Jordan CIGRE National Committee

Power System Update in Jordan

Jordan Overview

Total area:
89 213 sq. Km

Population:
10.1 Million

Sea Port:
Aqaba

Gross Domestic Product:
38.65 billion USD (2016)

GDP /capita:
4,087.94 USD

Electricity Sector

❖**The convergence of Jordan's rising energy consumption trends alongside decreasing security of energy supply is impacting public budget fiscal space for border development goals and country ability to users domestic energy services .**

❖**The government has been focusing on adopting several policies to satisfy growing energy demand and decrease its reliance on imported expensive fossil fuels.**

❖**The energy demand grew dramatically in the past years in Jordan: 5.5% year for primary energy demand (88% source from oil and oil product) and 7.5% year for electricity. This reflects both population and economic growth.**

Electricity Sector

❖Jordan is dependent on fuel imports for about 96% of the energy needs with a substantial impact on the county's GDP .

❖Jordan spend more than 17.6 % of its GDP to cover the cost of meeting its energy needs with a large share focused on electricity generation.

❖The Jordan electricity sector change during the last years. from total governmental owned market to the market where different parts in the value chain has become separated from each other with for examples 3 distribution companies and 6 generation companies .

❖Stats owned national electric power company NEPCO role in the market is to act as a single buyer.

Energy Strategy/Electricity

Diversifying the energy resources

Renewable energy
Oil Shale
Natural Gas

Increasing the Local content in the energy mix

Enhancing the efforts to utilize the local energy resources

Electricity Sector in Jordan

MEMR
(For POLICY Maker)

EMRC
(For Regulation)

Generation

- CEGCO
- Samra
- IPPs
- Renewables
- Interconnection

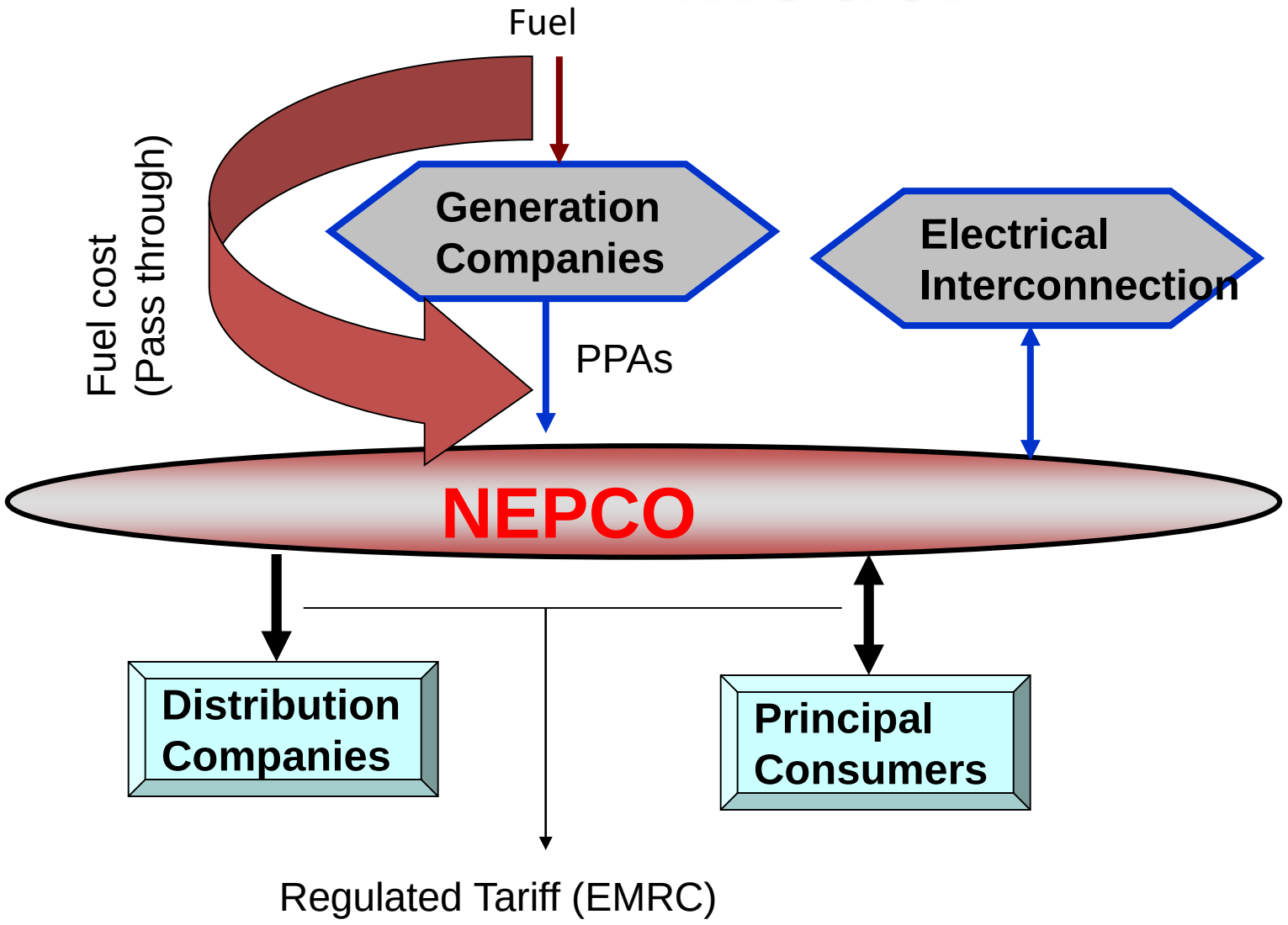
Transmission

NEPCO
System Operator
(National CC)
Network owner
Bulk Retailer

Distribution

- JEPCO
- IDECO
- EDECO
- Bulk Consumers

Single Buyer Model



NEPCO

NEPCO is responsible for the transmission sector and has the following duties:

1. Planning, Construction, Development, Operation & Maintenance of the Electrical Transmission Grids.

2. Management of the National Grid and the Process of Transmitting the Electric Power inside Jordan and to the Neighboring Countries.

3. Purchase Energy from Various Sources and Sell this energy.

4. Import and Export of the Electric Power.

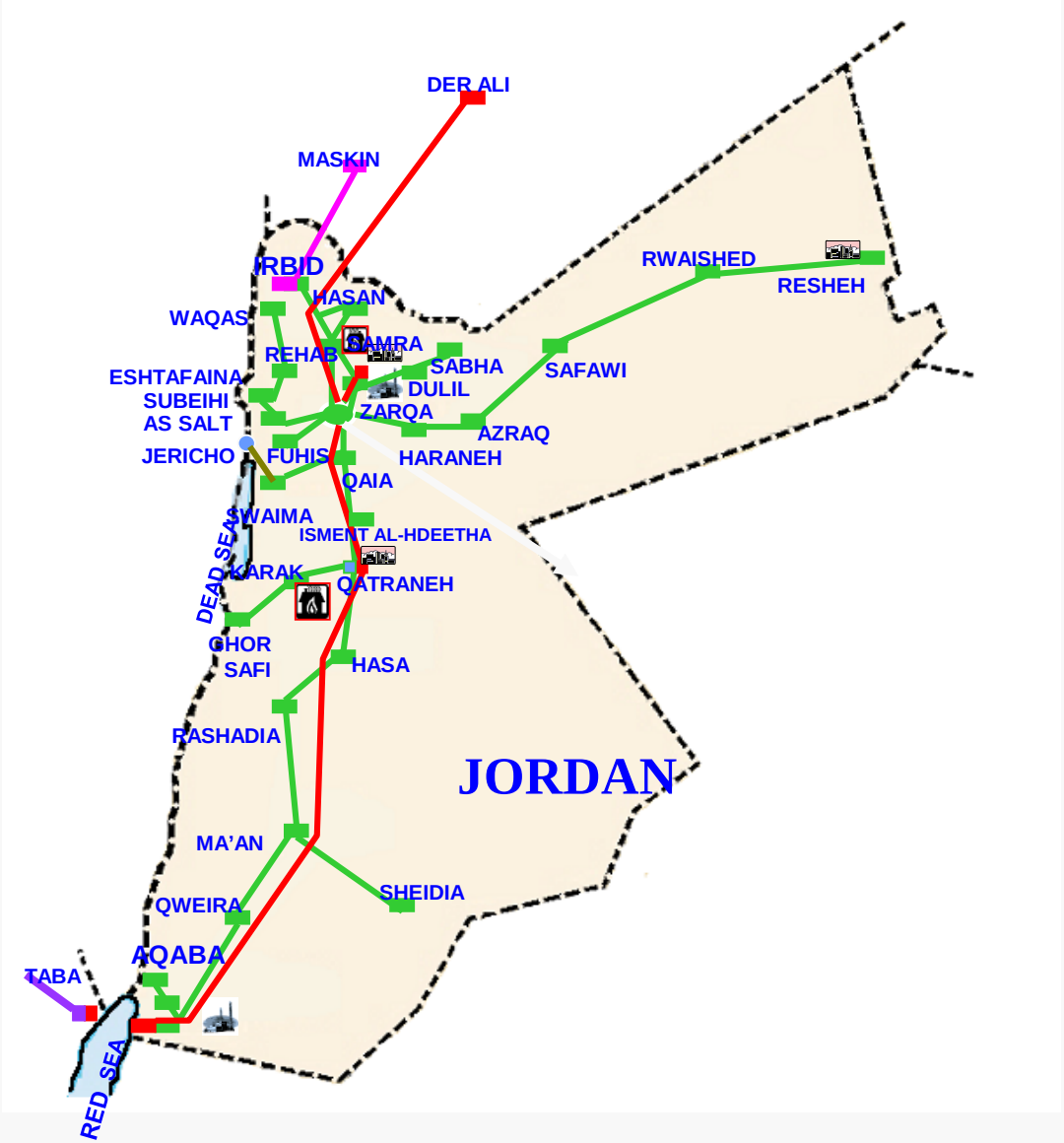
5. To permit the licensed companies to generate electric power to utilize the transmission network.

6. Purchase of natural gas from the seller and supplying it to the power generation companies.

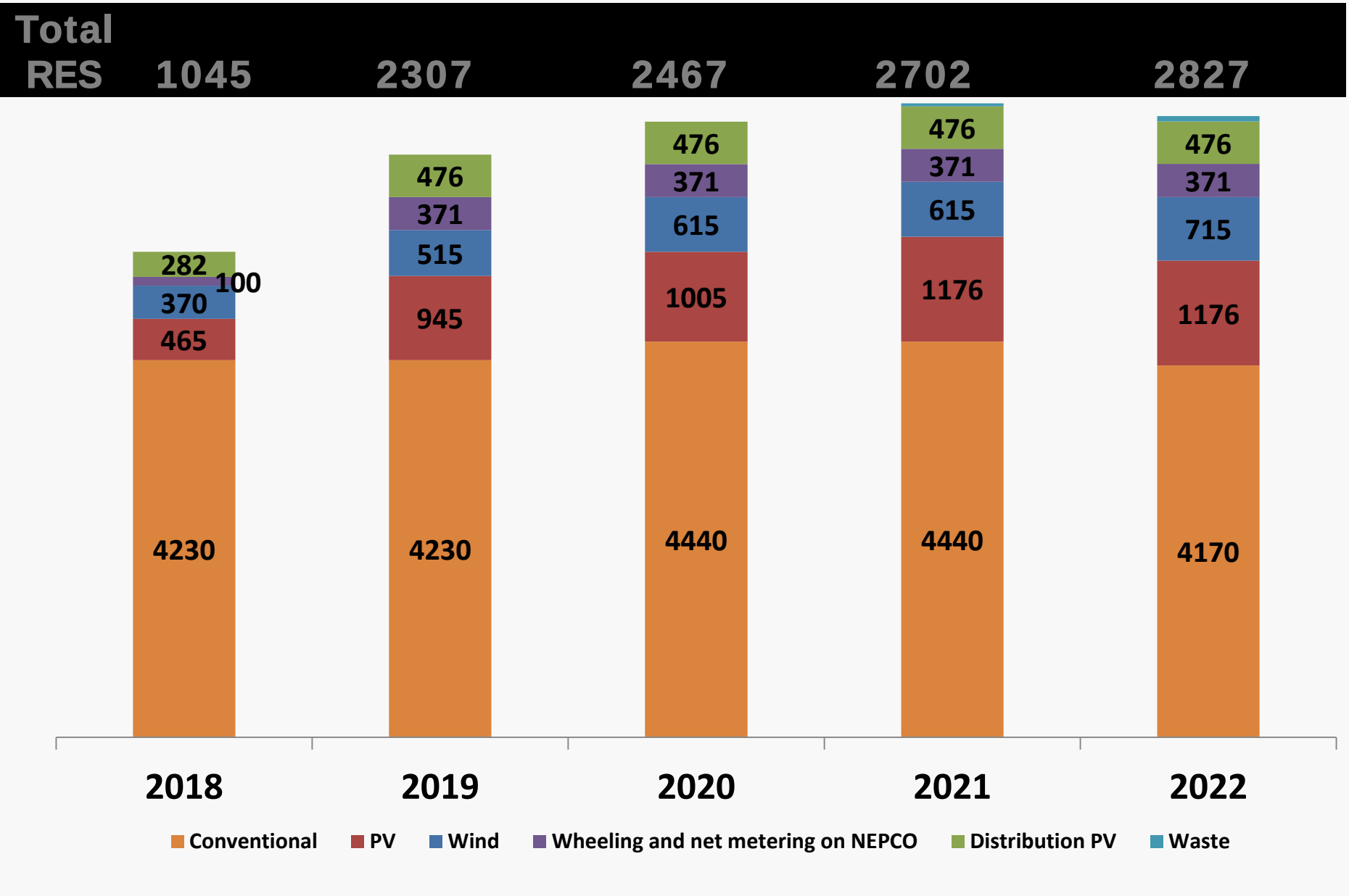
Jordanian Electrical System

Substations	
Type	Number
400/132/33 KV	7
132/33 KV	67
132/6.6 KV	4
33/10 KV	3

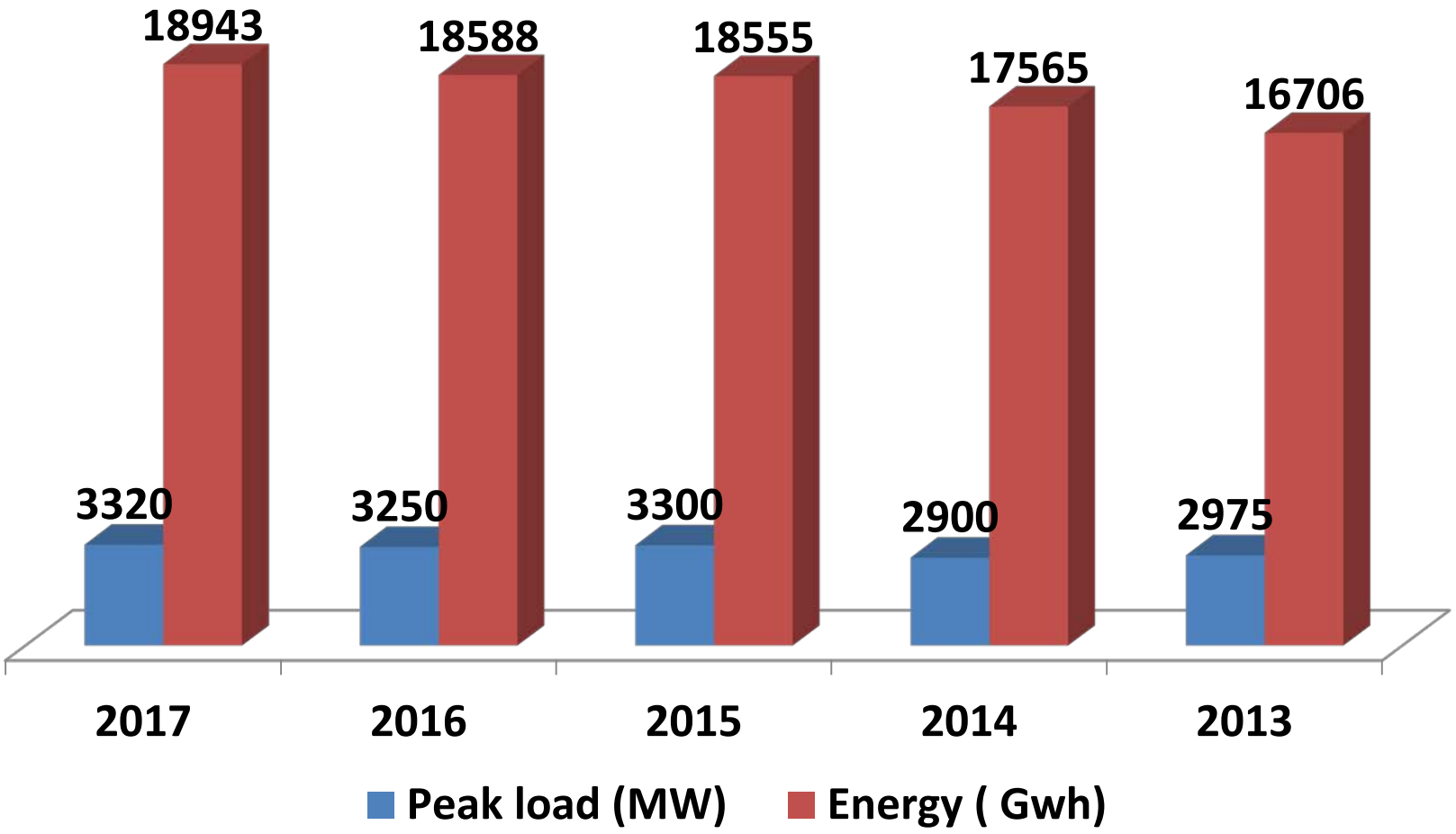
Transmission Lines	
	Length/ Km.Circuit
OHTL 400 KV	924
OHTL 132 KV	3511
Cables 132 KV	100



Installed Generation Capacity



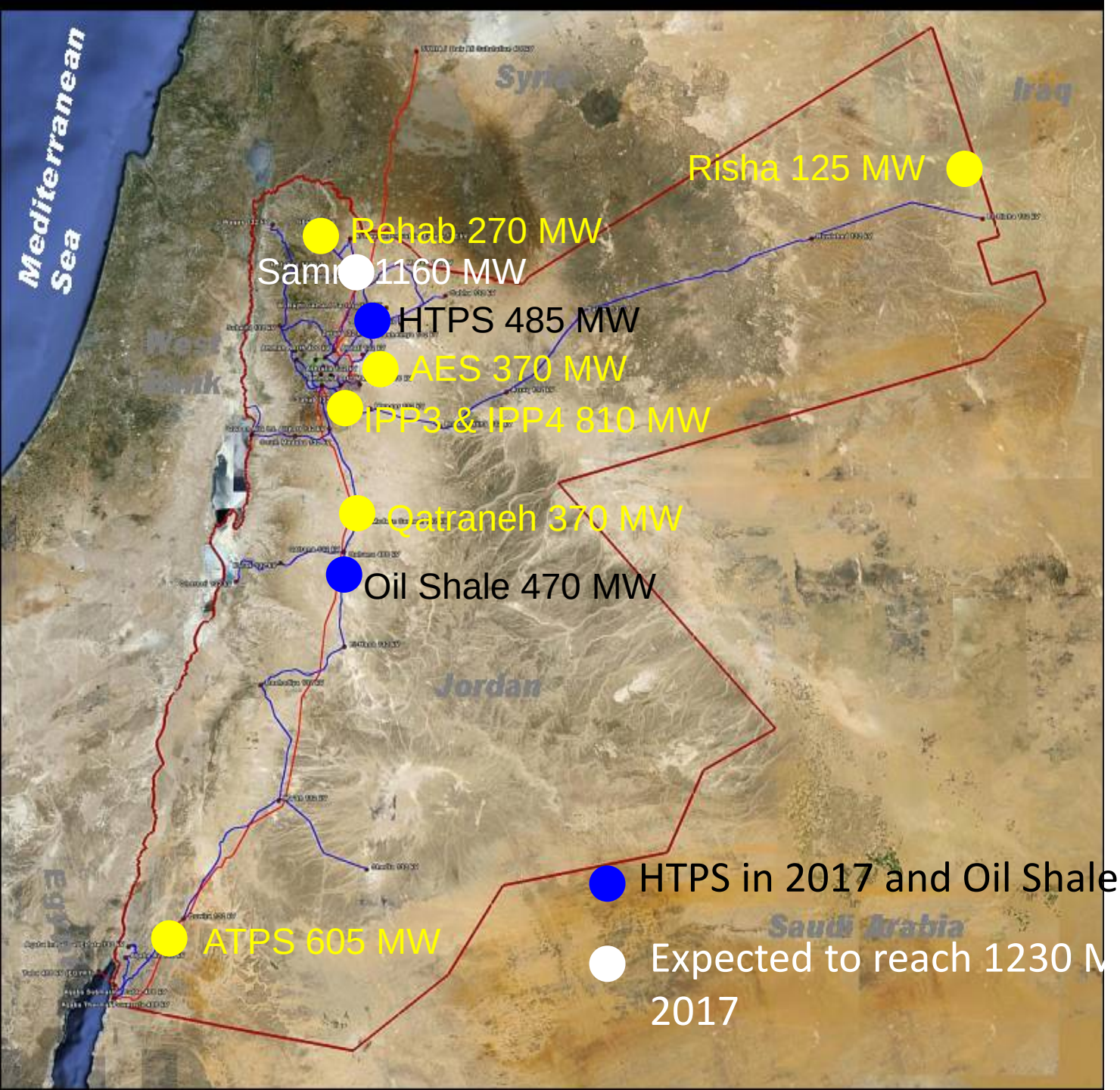
Key Figures for Electricity Sector in 2017



Average Growth 2% for Peak Load, 2.5 % for Energy for the last 5 years

Conventional Power Projects

Power Plant	2017	2018	2019	2020	2021	2022
AES (IPP1)	370	370	370	370	370	370
QEPC (IPP 2)	373	373	373	373	373	373
IPP3	573	573	573	573	573	573
IPP4	241	241	241	241	241	241
ACWA Zarqa	-	485	485	485	485	485
ATPS	603	603	603	361	361	361
Rehab	325	295	295	268	268	0
Risha	58	58	58	58	58	58
Samra 1	302	302	302	302	302	302
Samra 2	300	300	300	300	300	300
Samra 3	429	429	429	429	429	429
Samra 4	145	210	210	210	210	210
Oil Shale	-	-	-	470	470	470
Total	3720	4239	4239	4440	4440	4172

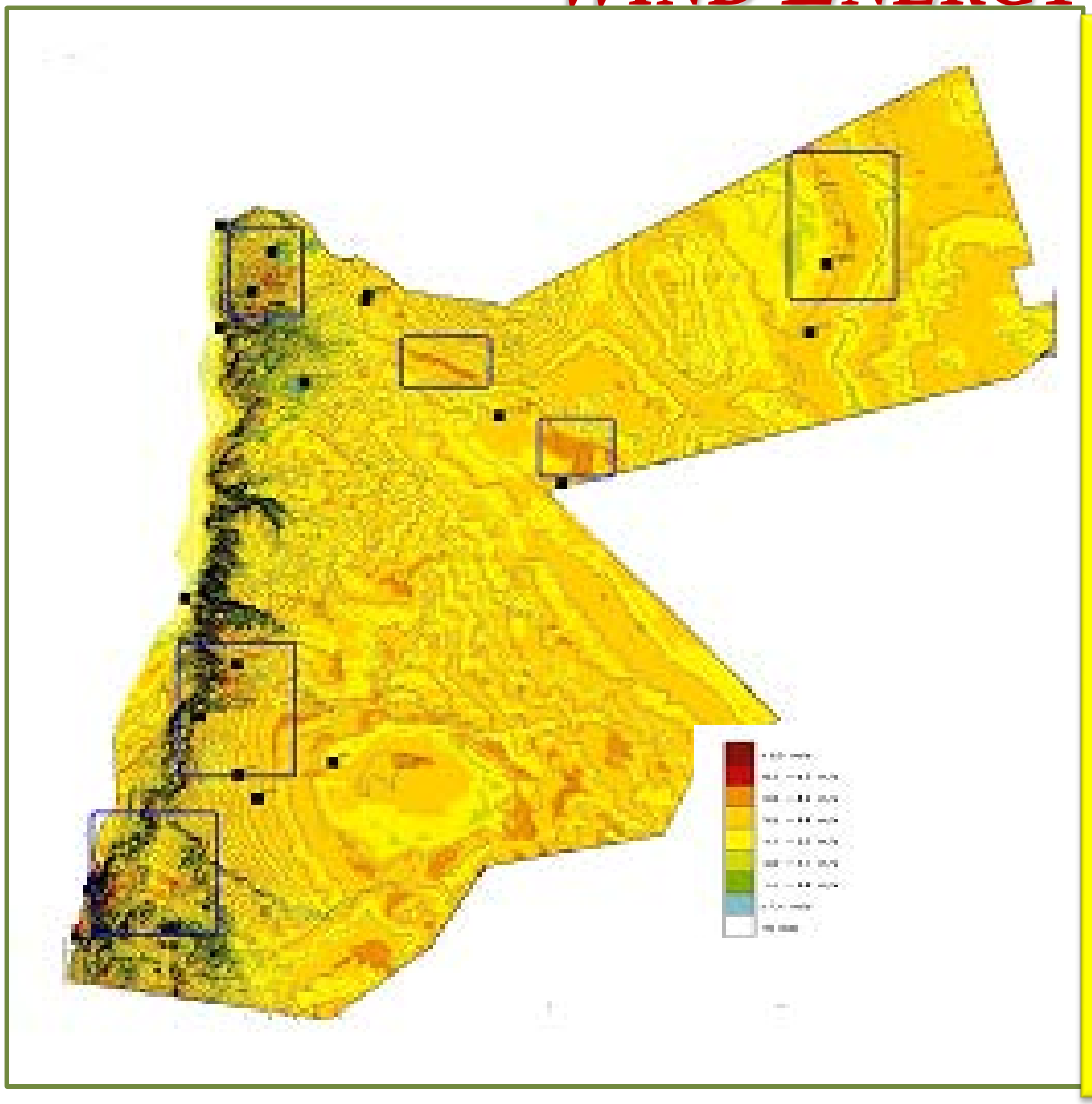

Mediterranean Sea
Syria
Iraq
Risha 125 MW
Rehab 270 MW
Sami 1160 MW
HTPS 485 MW
AES 370 MW
IPP3 & IPP4 810 MW
Qatraneh 370 MW
Oil Shale 470 MW
Jordan
Saudi Arabia
ATPS 605 MW
HTPS in 2017 and Oil Shale in 2020
Expected to reach 1230 M
2017

The Attarat Power Project

Shareholders	YTL Power	Yudean	Enefit
Shares	• 45%	• 45%	• 10%

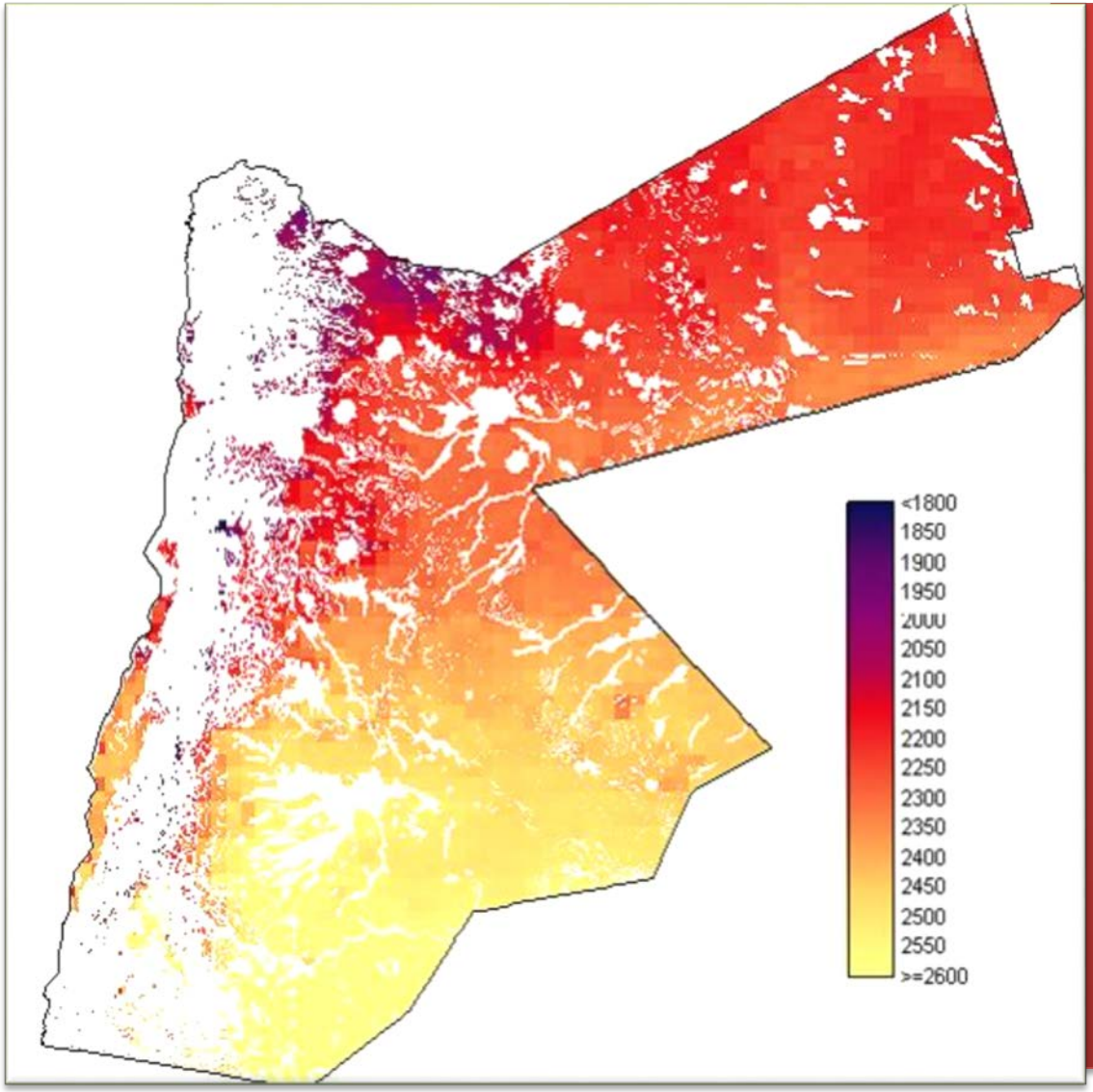
- The Attarat Power Project will be the 1st oil shale power plant & oil shale mine in Jordan which contribute to Jordan's long term energy security and independence
- Largest private inward investment to Jordan, USD 2.1 billion and kick-starts Jordan's oil shale industry
- Largest Chinese Project Financing for private infrastructure project outside China, c. USD 1.6 billion.
- 1st oil-shale fired power plant & mine in the world using limited private financing.

JORDAN ENJOYS WORLD CLASS QUALITY WIND ENERGY



- **Wind speed reaching between 7.5 to 11.5 m/s in some places.**
- **Wind projects are now feasible and competitive**

JORDAN ENJOYS WORLD CLASS QUALITY SOLAR ENERGY



High solar radiation figures of 5 – 7 kWh/m2 per day with about 300 sunny days per year.

Jordan future Renewable Energy source is Solar Energy.

Direct Proposal

EPC

As a result, many projects are aimed at building solar power and wind power capacities in an effort to the set target of 10% of the country's primary energy mix by 2020

Wheeling

Net Metering

Direct Proposal Legal Framework

- In year 2010 Jordan enacted a Renewable Energy Law that provides for the legal framework for the sector.

- The Law permits and encourages the exploitation of renewable energy sources at any geographical location in the Kingdom. By allowing for the Direct Proposal Submissions of projects for generating electrical power and connecting to the grid (Ref price list).

- The Law provides that the tariff that the project developer sets out in its proposal shall "within an acceptable range according to the Reference Price list".
- The Reference Price list is prepared and updated by Jordan's EMRC together with relevant bodies.
- Tariff then changed to be competitive but still within updated Reference Price list

Net Metering Legal Framework

- The Law permits home-produced energy to be sold to grid thereby accelerating the adoption of clean energy technologies at both residential and commercial levels (Net Metering).
- Exempting all Renewable Energy and Energy Efficiency Systems and Equipment's from Sales Tax and Custom duties.
- The investors can benefit from Jordan Investment Promotion Law and the Development Zones' corporate tax incentives and customs tax exemptions.

Wheeling Legal Framework

- The Law permits home-produced energy to be sold to grid thereby in a place and consume instead of it in other place.

- Wheeling Charges are applied: 0.6 and 0.9 Cent/ kWh (transmission and distribution networks respectively) and 2.3 % and 6% of the energy is deducted as losses (transmission and distribution networks respectively).

- This cause bulk costumers who subsides the Tariff to have this system instead paying electricity to the government (huge financial losses to the government).

For Renewables to have the right position within the global Energy Context:

- Stable Regulatory Framework.
- Adequate and Transparent Public Policies and Targets.
- Clear Financial and Support Schemes.
- Well defined Infrastructure Provisions (Lands, Grid connections, etc.)
- Stable Electrical Grid.
- Bankable Project Agreements.

Solar Projects

Date of Operation	Capacity (MW)	Name of Project
2016	204	Round (1)
Forecast to operate in end of 2018 and beginning 2019	204	Round (2)
Forecast to operate in 2019 and 2020	460	Direct proposals
Azraq operated in 2015 and Quwiera in beginning 2018	108	Governmental Project (Azraq, Quwiera)
Forecast to operate in end of 2021	200	Round (3)
	1176	Summation

Wind Projects

Date of Operation	Capacity (MW)	Name of Project
At the end of 2018 and 2019	230	Round (1)
Tafilla:2015 Fujiej: the end 2018 Mass:2019	306	Tafilla, Mass, Fujiej
2017	80	Governmental Project (Ma'an)
Forecast in 2022	100	Round (3)
	716	Summation

RE Projects

Project	MW	COD
Tafila	117	2015
Hussain	80	2015
Rajif	83	2018
Fujaij	90	2018
Kospo	50	2019
Xenel	50	2019
Mass	100	2019
Shobak	45	2019

Project	MW	COD
Round 1	200	2016
Round 2	200	2018
Quwera	103	2017
Masdar	200	2019
Azraq	5	2015
AES	40	2019
Risha	50	2019

EGYPT

SUCCESS STORY IN RENEWABLE ENERGY

RE Challenges:

- Variability and intermittency in supply according to weather condition.
- Uncertainty of energy production forecasting.
- Fast ramping, cant followed from conventional units.
- Difficulties in balancing between the generation and the load.
- Power Quality Problems.
- Inflexibility
- Curtailed energy is still paid from NEPCO.

RE share will exceed 25% in 2020

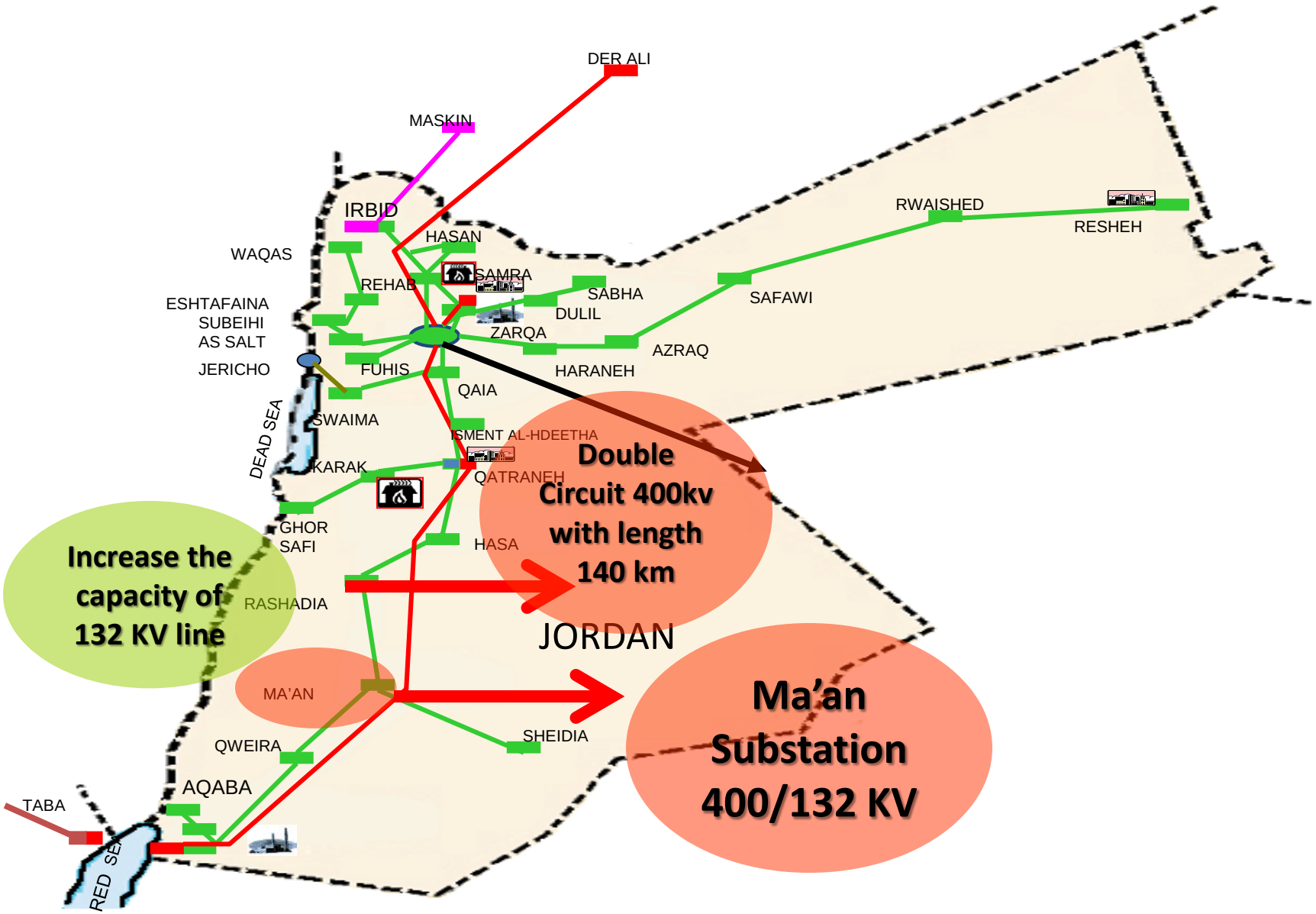
All above challenges are maximized when you have high RE share, it is become challenging to manage

Action Plan & Solutions:

NEPCO has taken real protective action plan

- Electrical Battery Storage to be considered in Round 3.
- Pump storage under studding.
- Electrical Interconnection with gulf countries and Iraq.
- Special energy forecasting systems that considering RE will be implemented in the system.

Green Corridor



LNG PROJECT STRUCTURE

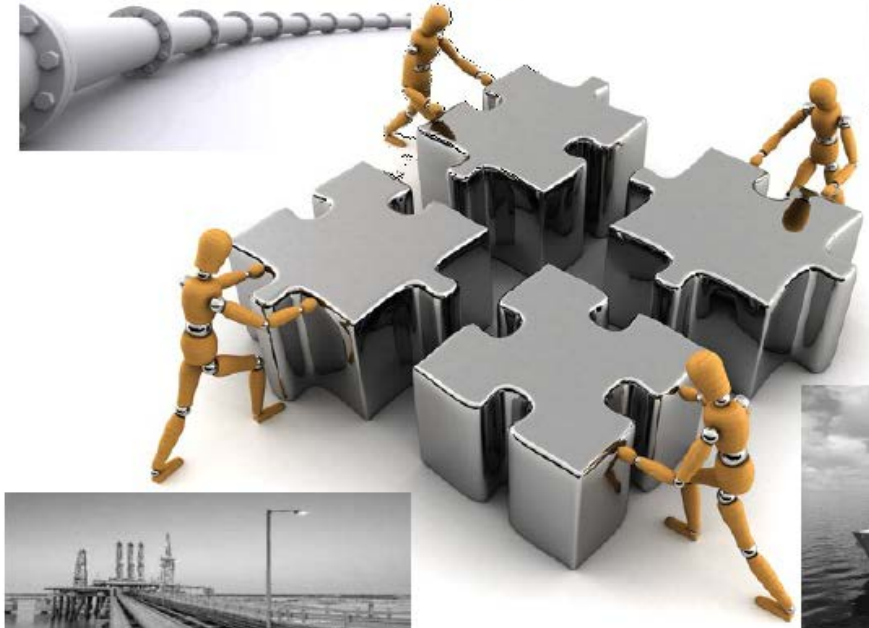
LNG PROJECT STRUCTURE

- An 160,000 m3 FSRU arrived to the LNG Terminal at Aqaba on 25.05.2015 to remain working for 10 years
- The Terminal started commercially to receive LNG cargoes since 10/07/2015

Project Main Elements

LNG Supply

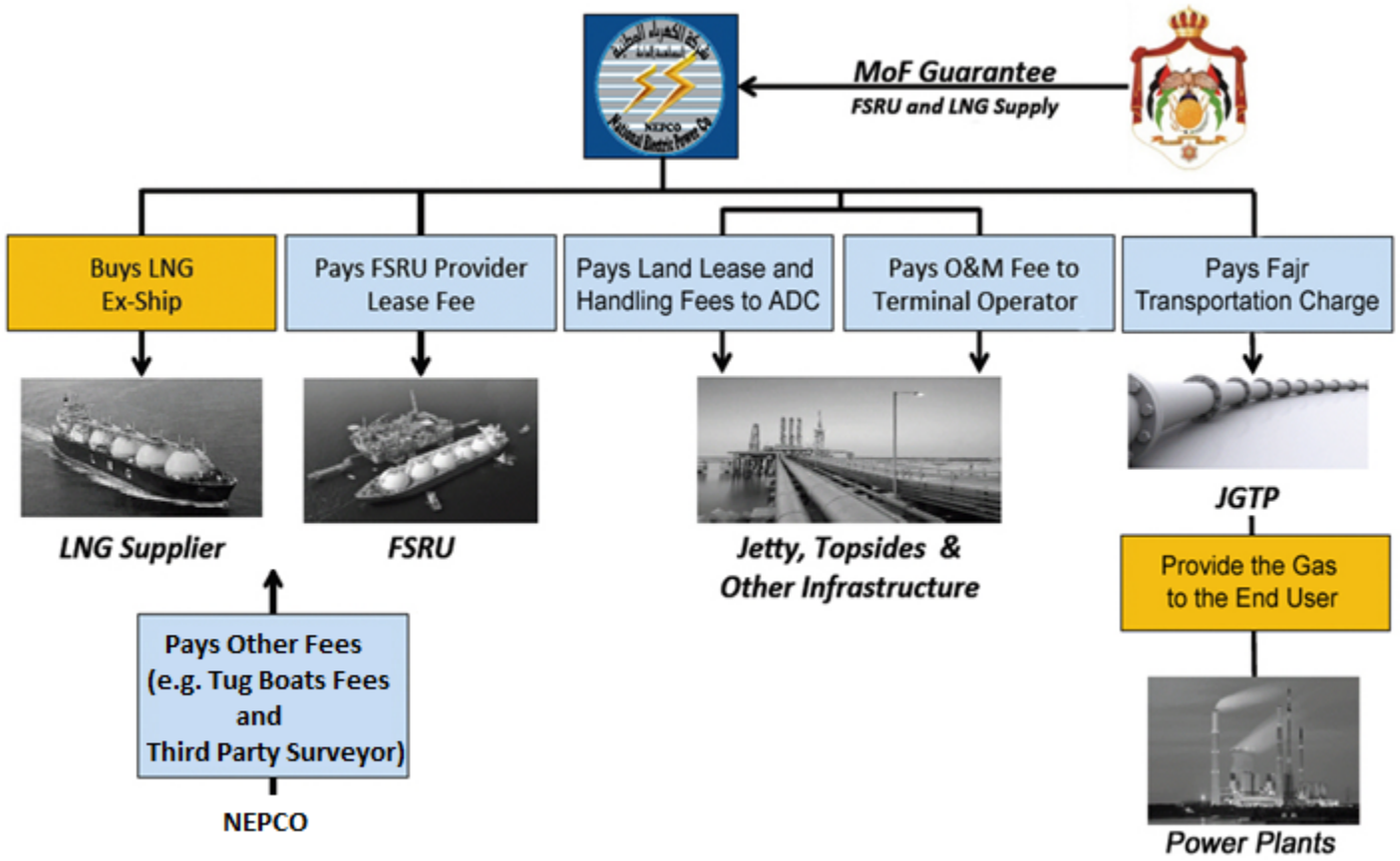
Gas Transportation
(Jordan Gas Transmission Pipeline)



Aqaba Terminal Infrastructure

Floating Storage &
Regasification Unit

NEPCO Role



- **MEMR** act [As *Regulator*]
- The terminal started to receive LNG cargoes since **10.07.2015**

Sheikh Sabah Al Ahmad Terminal

- Terminal construction cost was USD 65 million financed by Kuwait Fund For Arab Economic Development.
- The Terminal site and facilities has been leased to NEPCO through a “Terminal User Agreement” with ADC.
- The Terminal has been reviewed and approved by Shell, Vitol, BG, PB and Trafigura.
- Terminal doors are open for any company for inspection and study, and NEPCO welcomes any comment.

Golar Eskimo

- Golar has been reached upon a tender issued by MEMR in 2013.

- The contract was signed on 13.11.2013 between MEMR & Golar Eskimo, and transferred to NEPCO in August 2015 through Novation Agreement signed between the parties.

- The term of the agreement is for 10 years can be terminated after the 5th year by NEPCO option.

- Golar Eskimo upon arrival on 25.05.2015 -

Golar Eskimo

- Golar Eskimo is an 160,000 m^3 Floating Storage & Regasification Unit.
- By its three Regasification Skids, Golar Eskimo can send out NG up to 710 mmscft/d (Peak Capacity).
- Contractually, the maximum send out rate is **490 mmscft/d** (Maximum Capacity).
- The contractual availability of the FSRU is 98%

Marine Services

- In spite of the relative stability of the sea water in the gulf of Aqaba, we have 4 tug boats in Aqaba with power of 80 tons/tug.
  - These 4 tugs are specialised only for the LNG terminal.
  - The 4 Tugs are brand-new made in Turkey by Sanmar.

Terminal O&M

- **SPT** has been reached upon a tender issued by NEPCO in 2014.
- **SPT** has a good experience in this field as they work in Mina Al-Ahmadi Gasport, Kuwait since 2007.

Third Party Surveyor

- **NEPCO** contracted with **INTERTEK** as the Third Party Surveyor for whole **LNG** cargoes reaches **Sheikh Sabah Al Ahmad Terminal.**

Gas Transportation

- A 10 years Gas Transportation Agreement has been entered with Fajr Company.

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

- Under the Agreement, Fajr transports the Gas from the output of Terminal at Aqaba to the inlet of the power plants all over the country.


ISO 9001:2008
شبكة الكهرباء الوطنية
National Electric Power CO. (NEPCO)

Thank You