




# ***“Medgrid Technical Rendez Vous”***

***6<sup>th</sup> January 2015***



## **National Electric Power Company**

***Eng. Abdelfattah Aldaradkah  
Managing Director***

# Jordan Overview



Total area:  
**89 213 sq. Km**

Population:  
**6.46 million**

Sea Port:  
**Aqaba**

Coastline:  
**26 Km**

GDP:  
**33.68 billion  
USD (2013)**

GDP /capita:  
**5,214.19 USD**



# *Jordan Electricity Sector*

The rising of energy consumption trends alongside with 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 country's GDP .
- ❖ Jordan spend more than 20% of its GDP or more than 7-8 % of its national income 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 .
- ❖ State owned national electric power company NEPCO role in the market is to act as a single buyer.



# *Electricity Sector*

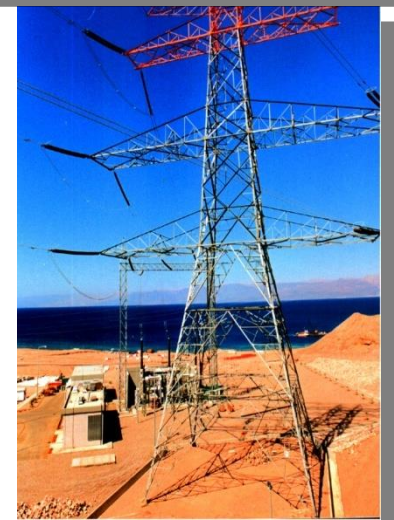
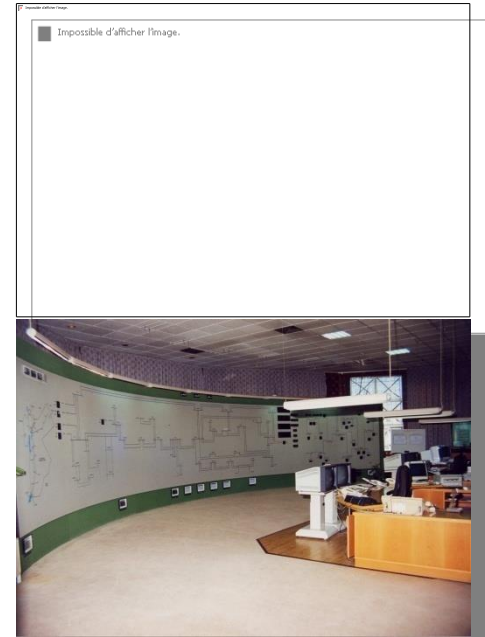
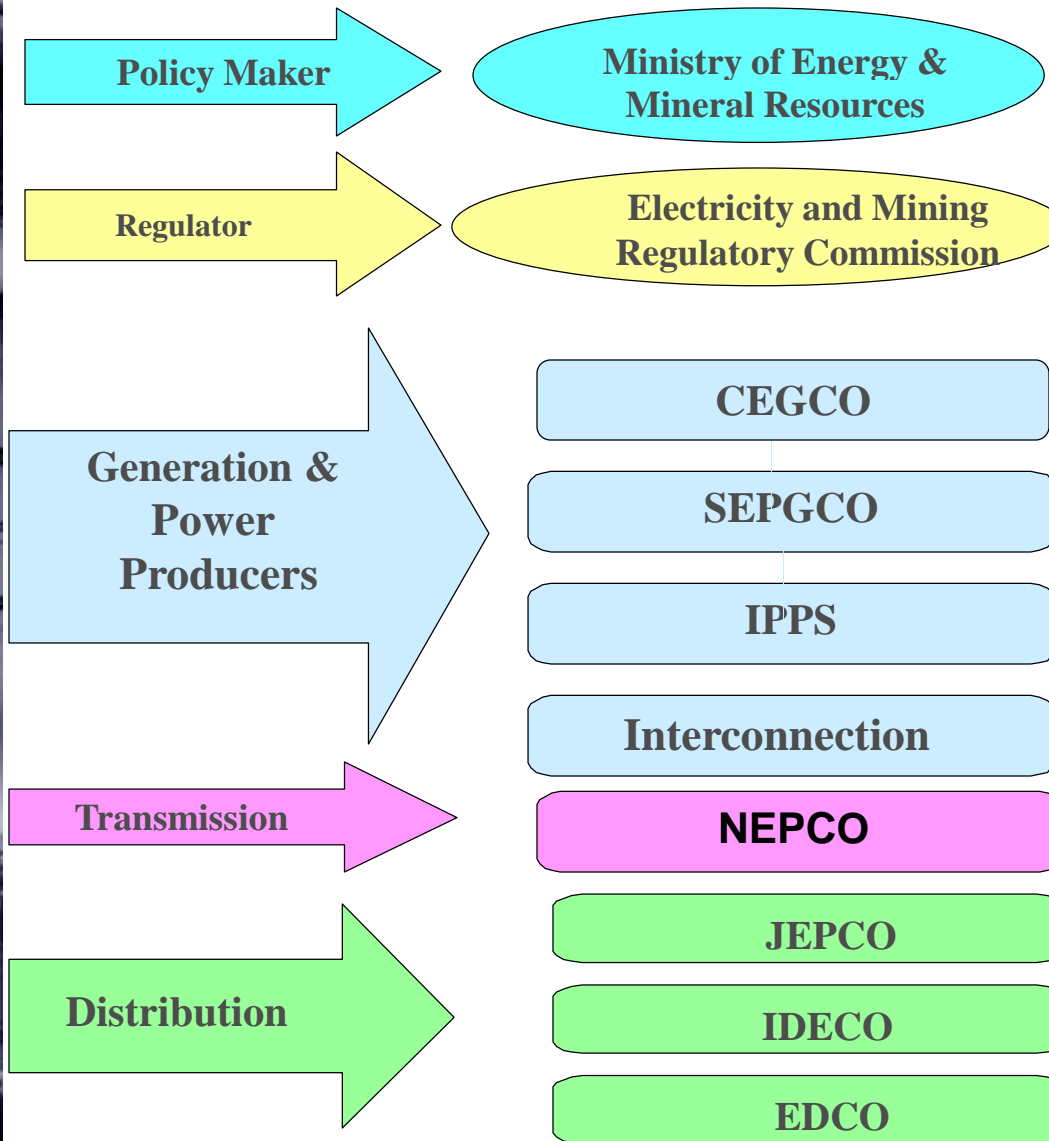
- ❖ The tariffs to the distribution companies and principal consumer are set by energy and mining regulatory commission EMRC.
- ❖ The Power Purchase Agreement (PPA) between NEPCO and the generation companies governs for purchase electricity.
- ❖ NEPCO is responsible for purchase of fuel and to provide the generation company with fuels .since the prices for buying and selling are already stipulated, NEPCO has to capture prices fluctuations for fuel in their profit and loss account (P&L).
- ❖ According to the agreement between Jordan and Egypt Jordan relied on 80% of its electricity generation on natural gas imparted from Egypt.
- ❖ Egyptian natural gas exports declined substantially falling by an annual average of 30% from 2010 – 2013 and stopped completely since April 2014.



# *Electricity Sector*

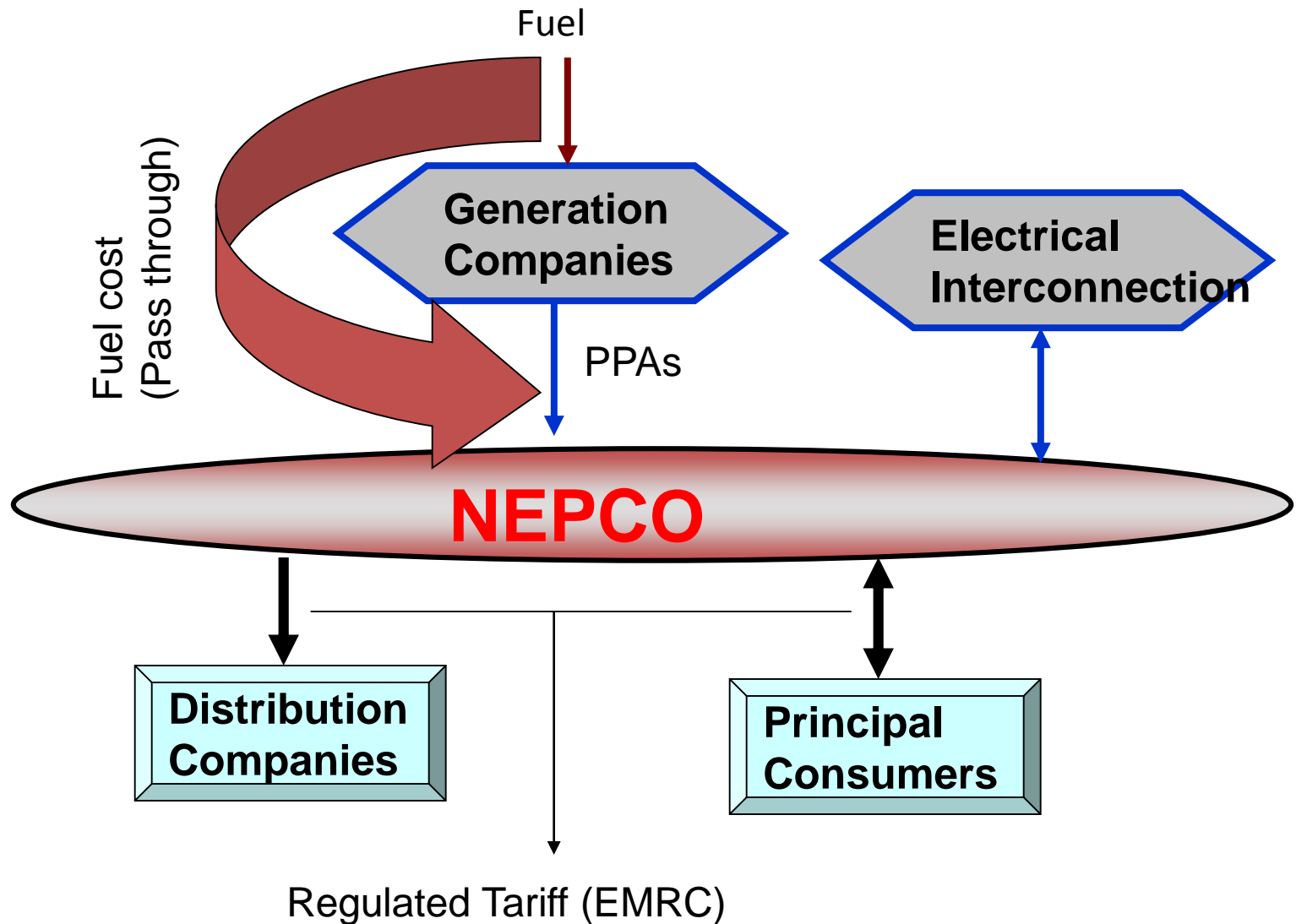
- ❖ As a result Jordan has resorted to import more expensive fuels such as HFO and LFO which raised the energy bill further to 20% of the GDP and forced NEPCO to increase substantial losses.
- ❖ The above described situation can lead to an enormous cash flow problem leaving NEPCO to focus on this problem instead of its core assignment of managing the purchase transmission, dispatch, control, and selling of electric power inside Jordan.
- ❖ Current priority in the sector is to reduce NEPCO losses and allow the company to recover all its costs by the end of 2017.
- ❖ Several investment decisions have been taken and implemented to import cheaper liquefied natural Gas (LNG) and increase share of renewable in the Jordan energy mix.

# Electricity Sector



# *National Electric Power Company*

## *Single Buyer Model:*







# ***Jordan's Power System (2014)***

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**Peak Load: 2975 MW**

**Peak load (till Dec. 2014 ): 2860 MW (-3.9%)**

**Generated Energy: 16710 GWh**

**Generated Energy(till Oct 2014): 14585 GWh**

**Imported Energy : 381 GWh**

**Exported Energy : 11 GWh**

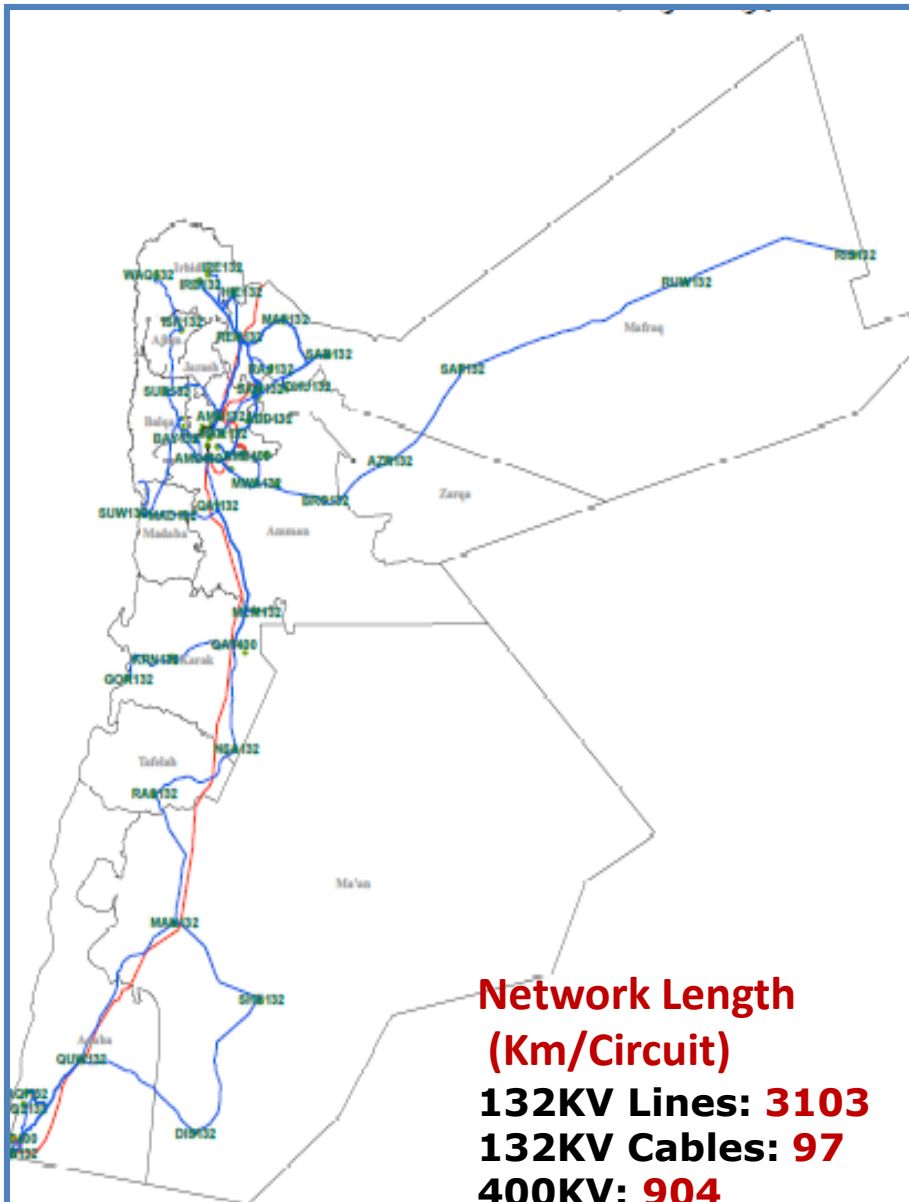
**Installed Capacity: 3840 MW**

**Transmission Lines Length: 4219 Km.circuit**


**Total Substations Capacity: 12580 MVA**

**Electrification Rate: 100%**

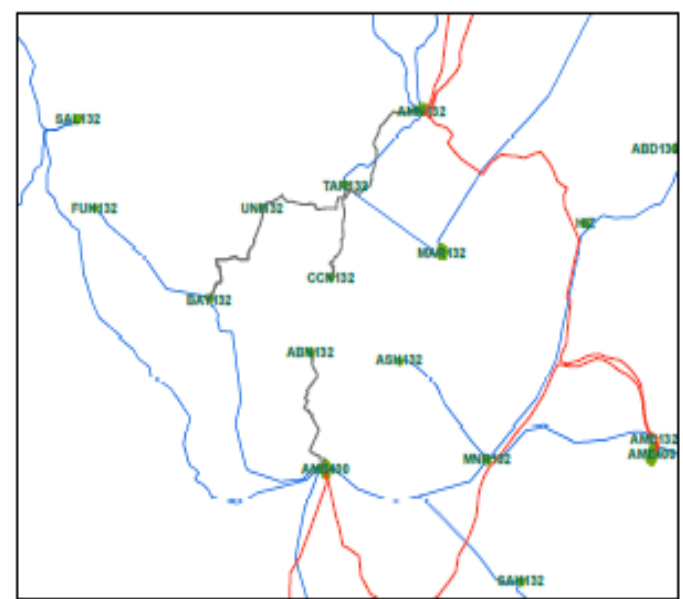
# Transmission Grid



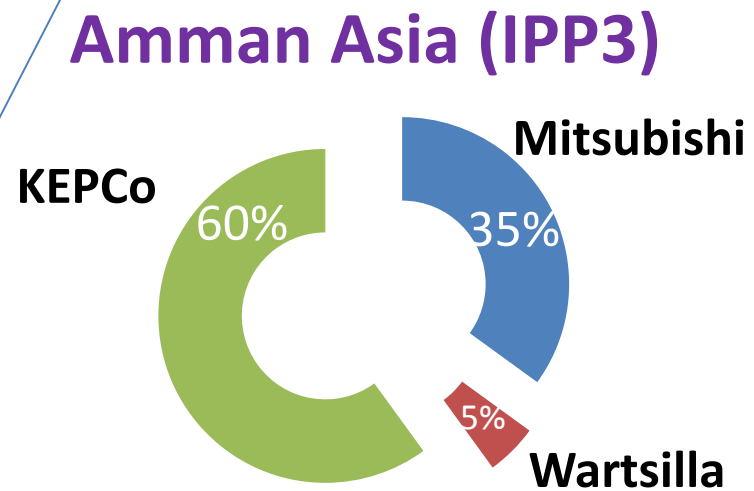
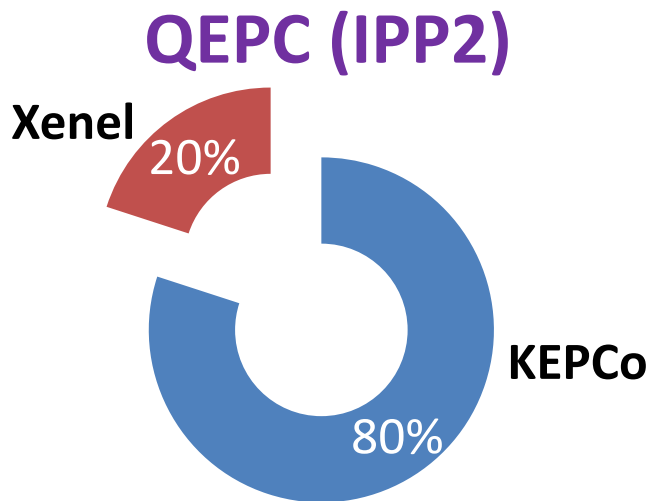
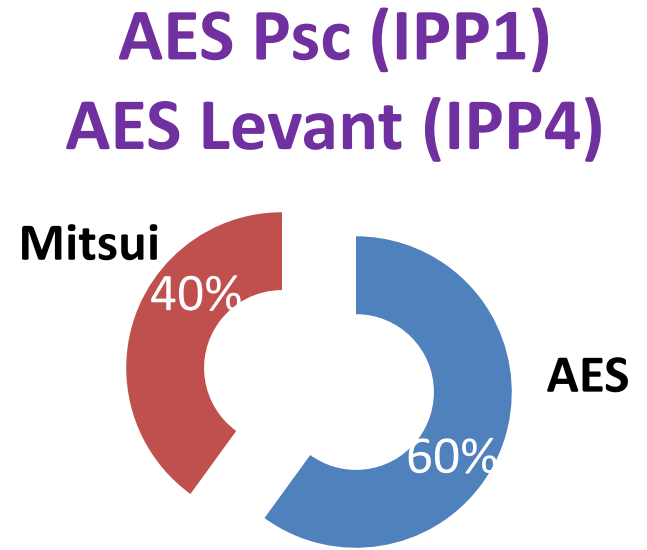
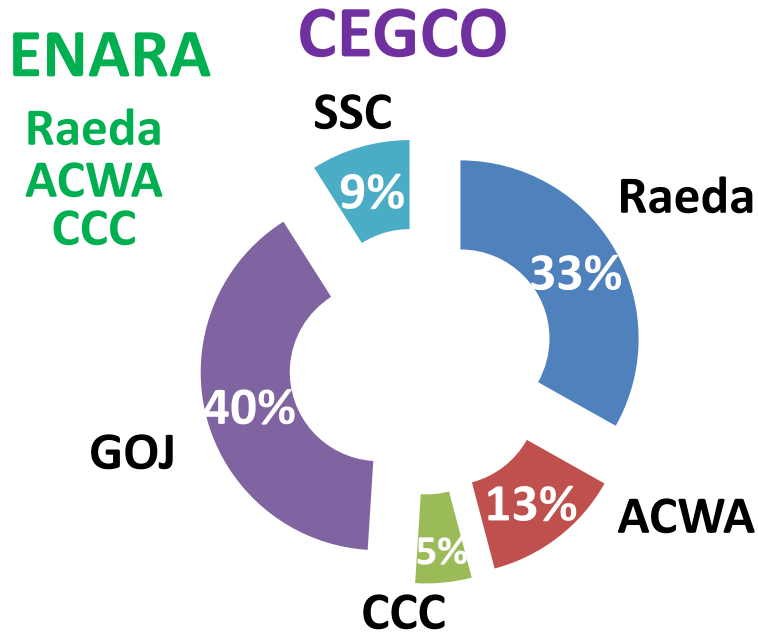
GIS Section  
03/02/2013

- LINE132kV
- LINE400kV
- UnderGroundCable
-  SUBSTATION

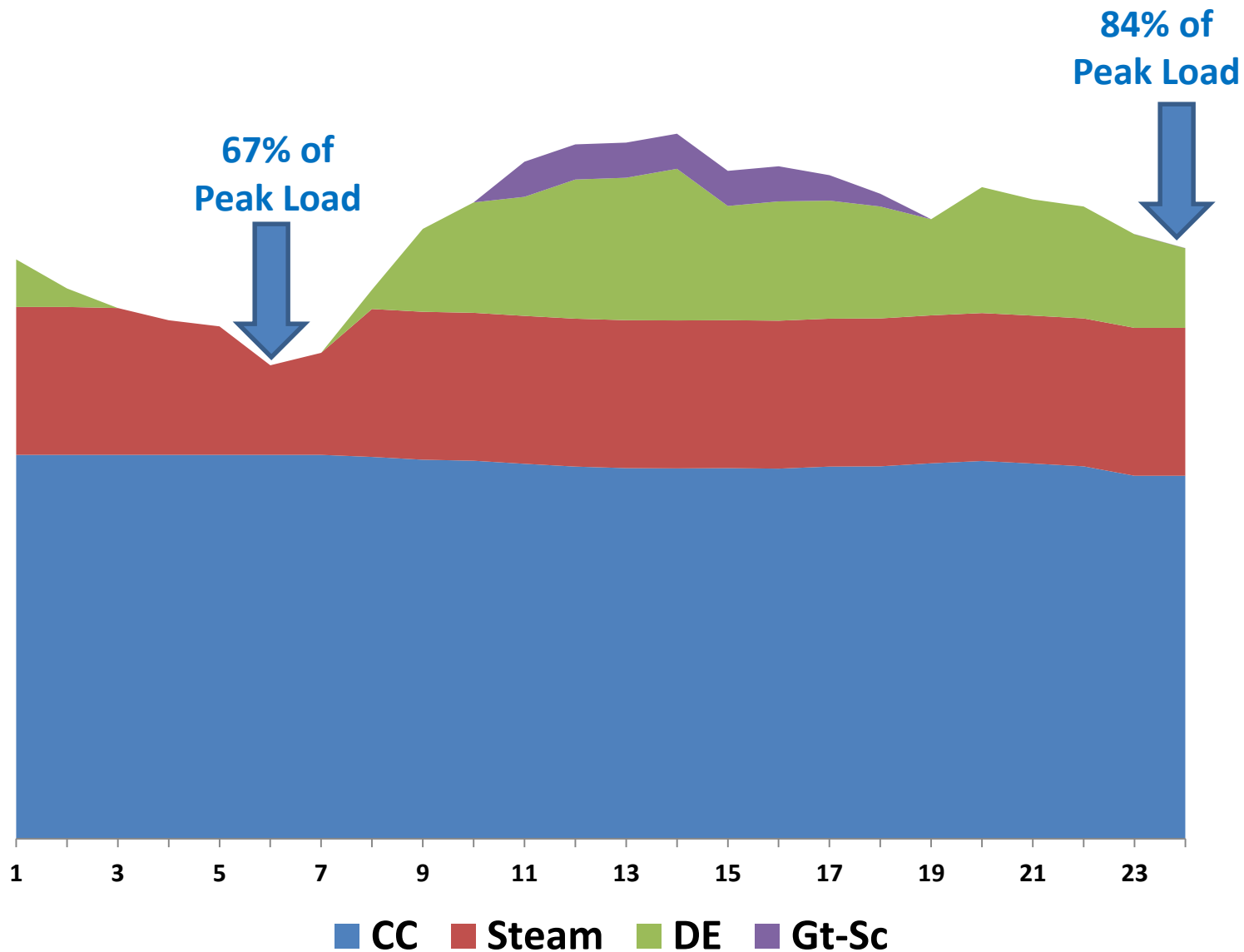
**Network Length  
(Km/Circuit)**  
**132KV Lines: 3103**  
**132KV Cables: 97**  
**400KV: 904**



# Generation Companies



# Generation Units Merit Order





# *Generation Expansion*



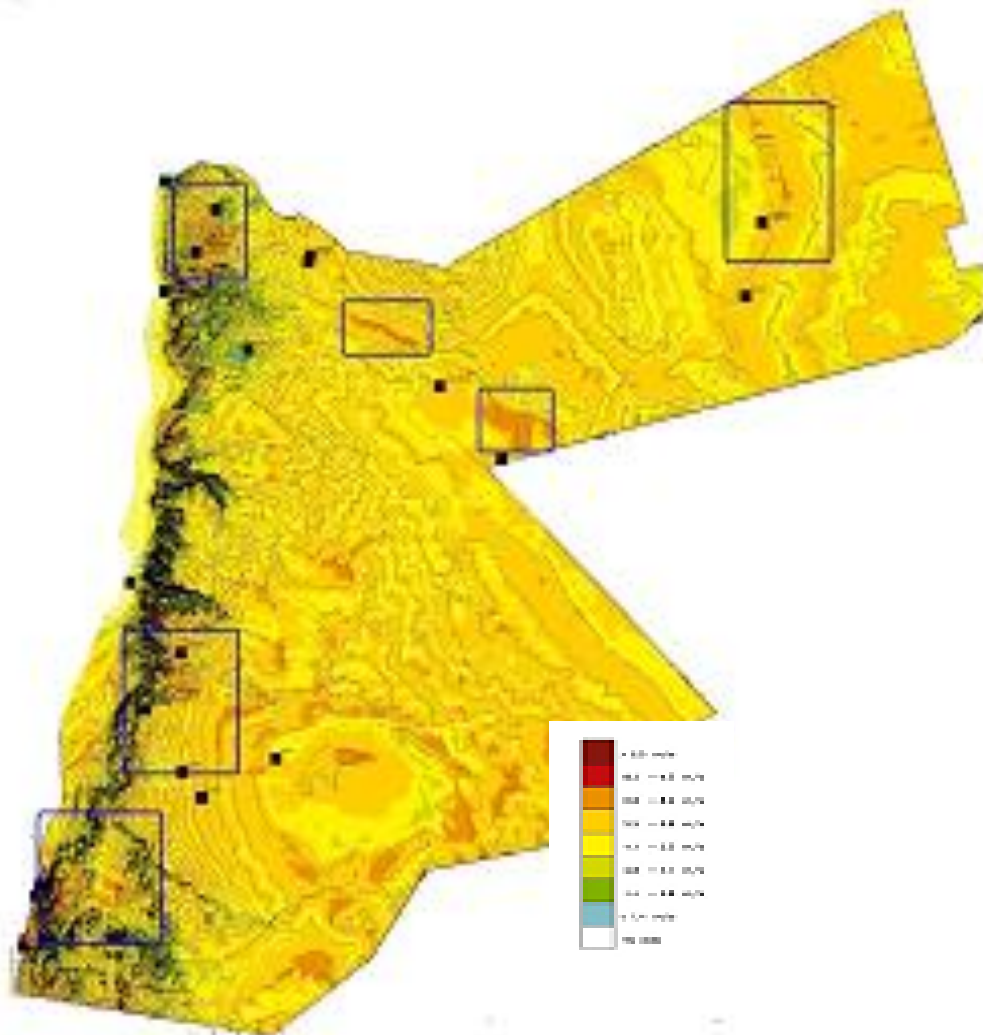
# *Generation Expansion Plan*

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## *Challenges:*

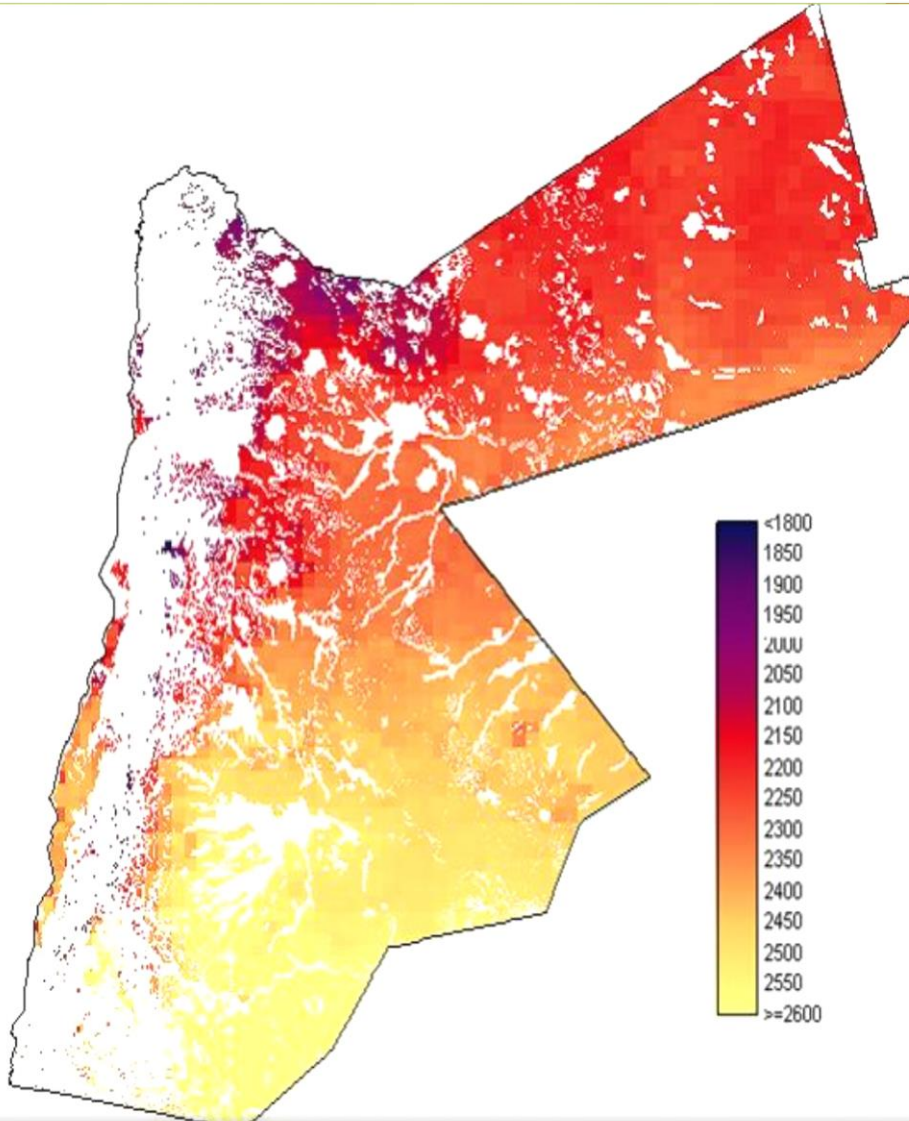
- ❖ **Growing energy demand.**
- ❖ **Increasing energy costs.**
- ❖ **Lack of conventional energy resources.**
- ❖ **Lack of water resources.**

# Jordan enjoys world class quality Solar and 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 and Wind Energy



High solar radiation figures of 5 – 7 kWh/m<sup>2</sup> per day with about 300 sunny days per year.

Jordan future Renewable Energy source is Solar Energy.

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



# *Ongoing Renewable Generation Projects*

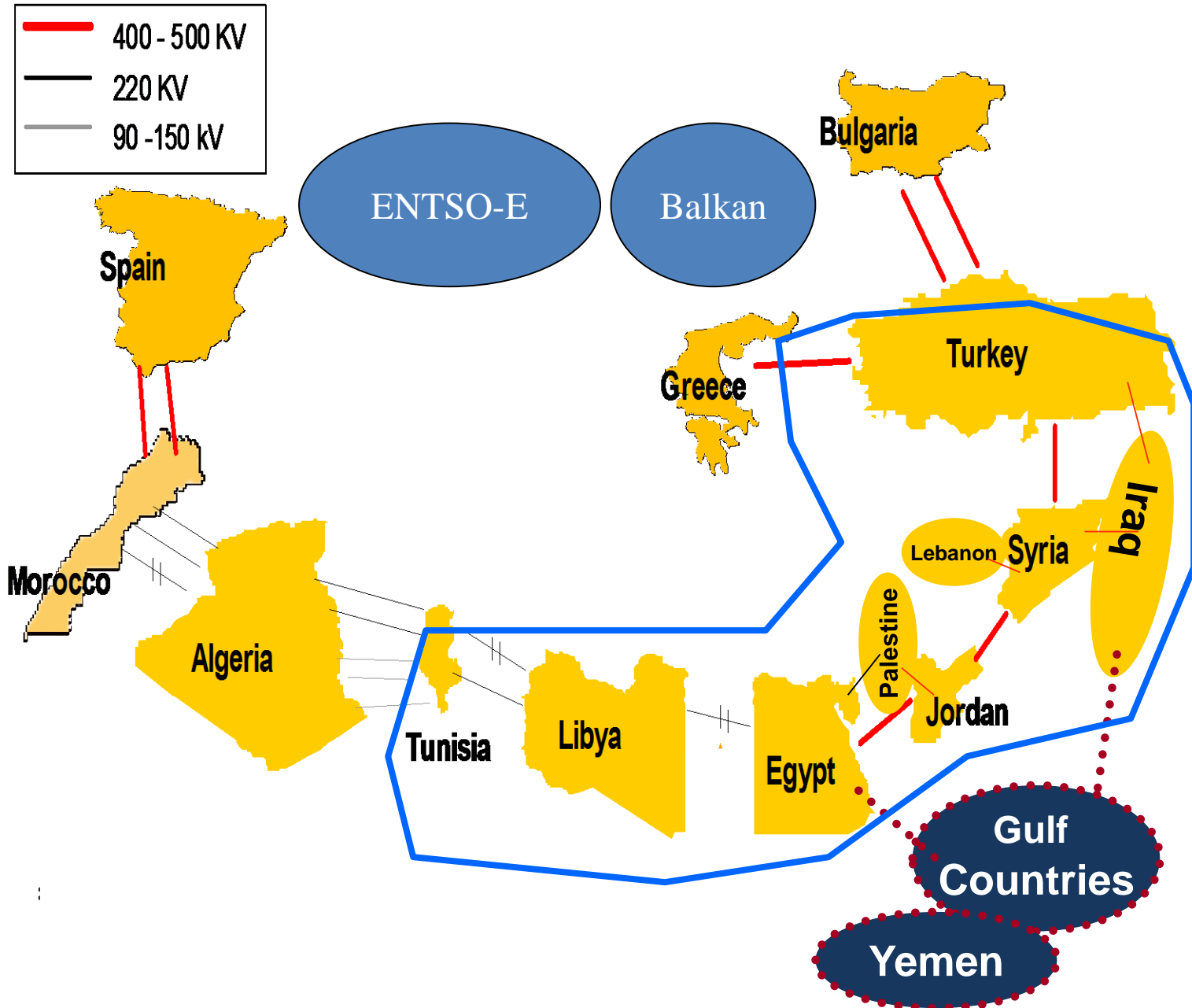
Type	Project Name	Size (MW)	Comment
Wind (Direct Proposal)	Tafilah	117	(under construction) Completion by Q3-2015
PV (EPC)	Al-Queira	75	Completion by 2016
PV(Direct Proposal)	PV Round 1 (12 Projects)	200	Completion by 2016
Wind (Competition)	Al-Fujeij	70	Completion by 2016/17
Wind (EPC)	Al-Hussein	66	Completion by 2016/17

# *Expected Renewable Generation Projects*

<b>Project</b>	<b>Type</b>	<b>Installed Cap. (MW)</b>	<b>Date of operation</b>
<i>PV Round II ( 4 Projects)</i>	<b>Direct</b>	<b>4 x 50</b>	<b>After 2016</b>
<i>China International Wind Farm</i>	<b>Direct</b>	<b>50</b>	<b>After 2016 *</b>
<i>Sweg Wind Farm</i>	<b>Direct</b>	<b>30-50</b>	<b>After 2016 *</b>
<i>Ayla power Wind Farm</i>	<b>Direct</b>	<b>24</b>	<b>After 2016 *</b>
<i>Xenel Wind Farm</i>	<b>Direct</b>	<b>30-50</b>	<b>After 2016 *</b>
<i>Green Watt Wind Farm</i>	<b>Direct</b>	<b>83</b>	<b>After 2016 *</b>
<i>Kospo Wind Farm</i>	<b>Direct</b>	<b>75</b>	<b>After 2016 *</b>

**\* Not before construction of New Ma'an 400/132/33 kV**

# Interconnection Project





# *Arab League of States Recommendations*

- ❖ **To have reliable connection, Arab League of States recommended, in January 2014, to implement the following projects:**
  - **Egypt-Libya connection on 400/500 k.V by 2017.**
  - **Libya- Tunisia connection on 400 k.V by 2020.**
  - **Support the Egypt-Jordan connection by another 400 k.V connection line by 2020.**
  - **Support the Syria-Jordan connection by another 400 k.V connection line by 2020.**

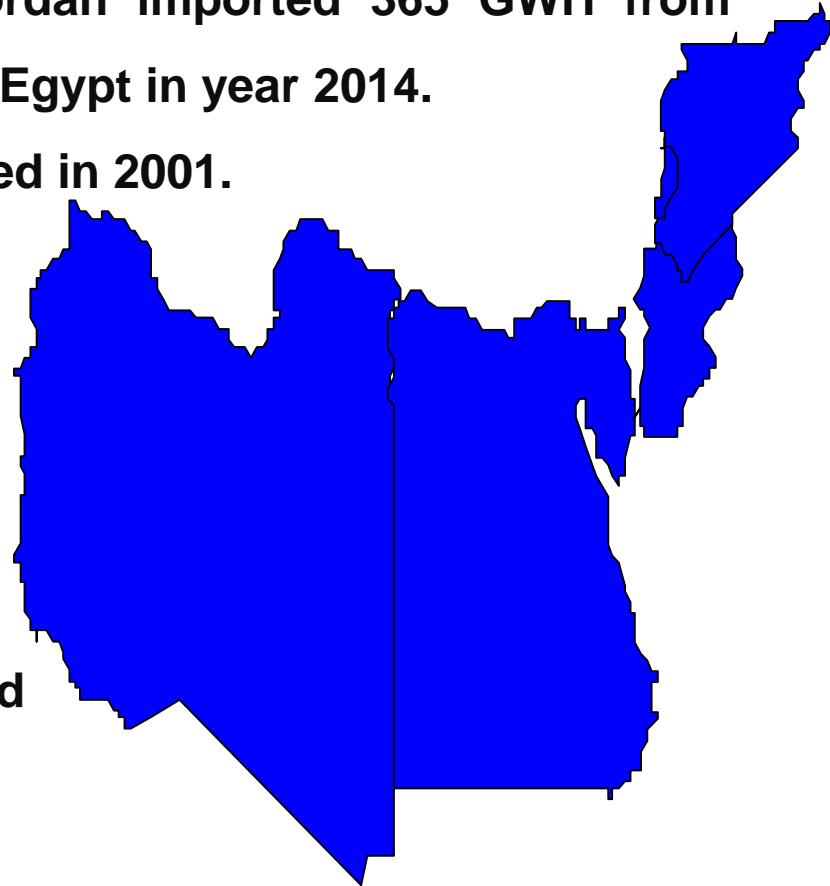


*Electrical  
Interconnection  
Among  
The Eight Countries*

# The existing projects

## (Egypt-Jordan - Libya- Syria)

- ❖ Jordan & Egypt were connected in Oct 1998.
- ❖ The exchange of electrical energy continued between Jordan and Egypt from that date, Jordan imported 365 GWH from Egypt and exported 23 GWH to Egypt in year 2014.
- ❖ Jordan & Syria were connected in 2001.
- ❖ There was no electrical exchange between Syria and Jordan since med of 2012 due to the circumstances in Syria.
- ❖ Libya & Egypt were connected in 1997 but in 220 kv level.



# The existing projects (Egypt-Jordan - Libya- Syria)

## Syria – Lebanon interconnection project:

- ❖ The Syrian & Lebanese networks were interconnected on 27 April /2009 on the 400 kV level.(Not synchronized) .



**Electrical Energy exchanged among  
Egypt-Jordan-Libya-Lebanon - Syria-Turkey-Iraq**

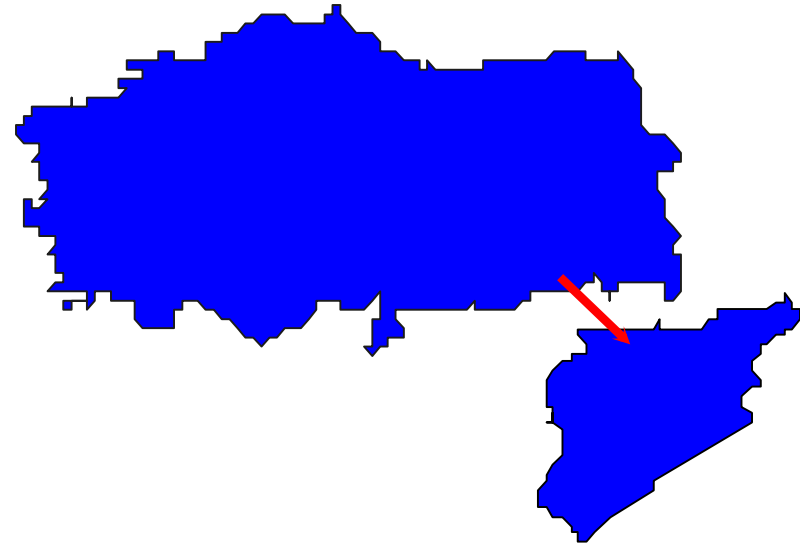
<b>Year</b>	<b>Egypt to Jordan GWh</b>	<b>Egypt to Syria GWh</b>	<b>Egypt to Libya GWh</b>	<b>Egypt to Lebanon GWh</b>	<b>Jordan to Egypt GWh</b>	<b>Jordan to Syria GWh</b>	<b>Libya to Egypt GWh</b>	<b>Syria to Jordan GWh</b>	<b>Syria to Egypt GWh</b>	<b>Turkey to Syria GWh</b>	<b>Turkey to Iraq GWh</b>
2000	45	--	--	--	--	--	--	--	--	--	--
2001	267	--	--	--	--	--	--	--	--	--	--
2002	322	--	1.3	--	--	--	--	--	--	--	--
2003	972	--	16.7	--	--	--	--	--	--	--	--
2004	788	--	8.6	--	--	--	--	38	--	--	--
2005	741	--	10.7	--	0.26	--	5	241	--	--	--
2006	472	50	30.3	--	8.6	--	0.2	41	2	--	--
2007	200	274	6.6	--	13	159	1.9	8	3.8	--	--
2008	534	206	49	--	8.6	244.8	87	13	5.2	95	912
2009	163	72.4	129	522	1.5	8.7	113	2.4	0.6	334	1215
2010	445.8				3.8			224.3			
2011	1457.6				4.2			280.5			
2012	784.3				14.5			--			
2013	381.1				10.8			--			
2014*	365				23			--			

• Till November 2014



# The under construction projects :

## ➤ Syria-Turkey :

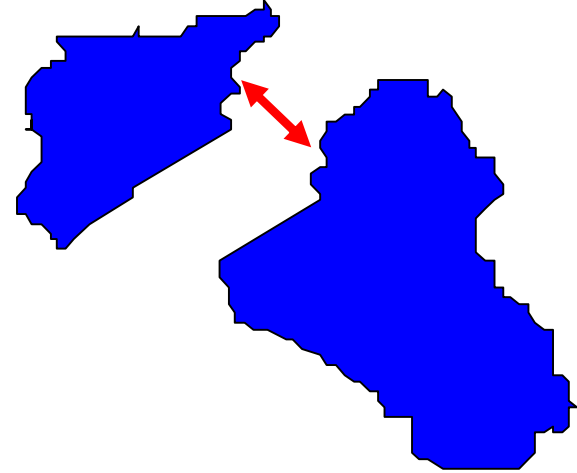


❖ All the works related to the 400 kV interconnection transmission line between the two countries is completed. This line was completed in 2003.

❖ The energy transfer between the two grids is continued in the isolated mode from Turkey to island areas in Syria.



## The under construction projects:



### ➤ Iraq-Syria :

- ❖ 100 % of the interconnection line is completed in the Iraqi side and energized from the Iraqi side.
- ❖ The 400 kV substations in the Syrian side were completed. And the 400 kV interconnection lines are under construction.
- ❖ This project is still not operated due to the circumstances in the area.

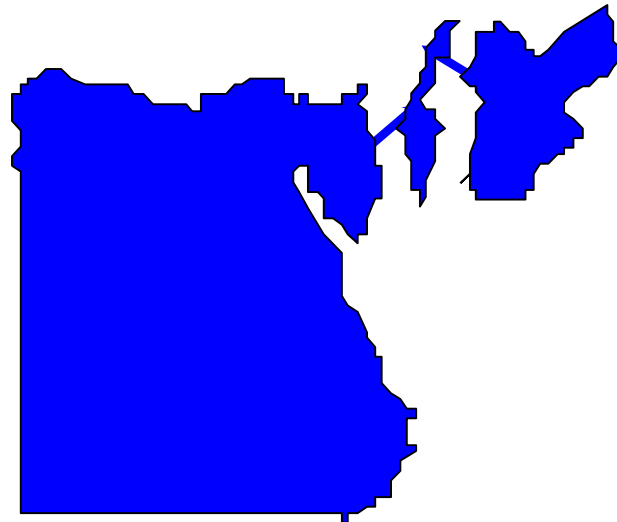


# The planned projects :

## ➤ (Egypt-Gaza) :

❖ This project is one of the strategic projects in Gaza strip, the cost of the project is about USD 40 million, the project will be financed by the Islamic Development Bank.

❖ Gaza Strip will be provided by about (70-150 ) MW from the Egyptian network.





# ***Euro-Mediterranean***

- ❖ We believe that the Euro-Mediterranean integration is unavoidable requirement to ensure a common future, safer, and healthier for all populations of the southern, eastern and northern shore, and especially for new generations.
- ❖ The southern and eastern shore of the Mediterranean is affected by phenomena of economic growth, young population and increasing consumption.
- ❖ In the northern shore, special structure is changing because of a progressive aging population (and related social problems) decreasing of consumption.



# *The Challenges*

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The Political challenges due to political situations in some countries.

The financing challenges due to finance needed to upgrade the infrastructure

The Technical challenges include differences in the following between the interconnected systems:

1. Different grid codes and regulations.
2. Infrastructure and hardware.
3. Controls, communications and SCADA systems.
4. Operating procedures used for frequency regulation and voltage regulation.
5. Fault protection systems.



# *Summery and Recommendations*

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- ❖ The phenomena taking place in the Mediterranean shows important element of complementary between all Mediterranean shores.
- ❖ The Mediterranean project promotes the creation of jobs through the expansion of infrastructure, taking into consideration that the development of basic infrastructures (energy, water, transport) is the requirement for the social and economic development.
- ❖ More detailed Technical and feasibility studies should be implemented in order to adopt the best polices to assure the interconnection procedures taking into consideration all the political, economical, social and technical circumstances.



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# Thank You