving renewable energy technologies and energy efficiency.

- **Schools Heating Program**

Develop King Abdullah II Initiative in partnership with the stakeholders within 5–8 years to cover 2600 schools to create a positive classroom environment.

- **Tourism**

Launch three–star hotels and less renewable energy and energy efficiency project in Petra, Aqaba and Madaba.

- **Public Institutions**

Implement applied plans of energy auditing studies for public premises.

- **Mosques**

Cooperate with Ministry of Awqaf and Islamic Affairs to implement renewable energy schemes.

- **Public Campaigns**

Create energy efficiency campaigns over solar heater, solar cells promotion, and renewable energy and energy efficiency awareness campaigns.

### **Funding Mechanisms**

- Involve community based organizations (CBOs) in the governorates with JREEEF programmes for small return of investment. JREEEF has signed 188 MOUs with many CBOs and electricity distribution companies to provide service and save money and time.

- JREEEF to guarantee loans on behalf of institutions and develop zero-interest funding programmes supported by Central Bank of Jordan and in cooperation with commercial banks and Jordan Loan Guarantee Corporation JLGCC.

The projects have positively impacted the community. The investment achieved JOD 50 Million and created more than 200 permanent jobs for the implemented companies.

It has also increased renewable energy and energy efficiency awareness and demand. The projects rebuilt trust in CBOs and charitable activities alongside achieving good economic and social impact on citizens while using solar heating systems, solar cells and energy saving lamps reducing at least 70% of the monthly electricity bill and the government assistance discount on electricity bills. Likewise, the projects contribute in achieving the global indicators required from Jordan due to signing international agreements relevant with climatic changes and emission commitments.

### **Electricity**

- A combined cycle power plant project located 31 km north east of Amman in the city of Zarqa Industrial Zone. The project substitutes Hussein Thermal Power Station, one of the oldest and most inefficient Heavy fuel oil (HFO)-fired power plants in Jordan and it consists of three gas turbines and one steam unit with a total capacity of 485 MW, expected to be completed in 2018. The contract was

awarded to ACWA Power at an estimated cost of JD 325 million.

- Samra Electricity Company was assigned to convert the seventh gas turbine with a capacity of 145 MW to a combined cycle by adding a steam turbine with a capacity of 70 MW. The project to be operated on 12/3/2018.
- Sign an MOU with the Kingdom of Saudi Arabia to start technical studies for the construction of an international electric transmission line between Jordan and Saudi Arabia. The project covers the future growth rates after 2024 at competitive prices adding to its contribution to increasing the reliability of the National grid significantly.
- Start serious discussions and joint technical teams with the Egyptian side to enhance the Jordanian–Egyptian electrical interconnection lines to increase the stability of the Jordanian electrical system, especially after increasing the contribution of renewable energy plants considerably.
- Strengthen the capacity of the National Electricity Grid in the northern and eastern parts of the Kingdom to increase the capacity in the region and enhance the network for the interconnection with the neighboring countries.
- Some international companies have been qualified to submit bids for the Green Corridor project for a JD 45 million to increase the capacity of the national grid from 500 to 1450 MW for loads generated by renewable energy projects in the South of the Kingdom. The Green Corridor project will be operated by the beginning of 2019.

- Produce electricity using the direct burning of oil shale with a capacity of 470 MW and a total investment worth USD 2.2 billion in the central region of Attarat–Umm Ghudran which is expected to start operating in 2020.
- Extend the contract with Egypt to exchange electricity for 2017 and issuance of approvals by the Cabinet of Ministers.
- Follow-up the executive agreements signed between the Ministry of Energy and Mineral Resources and the developed companies for the independent power producer power projects commonly referred to as the IPP1, IPP2, IPP3, and IPP4 to study companies' requests and facilitate their work.
- The Energy and Minerals Regulatory Commission (EMRC) awarded bids to an international consultant to prepare technical studies for restructuring electricity tariff distortions, and reduce burden on energy sector. Yet, another study was prepared on wheeling charges taking into consideration the real costs of the electrical system and the situation of large consumers funded by the French Development Agency (AFD) to be expected during the first half of 2018.

### **Natural Gas**

The Ministry of Energy and Mineral Resources pursues the strategic objective of increasing the contribution of natural gas in the energy mix by implementing the following:



## **First: Development of Indigenous Resources**

### **Risha Power Station**

The power station began producing electric energy by burning natural gas since 1989. Jordan signed a Concession Agreement with the National Petroleum Company (NPC) by law No. 9 of 1996 for 50 years.

- The quantities produced from Risha field reached around 3,562 MMscf of natural gas with an average of 9.8 MMscf/d with around 1% of contribution to electricity generation in 2017.
- The Council of Ministers approved in Article 2 of Resolution No. 3052 in 24/5/2017 appointing Oil Pricing Committee to calculate and determine the gas sale produced from Risha gas field per month in June based on a pricing equation adopted in paragraph 1 on 31/5/2017.
- The amendment in gas prices enabled NPC to implement plans and programs stated in the Strategic Plan 2017–2019. The Company announced the intention to boost gas production from Risha gas field to 16.5 MMscf by end 2018.

## **Second: Expansion of Natural Gas Use for power Plants and Industries**

- The Jordan Gas Transmission Pipeline Project (JGTP) from Aqaba to the North: It was agreed with the Egyptian side to amend Gas Sale Agreement and Gas Purchase

Agreement signed on 25/1/2004 and to resume resupplying Jordan from 1/1/2019.

- In cooperation with the National Electricity Company NEPCO, the Ministry of Energy and Mineral Resources secures power plants needs of natural gas by signing three Sales and Purchase Agreements SPA between NEPCO and Shell International to supply 150 MMscf/d of natural gas for five years 2015–2020, two years 2016–2017 and one year in 2018. However, NEPCO covers any additional quantities of natural gas from Spot Market.
- The total LNG cargoes amounted to 53 cargoes in Sheikh Sabah Al Ahmad LNG Terminal in Aqaba for 2017; by which 42 cargoes were consumed in power plants and 11 cargoes were exported to Egypt under the FSRU Usage Agreement signed on 5/8/2015.
- The total quantities of natural gas consumed by power plants have amounted to 126,785 MMscf with an average of 347 MMscf/d contributed with around 87% of power generation in 2017.
- The Council of Ministers approved Resolution No. 1454 on 22/1/2017 to extend the Floating Storage and Regasification Unit FSRU to provide the Egyptian side with the surplus storage capacity of the FSRU up to 31/12/2018 under the same contractual terms of the FSRU Usage Agreement signed on 5/8/2015. The total quantities of natural gas exported to Egypt amounted to 33,067 MMscf with 90 MMscf/d of natural gas production for 2017.

## **Supplying NG Industries**

- The Ministry studied the regulatory, contractual and technical requirements to supply industries with natural gas. The Ministry placed clear and transparent foundations to determine supplying priorities and studied the requests of industries interested to identify the technical and operational requirements needed to receive natural gas through pipelines and to establish the required infrastructure.
- Required measures were taken to study the possibility of supplying large industries with natural gas and a Master Gas Sales and Purchase Agreement MSA was signed between NEPCO and FAJR Company on 7/8/2016. The agreement regulates sales and purchase of natural gas supplied through Sheikh Sabah Al Ahmad LNG Terminal, the main umbrella for natural gas sales agreements to be signed between FAJR and NG industries.
- Gas Sale Agreements were signed between FAJR Company and Nuqul Group (Al-Snobar & Al-Keena) on 12/1/2017 to provide 3.92 MMscf/day, and with the United Iron and Steel Manufacturing Co PLC (Manaseer Steel) on 2/4/2017 to provide 3.8 MMscf/day.
- The Petroleum Pricing Committee has been assigned to determine NG monthly price which will be sold by the National Electricity Company to FAJR Company for industrial supply. The Committee started pricing on 1/1/2017.

- Pursuant to the Cabinet decision No. 4366 on 14/9/2017, the Cabinet has approved granting the required machines and equipment for piping the exemptions provided in the Investment Law No. 30 of 2014 to be considered as fixed assets on a case-by-case basis by Jordan Investment Commission (JIC).

### **Third: NG Additional Resources**

#### **North Gas Pipeline Project**

- Sign a Gas Sale and Purchase Agreement GSPA on 26/9/2016 between NEPCO and Noble Energy to supply 300,000 MMBtu of natural gas for 15 years from the commencement of commercial supply date expected on 1/1/2020.
- Pursuant to the Cabinet decision No. 2948 on 10/5/2017, the Cabinet has approved to assign FAJR Company to implement the North Gas Pipeline Project on BOOT basis under the provisions of the License Agreement signed between the Government represented by the Ministry of Energy and Mineral Resources and FAJR Company on 25/1/2004.
- The Deloitte Consulting Services chose Stantec Inc. to prepare an economic and technical feasibility study in July 2017. Moreover, Stantec studied the financial and technical proposals done by FAJR Company in August 2017.

- The project negotiations are finished. The second Supplemental Agreement to the License Agreement to be signed between the Ministry and FAJR Company and the Gas Transportation Agreement GTA to be signed between NEPCO and FAJR Company. Both agreements will be submitted for Cabinet approval.

### **Natural Gas Diversification**

- Sign a Memorandum of Understanding MOU to develop cooperation between the Ministry of Energy and Mineral Resources and the Egyptian Ministry of Petroleum concerning imports and exports of natural gas on 2/4/2017.
- A letter of intent LOI was signed between the Ministry of Energy and Mineral Resources and the Ministry of Oil and Gas in Oman concerning imports of natural gas on 21/5/2017.

### **Bio Energy**

Jordan Biogas Company Ltd. continues processing the organic waste in Rusaifa Landfill. The generated electricity quantity has amounted to 6.5 GWh in 2017. The mitigated volume of biogas has amounted to 5 million cubic meters.

## **Peaceful Uses of Nuclear Energy**

Jordan's interest of nuclear energy stemmed from the dire need to face all challenges represented by the scarcity of domestic energy and water sources. In other words, to provide domestic long-lasting sources of energy, the National Strategy of Energy for 2007 has strengthened the development role of energy domestics and diversification by introducing nuclear energy as an alternative to electricity generation. Accordingly, Jordan Atomic Energy Commission was created in 2008 to implement the National Strategy and develop and promote nuclear energy in Jordan to utilize it in electricity generation, water desalination as well as exploitation and investment of nuclear natural resources especially Uranium, empowering qualified domestic human resources, and supporting nuclear sciences and applications infrastructure besides activities supporting the Jordanian nuclear program. Accordingly, Jordan Atomic Energy Commission has continued during the year 2017 all activities designed to achieve the objectives designated.

### **First– Empower Jordan HR Core Competencies**

The commission carried on all appropriate plans to complete Jordan Reactor for Training and Research JRTR, the cornerstone to Jordan Center for Nuclear Research in University of Science and Technology inaugurated under Royal patronage in December 2016. The Commission started training Jordanian human resources, conduct scientific research and radioisotope production to support nuclear applications in the fields of medicine, agriculture, water and industry at the regional level. The operating

license was obtained from the Energy and Minerals Regulatory Commission (EMRC) in November 2017. In trail period, the Jordanian team succeeded in producing Iodine-131(<sup>131</sup>I), Technetium-99m (<sup>99m</sup>Tc), and Iridium-192 (<sup>192</sup>Ir) isotopes within the terms of the operating license granted to the nuclear reactor. The production license was obtained from Jordan Food and Drug Administration. The neutron activation systems have been successfully completed and accurately verified compared with the standard models from the International Atomic Energy Agency (IAEA) efficiently.

### **Second– Jordan Nuclear Power Plant**

Based on detailed studies covering all possible areas and considering international standard, the Nuclear Power Plant Commission has finally selected Jordan Nuclear Power Plant site in Amra as the most suitable site for the construction of the nuclear plant in Jordan. The Government agreed on establishing Jordan Nuclear Power Company to complete site work, studies related to connection, water needs and the preparation of all technical and financial studies required for project implementation. The Jordanian Atomic Energy Commission High advisory Committee was initiated by international scientific, technical and political specialized dignitaries to support Jordanian staff at local and international levels and to evaluate the progress made in the nuclear program to use it as a political tool and promote the program locally, regionally and globally. However, the second report of the committee was issued in November 2017.

Likewise, the commission work on large power reactors (LNPP) to introduce small and medium power reactors (SMRs) expected to be less expensive and 60 years old needless to say, the SMRs do not require development of the electrical grid and can be used for water desalination, bear increased seismic effect and need less water cooling.

### **The Action Plan I**

- Prepare a preliminary technical study on modern technologies available for small and medium power reactors (SMRs) and their technical specifications.
- Prepare bookmark base for feasibility studies of the nuclear power plant project using SMRs with the manufacturers to ensure project financing.
- Prepare technical assessment required.
- Sign number of SMRs MOUs between the Jordanian Atomic Energy Commission and technology manufacturers.
- Implement the MOU between the Jordanian Atomic Energy Commission and King Abdullah City for Atomic and Renewable Energy using a Jordanian–Saudi–Korean team to carry out the feasibility study for the construction of two SMART reactors technically, economically and financially.
- Participate with the Jordan Nuclear Power Company to supply the nuclear power plant with water quantities needed to ensure continuation, operation and safety of the station at the optimum level.

### **Third–Uranium Utilization**



Consequent to the first stage in 2014 on the Uranium sources estimates in central Jordan, the Jordanian Uranium Mining Company JUMCO qualified for organized and systematic exploratory work in the midst of Jordan prepared a technical report signed by international experts specialized in the exploration of Uranium according to a global JORC Code–2012 Edition for the third phase of exploration under the supervision of international experts and specialists and a specialized Jordanian team.

It is expected that  $U_3O_8$  estimates will exceed those declared in the second phase of exploration with a total of 39 thousand tons of uranium at a concentration of (160) parts per million for the surface area.

In the field of extracting uranium from Jordanian crude in the central Jordan region, the Jordanian team designed the industrial process to produce yellow cake and in a laboratory, in addition to building a pilot unit for uranium testing and extract about one kilogram of yellow cake. Future work includes the completion of the pilot unit and the operation to produce the yellow cake.

Furthermore, a research and development agreement was signed between King Abdullah City for Atomic and Renewable Energy and the Jordanian Atomic Energy Commission in March 2017.

The Commission's achievements included preparing and approving the national policy in the management of spent fuel and radioactive waste, transportation of radioactive sources and wastes by various means of transportation available in accordance with the international transport regulations and the management

and treatment of radioactive waste produced by peaceful uses of radioactive isotopes in medical, agricultural and industrial fields.

#### **Fourth– Nuclear Sciences and Applications**

The Nuclear Science Applications Commission sustained developing scientific researches and various nuclear applications to transfer peaceful uses of nuclear energy and radiation technology in Jordan through developing skills and empowering human resources, specialized training, scientific research visits inside and outside Jordan, laboratory testing and analytical services for production and services sectors particularly those provided by the secondary calibration laboratory, laboratory to measure the exposure of personnel to radiation, and the Mega Gamma-1 Irradiator center to radiate various samples and sterilization of medical devices and research purposes. Meanwhile, the Commission also carried on implementation of the national scientific activities to identify work development and mechanisms of support provided to Synchrotron centers and international scientific research centers. However, members of the Jordanian network has founded Specialized research teams of Synchrotron light users to conduct scientific researches implemented by early stages of starting the Synchrotron center inaugurated under royal patronage on 16/5/2016.

Likewise, the Commission adhered to projects and scientific research activities in universities, research centers and production and services sectors in Jordan financed by the International Atomic Energy Agency IAEA and the Arab Atomic Energy Agency

(AAEA) to develop Radiological emergency programs by detecting individual and spatial radiological exposure.

## **Geology and Mining**

Geology and mining is considered to be one of the vital sectors which play an active role in the development and growth of the national economy. Despite the instability in contribution, geology possesses a great value and represents one of the most important pillars of the national economy.

The mining sector is mainly based on the exploitation of local raw materials and comprises of the two main mining industries:

- **Mining Extractive Industries**

Phosphates, potash, carbonate and quarrying products, etc.

- **Mining Transformative Industries**

- A. Chemical Industries**

- Fertilizer, chemical acids, quick and hydrated lime.

- B. Construction Industries**

- Cement, white cement, ceramics and building materials.

The Ministry traded mineral resources via conferences and specified local and international workshops inside and outside Jordan.

## **Geology Achievements**

- Discuss the first MOU draft to be signed with the As Sahra Mining Co. for gold exploitation in Wadi Araba.

- Discuss an MOU to be signed with the Arab Potash Co. and Manaseer Group for conducting studies to assess Potash in Lisan–Dead Sea.
- Follow–up an MOU with the Manaseer Gorup for exploiting Copper in Dana Biosphere Reserve.
- Terminate the MOU period with the Altos Hornos de México, S.A.B. de C.V. (AHMSA) to commence a concession agreement for exploiting Copper in Wadi Abu Khushayba.

## Main Projects

### First: Geological Mapping Project

#### 1. Geological Mapping

The National Mapping Project aims at producing geological maps at different scales (1:50,000) and (1:100,000) in Jordan, in addition to preparing petrographic studies, the supervision to the Geological Museum and the Training services for public and private sectors.

### Status of Geological Maps

No.	Maps/ Bulletins	Scale	Current Situation
1	Ain Jedi & As–Safi Map	1:50,000	Ready for publishing
2	Mishah Hudruj Map	1:100,000	In progress
3	Wadi Hudruj & Wadi Ed Dhbei’ani Map	1:100,000	In progress
4	Wadi El–Fkok Map	1:100,000	In progress
5	Ras An Naqab Map	1:50,000	In progress
6	Wadi Maghar Bulletin	–	Published
7	Al Inab Bulletin	–	Under printing

## **2. Petrographic Studies**

Study components of rocks and minerals. In 2017, 34 microscopic samples were studied and 28 scientific reports were prepared for the Ministry and public and private sectors.

## **3. Geological Museum**

It highlights the significant achievements and the nature of the works in mineral resources through museum visits for all interested sectors. The number of visitors amounted to 993 in 2017 from public and private schools. The Geological Museum participated in the Jordanian International Mining Conference, the Arab–African Economic Forum and Gulf–Jordanian Economic Forum where various samples of rocks and minerals were displayed.

## **Second: Prospecting Studies**

The studies aims to add new prospect areas to increase the reserves, besides determining the horizontal and vertical extension of the ores, calculate quantities, and conduct the necessary tests to determine the quality of the oil shale, in order to provide accurate information for investors and prepare areas for investment.

### **1. Gypsum Prospecting Project/Azraq**

- The project was launched in Wadi Rajel to the south of Qa' El Azraq in August 2017. The aim of the project was to study the Diatomite, but after field visits to the area the presence of Gypsum near the

surface was revealed. When reviewing the old Bentonite well logs, the Gypsum was situated near the surface with 5 m of thickness.

- A total of 51 boreholes were drilled with depths between 3–10 m with 0–3 m of thickness. A total of 47 boreholes samples were sent to the Ministry laboratories for test and showed promising results.
- Prepare a digital data base and preliminary maps to show the quality and quantity of the Gypsum deposits based on the drilling results and chemical analyses of the samples.

## **2. Lithium Prospecting Project**

- Participate in Lithium prospecting project in Dubaydib Formation to study an area of approximately 160 km<sup>2</sup>.
- A total of 259 samples were collected and sent to Atomic Energy Commission laboratories in November, 2017. All samples were collected from the radioactive horizon of DB2 with 3–5 m of thickness.
- Prepare a data base for the project using ArcGIS.
- Field visit to Tal Hassan and Aritain areas to collect samples from the volcanic tuff and analyze Lithium percentage.
- Field visit to Arab Potash Co. /Dead Sea to collect 4 water samples and analyze Lithium percentage.

## **3. Oil Shale Prospecting Project**

- A total of 202 samples were collected from the storage boxes in Azraq storage facility to be sent for analysis.
- Assign two relinquished Shell areas for oil shale drilling to locate the proposed boreholes. Nevertheless, the work plan was postponed.

### **Third: Geochemistry Projects**

To carry out the surveys and investigation works for mineral exploration using different geochemical methods; the geochemistry of heavy minerals, stream sediments and rocks in the south of the Kingdom, and follow up the results of laboratory analysis of the various geochemical samples and evaluation.

#### **1. Rare Earth Elements**

A cooperation agreement was signed between the Ministry of Energy And Mineral Resources and the Jordanian Atomic Energy Commission (JAEC) in April 2017 to investigate the geological and exploratory geochemical study of the nuclear elements and the rare earth elements (REE) in south of Jordan (Dubaydib Formation) to determine the percentages of important elements concentrations in the three Dubaydib rock formation DB1, DB2, DB3 and focus on the DB2 rock member in the study areas using the geochemical methods.

- The work started in the northern part of the sheet Jabal Batra. The field work was extremely difficult due to the rough terrain so the work was moved to El-Dubaydib to cover the DB2 area for the purposes

of the Lithium project, which was carried out on the field, according to the work plan. The samples were sent for chemical analysis to the laboratories of the Jordanian Atomic Energy Commission and an area of 302 km<sup>2</sup> of Dubaydib formation was covered to collect 604 samples from the region representing 44% of the area.

- The total of 604 samples was sent to the laboratories of the Jordanian Atomic Energy Commission to be detected by the ICP system for data analysis to analyze 72 elements of rare and radioactive elements and by the Fluorometer system to analyze the uranium element.

## **2. Phosphogypsum**

- The Phosphogypsum project was launched In April 2017 in Aqaba. Experiments and analyses were carried out in the Ministry laboratories to detect raw contaminants due to proximity coast and serious environmental effects.
- A total of 32 samples of phosphogypsum and 25 samples of the Dead Sea water were analyzed in the Ministry's laboratories and results were received.

## **3. Lithium**

- A total of 40 rock samples and 25 water samples were collected from El-Dubaydib and the Dead Sea and sent to the Ministry's laboratories and results were received.



#### **Fourth: Geophysical Studies Projects**

The geophysical studies are conducted in several parts of Jordan to support other geological surveys in order to locate the anomalous areas, which help in mineral exploration projects and earth crust studies including geological structures and groundwater reservoirs and geotechnical studies.

##### **1. General Gravity Survey**

The significance of the project is verified by carrying out several integrated geophysical and geological studies, finding prospecting mineral resources, and locating the groundwater reservoirs and geological structures .

According to the project–working plan, the gravity survey continued to cover Dubaydeb, Batn Al Ghul and Mudawwara regions in the southern Jordan covering about 30% of 4290 km<sup>2</sup>.

- Measure a total of 275 gravity measurement stations using ground gravity–meters (CG3, and D20).
- Identify the coordinates of the gravity stations using a Differential GPS device to overcome the difficult topography and comprehensive coverage.
- Establish new universal gravity base station at Ma'an field center transferred from the Jordanian base station in Ras En–Naqab, and calculate the absolute gravity value to add it to the gravity base stations network of Jordan; a part of the global gravity base

stations network to save network from disappearing dues to construction and further urban extension.

- Field data entry, necessary corrections, calculates Bøuguer, free air anomalies and absolute gravity at every point using specialized software.
- Update the project database by adding the gravity data to Jordan survey data file.

## **2. Geophysical Services**

The Ministry carried out several geophysical studies as a request of public, private and research institutions.

### **- Geophysical Study at Amman–Irbid Highway Landslide**

Based on a request from the Ministerial Committee to conduct a geophysical study for the landslide at Amman–Irbid highway (Jarash area) near Sail El-Zarqa, The study determined the subsurface sources of water seepage observed along the cut section at the slope side of the landslide which leads to landslides; obstruct roads rehabilitation and maintenance. The report was submitted to the concerned authorities.

### **- Geophysical Data and Information Services**

The Ministry provided several institutions with the geophysical data and information services to the Jordan Valley Authority (JVA), Wadi Araba

Development Company to use in the studies of aquifer at Wadi Araba area.

#### **Fifth: Jordan Seismological Observatory**

The seismic observatory records, around the clock, any seismic activities through a network of monitoring stations (short and long frequency). A network of stations that monitors strong movement installed at important infrastructures in Jordan, for the purpose of registration the ground acceleration necessary for the earthquake-resistant engineering designs as well as developing seismic data to update the Jordanian National Building Codes and prepare earthquake catalogue.

- Follow-up maintenance and calibration of regular seismic stations and strong traffic stations according to monthly maintenance programs previously prepared to replace broken parts and maintain the sustainability of monitoring process optimally.
- Jordan Seismological Observatory (JSO) recorded 624 earthquake events in 2017; 105 local earthquakes mostly in Jordan Rift Area (the strongest event happened in the Gulf of Aqaba on 19/5/2017, with a magnitude of 4.2), 238 earthquake events within the Eastern Mediterranean regions, and 281 distant seismic events.
- Two new seismic stations were installed in Ruwaished and Petra to be operated with Jordan Seismological Observatory (JSO). Another two new sites were located for two stations next year in Wadi Araba (Rahma and Finan).

- Rehabilitation of Jordan University Science Technology (JUS), Hashemite University (HSU), Azraq (AZR), Saham (SHM) and Wala (WAL) seismic stations.
- A new facility was built in El-Balqa' Station. The facility will be provided by equipment obtained from Germany government through the Dead Sea Research Project.

#### **Sixth: Survey**

- Carry out fields and surveying works related to natural gas projects in all governorates and participate of the acquisition committees.
- Follow-up the secretion and allocation of land which belongs to the Ministry projects.
- Work in As Samra gas line and Hussein Thermal Power Station in Zarqa.
- Detect the North Gas Line project up to the northern border and participate in determining the project path.
- Observe monitoring rooms and gas line stations in El-Quwera, El-Humaimah and Er-Rashdiyah. A total of 38 survey points were monitored in addition to 13 transformation points.
- Work on the Solar Cell Project in Za'atri-Mafraq, the Solar Power Project in El-Quwera and the Solar Energy Project in Madaba-Umm Qasir.
- Calculate the coordinates and altitude/elevation to be sent to the concerned authorities.

### **Seventh: Drilling**

The Ministry monitors Hamza Oil Field and executes drilling geological and mining projects, prepares, supervises and documents the drilling plans and reports besides sustaining excavators and machineries.

- **Pure Limestone Project/ East Qatraneh**

Drill 6 wells using the SD 300.

- **Iron Project/ Wadi Abu El Assal**

Drill 9 wells using the SD 300.

- **Gypsum Project/ Azraq**

Drill 52 wells using the SD 300.

- **Supervising Hamza Oil Field/Azraq**

Operate and supervise the production of Hamza Oil Field.

- **Lithium and Rare Earth Elements Drilling Activities**

Under discussion.

### **Eighth: National Cooperation**

Innumerable specialized technical studies were submitted all over the Kingdom through scientific cooperation between the Ministry and national institutions:

- **The Royal Geographic Center**

Sign an agreement on 3/12/2017 to follow up the extension of the Geological Maps Printing Agreement .

- **The Atomic Energy Commission**

Study and appraise the location of the proposed nuclear plant and carry out two field visits plans to collect samples for the purpose of Uranium extraction in Dybaydeb. The

analysis showed promising results for both uranium and silver.

- **Ministry of Water and Irrigation and Jordan Nuclear Power Company**

Provide the available geophysical data. A draft cooperation agreement was prepared to provide expertise for conducting geophysical studies projects in 2017.

- **Energy and Minerals Regulatory Commission (EMRC)**

- Investigate the landslide in Kufranja Quarry.
- JSO started a new project to study the effect of explosions and quarries on the human life.

- **The National Center for Security and Crisis Management and the Higher Council of National Defense**

Prepare plans to deal with any seismic disasters.

- **University of Jordan**

Study Lithium ore in the Dead Sea.

### **Ninth: International Cooperation**

- **Arab Industrial Development and Mining Organization**

Prepare the geological and mineral map of the Arab region with the technical committee.

- **Freiburg University**

Cohort detailed studies for the Ordovician rock to collect many samples for paleontological and iconological studies to identify age and species.

- **Japanese Group**  
Decide tectonics and paleoseismicity in Dead Sea and Jordan Valley to assess seismic risk.
- **American Association of Petroleum Geologists (AAPG)**  
Organize a geological field trip to southern Jordan and prepare the field guide.
- **German Geophysical Research Center (GFZ)**  
Continue the Dead Sea Research Project.
- **Royal Scientific Society**  
Participate in the steering committee to assess pollution risk of the landfills in Jordan.

### **Laboratories**

The Ministry Laboratories analyzes all kinds of natural raw materials in different methods to determine types of minerals and main components of major and trace elements.

#### **First: Chemical and Mineral Analyses**

Analyze all types of natural raw materials to determine mineral type and content of the main, secondary elements, minor and rare earth elements using X-ray spectroscopy, X-ray diffraction, plasma, atomic/graphite absorption and degree of whiteness.

The total samples analyzed estimated around 1389 samples; 492 samples for Jordanian universities and private mining sector and 897 samples for the Ministry projects. The number of chemical tests carried out amounted to 4268 tests.

## **Second: Organic Geochemistry**

Analyze rock samples containing organic materials such as rocks and tar sand. Further samples were analyzed to find the proportions of organic materials and the proportions of the elements involved in the composition of substances such as carbon (organic and mineral), sulfur, hydrogen and nitrogen and the calorific value of samples; liquid or solid.

A total of 353 oil shale samples were received and analyzed for oil shale projects, 148 samples were analyzed by oil shale distillation, 75 samples to decide the calorific value, 65 samples for elements analyzing, and 65 samples to decide the organic carbon value. A total of 47 oil shale samples were received from the private sector companies and Jordanian Universities to decide contents of shale oil content, calorific value and other analyzing tests. Additional 3 samples were analyzed to determine conformity with OCMA.

However, water samples were chemically analyzed such as: pH, SO<sub>4</sub>, TDS to determine the physical properties of bentonite and find conformity with the international specifications OCMA.

## **Third: Soil Mechanics, Rock and Quality**

- A total of 36 test samples of oil shale, sand, gypsum, aggregate, surface corrosion, density, corrosion, Specific gravity & absorption.
- A total of 520 samples of Coarse & Fine aggregate, Berlite, Soil, Lime stone, Ziolite, Silica, Rock, Sand, Oil Shale, Pozolana, Phosphate, and Basalt to decide specific gravity



& absorption, speed of sound waves, bending coefficient and corrosion.

#### **Fourth: Mineral Processing and Ore Dressing**

A study to decide the concentration of Zircon metal and its separation from other light metals such as Silica, Feldspar and the concentration of other economic metals such as Rutile and Monazite to obtain the center of Zircon, Monazite and Rutile.

#### **Fifth: Samples Reception and Preparation**

Receive and process samples from the Ministry and public and private sectors. Consequently, minerals and other materials samples have been received, documented, given secret codes, and cost processed according to the technical specifications required through crushing, milling and sieving operations according to granular size suitable for various analyses and prepare thin section slides according to the appropriate technical specifications.

Furthermore, a total of 690 samples were received from both public and private sectors; 382 samples belong to the Ministry and 308 samples from the private sector. The total revenues from the public and private sectors amounted to around JD 35974 in 2017.

## **Institutional Development**

### **- Strategic Planning**

- Develop and update the Ministry's strategic plan 2016–2018.
- Plan workshops for all organizational units about the Ministry's Plan to spread knowledge, prepare executive plans and achieve effective awareness.
- Develop the relationship with stakeholders to improve communication and raise satisfaction.

### **- Operations and Services**

- Develop an operation guide by modelling best practices.
- Develop relationship with customers to increase customer satisfaction according to best practices approved by the Ministry of Public Sector Development, institutional development liaison officers and random customers. The percentage of satisfaction amounted to 91.7% in 2017 compared with 91% in 2016.
- Update service guide to include 31 provided services in terms of criteria stated. The guide has been uploaded to the Ministry and e–Government websites.
- Develop, print, and distribute the General Framework of the Customer Service Charter to all employees and clients.
- Study and prioritize services and develop an electronic transformation plan.
- Handle customer complaints over announced communication channels based on specific timing and

methodology and adjust the time period to respond any complaint within a week in compliance with the provisions of Services Development bylaw No. 156 year 2016.

- Activate the public service office to access public services easily.

- **Knowledge Management**

- Develop knowledge management plan.
- Develop a month visitor program and schedule 19 lectures in various domains.
- Archive explicit and implicit knowledge on the Ministry's website by modelling best practices.

- **Innovation and Excellence**

- The Ministry has approved the Creative Innovation Award.
- Grant the distinguished Employee Award on a quarterly basis.
- Launch the month of excellence in August/2017, which included several activities aimed at spreading the culture of excellence among employees like giving lectures on the criteria of the King Abdullah II Award for Excellence in Government Performance and Transparency, adopting excellence slogan (Towards Excellency and Sustainability), raising excellence awareness, holding meetings on excellence with all organizational units, showing the achievements of organizational units through an exhibition, brainstorming sessions, a

specialized training course for award criteria for a number of employees, implementing a number of community responsibility initiatives and visiting UAE institutions to raise the level of performance.

- The Ministry archived all confidential and protected documents in compliance with Law No.47/2007 on Securing the Right to Information Access.
- Institutionalize work through assigning information officer subjected to a specialized training held by the National Library, update lists of confidential and protected documents, awareness-raising workshops on Information Law, authority delegation to respond requests of information, integration of information request services within data and information services, information access automation, submit information requests electronically and manually.
- The percentage of information response service satisfaction amounted to 91% in 2017. The number of requested hit 111 requests in 2017 and the average amount of time spent in responding electronic and manual information reached 5.58 day.

## Financial Statements

No	Item	Allocations JD	Expenses JD	Disbursed Rate %
1	Current Expenses	8999000	8400188	93
2	Capital Expenses	127487213	101654808	80
3	<b>Total</b>	<b>136486213</b>	<b>110054996</b>	<b>81</b>

## Financial Statements of Major Capital Projects

Project	Allocations JD	Expenses JD	Disbursed Rate %
Support construction of an LNG network in the Kingdom	300000	242942	81
Wind energy to generate electricity –Ma'an	23810000	23547709	99
Solar heaters– EU grant	700000	573313	82
Oil products storage facilities	15900000	15343164	97
Utilize wind energy to generate electricity –Fujeij	1000000	999365	100
Support projects of Jordan Atomic Energy Commission	8040000	7155000	89
Support the use of solar heaters–the National Center for Research and Development	50000	50000	100
<b>Total</b>	<b>49800000</b>	<b>47911493</b>	<b>96</b>