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Building the foundation for renewable energy

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Main Points to discuss

- Egypt
- Electricity in Egypt
- Regulatory
- Renewable Energy sources
- Renewable Energy Strategy
  - Wind
  - Solar

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Egypt

- Area:1000000 km^2
- Population:83. 082. 869
- Population Density:76/km2
- The Capital (and largest city): Cairo
- Official Language: Arabic
  Government: Republic

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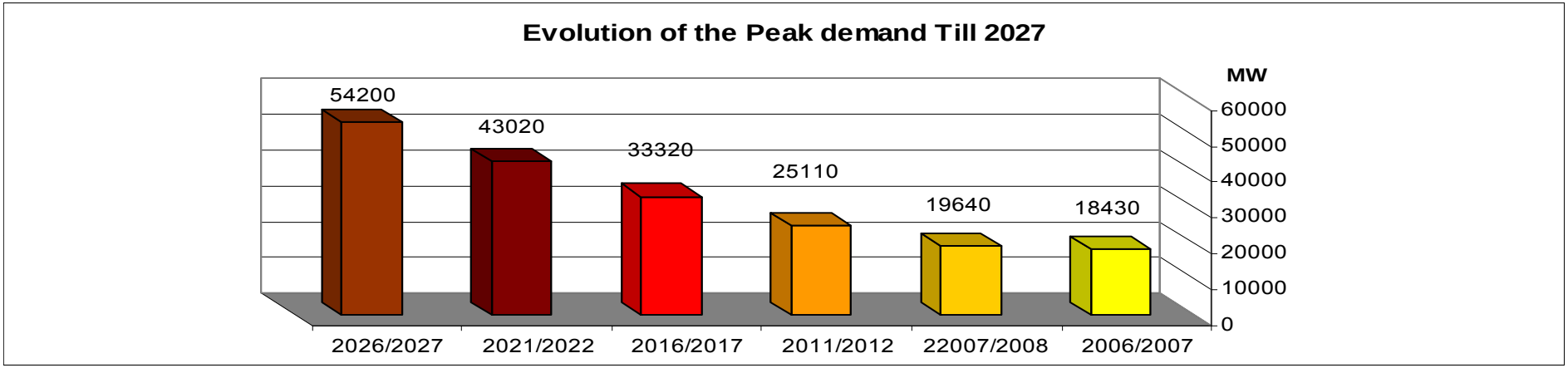
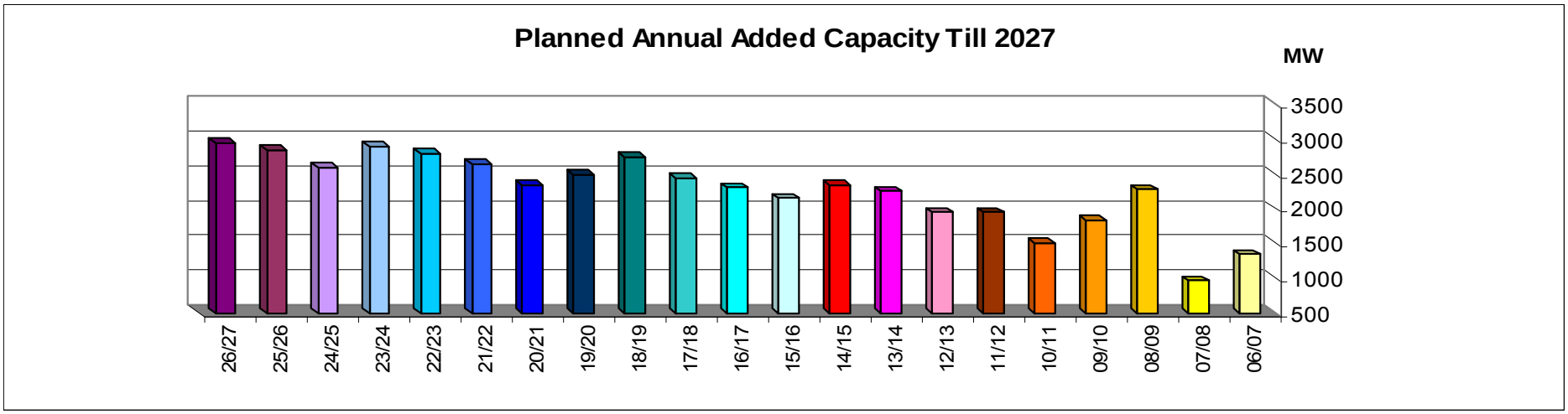
Electricity in Egypt

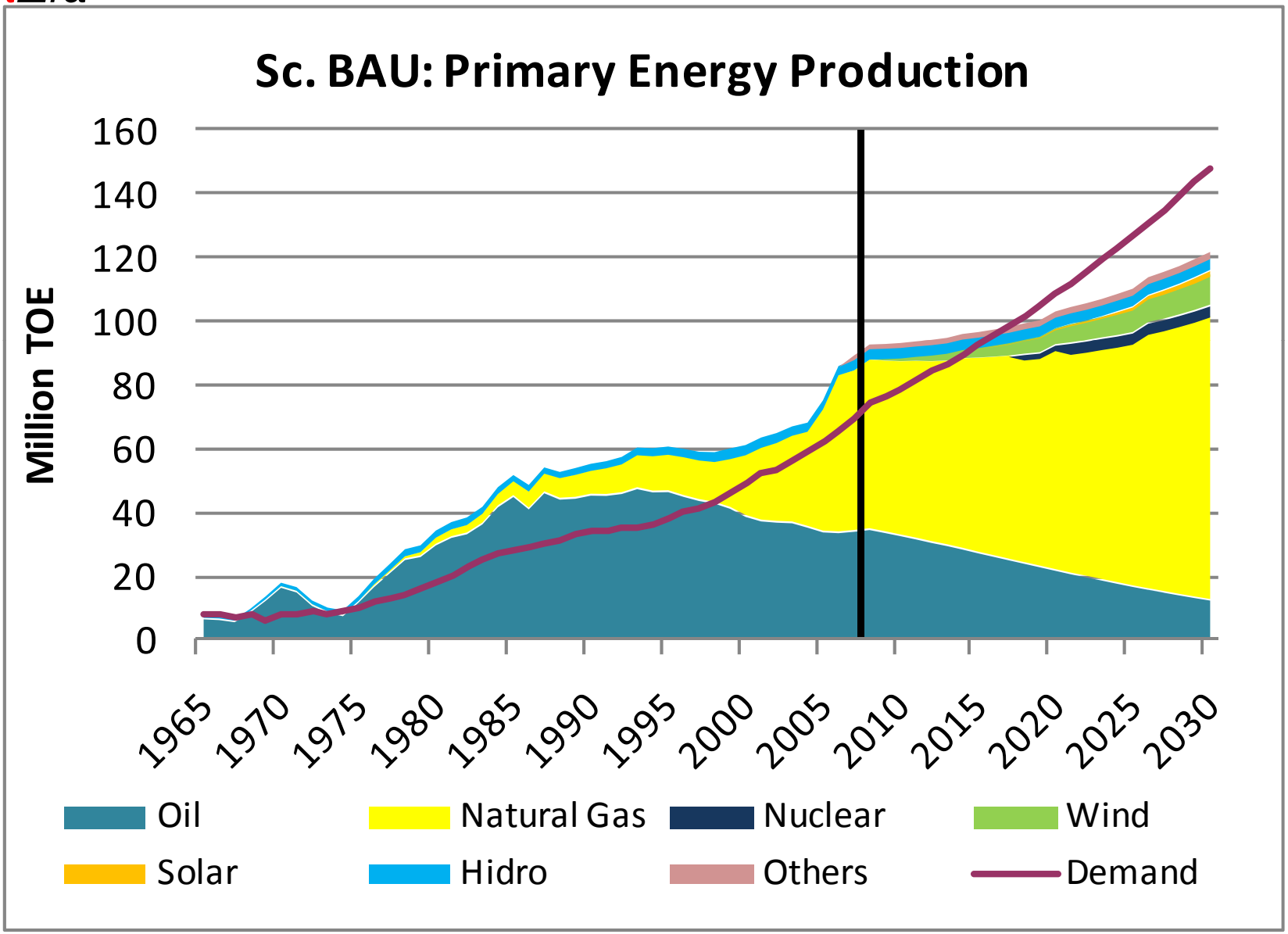
(Overview)

Evolution of Demand and Installed Capacities over the Next 20 years

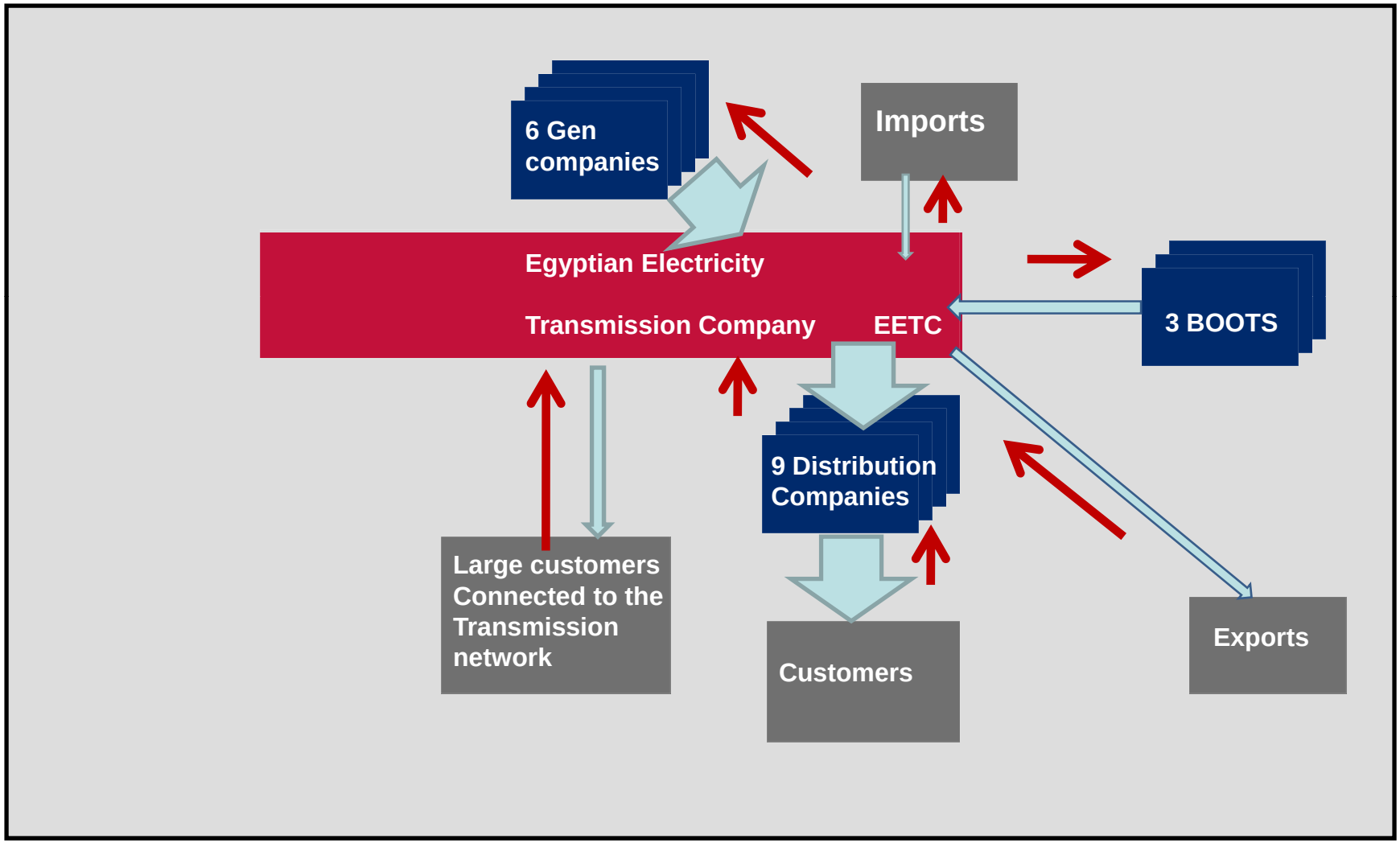




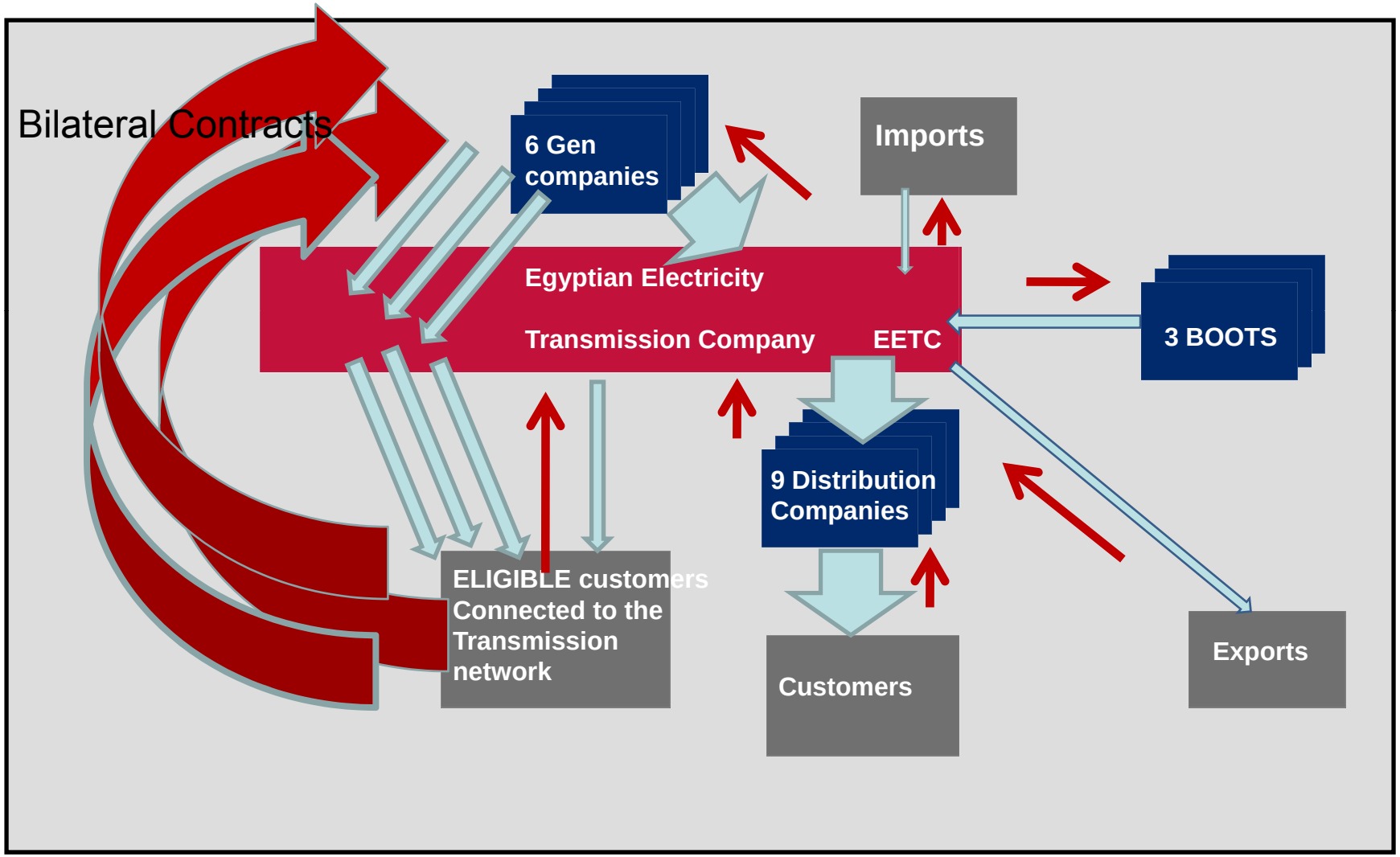
Egypt Demand For Energy Till 2030



Present Status of Electricity Market



The Proposed Electricity Market Structure



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Regulatory

(Overview)

Background on the Egyptian Electric Utility and Consumer Protection Regulatory Agency *"EgyptERA"*

Evolvement

- 1998 Regulatory system designed
- 2000 Presidential decree # 339 initiating the current agency
- 2001 Regulatory agency operational

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Objectives

- Regulates and supervises all electricity generation, transmission, and distribution
- Issuing licenses for the construction, management, operation and maintenance of the electric power generation, transmission, distribution, and sale projects
- Ensures availability of supply to users at the most equitable prices and considers environmental issues
- Prepares for fair competition in the field of electricity including generation and distribution
- Prevents any monopoly within the electricity market
- Considers interests of customers, producers, transmitters, and distributors

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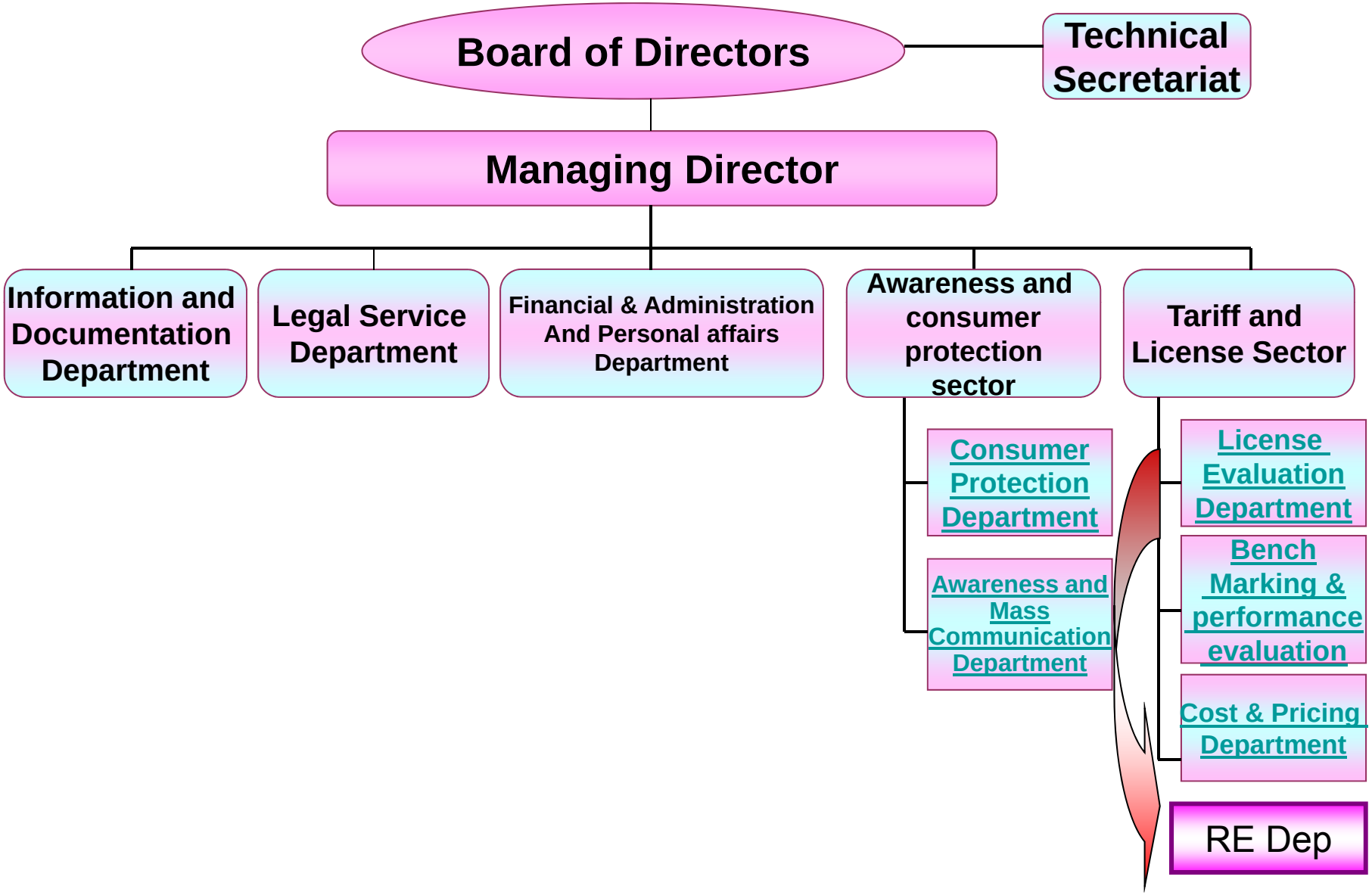
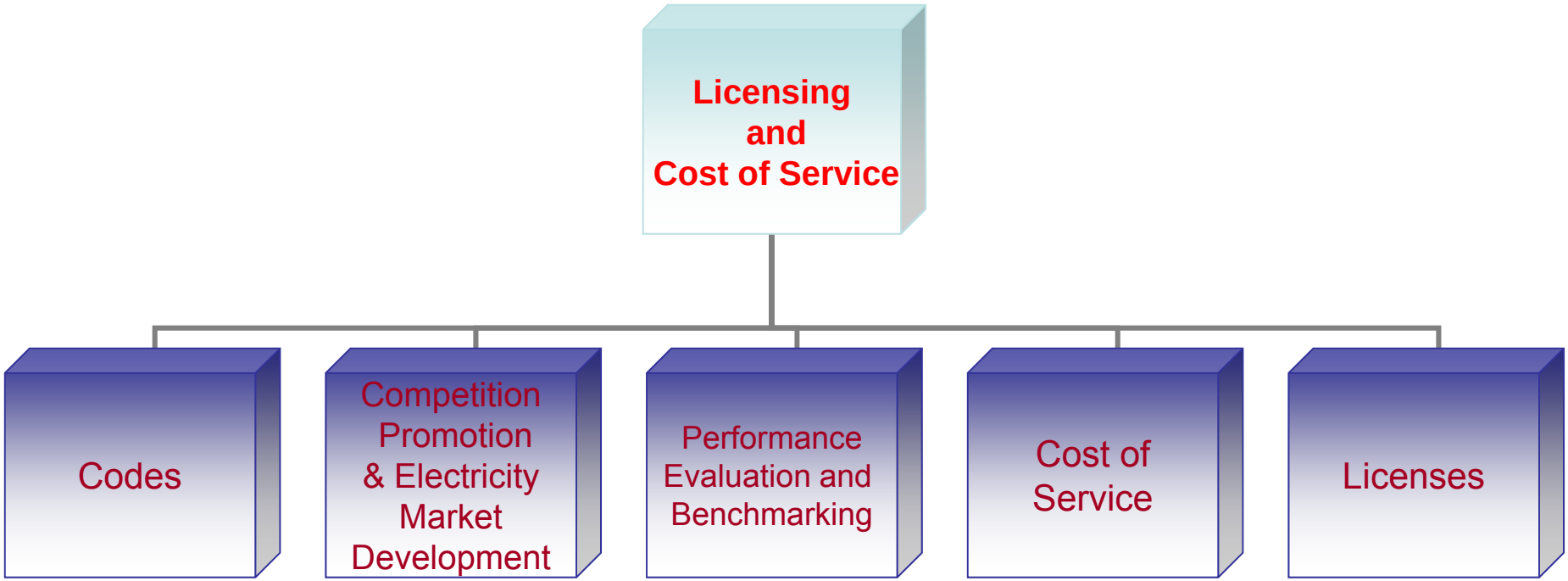
Organization Chart



Depts. Overview



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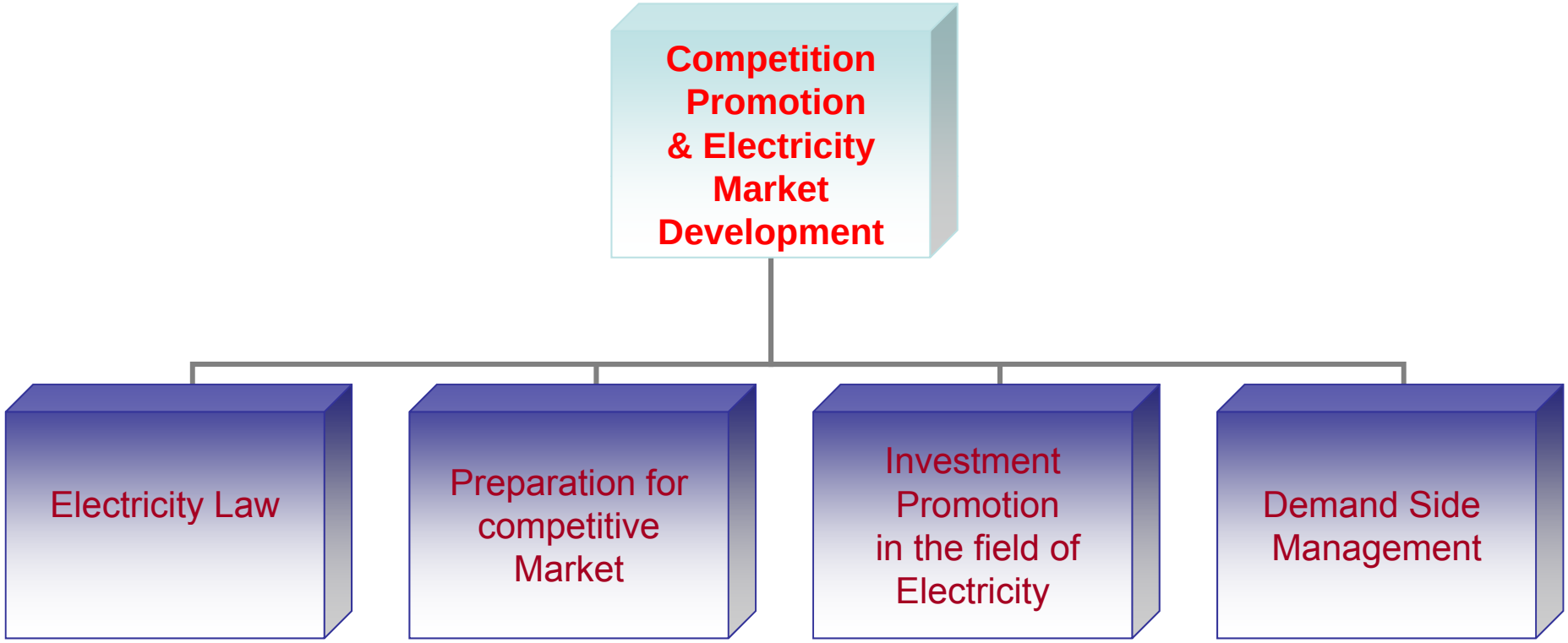

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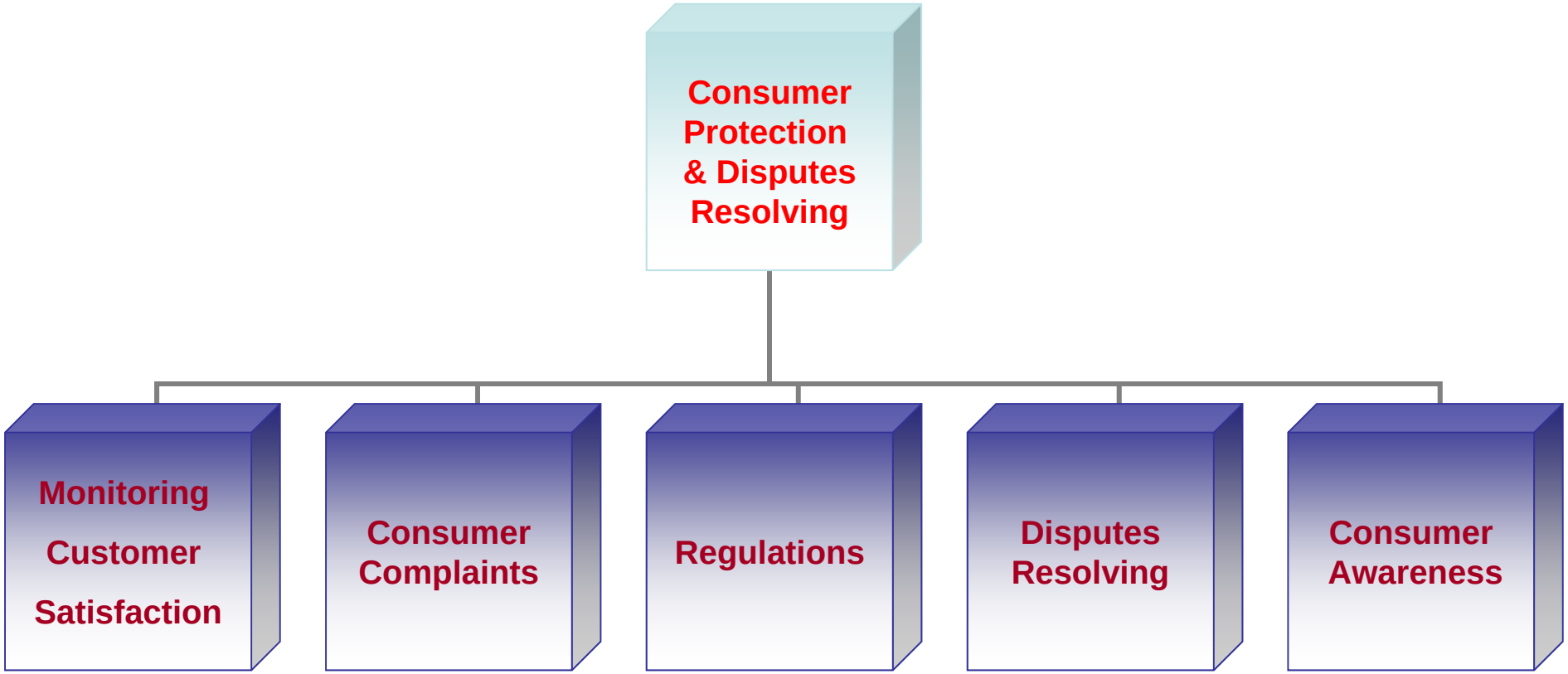

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Renewable Energy

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Renewable Energy Resources

- Egypt is a rich country with renewable sources which can be used for power generation on commercial scale. These sources include; wind, solar and biomass

- Atlases for both wind and solar energies have been developed
  - Two third of the country area has a solar energy intensity more than 6.4 kWh/m2 day (an annual global solar insolation of 2300 kWh/m2 year)
  - In some areas especially on the Red sea cost the wind speed approaches 10 m/sec or even higher

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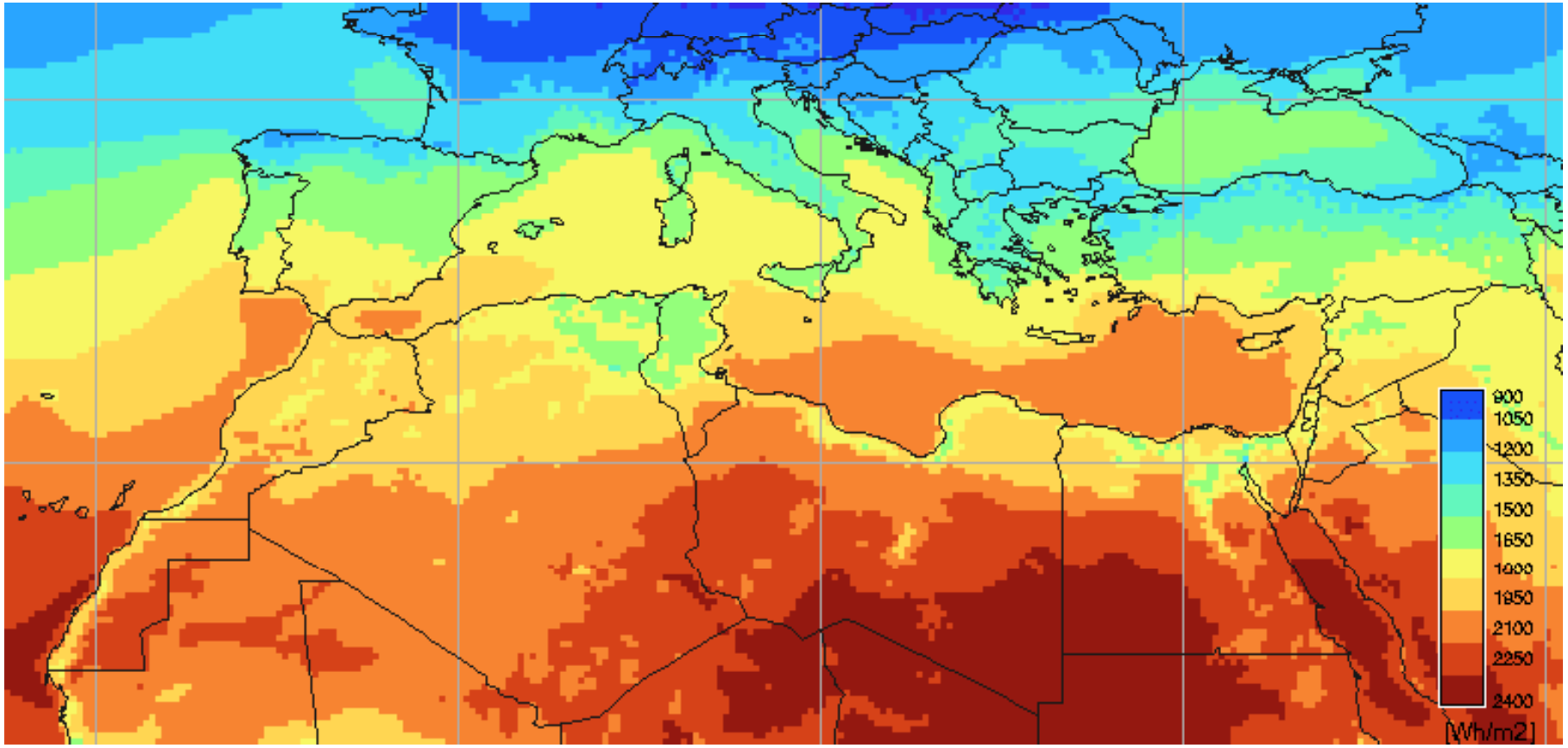
Potential of Solar Energy in Egypt from a Regional Prospective



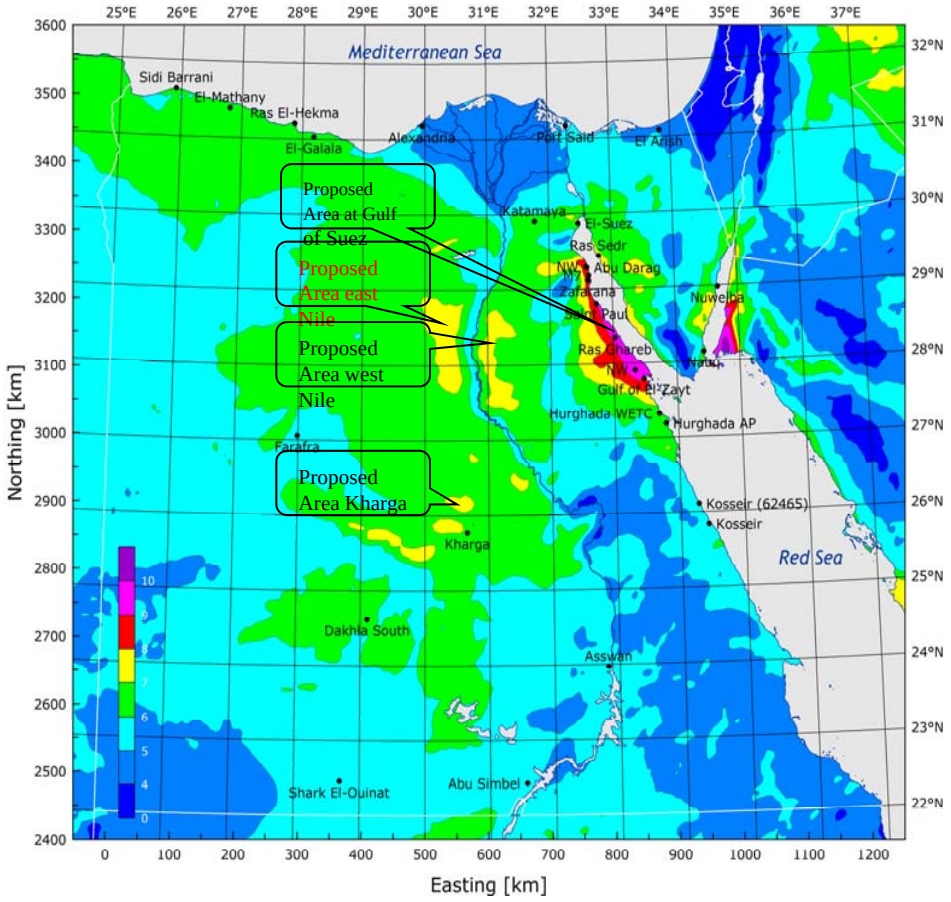
Renewable Energy Resources

- *According to the Wind Atlas of Egypt published by NAREA in cooperation with the National Laboratory RESO (Denmark) major areas with sufficient wind energy resources have been identified these areas include:*
  - Gulf of Suez area-Class 1 at the height of 50 m above ground level is between 400 and 800 W/m²- wind speed (> 9 m/s)
  - Western Egypt Domain at the west bank of the Nile-Class 1 at the height of 50 m above ground level is between 300 and 400 W/m² - wind speed (7-8 m/s)
  - Areas close to Kharga -Class 1 at the height of 50 m above ground level is between 300 and 400 W/m² -with wind speed (7-8 m/s)
  - Eastern Egypt domain at the east bank of the Nile-Class 1 at the height of 50 m above ground level is approx. 300 W/m² -wind speed (6-7 m/s)
  - Gulf of Aqaba area Class 1 at the height of 50 m above ground level is between 400 and 600 W/m². (nationally preserved, therefore it is restricted site)

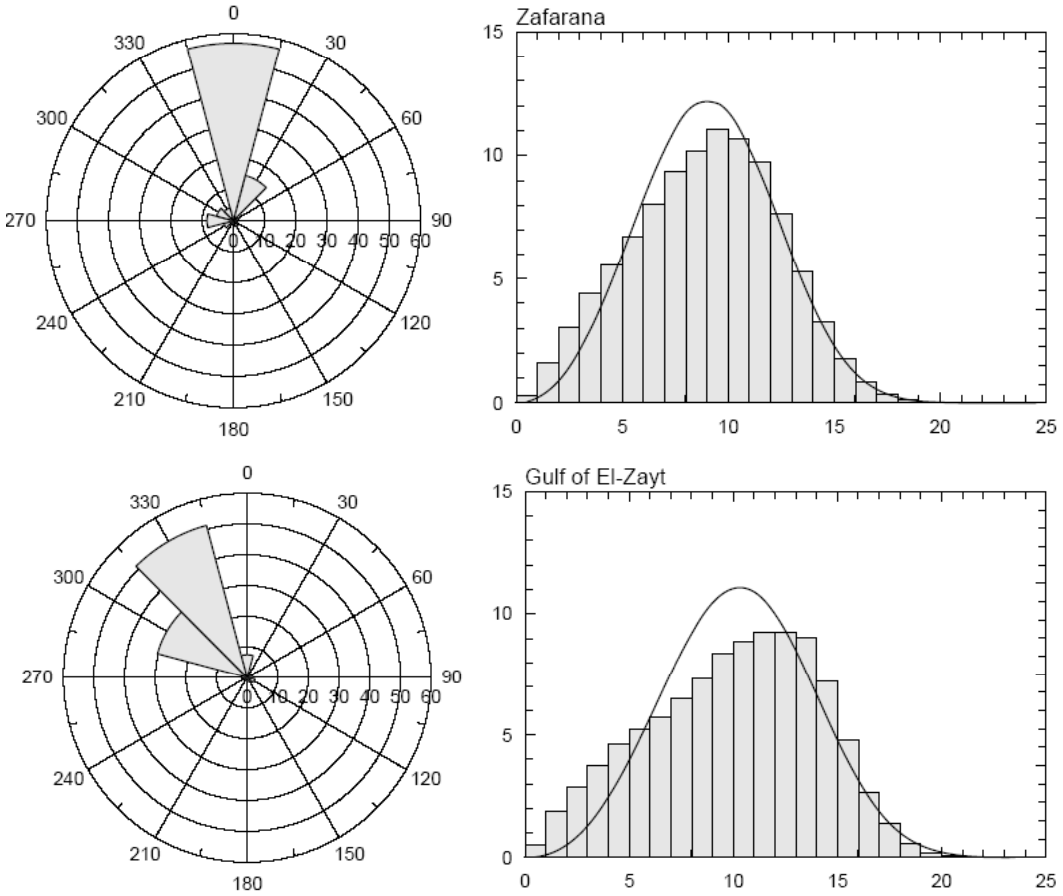
✓ Most of the sites where high wind speed exists in state owned lands

Wind

- Egypt renewable energy strategy for 20/20 has positioned wind energy as a first priority relative to other forms of renewable energies due to:
  - high potential in Egypt
  - high capacity factor
  - low cost compared with other forms of renewable energies



Wind Speeds at Gulf of Suez



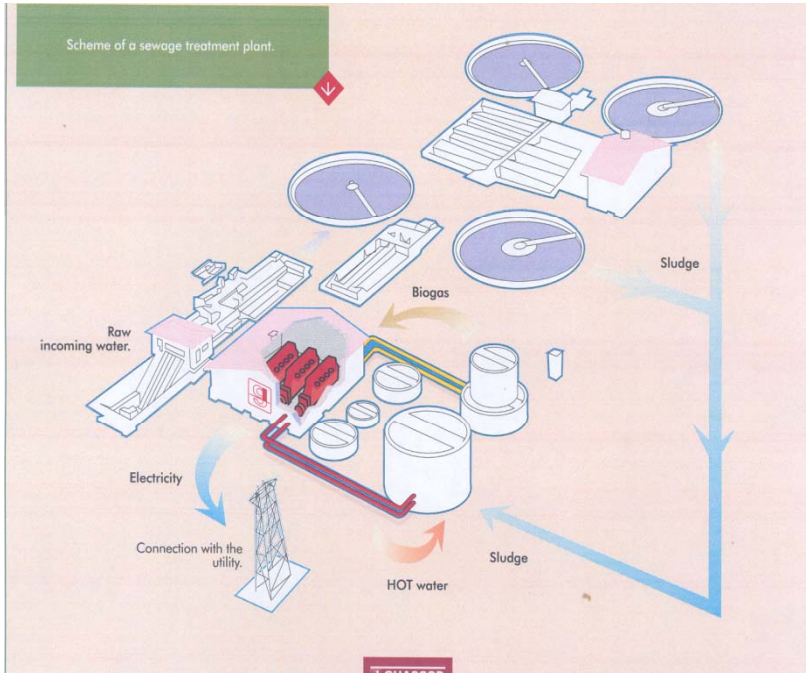
Source: NREA and Risø National Laboratory (DK): Wind Atlas for Egypt. December 2005

Main Features of Wind Energy in Egypt

- **Main features of wind energy in Egypt:**
  - **High wind speed resources but concentrated in some areas**
  - **Most of the sites with high wind speed are in remote areas**

Energy from Biomass

- Power generation from the gasification of sewage sludge in waste water treatment plants (EL-Gabal El-Asfer 23 MW plant) is already being used
- High potential projects for power generation based on gasification or direct combustion of organic solid wastes or agricultural wastes are under considerations
- A potential of 1000 MW could be generated from agriculture waste



Barriers for Promoting Renewable Energy Suppliers

- **Most of the renewable power sources are not competitive in price with electricity produced from fossil fuels in Egypt**
- **This is attributed on one hand to electricity subsidy and on the other hand to the intensive capital cost of these projects, since the equipment needed is not locally manufactured**
- **Most renewable sources have low power intensity which requires the power system, which is currently structured on the centralized plants, to adopt the concept of distributed generation**
- **Electricity Law is still a draft Law**

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Renewable Energy Strategy 2020

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Renewable Energy Strategy

- **In February 2008 the supreme council of energy has set a target to have 20% of the electrical energy mix from renewable sources including hydro by the year 2020**
- **The current hydro installed capacity represents 12% this will become less than 8% by the year 2020**
- **This means that 12% contribution from renewable source other than hydro need to be added by 2020. This is equivalent to installed capacity of 7200 MW.**
- **Other sources will be used to cover the difference such that the 20/20 target can be achieved**

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Renewable Energy Strategy

- **Solar**

  - **Large pilot implementations based on soft financing (e.g. Korimatte solar thermal).**
  - **Electrification of rural areas.**

  - **Regional Initiatives (Mediterranean Solar Plan "MSP", "Desertec")**

Renewable Energy Strategy

- **Biomass**
  - ✓ **1000 MW potential primarily from**
    - **Agricultural waste**
    - **Municipalities waste**
  - ✓ **Cooperation with Ministry of Environment and municipalities since biomass is a part of solid waste management strategy**

Renewable Energy Strategy

- **Geothermal**
  - **Assessment and identifying potential**

- **Hydro**
  - **Mini and Micro plants with total capacity less than 100 MW (not including Katarah depression).**
  - **This will be done in cooperation with Ministry of Irrigation and Water Resources**

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Justification for Relaying on Wind Energy

- High potential of wind energy in different sites with high capacity factor.
- Local Experience in wind energy since 20 years ago, support by a current installed capacity of 405 MW.
- High potential for an increasing share of local manufacturing of wind energy equipment
- Electricity generated from wind resources represent a near reach opportunity where it has the closest price to electricity generated from oil and gas.

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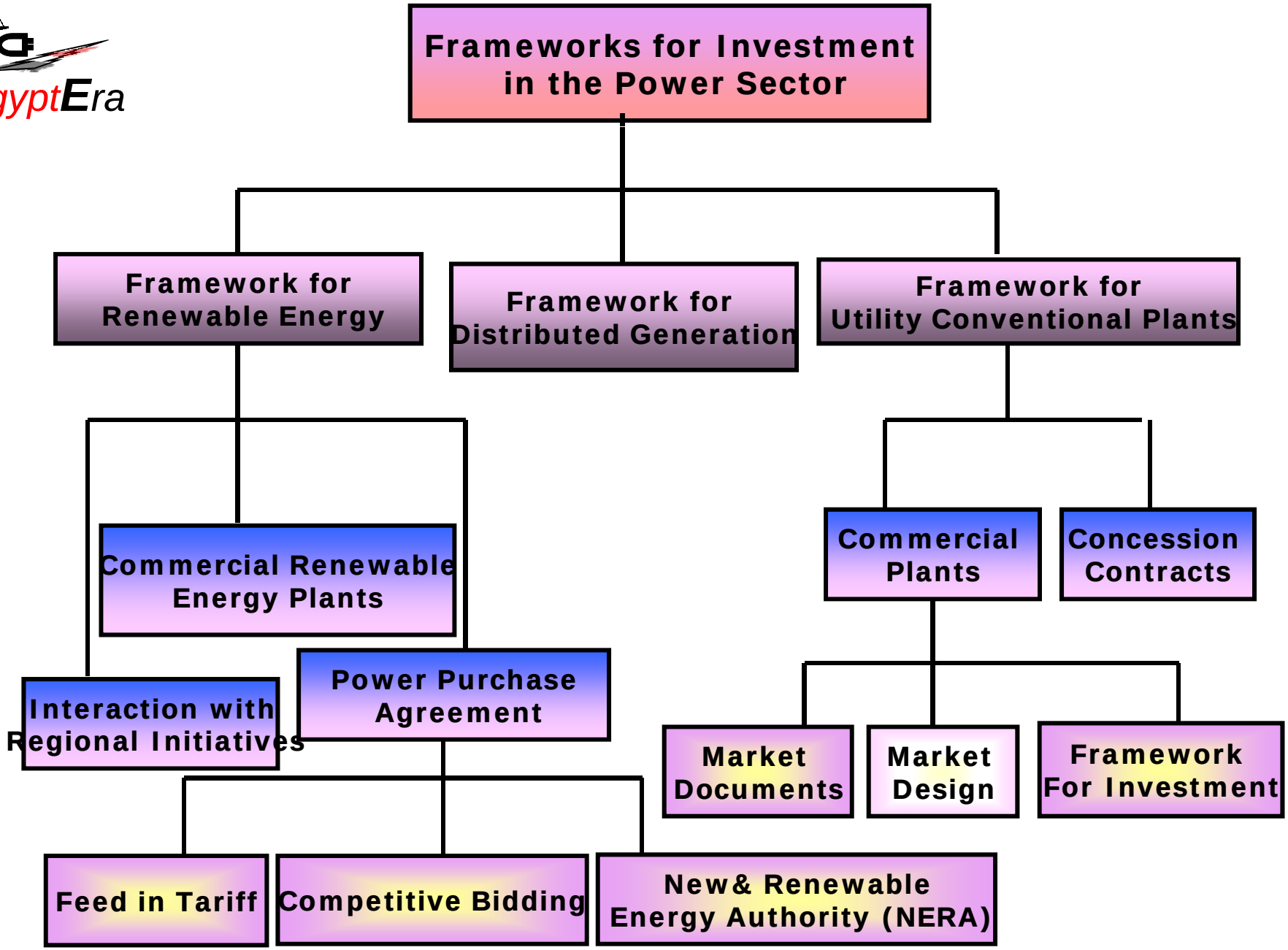

Frameworks for Investment in the Power Sector
Framework for Renewable Energy
Framework for Distributed Generation
Framework for Utility Conventional Plants
Commercial Renewable Energy Plants
Interaction with Regional Initiatives
Power Purchase Agreement
Feed in Tariff
Competitive Bidding
New& Renewable Energy Authority (NERA)
Commercial Plants
Concession Contracts
Market Documents
Market Design
Framework For Investment

Renewable Energy Implementation Plan

- **New electricity law "under ratification" has adopted three mechanisms for power generation from renewable sources these mechanisms are:**
  - **Plants built by NAREA**
  - **Plants built through Competitive bidding**
  - **Plants built through the Feed-in Tariff**

Implementation Plan for Renewable Energies

- In addition to the market reform which guarantee third party access, power generation from renewable sources will enjoy priority in dispatching whenever they are available.
- The proposed polices consists of two phases
- **Phase 1**: Competitive Bids
  - According to this approach the grid will issue tenders requesting supplying power from renewable energies resources

  This will be done within the scope of the following criteria:
    - Control the increase in RE capacities with reference to the capacity of transmission system and capacity of the market to absorb.
    - Increase local manufacturing
    - Increase private investment
    - Achieving the lowest possible prices.
    - Provide the investors with guarantees through long term power purchase agreements

Measures Adopted for Renewable Energies in the New Electricity Law (Contd.)

- **Phase 2 (after the adoption of the New Electricity Law)**
  - Feed in Tariff will work hand in hand with the competitive bids mechanism.
  - International experience has showed that feed-in tariff is more attractive for smaller investors like farmers, cooperatives and private investors.
  - To prevent intersection between the two mechanisms competitive bid will be for large size installations (250 MW wind farm), while feed in tariff will be restricted from small capacities (less than 50 MW installations).

Renewable Energy Fund

- Establishment of RE fund:
  - The fund could cover:
    - Full or partial deficit between the RE cost and market prices
    - Exchange rate risk in case of transferring cost full or partially to consumers.
    - Guarantee of the transmission company payments
- Financial support to pilot projects.
    - Research and development for RET.
  - ❖ The main sources of finance of the fund will include:
    - Subsidy currently given to the to the fossil fuels used in power generation.
    - State Budget.
    - Donations
    - Investment of the fund money

NREA Share in the Plan

- Projects in the pipelines till 2014 900 MW, by 2014 NAREA will reach 1270 MW)
- Current installed capacity is 400 MW

- There is a plan to add another 200MW every year (2015-2020) to reach 2200 MW.

- Added capacity after 2014 will developed either through the current business model, which relies on soft financing or through partnership with other governmental entities

Competitive Bidding

- 2500 MW to be executed by private sector through long term power purchase agreement with the grid
- The 2500 MW will be issued in blocks each of which of 250 MW
- The program will include 5 bids each will consists of more than one block except the first one which will be restricted to one block.
- It targets to attract highly qualified international developer with strong financial status and high capacity for technology transfer.
- Promotion of local manufacturing where bid evaluation will be based on points system which offers advantages for proposal having higher share of locally manufacture components.

Competitive Bidding

The bidding process consists of two Phases

- **Phase1: Pre-Qualifications based on experience and financial status (1-Year Period). It will also include**

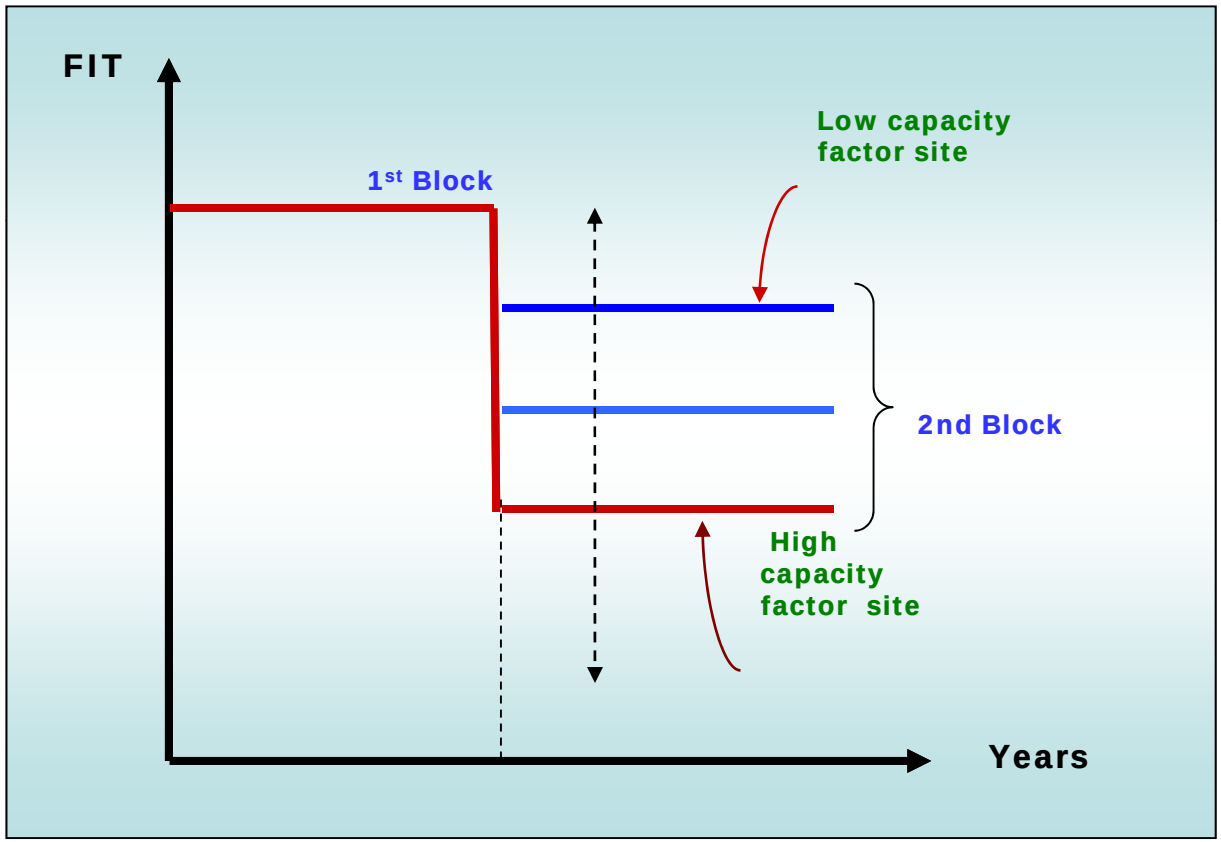
  - ✓ **Wind measurements**
  - ✓ **Bird Migrations & environmental impact assessment**
  - ✓ **Soil testing**

- **Phase2: Short listed bidders submit proposals to construct, own and operate the wind plant**
- **By the year 2017 the last tender will be solicited for achieving the targeted energy by the year 2020**

Feed In Tariff

- The Goal is to reach 2500 MW through medium and small developer, Tariff will be set for 15 years taking into consideration the wind speed and capacity. Feed in Tariff will work hand in hand with the competitive bids mechanism .but in order to prevent intersection between the two mechanisms competitive bid will be for large size installations (250 MW wind farm), while feed in tariff will be restricted from small capacities (less than 50 MW installations) since the International experience has showed that feed-in tariff is more attractive for smaller investors like farmers, cooperatives and private investors.

Feed In Tariff Design:



Wind Power Plants using Feed in Tariff:

- Wind Power plants on Investors owned land:

- At this case the investor is responsible for all required studies and measurements.

- Wind power plants on state owned lands

- At this case wind power plants could be built in compounds so that the transmission company could deal with them as one power plant the lands .
- *NREA will be responsible for*
- Dividing the state owned lands into areas with specified capacity.
- Do all the site studies and measurements
- Determine the technologies and min required requirements for each wind unit

Feed in Tariff framework

	Recommendations
Capacity	• < or = 50 MW • Min capacity determined as the technical requirements defined by the grid or distribution code
Local Components	No restrictions concerning the local components avoiding any complications that could arise
Other Previous projects	Not allowed for any other mechanisms as an example projects done through competitive bidding to switch to the feed in tariff mechanism
Actions in case of plant failure	The contract is terminated once the wind power plant stopped producing energy
Installing used units	Used equipments are not allowed for the establishment of wind power plant
Currency	Egyptian currency and foreign currency (at the changing date according to the central bank change rate) to distribute the risks
Feed in tariff revision period	2-4 years according to technical and financial changes that may occur
Carbon credit	Due to EETC or discos (per case)
Feed in tariff issuing date	Issued by Egypt Era

Renewable Energy Development Business Models

Item	NREA	Competitive Bidding	Feed-In-Tariff
Program size	2200 MW	2500 MW	2500 MW
Single Wind Farm Size	Large (100-400 MW)	Large ten Modules each (250 MW)	Medium and Small below 50 Mw
Developer	NREA	Private (most probably international)	Private (focus on local)
finances	Governmental and soft financing from international development agencies	Commercial finance	Commercial finance
Tariff Setting	Proposed by Egypt era and approved by the cabinet of ministers	According to the bid outcome	proposed by Egypt era and approved by cabinet of ministers
Contracting	20 years	Long term PPA mostly for 20 years	15 years
Off taker	Grid		Grid or distribution system
O/M	NREA	Developer	Developer
Construction Responsibility	NREA through EPC	Developer	Developer

Incentives for the Private Sector

- Allocation of more than 7600 square kilometers of desert lands appropriate for future wind projects in Gulf of Suez and east and west of the Nile, and this was according to the results of Egypt Wind Atlas.
- All permits for land allocation are already obtained by NREA.
- NREA prepares studies with the cooperation of International consultant concerning the
- Assessment of environment impact, including bird migration, for potential projects.
- Reducing project risks through signing long term Power Purchase Agreement, (PPA,) for
- 20-25 years

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Incentives for the Private Sector

- The Government of Egypt will guarantee all financial obligations under the PPA.
- Exempting renewable energy equipment from customs duties.
- The selling price for energy generated from renewable energy projects will be in foreign currency, in addition to a local portion, covers operation and maintenance costs, in local currency.
- Investors will benefit from selling certified emission reductions, CERs, resulted from the project implemented.
- Evaluation criteria for tenders of renewable energy projects will give privilege for local components

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Solar Initiative

National Solar Initiative

- A registered and internationally recognized logo will be issued which accredits Solar energy consumers. This logo shall offer its holders with better financing terms, export advantages and may be tax credits.
- Interested consumers will voluntarily commit themselves to consume up to 5% of their electricity consumption to be from solar energy.
- Solar Energy Trader “SET” will be established to consolidated the committed inquiries and contract suppliers through long term PPAs to satisfy these demands.
- “SET” will be owned and operated by a financial institution (s), committed consumers could have shares in “SET”, while suppliers couldn’t
- Transactions will be according to a feed in tariff which will be a pass through cost to consumers.
- Suppliers will renounce their carbon credit to SET against its service.

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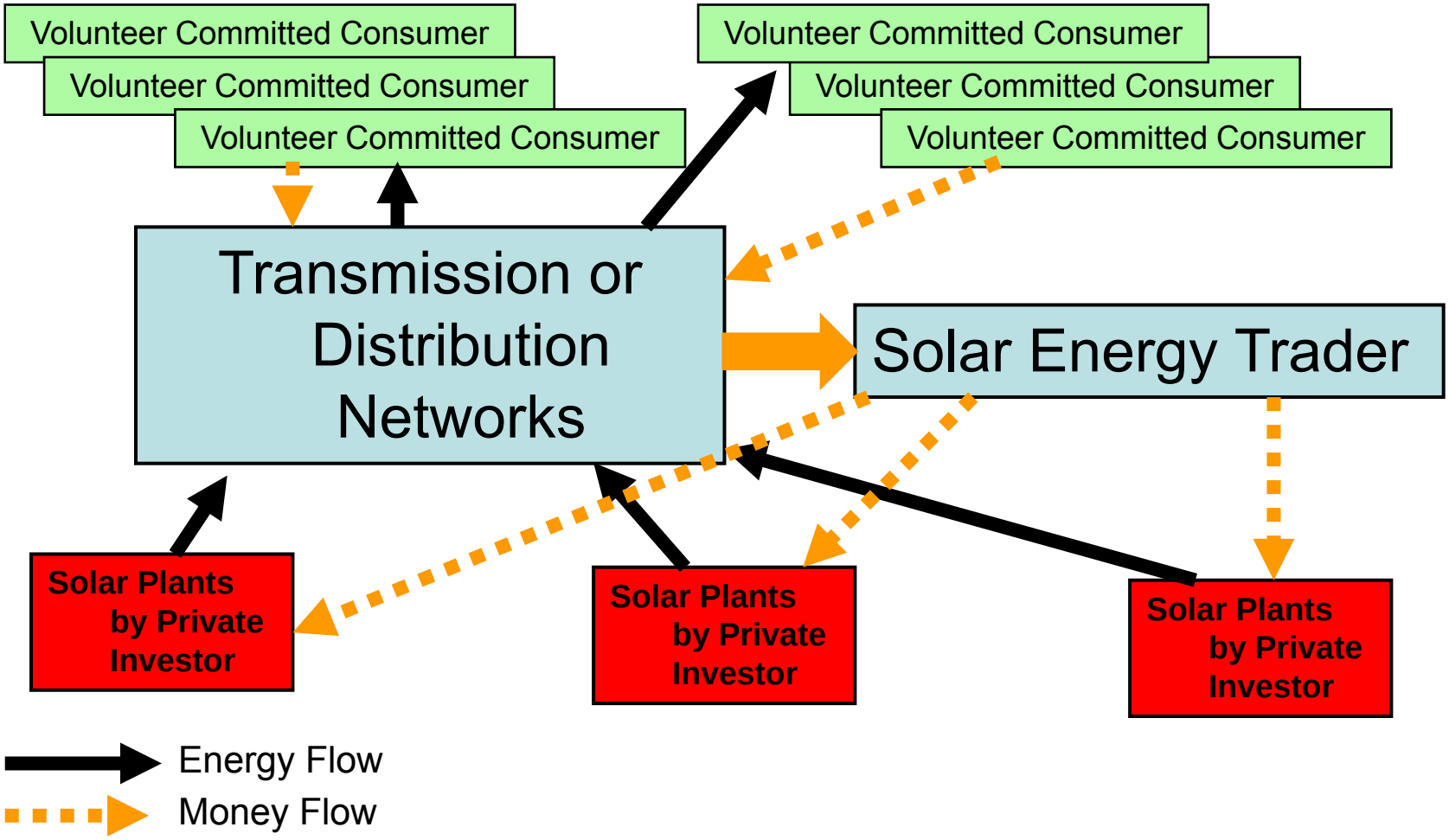
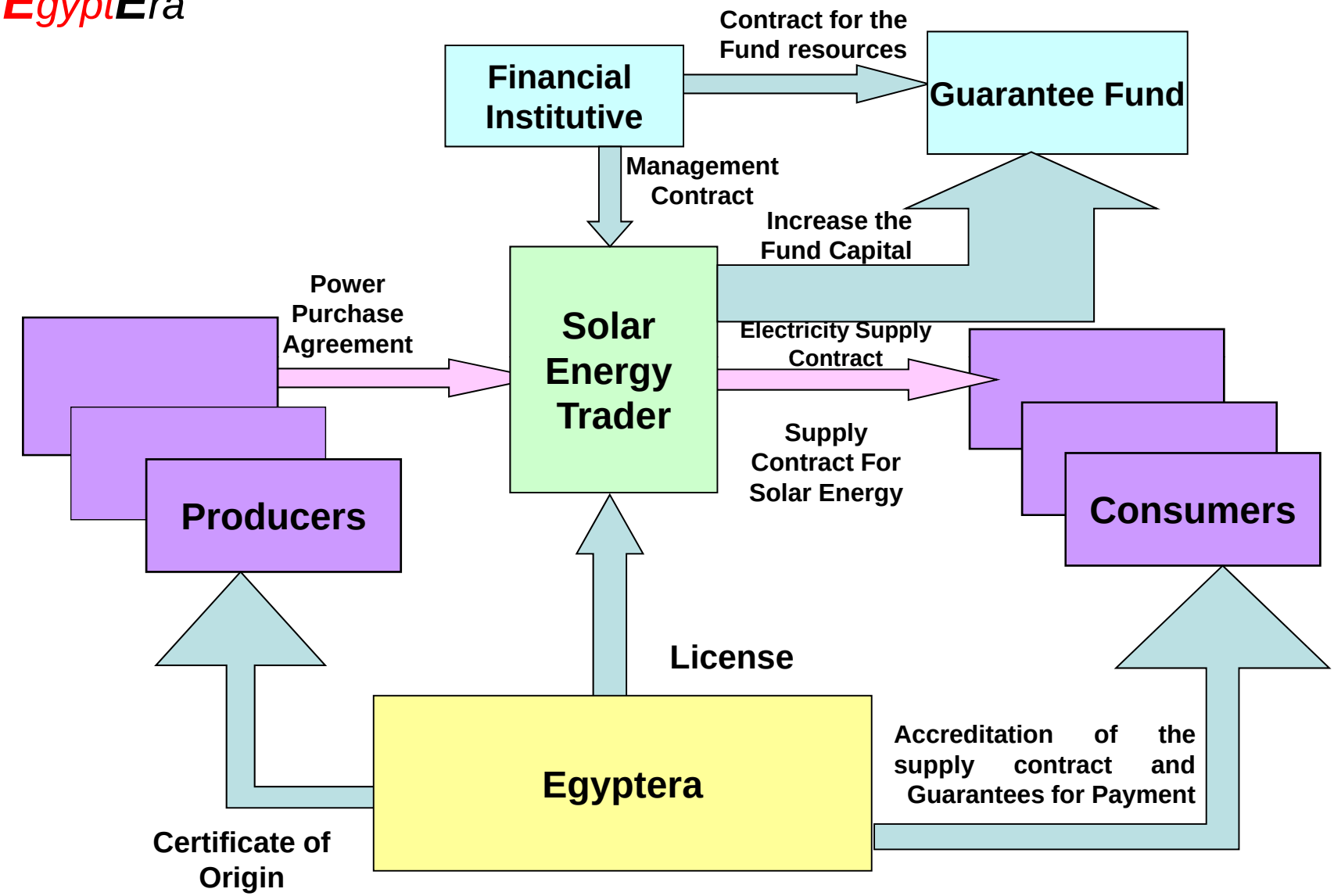
National Solar Initiative



Regulatory Requirements for the Initiative



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Income Sources of the Solar Energy Trader

Duties on Energy Trading

1. **20% of the difference between the Copping Price and the Supply Price**
2. **Income From Clear Development Mechanism & Emissions Trading (If exists)**

3. **50% of the Income of the Trader shall be directed to Increase the Capital of the Guarantee Fund and the rest for the share holder**

Potential Consumers and Their Cost Impact

- Potential consumers include: energy intensive industries, hotels, embassies, tourist facilities and exporting industries. They may extend to include residential compounds.
- Providing a cost of 25 ϵ cent/kWh for solar energy, cost for 1 ton of cement will not increase more than 11 L.E.
- In case of five stars hotel and providing occupancy level of 70% and allocating all the cost to the guest rooms, the cost per room per night will not exceed one US$ for 5% of electricity consumption from solar energy.
- The initiative is targeting to have commitment for 1000 GWh, this will be equivalent to 500 MW of installed capacity of Solar plants providing capacity factor of 0.23

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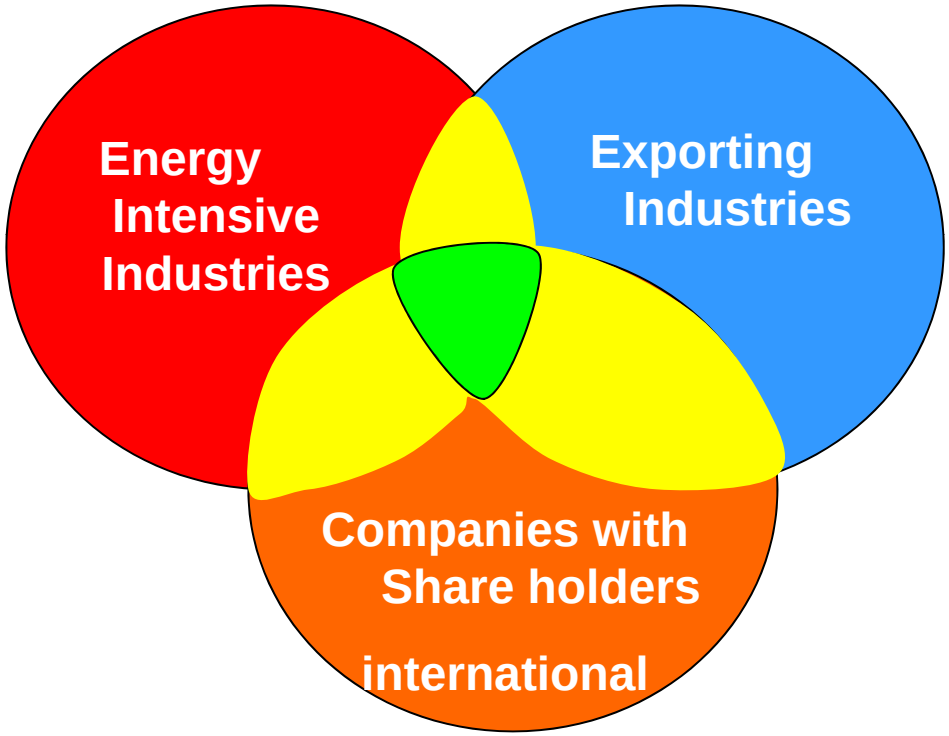
Target Consumers



Institutional Support by the Electricity Regulatory Agency "EgyptERA"

- Issue the Solar Energy Logo
- Develop committed consumer register and set mechanisms to guarantee their payments through their electricity supply contracts as well as transactions between the Solar Energy Trader and Networks operators (Transmission or Distribution).
- License for the Solar Energy Trader and monitor its operation to ensure transparency, free competition and nondiscrimination.
- Issue the solar feed-in tariff.
- Approve the PPAs and ensure their transparency.
- License the Solar energy producers and issue the certificates of origin.
- Ensure third party access and priority of dispatching.
- Exemption from transmission or distribution fees as well as energy banking as a requirement for Public Social Obligation (PSO) of network operators.
- Dispute resolution

The way forward

- Stakeholders include: Federation of Egyptian Industries, Industries Modernization Center, Businessman associations, investors associations, banks and financial institutions, hotel association, tourist development authority, ministry of foreign affairs and others including governmental representatives of MOF, MOEE, MOIT and Investment ministry.
- Steering committee could be formed from the representatives of the stakeholders. The scope of this committee is to promote the initiative among different business community, refine the initiative as well as to follow up the progress of the initiative
- EgyptERA can host this steering committee and provide finance for the preparatory work through its international partners

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Thank You

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