The Energy Sector In Jordan

ELECTRICITY REGULATORY COMMISSION

Introduction

Challenges in securing energy supply:

- **Almost no indigenous energy resources.**
- **High dependency on imported energy (96% import in 2007).**
- **High cost (2.6 billion JD in 2008 >20% of GDP).**
- **High demand for energy growth (average 5.5%).**

To Face the Challenges, a Royal Commission to review and update the national master strategy of energy sector was established on Dec. 2004. A summary of the update was issued on Dec. 2007.

Obstacles and updates

Most important obstacles and updates that emerged during the implementation of the strategy update project for the sectors can be summarized as follows:

- **In downstream oil sector domain:**
  - **Jordan Petroleum Refinery Company failed to attract a strategic partner for expanding the refinery.**
  - **Could not be agreed with Saudi Arabia on rehabilitating the Tapeline.**
  - **Impossibility of executing the MOU with Iraq on 15/8/2007 concerning the supply of Kirkuk oil.**

Obstacles and updates

- Recent updates involving this sector include:
  - ✓ The need to build ground storage capacities for crude oil in Aqaba to replace the oil tanker Jerash with a minimum capacity of 230000 tons.
  - ✓ The need for studying the issue of reinforcing the strategic reserve of crude oil and oil byproducts.

Obstacles and updates

- **In Electricity Sector Domain:**
  - **The great challenge represented in securing necessary investments to meet the accelerating growth in demand.**
  - **Unavailability of natural gas quantities required for future CCGT projects which may affect the time schedule for execution and increases the power generation cost.**

Obstacles and updates

- In Electricity Sector Domain (updates):
  - Develop a mechanism for having a substitute for nuclear technology in electricity generation expansion programs.
  - To use oil shale for electricity generation expansion programs.

Obstacles and updates

- In Natural Gas Domain:
  - High demand for natural gas in Jordan for existing and new power generation stations and industries and natural gas distribution projects.
  - Limited gas quantities from Egypt.
  - Egyptian request to increase the price of natural gas in respect to any additional quantities.
  - Arab gas pipe line is regional not for Jordan only.

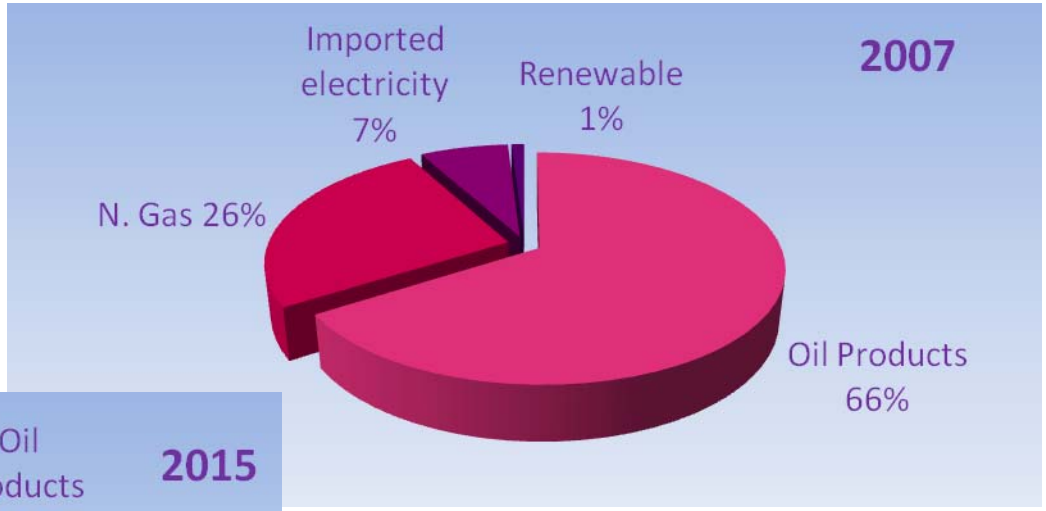
Obstacles and updates

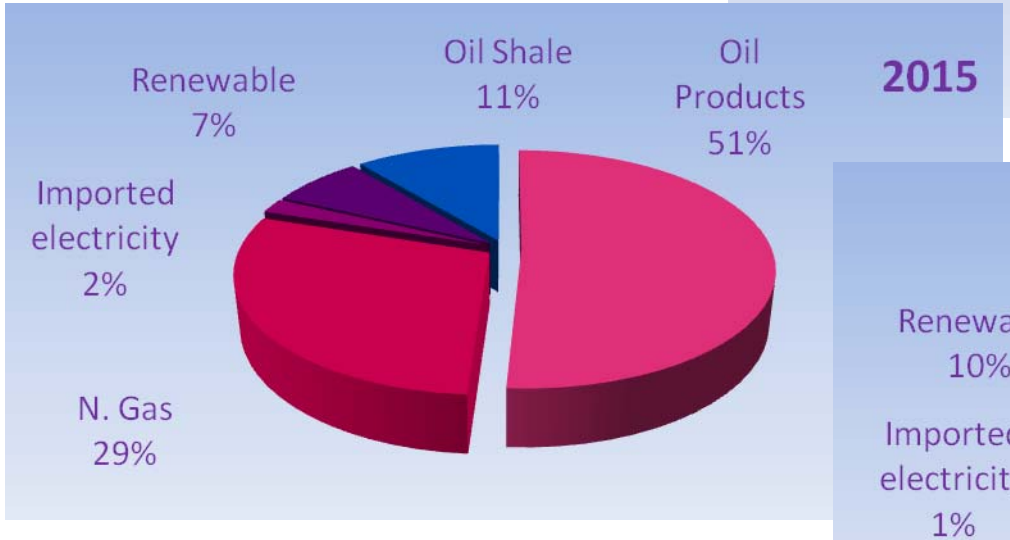
- In Renewable Energy and Energy efficiency Domain:
  - High investment cost compared to traditional gen.
  - Renewable energy projects need wide land areas.
  - Lack of special legislations concerning renewable energy projects covering facilities and incentives.
  - Government decisions to adopt BOO system by private sector will lead to rise in the cost of projects due to risk factors.

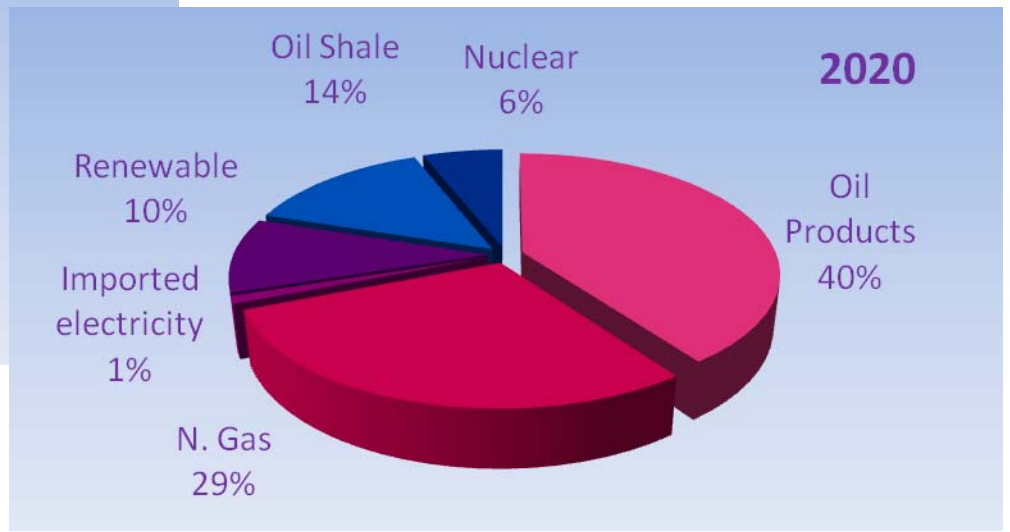
Obstacles and updates

- In Local Energy Domain:
  - The current National Resources Authority law is not keeping with the investment requirements and the dire need for updating and restructuring.
  - Decline of financial allocation for NRA to complete the agreements in oil and gas exploration projects.
  - Emigration of technical qualified personnel.
  - Obstacles impeding investment in oil shale (risk in proving technology, high sulfur content).
  - Need for large quantities of water.
  - Magnitude of required investments.

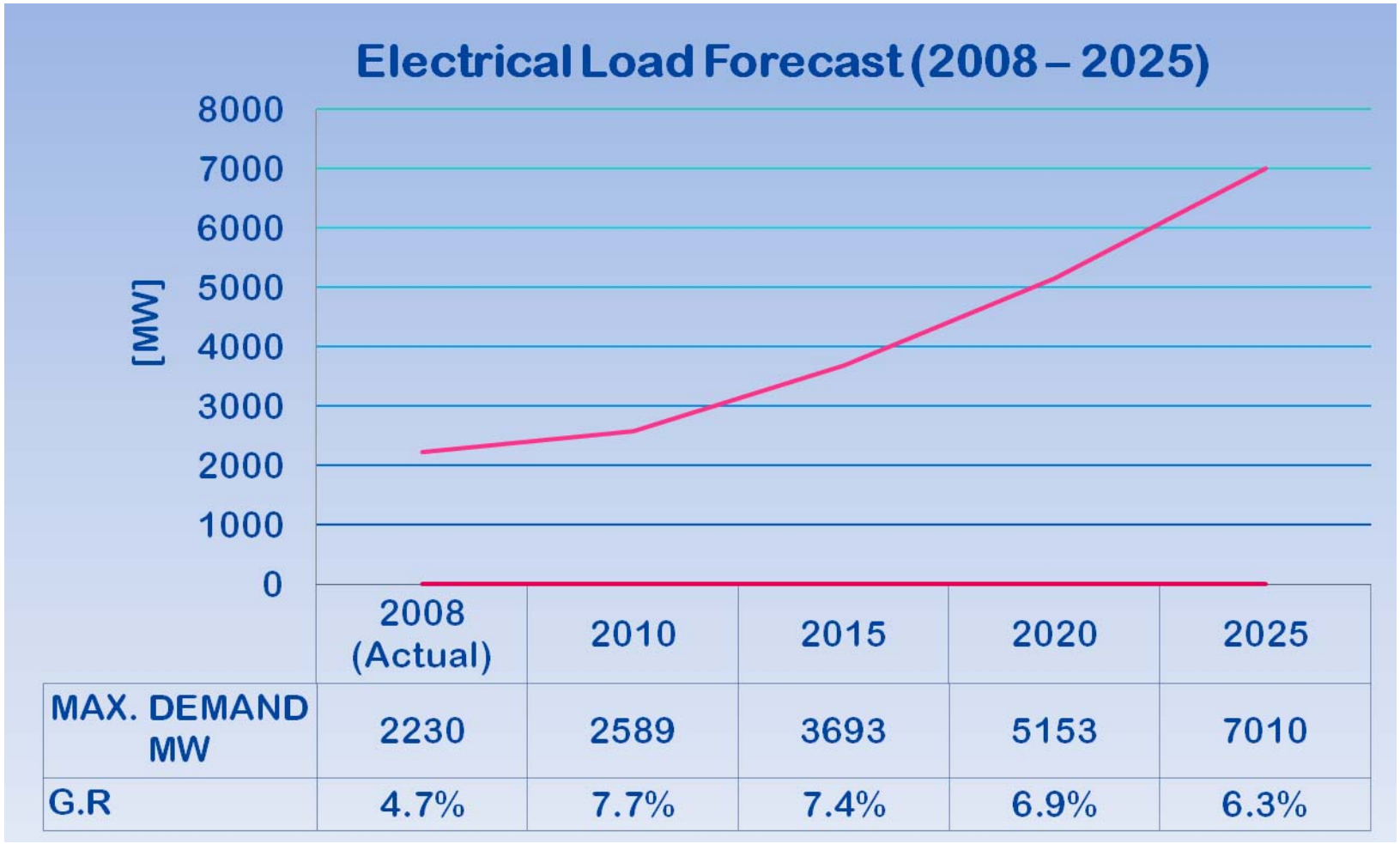
The Energy Mix (2007 – 2020)







Electricity Sector



	2008 (Actual)	2010	2015	2020	2025
MAX. DEMAND MW	2230	2589	3693	5153	7010
G.R	4.7%	7.7%	7.4%	6.9%	6.3%

Electricity Sector

- New Capacity will be implemented through Independent Power Projects (IPPs) on BOO basis:
  - First IPP: 380MW CCGT (Amman East Project).
    2x125 MW GT in operation and
    130 MW steam turbine expected in 2009.
  - Second IPP: 380MW CCGT (Qatrana Project).
    2x125 GT are expected ready by Nov. 2010
    130 steam in 2011
  - 2x100MW GT at Al-Samra (assigned by GOJ).

Fuel and Fuel Security

- Jordan remains heavily dependent on imported gas from Egypt, About 80% of electricity from NG.

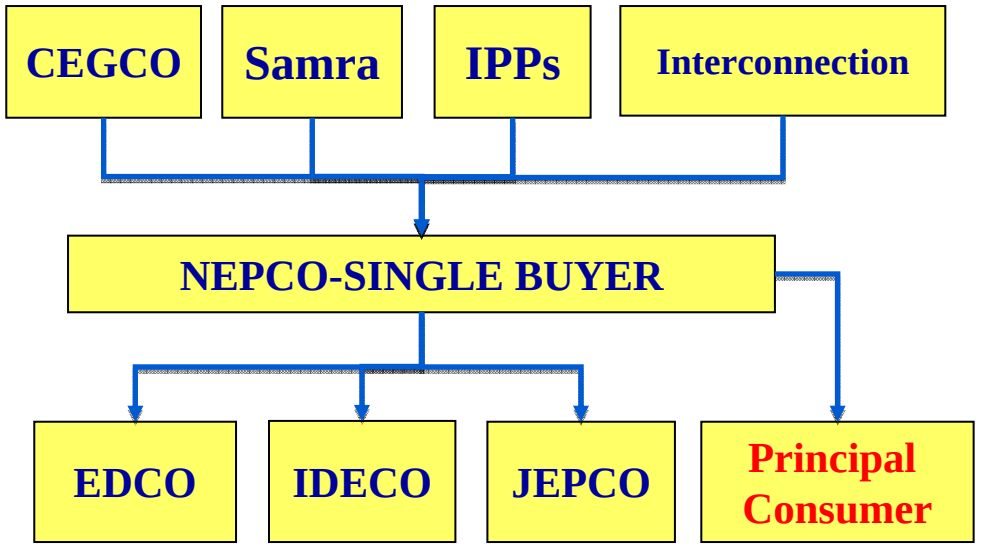
- Due to limited gas, fuel security alternatives for electricity supply are:
  - ✓ Increase gas allocation from Egypt.
  - ✓ Development of oil shale resources.
  - ✓ New thermal plants rather than CCGT.
  - ✓ Nuclear plants.
  - ✓ Reinforce Electricity Interconnection.

Estimated Investment

- **CCGT and other power plants will be IPPs, in which case majority of the generation expansion costs will belong to the IPP developers.**

Investment Costs for Generation and Transmission expansion for the period (2008 - 2025)	
Year	**Accumulated Total, $US Million**
2008	141
2015	4777
2020	11032
2025	14981

Electricity Market Situation



- **Electricity sector is currently running according to the single buyer model (competition in the procurement or entry of new generation).**
- **Characterized by long term PPAs.**
- **Working forwards to a more competitive Market**

Natural Gas

- About 80% of electricity is currently generated from NG.
- Plans to use NG in industry and for distribution in main cities.
- Jordan is seeking alternative sources of NG from other countries in the region.
- Jordan is working on developing local NG sources.

Renewable Energy Strategy Framework

- ✓ Maximize the utilization of RE resources.
- ✓ Continue to conduct resource assessment and identify development priorities.
- ✓ Promote private investments in RE projects.
- ✓ Provide incentives, increase the awareness and strengthen the capacity of RE stakeholders.
- ✓ Promote the local manufacture of RE technologies.
- ✓ Enhance access to energy services in remote communities.
- ✓ Introduce Renewable Energy Legislation.
- ✓ Establish RE and Energy Efficiency Fund.

Renewable Energy Legeslation

Main Goals

- Provide a legal mandate for the government and a regulatory framework for RE development.
- Promote the use of RE in Jordan.
- Encourage private-sector investment in RE.
- Diversify energy sources in Jordan.
- Reduce greenhouse gases.
- Develop in-country expertise related to RE.

Renewable Energy and Energy Efficiency Fund

Main Aims

- Promote the use of RE and EE in Jordan.
- Provide incentives and financial support for RE and EE measures, studies and projects.
- Encourage private-sector investment in RE and EE projects and activities.

Renewable Energy Targets

Promoting Renewable Energy to share 7% in the primary energy mix in 2015 , and 10% in 2020 :

- **600 - 1000 MW Wind Energy**
- **300 - 600 MW Solar Energy**
- **30 - 50 MW Waste to Energy**

Development Target: Wind Power

- Jordan has an ambitious program in wind energy development, where about 600 MW of wind turbines to be installed by the year 2015, to be doubled by 2020.

- A bid process for the Al Kamshah 30-40 MW wind project was launched in 2008 and is now under negotiation with the preferred bidder and planned to be in operation during the year 2010.

- Jordan would like to see more rapid development of wind sites and so a series of new wind farms are planned, these include :

Development Target: Wind Power

- Al Fujeij, Shoubak (80-90 MW) on BOO basis – A tender is announced recently for prequalification. The project commercial operation date is expected in 2011.

- Wind Pooling: a study is ongoing to pool selected sites in the South of Jordan (Harir, Wadi Araba and Ma'an) with a total capacity of (300-400) MW in one international bidding process, to be launched in the second half of 2009.

Solar Energy

Extremely high Resources:-

- Daily Average Solar Radiation 5-7 Kwh/m2
- Potential : 6400 GWh annually for concentrating Solar power.

Past and on-going activities in Solar Energy

- Decentralized photovoltaic units in rural and remote villages for lighting, water pumping and other social services (1000 kW of peak capacity).
- 15% of all households are equipped with Solar water heating systems.
- Solar pond for potash production

Oil Shale

- **Over 40 Billion Tons of surface reserves are estimated in Jordan.**

- **GOJ is engaged in three-tracks to utilize Oil Shale:**
  - ✓ **Exploit deep Oil Shale for oil extraction using "In–Situ Conversion Process (ICP)". (an agreement is signed with Shell Company)**
  - ✓ **Produce oil from surface Oil Shale through different retorting technologies.**
  - ✓ **Oil Shale Power Generation Project: An agreement is signed with Estonian Company to develop 300MW plant using direct combustion by 2015 and 300MW more by 2017.**

Nuclear Energy

- GOJ is engaged in two tracks to utilize Nuclear Energy for peaceful applications:
  - ✓ Exploring the local natural resources of nuclear fuel (80,000 tons of Uranium resources are estimated in Jordan).
  - ✓ The application of nuclear power for electricity and water desalination.
- GOJ has signed agreements with France, Canada, China and South Korea and initially with Russia.
- The agreements are expected to lead to the construction of five reactors within the coming 30 years.

Thank you

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