



# Roadmap for Solar and Wind Energy in Egypt

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# Renewable Energy Strategies in Egypt

# Vision, Strategy, and Policies

## Vision

Increase Share of renewable energy in the energy sector.

## Strategy

Satisfy 20% of the generated electricity by renewable energies by 2022.

## Policies

- a) Competitive Bidding
- b) Merchant Scheme
- c) Feed-In Tariff, FiT

# Energy Strategy, Y 2035

**Overall objective** To contribute to the improvement of the energy policy and regulatory framework and to the promotion of the energy efficiency in Egypt and mitigation of Green House Gas emissions.

**Component A**  
*Assistance* in updating or modernising Energy Sector elements - Energy Strategy, Action Plan, Monitoring system.

**Component B**  
*Support* for development of Regulation of Gas sector (organisational structure, bylaws, codes).

**Component C**  
*Support* for strengthen the existing central Energy Efficiency Institutional System in two directions through reinforcement of the institutions and providing operational tools.

# Energy Strategy Y 2035, Main factors for Scenarios

**1. Indigenous Oil and Natural Gas production: 3 Alternatives (October 2015)**

**2. Fuel Subsidies: Alternatives:**

- The level of subsidies is kept the level of July 2014 only in Baseline -a
- The level of subsidies of July 2014 are gradually reduced by 50% until 2020 and are completely removed by 2025
- The subsidies are gradually reduced from the level of July 2014 and are completely removed by 2020.

**3. Availability of coal for electricity production**

**4. Nuclear Power plants:** Current plan: first unit of 1.2GW in 2022, a second in 2024, a third in 2026 and a fourth in 2028, reaching a total of 4.8GW by the end of 2028

**5. Renewable Energy.** Reference Scenario for Renewables of the Combined Renewable Energy Masterplan, Delayed Reference Scenario (starting 5 years late), Minimum Fuel Scenario, 20% RES electricity by 2021/22 Scenario.

**6. Energy Efficiency:** “current rates” efficiency improvement due to the replacement of the existing technologies that “die out” by new technologies and the installation of new technologies to satisfy the growing demand. **High efficiency** scenarios details in the EE Strategy for Industry and the EE Strategy for Buildings and for Transport.

# Scenarios for Energy Strategy, Y 2035

	Baseline		Scen 1 (3 alternatives for RES)			Scen 2 (Delayed Nuclear and RES, High EE)	Scen 3 (Focus on RES and EE)	Scen 4 (All alternatives competing, based on costs)	
<b>Oil and N. Gas Production</b>	“Most likely” forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with “high” and “low” production forecast.		“Most likely” forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with “high” and “low” production forecast.			“Most likely” forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with “high” and “low” production forecast.	“Most likely” forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with “high” and “low” production forecast.	“Most likely” forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with “high” and “low” production forecast.	
<b>Fuel Subsidies</b>	(a) The level of subsidies in July 2014 is kept constant until 2035	(b) Subsidies are reduced by 50% from the July 2014 level by 2020 and 100% by 2025.	Subsidies are reduced by 50% from the July 2014 level by 2020 and 100% by 2025.			Subsidies are reduced by 50% from the July 2014 level by 2020 and 100% by 2025.	Subsidies are reduced by 50% from the July 2014 level by 2020 and 100% by 2025.	Subsidies are reduced from the July 2014 level to zero by 2020.	
<b>Availability of Coal for Electricity production</b>	Yes (after 2019/20)		Yes (after 2019/20)			Yes (after 2019/20)	No coal in electricity production	Yes (after 2019/20) On a cost optimization basis	
<b>Nuclear Power</b>	As planned (first unit 1.2GW operational in 2022/23 a second in 2025/26, a third in 2027/28 and a fourth in 2029/30)		As planned (first unit 1.2GW operational in 2022/23 a second in 2025/26, a third in 2027/28 and a fourth in 2029/30)			Delayed by 5 years (first unit operational in 2027/28)	No nuclear until 2035	(a) On a cost optimization basis	(b) two units operational in 2024/25 a third in 2025/26 and a fourth 2026/27
<b>Renewable Energy</b>	Baseline RES.		(a) 20% target RES	(b) Delayed Reference CREMP	(c) Minimum Fuel CREMP	Delayed Reference CREMP	Minimum Fuel CREMP	Minimum Fuel CREMP as an upper bound	
<b>Energy Efficiency</b>	Current Rates		Current Rates			High Energy Efficiency	High Energy Efficiency	High Energy Efficiency	

# Scenario #4 for Energy Strategy, Y 2035

Scenario 4 represents a least cost options scenario, where the alternative options of energy supply are competing on the level of economic merit.

The bounds that were used in the previous scenarios regarding the lower share of renewable electricity and the forced programme of nuclear power plants are removed in Scenario 4, while the same approach regarding energy efficiency measures as in Scenarios 2 and 3.

Two variants (a,b) are explored for nuclear.

<b>Scen 4</b> <b>(All alternatives competing, based on costs)</b>	
"Most likely" forecast provided by EGAS for N. Gas and EGPC for oil. Sensitivity analysis with "high" and "low" production forecast.	
Subsidies are reduced from the July 2014 level to zero by 2020.	
Yes (after 2019/20) On a cost optimization basis	
(a) On a cost optimization basis	(b) two units operational in 2024/25 a third in 2025/26 and a fourth 2026/27
Minimum Fuel CREMP as an upper bound	
High Energy Efficiency	







# Renewable Energy Sector

# New and Renewable Energy Authority, NREA

**Established in 1986**



**The national focal point to develop and introduce renewable energy technologies to Egypt on a commercial scale together with implementation of related energy conservation programs**

# Legal Framework

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## 1) Constitution / Article 32

*To get optimum benefits from renewable energy, promote its investments, and encourage R&D, in addition to local manufacturing.*

## 2) Law No. 203 of Year the 2014

*To Motivate Production of Electricity from Renewable Energy Sources.*

## 3) Electricity Law, July 2015

*It governs the electricity sector in Egypt.*

## 4) Announcement of the Second Round of FiT

## 5) Cabinet Decree No. 1947 of the Year 2014 on Feed-in Tariff -1<sup>st</sup> Round

*It establishes the basis for Feed-in Tariff for energy produced from renewable energy projects and encourage investment in renewable energy.*

## 6) Prime Ministerial Decree No. (2532) of the Year 2016 on Feed-in Tariff-2<sup>nd</sup> Round

*Regulations to Avail Land for renewable Energy Projects.*

# Legal Framework

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7) Prime Ministerial Decree No. (37/4/15/14) of the Year 2015  
*Regulations to Avail Land for renewable Energy Projects.*

8) Investment Law No. 8 of the Year 1997 (as amended)  
*On Investment Guarantees and Investments*

9) Companies Law No. 159 of the Year 1981 (as amended)  
*It establishes the requirements for incorporation of an SPV and the general rules for its management.*

10) Law No. 102 of the Year 1986 (as amended)  
*Establishes the New and Renewable Energy Authority, NREA. NREA has the primary role in promoting and developing renewable energy in Egypt.*

11) Presidential Decree No. 326 of the Year 1997 (as amended)  
*It establishes the Electric Utility and Consumer Protection Regulatory Agency, affiliate of the Ministry of Electricity and Renewable Energy, responsible of the issuance of permits and licenses for generation, transmission and distribution.*

# Renewable Energy in Numbers

**30**

**Years of  
Experience**

**+750 MW**

**Installed  
Capacity**

**+ US\$ 1.7  
billion**

**Total investment**

**+ 5000  
MW**

**In the development  
Phase**

**+400 MW**

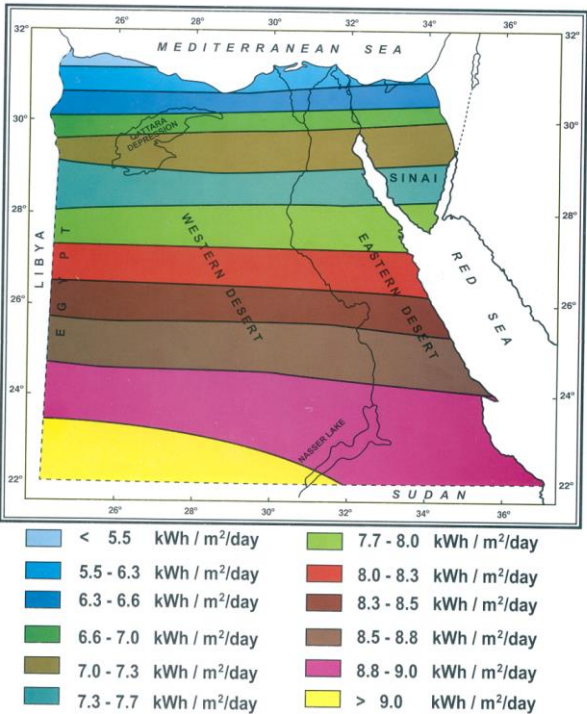
**Capacities under  
construction  
(wind + PV)**

**≈US\$ 500  
million**

**Total Invest. In  
2015-2016**

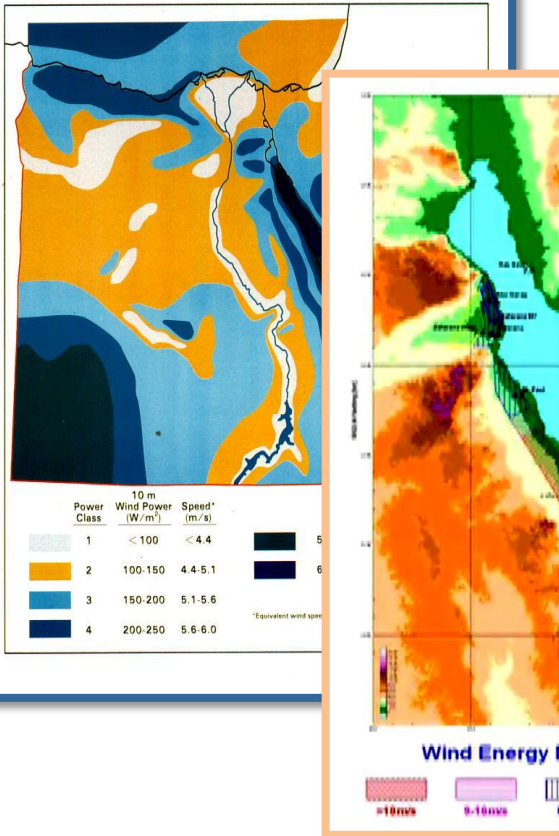
# Resource Assessment

Egypt Annual Average Of  
Direct Solar Radiation

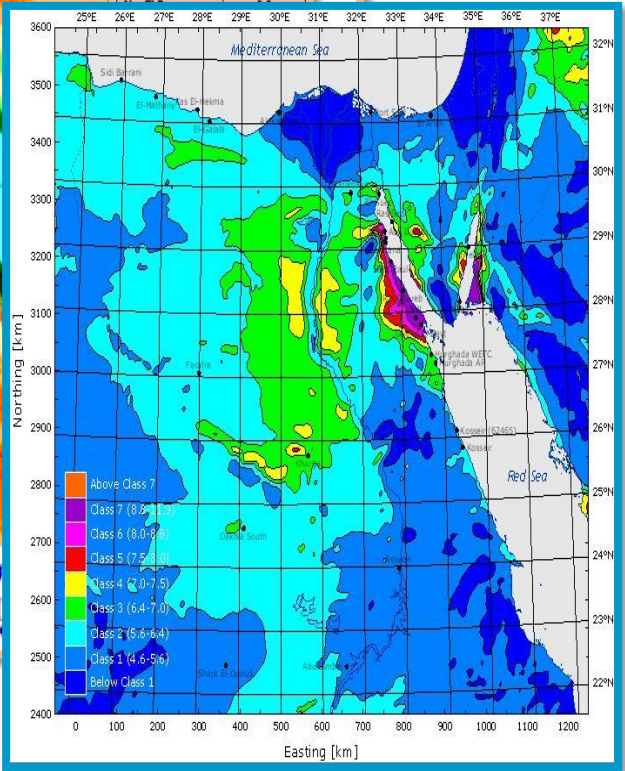


Solar

Egypt Annual Average Wind Power Estimates



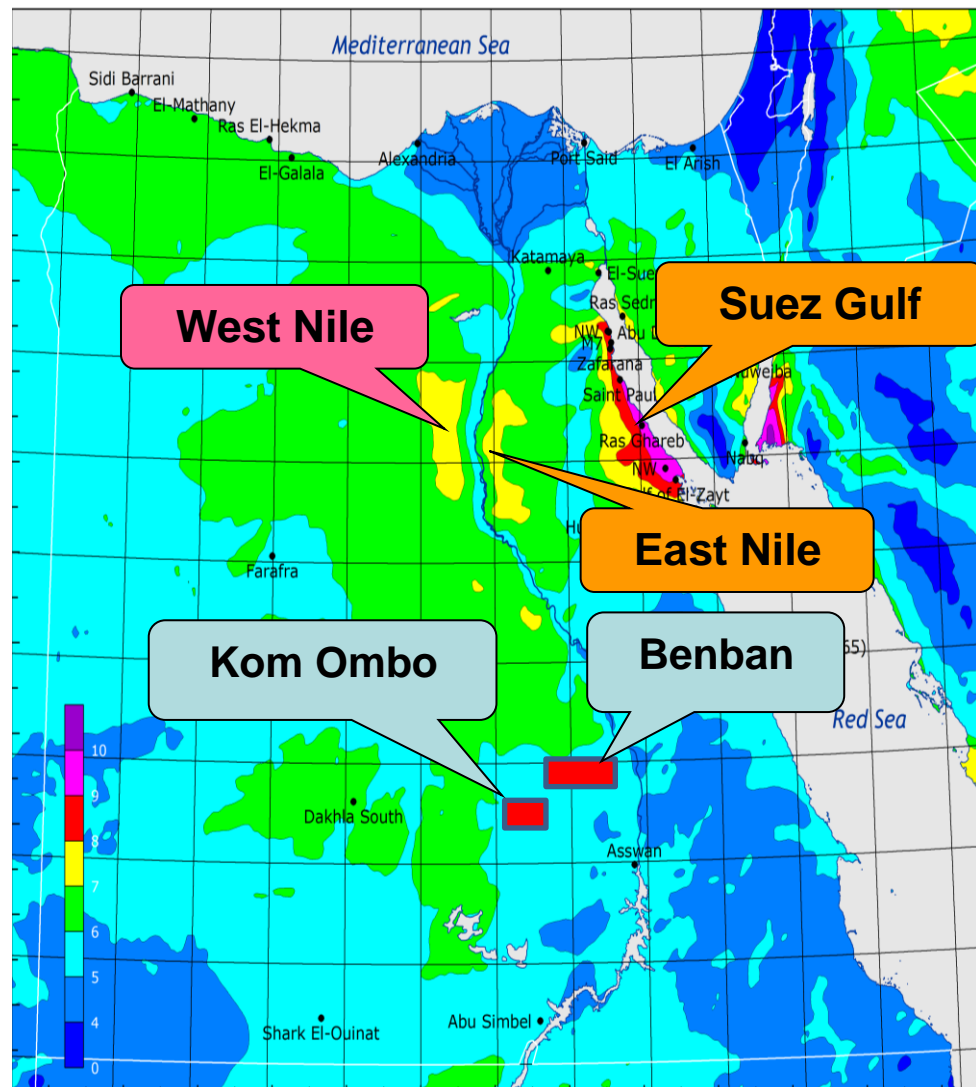
Wind



# Lands Allocated for Renewable Energy

Areas		
Zone		Areas (km <sup>2</sup> )
Suez Gulf (wind)		1220
East Nile	Wind	841
	Solar	1290
West Nile	Wind	3636
	Solar	606
Benban (Solar)		37
Kom Ombo (Solar)		7
<b>TOTAL</b>		<b>7637</b>

**Total Capacities ≈ 56 GW (Wind + Solar)**





# List of Permits for NREA's Land

- 1) The Armed Forces;
- 2) The Ministry of Petroleum;
- 3) The Civil Aviation Authority;
- 4) The Ministry of Agriculture and Land Reclamation;
- 5) The Antiquities Authority;
- 6) The National Centre for Land Reclamation;
- 7) The Ministry of Communications and Information;
- 8) The Ministry of Planning, Economic Utilities and Urban Development;
- 9) The Ministry of State for Environmental Affairs;
- 10) The Governorate of Suez; and
- 11) The Ministry of Investment and Planning.

**Presidential Decrees already obtained**





# Renewable Energy Schemes in Egypt

# Renewable Energy Development Schemes

## Framework for RE Development Mechanisms

### Competitive Bidding

### Merchant Scheme

### Fit/Quota since 2014

- 2000 MW Wind
- 2000 MW PV
- 300 MW PV (rooftop)

### NERA\*

- EPC contracts since 1993
- 750 MW → 1890 MW
- Solar (PV) ≈ 80 MW

### EETC<sup>+</sup>

- a) Wind (Contractual Phase)
  - 250 MW @ Gulf of Suez
- b) Tendering Phase
  - 250 & 50 MW, Wind & CSP, respectively
  - 10 × 20 MW and 200 MW PV Projects

+ EETC: Egyptian Electricity Transmission Company

\* NREA: New and Renewable Energy Authority

# Renewable Energy Development Schemes

## Framework for RE Development Mechanisms

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# Projects done through Competitive Bidding

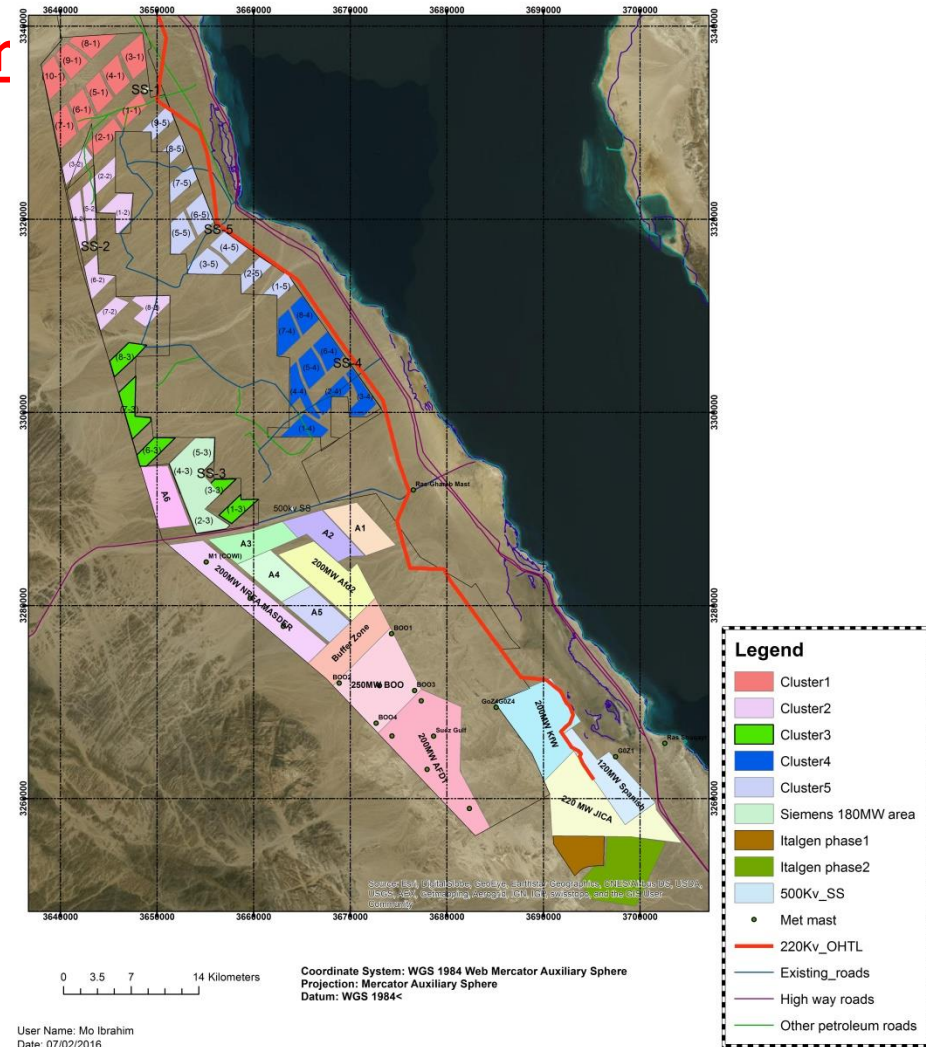
- 1040 MW Wind Energy in operation, and erection phases.
- The 1st CSP plant is 140 MW including solar field of 20 MWe based on parabolic trough technology and 120 MW combined Cycle. It is in operation since July 2011.



# Projects Planned to be established through Competitive Bidding

## Wind Projects Under Development

- a) FiT Projects; i.e. 9 x 50 MW
- b) 200 MW, NREA/MASDAR
- c) 200 – 250 MW, in Cooperation with KfW Germany, EU, Afd, and EIB.
- d) 200 MW, in cooperation with French Agency for Development, Afd.



# Solar Projects Under Development

## **a) EPC:**

2 grid connected PV projects, 20 MW each, in Hurghada & Kom Umbo are in the tendering phase.

## **b) BOO:**

200 MW PV Projects at Kom Umbo

200 MW PV Project at West Nile region

100 MW CSP Project at West Nile region



# Renewable Energy Development Schemes

## Framework for RE Development Mechanisms

Competitive  
Bidding

Merchant Scheme

Fit/Quota since 2014  
- 2000 MW Wind  
- 2000 MW PV  
- 300 MW PV (rooftop)

NERA

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# Renewable Energy Development Schemes

## Framework for RE Development Mechanisms

**Competitive Bidding**

**Merchant Scheme**

**Fit/Quota since 2014**  
- 2000 MW Wind  
- 2000 MW PV  
- 300 MW PV (rooftop)

**NERA**

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**EETC<sup>+</sup>**

- a) Wind (Contractual Phase)
  - 250 MW @ Gulf of Suez
- b) Tendering Phase
  - 250 & 50 MW, Wind & CSP, respectively
  - 10 × 20 MW and 200 MW PV Projects



# Feed-in-Tariff, 2nd Round

**Due date:** Oct. 28, 2016

## **A) Wind Energy**

### **A-1) Tariff**

Ranges from US\$ 7.6 Cents/ kWh to US\$ 4.0 Cents/kWh, according to the full operating hours in the site, from 2500 h to more than 5000 h, respectively.

### **A-2) Maturity: 20 Years**

**A-3) Payment conditions:** 40% at EGP 8.88 and 60% pegged to the USD at the rate applicable on the due date

**A-4) Project components:** 60% foreign and 40% Egyptian.

**A-5) Arbitration:** Will be governed by the Rules of the Cairo Regional Centre for International Commercial Arbitration (CRCICA). The seat of arbitration will be offshore (exact location not announced).

**A-6) Eligible Developers:** Only the pre-qualified developers under Round 1.

**A-7) Financial Closure:** within 1.5 years for wind projects

**A-8) Targeted Capacity:** 2000 MW

# Feed-in-Tariff, 2nd Round

Due date: Oct. 28, 2016

## A) Photovoltaic > 500 kw

### A-1) Tariff

US\$ 8.4 Cents/ kWh to projects range from 20 – 50 MW

US\$ 7.99 Cents/kWh to projects more than 500 kW

### A-2) Maturity: 25 Years

**A-3) Payment conditions:** 30% at EGP 8.88 and 70% pegged to the USD at the rate applicable on the due date

**A-4) Project components:** 70% foreign and 30% Egyptian.

**A-5) Arbitration:** Will be governed by the Rules of the Cairo Regional Centre for International Commercial Arbitration (CRCICA). The seat of arbitration will be offshore (exact location not announced).

**A-6) Eligible Developers:** Only the pre-qualified developers under Round 1.

**A-7) Financial Closure:** within 1.0 year for wind projects

**A-8) Targeted Capacity:** 2000 MW

# Feed-in-Tariff, 2nd Round

**Due date: Oct. 28, 2016**

## **A) Photovoltaic < = 500 kw**

### **A-1) Tariff**

1.0288 EGP/ kWh for residential sector

1.0858 EGP/kWh to projects less than 500 kW

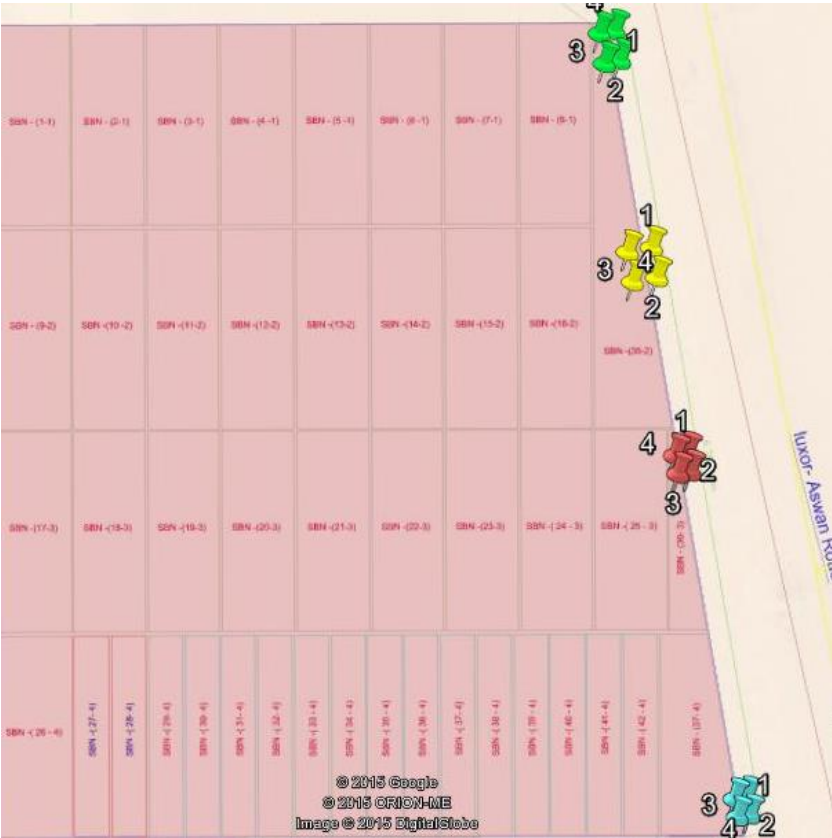
### **A-2) Maturity: 25 Years**

### **A-3) Payment conditions: EGP**

### **A-6) Eligible Developers: Open.**

### **A-7) Targeted Capacity: 300 MW**

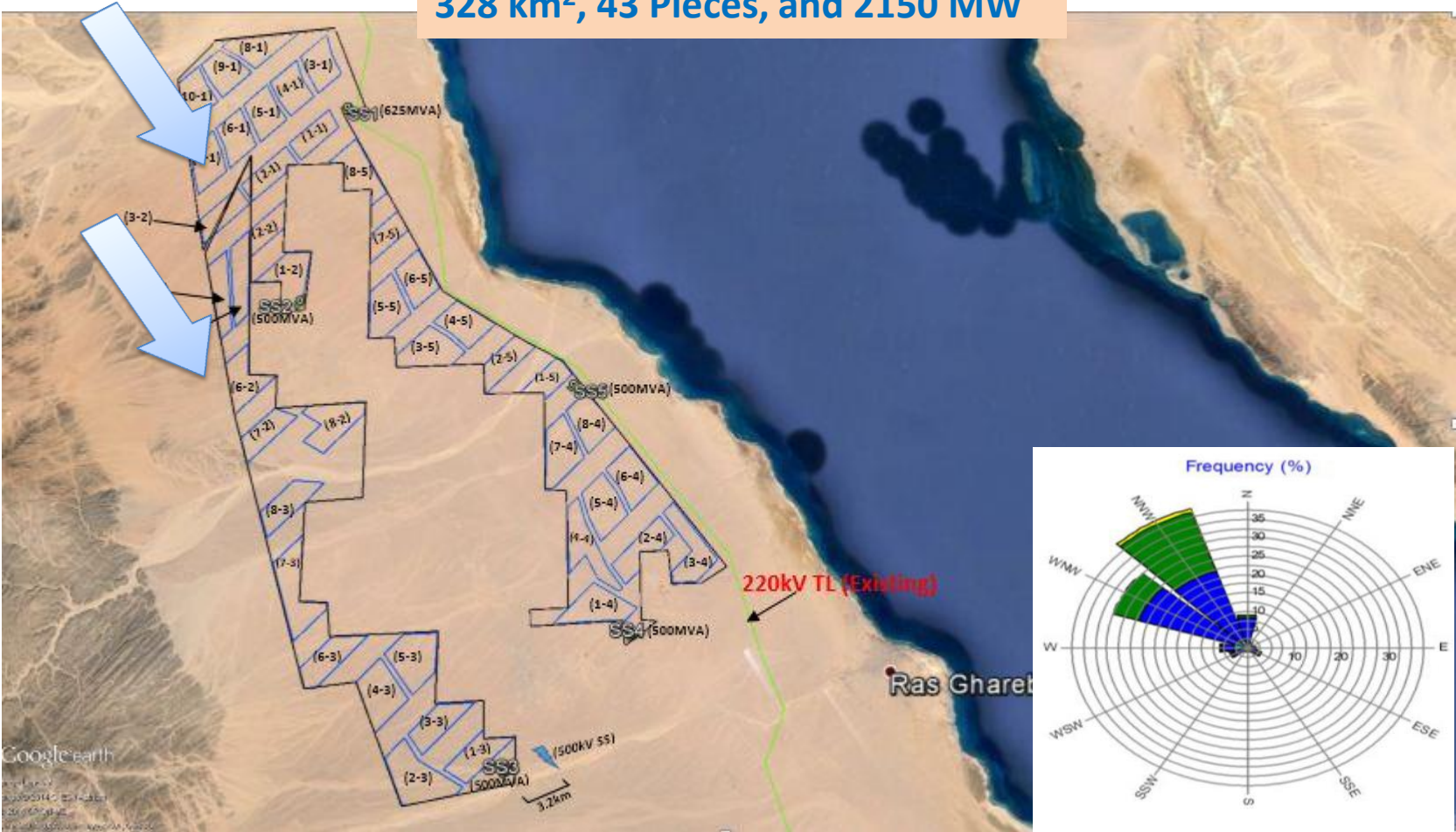
# Feed-in Tariff/ Locations of FiT PV Project



**37 km<sup>2</sup>, 45 Pieces, 1750 MW  
@ Benban/Aswan**

# Feed-in Tariff/ Locations of FiT Wind projects at Gulf of Suez

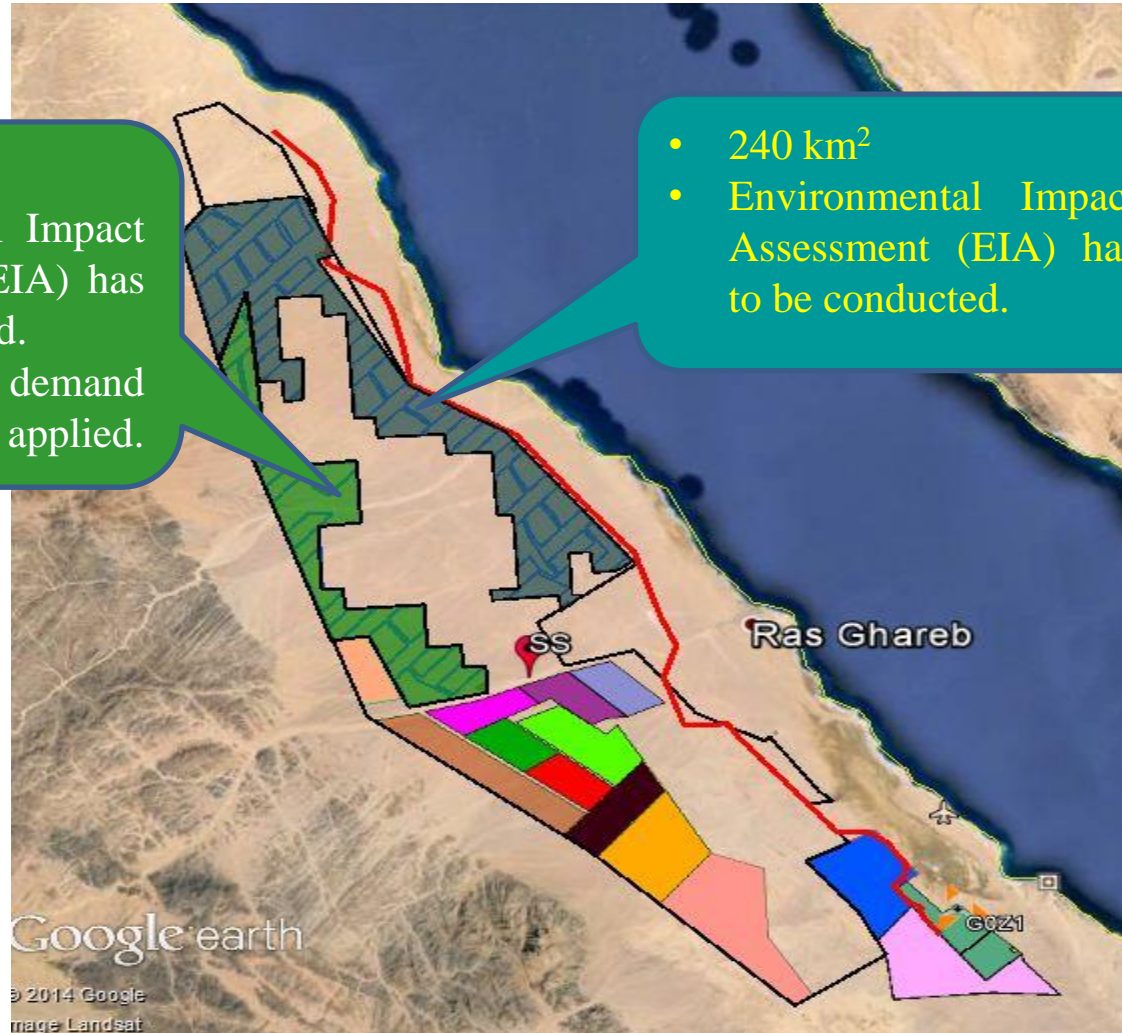
328 km<sup>2</sup>, 43 Pieces, and 2150 MW



# Feed-in Tariff/ Environmental Issues for Wind Energy Sites

- 128 km<sup>2</sup>
- Environmental Impact Assessment (EIA) has been conducted.
- Shutdown on demand system will be applied.

- 240 km<sup>2</sup>
- Environmental Impact Assessment (EIA) has to be conducted.



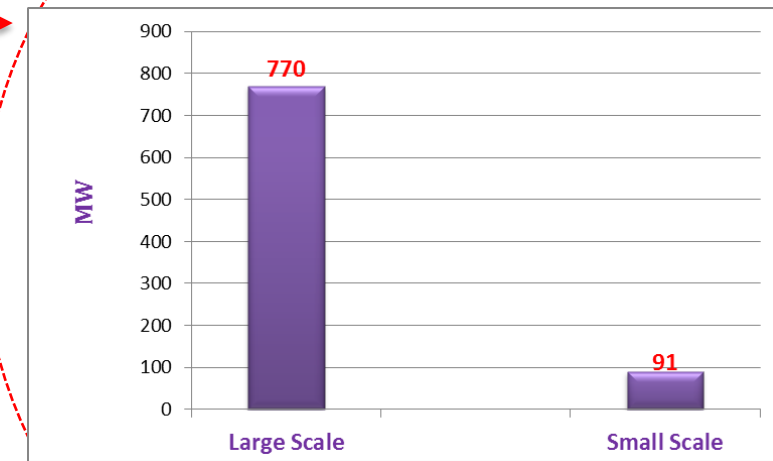
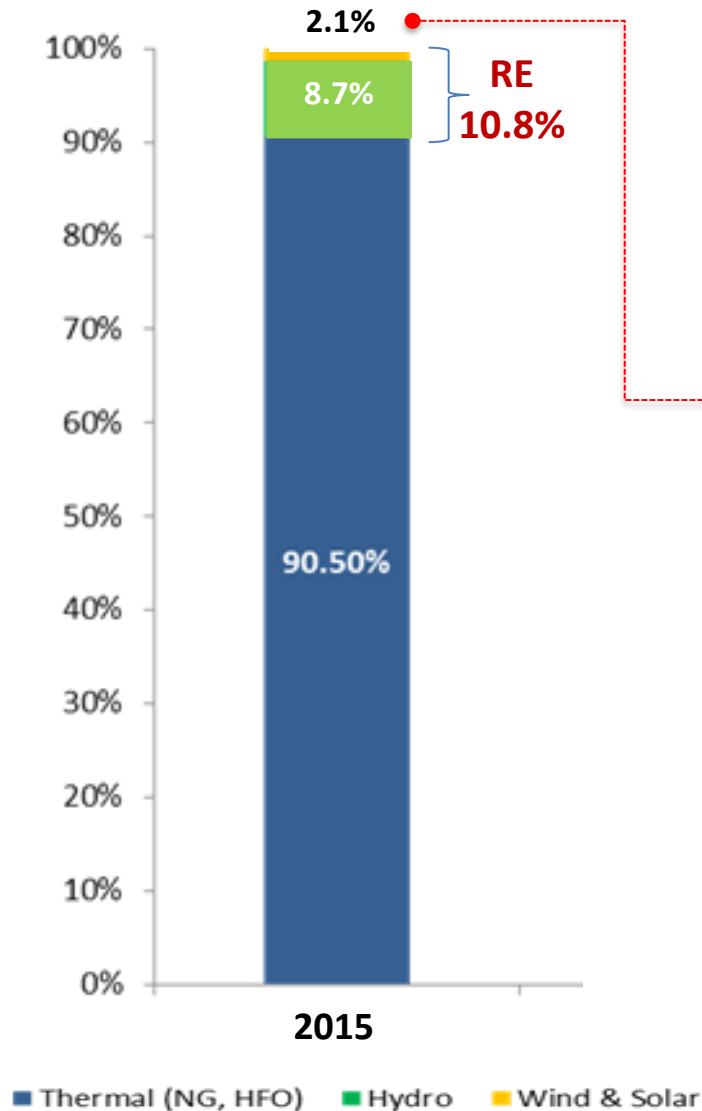




# Distributed Renewable Energy Systems



# Electricity Portfolio in Egypt, 2015

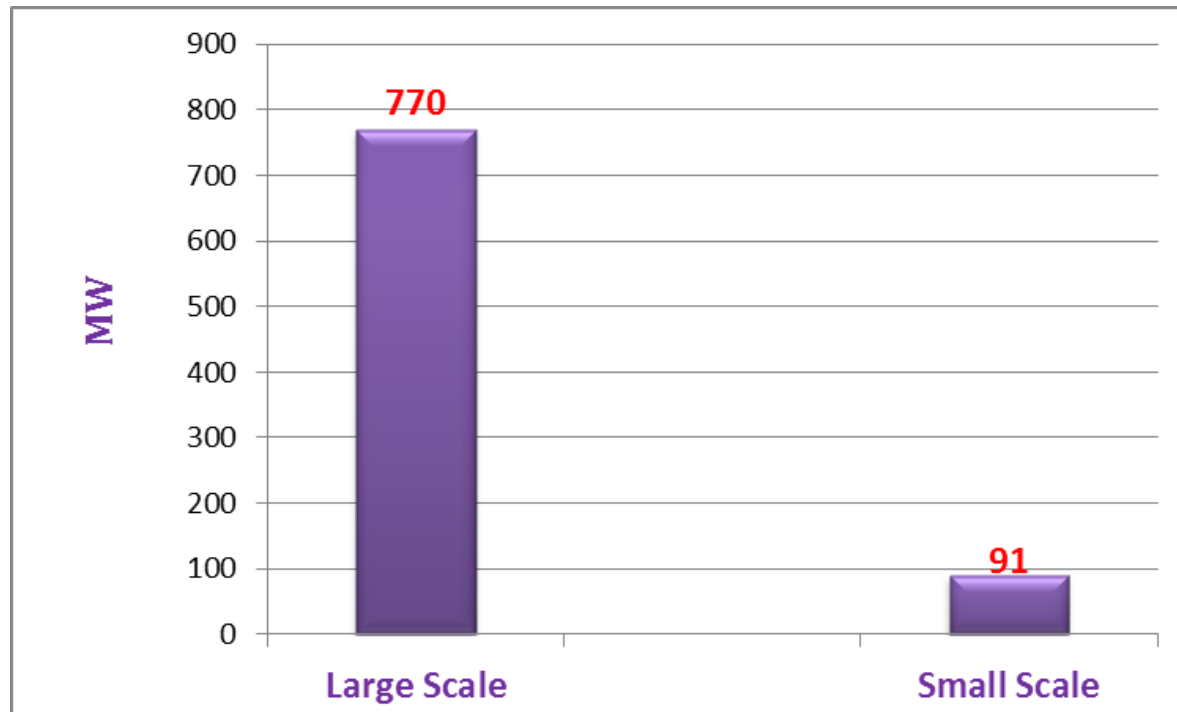


Small scale refers to both on-and-off-grid PV systems





# Installed Capacities of Wind and Solar Projects



- There is a need to focus on distributed renewable energy systems, mainly PV, SWHs, and solar cooling.
- Introducing new applications; i.e. biomass and hybrid systems.



# Feed-In Tariff Rates for PV Rooftop

Sector	Tariff	
	1 <sup>st</sup> Round EGP/kWh	2 <sup>nd</sup> Round EGP/kWh
Residential	0.844	1.0288
Installed Capacity $\leq$ 200 kW	0.901	1.0858
200 kW $\leq$ Installed Capacity < 500 kW	0.973	



- PV Installers have to prove their capabilities to design, install, operate and maintain PV systems.
- Criteria for certification is already published on NREA website:  
<http://www.nrea.gov.eg/arabic1.html>
- More than 170 PV Installers are already certified



# Egysol Project

## Partners:

- 1) Italian Ministry of Environment
- 2) New and Renewable Energy Authority, NREA

## Targeted Touristic Areas:

- + South of Sinai Governorate
- + Red Sea Governorate

## Objectives

- + SWH : 5000 m<sup>2</sup> (**75% achieved**)
- + Oil Savings: 4000 toe
- + CO<sub>2</sub> abatement: 12 k-ton



# Solar Projects

Electrifying 195 Remote Villages and Cities by using Photovoltaic System in Cooperation with the United Arab of Emirates (UAE) Government in addition to implement PV power plants with **total capacity 37 MW**.





# MED-Desire Project

- **Objectives**

“Raising public awareness on energy efficiency through the transferability and implementation of good practices in legal, regulatory, economic, and organizational issues including the promotion of new financing mechanisms to facilitate the take up of solar technologies”

## **Final beneficiaries:**

Local communities: new jobs

Retail and industrial energy consumers:  
greater energy price stability

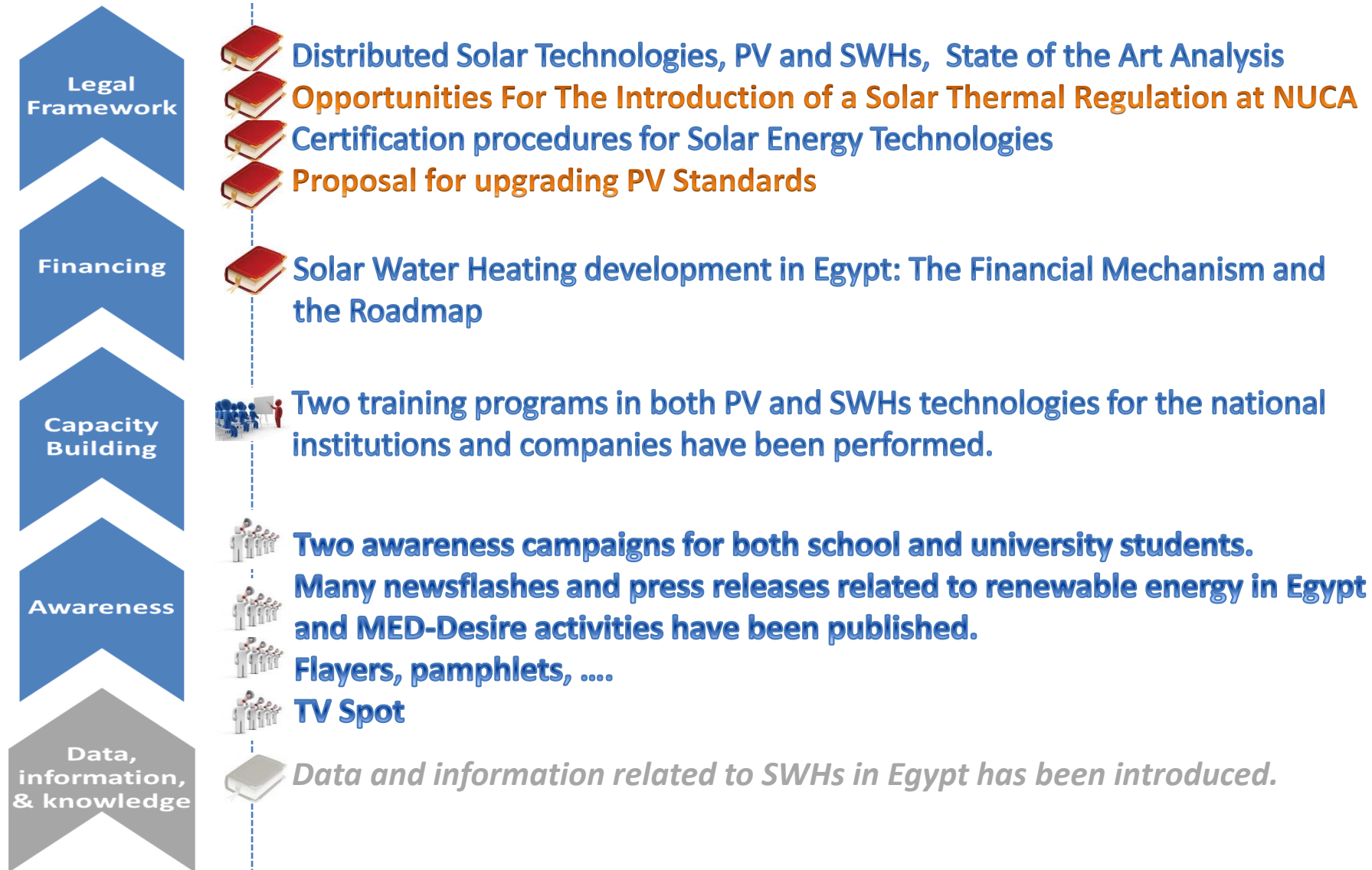
Research centres and universities: cross-  
border technology transfer and cooperation

**Period: Jan 2014 to Dec 2015**





# Cross-Cutting between RE Market in Egypt & MED-Desire





# Other Energy Efficiency



# Energy Efficiency Laboratories for home Appliances

- ❑ The Center is entrusted to serve the Egyptian energy efficiency standards & labeling program through specialized laboratories for refrigerators, washing machines, electrical water heaters, air conditions and lighting units.
- ❑ It plays an important role through the cooperation with the Egyptian Organization for Standardization and Quality (EOS), General Organization for the of Exports & Imports Control (GOEIC), to ensure the Egyptian standard specification commitment to paste the energy efficiency label on household electrical appliances before posed in the Egyptian Market to the consumers.
- ❑ The labs are accredited from Egyptian Accreditation Council (EGAC) according to the international standard 17025 from the year 2007 .







# 41 electric home appliances are classified into 11 sections

1. *Lighting*
2. *Air conditioning*
3. *Space heating*
4. *Electric fans*
5. *Electric water heating*
6. *Laundry*
7. *Kitchen*
8. *Cold apparatus*
9. *T.V and Receivers*
10. *Office equipment*
11. *Personal care*
12. *Others*



# Energy Efficiency Laboratories for home Appliances



**Refrigerators  
Lab**

► 3162 Local and imported production



**Air Condition  
Lab.**

► 1291 Local and imported production



**Washing  
Machine Lab.**

► 2008 Local and imported production



**Electric heater  
Lab.**

► 490 Local and imported production



**Lighting Lab.**

► 1309 Local and imported production

Energy Efficiency Laboratories  
for home Appliances



# Electricity Sector Activities in Energy Efficiency

- Distributing over 20 million CFL lamps for residential sector with half price.
- More than 550 thousand street lighting efficient lamps were installed to replace conventional lamps. The electricity sector is now studying an initiative to replace 1 million conventional lamps with efficient lamps through PPP scheme.
- Energy conservation measures (mainly efficient lighting and power factor correction) in many administrative buildings.
- Labeling and standards program for home appliances.
- Energy efficiency codes for residential, commercial and public buildings.





# Activities in RE by Other Entities in Egypt

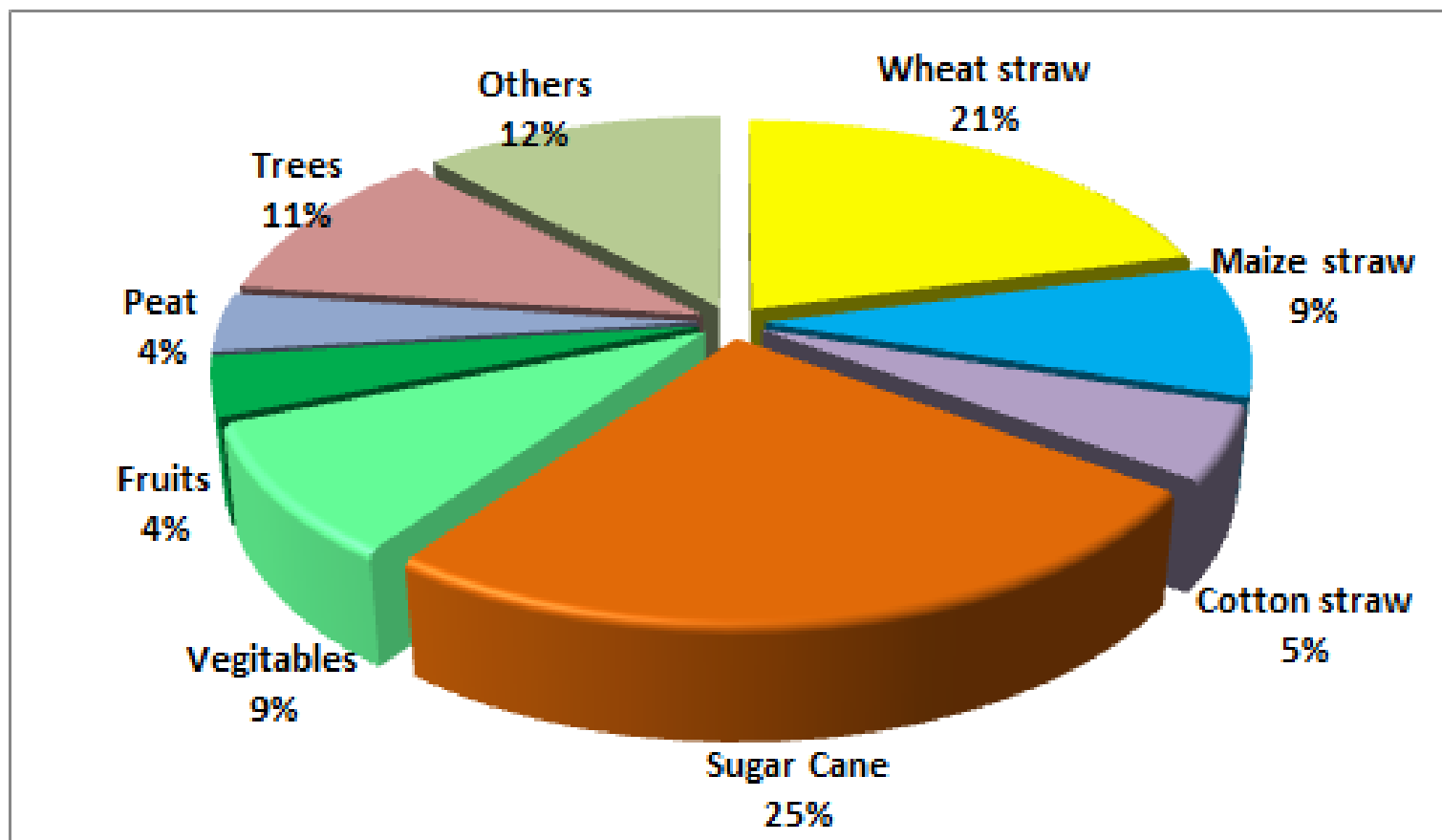


# **Egyptian Environmental Affairs Agency, EEAA**

***Bioenergy for Rural Sustainable Development Project***



# Biomass Resources in Egypt





# Biomass Energy in Egypt

- Total biomass resources potential **reaches around 40 million Ton per year**, 40 % of it is used for feeding animals and the rest can be used for energy purposes.
- The biomass resources **contribute more than 3.6 MTOE per year (primary energy)**.
- It is expected that, new applications of the efficient new modern technologies on the available biomass resources this contribution effect will be increased in the future.
- Biomass Projects in Egypt are mainly small-scale biogas plants
- Other applications, such as large-scale biogas plants and Plant Residues Briquetting Systems, still need more development.





# Biomass Energy in Egypt

## Small Scale Biogas Plants

- More than 1000 small biogas digesters already installed in Egypt, less than 50% of them are in operation.
- Approximately 80 new plants are constructed every year.
- The total potential for small biogas plants in Egypt is estimated as more than 1 million units.
- Most of the small biogas plants are installed by rural families.





# Biomass Energy in Egypt

- In 2015, the Cabinet declared the Feed-in-Tariff, FiT, for biomass;
  - EGP 0.92 ( $\approx$  US\$ 0.09) per kWh
  - 70% of the international prices for oil products
- Prices will be paid in Egyptian Pound.
- Such FiT still need more elaboration and to identify relevant prices according to specific technologies.





# Biomass Energy in Egypt

## The Bioenergy for Sustainable Rural Development Project “BSRD”

- Initiated in 2009 by the Egyptian Environmental Affairs Agency “EEAA” and funded by the United Nations Development Program “UNDP” and the Global environmental Facility (GEF).
- The project is Encouraging youth to be Entrepreneurs.
- The project has achieved remarkable progress in developing and disseminating biogas digesters to rural areas.





# Biomass Energy in Egypt

## The Bioenergy for Sustainable Rural Development Project “BSRD”

- During three years of its operation, the project developed and operated;
  - 960 biogas units of different sizes in 18 Egyptian Governorates
  - 20 registered Bioenergy Service Providers were established and spread all over the Egyptian villages providing their service to more than 1000 family.
- Opened channels towards consideration of a feed-in-tariff regulation on biomass systems.





# New Urban Communities Authority, NUCA



# New Urban Communities Authority, NUCA

## Street Lighting

Using PV cells and Led lamps in the streets

## Solar Energy

Using PV on the roof tops

Using Solar energy in the new cities

Using solar heaters on the roof tops

## Energy Efficiency

Using Led in Lightening

Dissemination of the energy efficiency Concept in the new cities







# New Urban Communities Authority, NUCA

-Using LED lightening in the New Urban Communities Authority building

-Developing an energy efficiency plan and using Led in all new cities

1- A solar energy station on the surface of Tiba local authority of the power of 90 kw

2- A solar energy station for the new Urban Community building by the power of 50 kw per hour

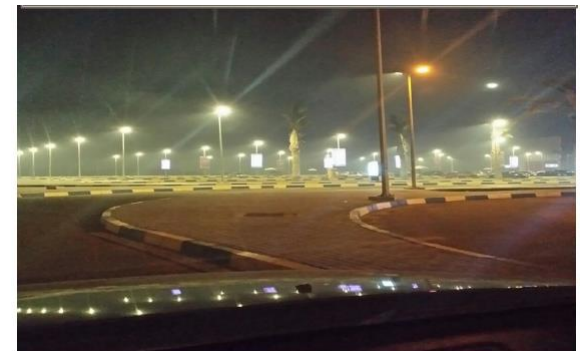
3- Solar energy station in the local authority building of 10<sup>th</sup> of Ramadan city by the power 3 kw per hour

4- PV cells above the local authority building of Borg el Arab by power of 65 kw per hour

5- PV cells above 15<sup>th</sup> of May local authority building by the power of 45 kw per hour

6- Solar heaters above the buildings in ( new Tiba – Asyout –Sohag -Badr) cities

7- guideline model with private sector







# Ministry of Industry and Trade

*Egyptian National Cleaner Production Center*



## Some of ENCPC Projects

- ❑ Fostering Renewable and Sustainable Energy in Africa through R&D (FORWARD)
- ❑ Low Carbon and Climate Resilient Industrial Development
- ❑ European Energy Manager Project
- ❑ Promoting low-Carbon Technologies for Cooling and Heating in Industrial Applications in Egypt





## ECO - FEI Services

- ☐ - Energy efficiency Projects
- ☐ Renewable Energy Projects
- ☐ Revolving Fund / Financial Support
- ☐ Capacity Building





# Thank You

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