New & Renewable Energy Authority
هيئة الطاقة الجديدة والمتجددة

# ANNUAL REPORT
# 2020


# Proud of
# Our Projects and Achievements

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## Executive Chairman's Speech


Dr. **Mohamed El Khayat**

Affected by Covid -19 pandemic, countries closed their airports and borders, unemployment rates rose, the global economy has slowed down, the number of infected people is beyond 100 million, and the death toll is more than two million. As the global economy declined, demand for energy sources fell, and the International Energy Agency (IEA) had published its forecast for a decline of range from 5% to 20% on energy sources, the only source that maintained its positive performance, albeit low, was renewable energy.

At the national level, despite all the challenges imposed by the Corona virus, the Egyptian market was able to maintain its attractiveness, which was reflected in the conclusion of new offers worth more than one and a half billion dollars evenly divided between solar energy projects in Aswan governorate and wind power in Gulf of Suez region enjoys high wind speeds, about 10 m/s, and also rich in oil. It is a Unique integration.

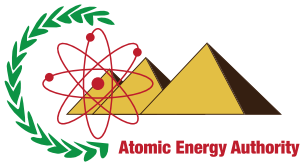
In a similar vein, the green bonds issued by Egypt in September 2020, attracted $750 million, exceeding the target by about 50%, which made it possible to reduce interest rate. The green bond portfolio is diversified to cover environmentally friendly projects such as energy efficiency, sustainable transportation and wastewater treatment. Based on the result of this round, future issue of these bonds is expected to receive increased attention, with projects with a total investment of about $2 billion, improving the country's economic indications.

Under this momentum, Benban Solar Complex, 32 projects with a total capacity of 1,465 MW, has strengthened its standing with the third International award, the Arab Government Excellence Award awarded by the government of United Arab Emirates, to add to two previous awards received by the Complex in 2017 and 2018, the IJ Global Award and the World Bank.

A t the small-scale energy projects level, Egypt-PV project has been able to implement more than 100 projects in several sectors, residential, commercial, tourism, industrial, and service, in thirteen governorates, enabling it to win the British Energy Institute award for the year 2020 as the best project in the low carbon category.

Indeed, this year is an extraordinary one in terms of challenges, exacerbated by the consequences of the Corona virus, but the harmonious performance of the governmental institutions has helped to attract investments that have added up to thirty percent of the current capacities, so that the installed capacities, once these projects are completed, will reach 8,000 MW, which reinforces Egypt's attempts to become a regional energy hub, integrate new technologies - green hydrogen production, energy storage and others - into the energy strategy, as well as increasing the share of renewable sources by more than 40 percent. 2035.

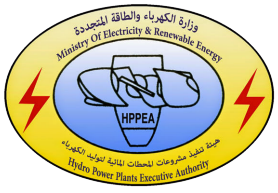
This year reminds us of many successive events but it will be a remarkable one for those who are interested in the field of renewable energy specially in terms of investments and its expected returns.



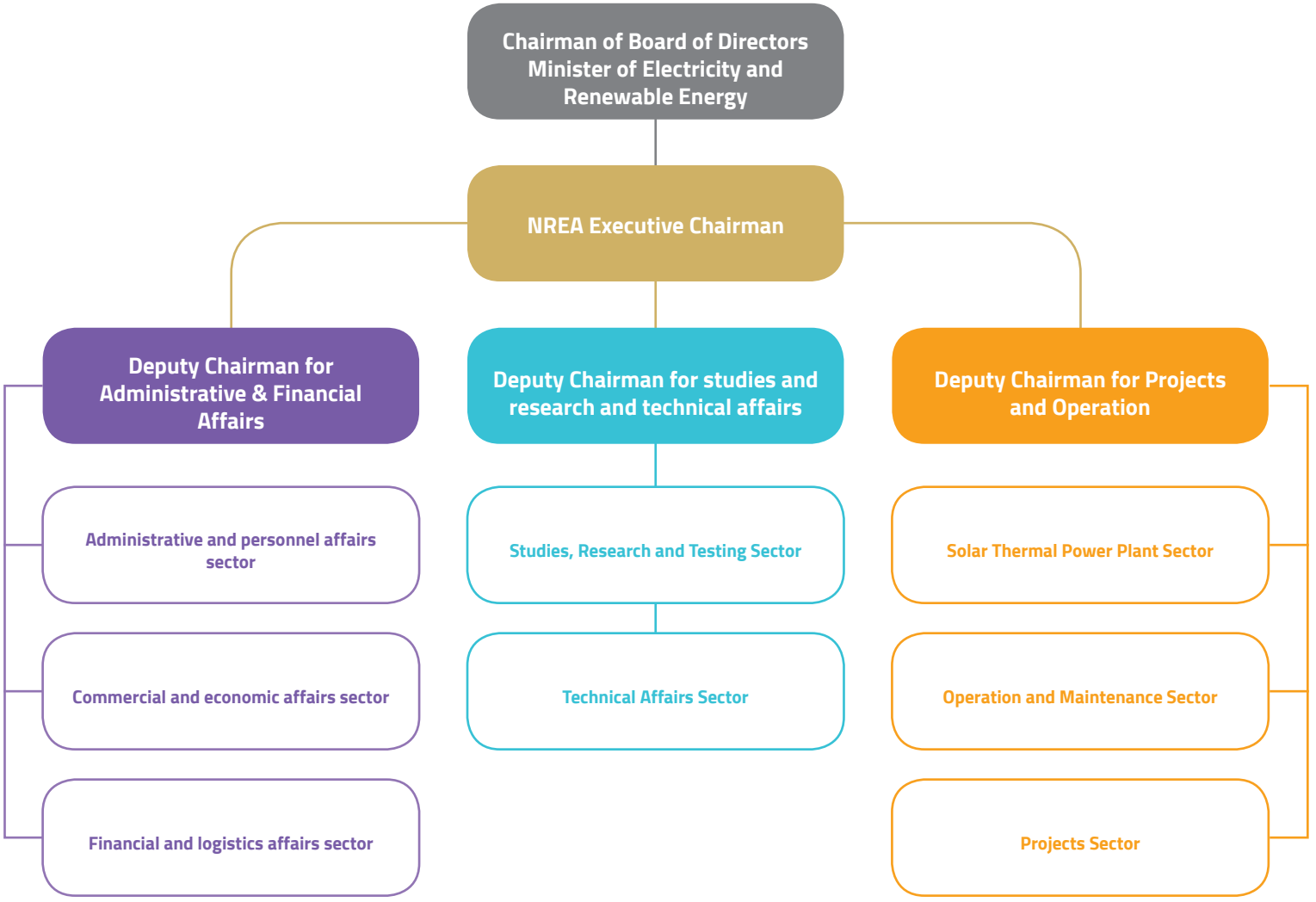


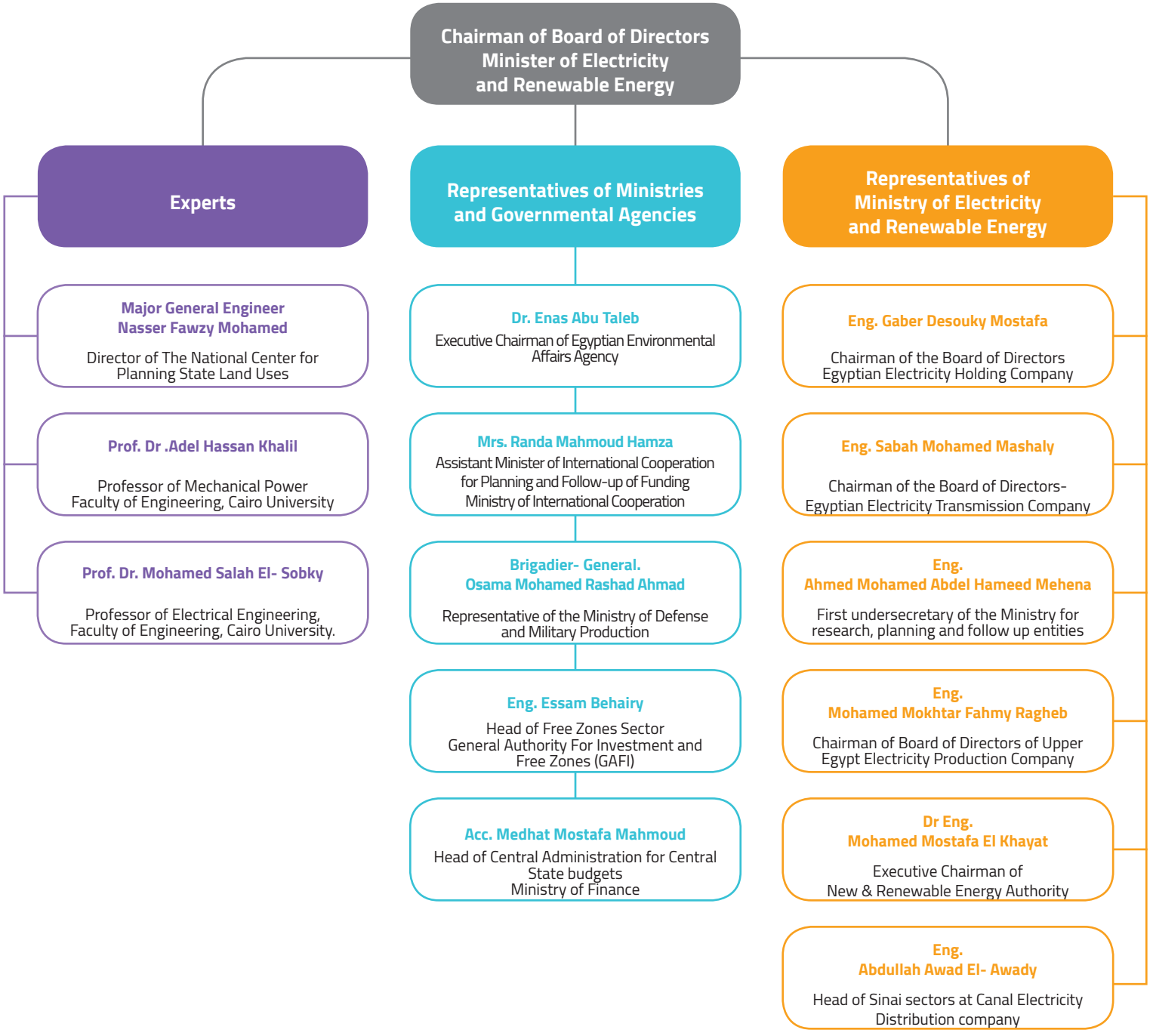



Ministry of Electricity and Renewable Energy




## NREA Organizational chart




Chairman of Board of Directors
Minister of Electricity
and Renewable Energy
Experts
Major General Engineer
Nasser Fawzy Mohamed
Director of The National Center for
Planning State Land Uses
Prof. Dr .Adel Hassan Khalil
Professor of Mechanical Power
Faculty of Engineering, Cairo University
Prof. Dr. Mohamed Salah El- Sobky
Professor of Electrical Engineering,
Faculty of Engineering, Cairo University.
Representatives of Ministries
and Governmental Agencies
Dr. Enas Abu Taleb
Executive Chairman of Egyptian Environmental
Affairs Agency
Mrs. Randa Mahmoud Hamza
Assistant Minister of International Cooperation
for Planning and Follow-up of Funding
Ministry of International Cooperation
Brigadier- General.
Osama Mohamed Rashad Ahmad
Representative of the Ministry of Defense
and Military Production
Eng. Essam Behairy
Head of Free Zones Sector
General Authority For Investment and
Free Zones (GAFI)
Acc. Medhat Mostafa Mahmoud
Head of Central Administration for Central
State budgets
Ministry of Finance
Representatives of
Ministry of Electricity
and Renewable Energy
Eng. Gaber Desouky Mostafa
Chairman of the Board of Directors
Egyptian Electricity Holding Company
Eng. Sabah Mohamed Mashaly
Chairman of the Board of Directors-
Egyptian Electricity Transmission Company
Eng.
Ahmed Mohamed Abdel Hameed Mehena
First undersecretary of the Ministry for
research, planning and follow up entities
Eng.
Mohamed Mokhtar Fahmy Ragheb
Chairman of Board of Directors of Upper
Egypt Electricity Production Company
Dr Eng.
Mohamed Mostafa El Khayat
Executive Chairman of
New & Renewable Energy Authority
Eng.
Abdullah Awad El- Awady
Head of Sinai sectors at Canal Electricity
Distribution company

## Introduction

Over the past year, significant changes have occurred within the energy sector domestically and internationally as a result of the outbreak of Corona virus and the turmoil it has caused in the oil and gas markets in addition to its negative impact on energy supply chain which in turn has affected project implementation plans globally.

As world economic activity resumes with precautionary measures together with the work in various sectors, renewable energy projects have continued to grow significantly, along with enhanced international attention to issues of accelerating the transition to renewable energy and more environmentally friendly practices in addition to growing global momentum towards emerging technologies and green hydrogen production together with storage technologies.

At the local level, 2020 has seen a rise in demand for investment in renewable energy, -both wind and solar energy projects- as well as increase in the energy generated from renewable energy which stop the disruptive effect of the pandemic.

Continuing its role in raising awareness of the importance of energy conservation and energy efficiency, NREA laboratories- in cooperation with national institutions-pay more attention to quality through testing PV cells components and solar heaters in accordance with the latest standards, in addition to testing many electrical appliances, refrigerators, dishwashers and clothes, air conditioners, to ensure high energy efficiency, also a program was conducted to certify solar cells installer. This reflects positively on the deployment of small and medium-solar energy applications, maintaining a high level of efficiency.

NREA has also been working to confirm its leading role in preparing trained cadres to work in renewable energy fields and raising their capacities, whether university students or companies qualified to implement solar energy projects, or representatives of African countries. And for that NREA has implemented several training programs remotely and via video conferences in line with precautionary measures, as well as programs to raise the efficiency of workers in various fields of renewable energy. NREA has applied all occupational safety and health standards to reduce the spread of the Corona pandemic in all its sites.

Under this momentum, the positive role of renewable energy in generating clean energy is expected to grow attracting foreign direct investment and creating jobs in different sectors .

**Fuel saving**

**4.7**

**Million Tone of Oil Equivalent**

**24688**

**Million kWh**

**Total Energy Produced**

**5982**

**MW**

**Total Installed Capacity**

**15119**

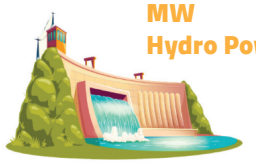
**Million kWh**

**Hydro Power Plant**

**2832**

**MW**

**Hydro Power Plant**



**4696**

**Million kWh**

**Wind Energy**

**1375**

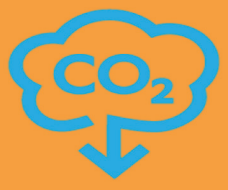
**MW**

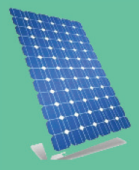
**Wind Energy**

**13.6**

**Million Ton Co2**

**Co2 Emission Reduction**



**4316**

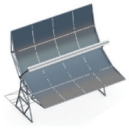
**Million kWh**

**PV**

**1623**

**MW**

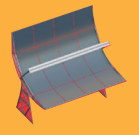
**PV**



**526**

**Million kWh**

**CSP**



**140**

**MW**

**CSP**

**30**

**Million kWh**

**Biomass**

**12**

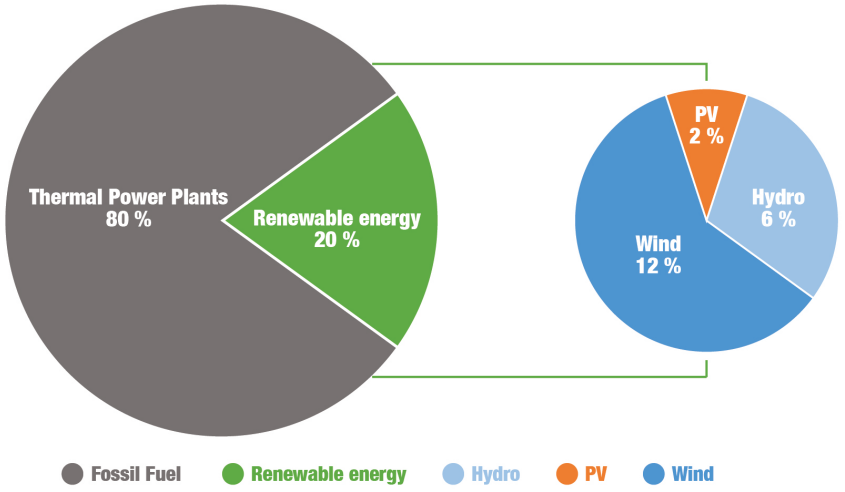
**MW**

**Biomass**

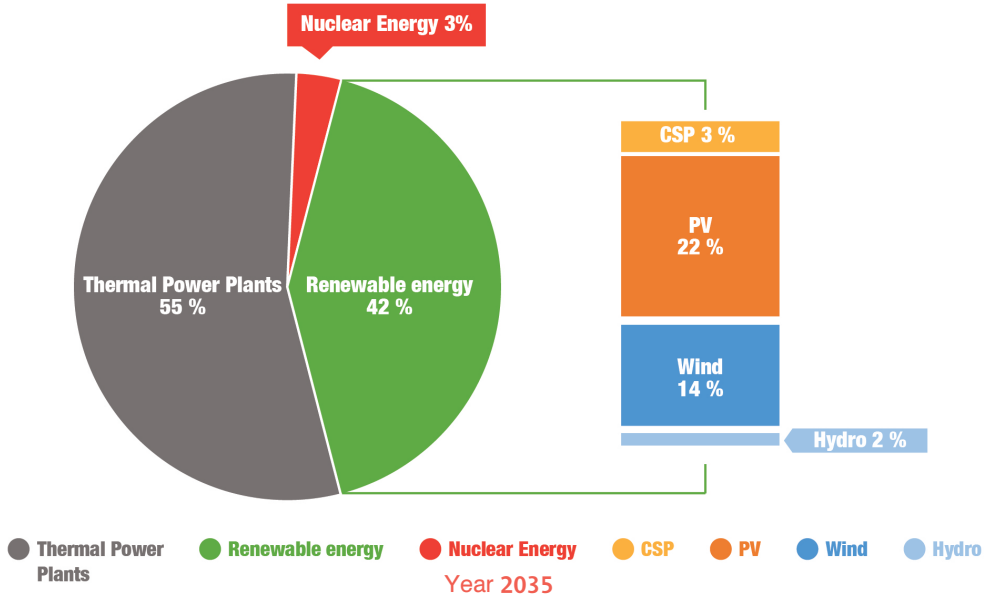
## Electricity Statistics

| Description | | 2017/2018 | 2018/2019 | Variation % |
|---|---|---|---|---|
| **Total Installed Capacity [1]** | **MW** | **55213** | **58353** | **5.7** |
| Hydro | MW | 2832 | 2832 | - |
| Thermal (Affiliated Companies & EEHC Plants) [2] | MW | 49176 | 51226 | 4.2 |
| New and Renewable Energy (Wind & Solar) [3] | MW | 1157 | 2247 | 94.2 |
| Private Sector BOOT (Thermal) | MW | 2048 | 2048 | - |
| Peak Load | MW | 30800 | 31400 | 2 |
| **Total Power Generated** | **GWh** | **196760** | **199843** | **1.6** |
| Hydro | GWh | 12726 | 13121 | 3.1 |
| Thermal [4] | GWh | 169380 | 170440 | 0.6 |
| New and Renewable Energy [5] | GWh | 2871 | 4543 | 58.2 |
| Energy Purchased from (IPPs) | GWh | 42 | 43 | 2.4 |
| Private Sector (BOOT) | GWh | 11626 | 11554 | (0.6) |
| Power Generated from Isolated Plants | GWh | 115 | 142 | 23.5 |
| **Total Fuel Consumption [6]** | **Ktoe** | **37335** | **34778** | **(6.8)** |
| Production Companies (including EEHC Plants) | Ktoe | 34935 | 32309 | (7.5) |
| Private Sector (BOOT) | Ktoe | 2400 | 2469 | 2.9 |
| Fuel Consumption Rate at Production Companies (gen.) | gm/KWh | 206.3 | 189.6 | (8.1) |
| Fuel Consumption Rate, including BOOT (gen.) | gm/KWh | 206.3 | 191.1 | (7.4) |
| Thermal Efficiency (including Private Sector BOOT) | % | 42.5 | 45.9 | 8 |
| N.G Ratio to Total Fuel including BOOT | % | 84.4 | 92.8 | 10 |
| N. G ratio for power plants connected to gas grid Including BOOT | % | 85.5 | 94.7 | 10.8 |
| T. Length of Transmission Lines & Cables on HV & Extra HV | Km | 46890 | 48832 | 4.1 |
| T. Substation Capacities on HV and Extra HV | MVA | 130868 | 145840 | 11.4 |
| T. Length of Distribution MV&LV Lines and Cables | Km | 486608 | 522606 | 7.4 |
| T. Capacity for distribution transformers MV&LV | MVA | 79620 | 86224 | 8.3 |
| No. of Customers at Distribution Companies | Million | 35.1 | 36.4 | 3.7 |
| No. of Customers at EETC | Customer | 134 | 139 | 3.7 |
| No. of Employees at EEEC and Subsidiaries | Thousand | 161.6 | 156.8 | (2.9) |

1- There are isolated plants with a total installed capacity of 205 MW.
2- EEHC plants (Beni Suef - Burullus - New Capital) Units have been implemented in - Cooperation with Siemens.
3- Include the solar component of kuriemat Solar/Thermal Plant 20 MW.
4- Include operation test and EEHC Plants.
5- Connected to the national unified grid (wind & solar).
6- In addition to the total consumed fuel at the isolated plants amounting to 30.2 K toe.




Year 2022




Year 2035

Source: tares scenario 4b

## Renewable Energy Regulations

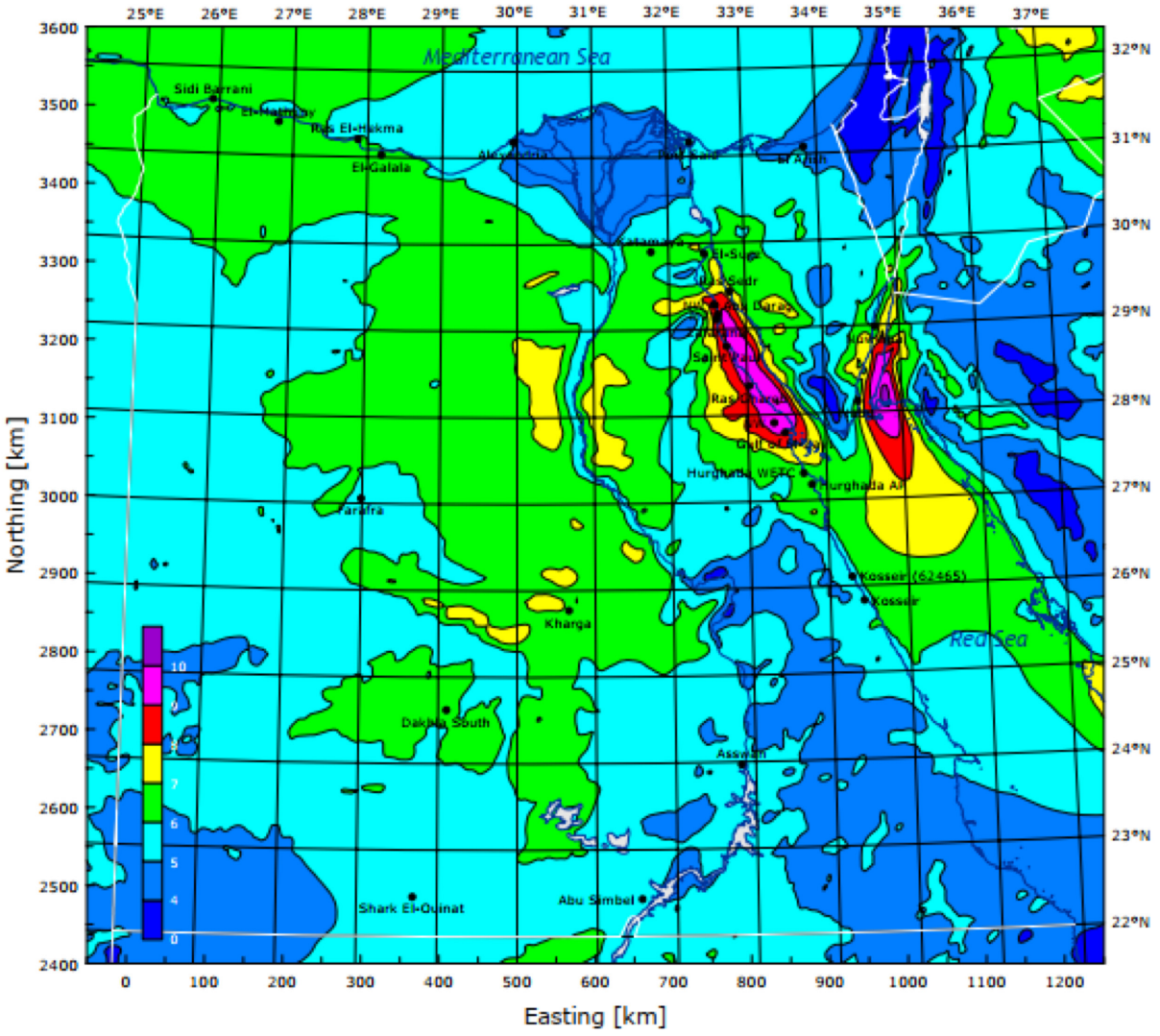
| | |
|---|---|
| MAY 2020 | Periodical Decree No. 2/2020 Restructuring the Net Metering Scheme. |
| OCT 2019 | Cabinet Decree for Electricity Prices for Biomass under Fit scheme. |
| AUG 2017 | Periodical Decree No. 3 / 2017 Net meterings scheme for photovoltaic projects up to 20 MW. |
| OCT 2016 | Presidential Decree No. 116 / 2016 for allocating around 7600 km2 of arid areas to NREA to be used in implementing renewable energy projects. |
| SEP 2016 | Cabinet Decree No. 2532 / 2016 the Second Round of Fit-in Tariff Mechanism. |
| JUL 2015 | The Electricity Law No.87 / 2015. |
| DEC 2014 | Renewable Energy Law No. 203 / 2014. |
| OCT 2014 | Presidential Decree No. 135 / 2014, OF NREA. |
| SEP 2014 | Cabinet Decree No.1974 / 2014, The First round of Fit in Tarrif Mechanism. |
| JUL 2014 | Electricity Tariffs Reform. |
| JUL 1986 | Law No. 102 / 1986, Presidential Decree on the establishment of New and Renewable Energy Authority. |


Gamesa

## Renewable Energy Investment Mechanisms

| | |
|---|---|
| **Tenders EPC** | Governmental projects tendered and owned by NREA for design-supply and construction of projects. |
| **Build-Own-Operate Projects BOO** | EETC invites private investors to submit their offers for specific capacities and the award will be made to the lowest kWh price. |
| **Feed in-tariff** | EETC invites private sector company to bid for projects and sell electricity to the grid. |
| **Auctions** | Projects announced by the state and the award will be made according to the lowest price. |
| **Net metering** | Grid-connected solar PV projects up to 20 MW. |
| **Independent Power Producers IPP** | Projects implemented by private sector investors either to feed their own loads or to sell it to their own consumers. |

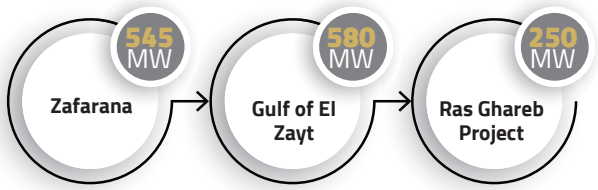
# Kom Ombo PV Power Plant 26 MW



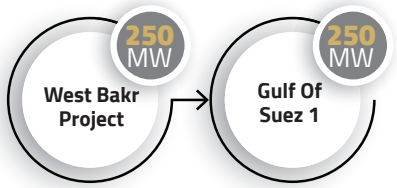

The map shows the mean wind speeds in [ms-1] at a height of 50 m over the actual (model) land surface. The horizontal grid point resolution is 7.5 km.

Source: Egypt Wind Atlas

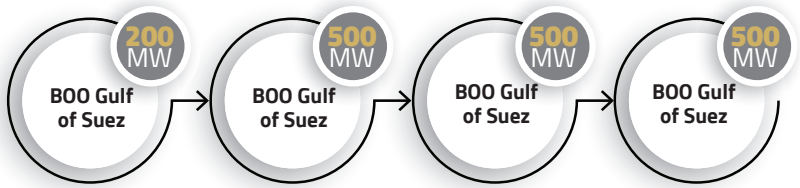
**1375MW**
**Installed Capacities**



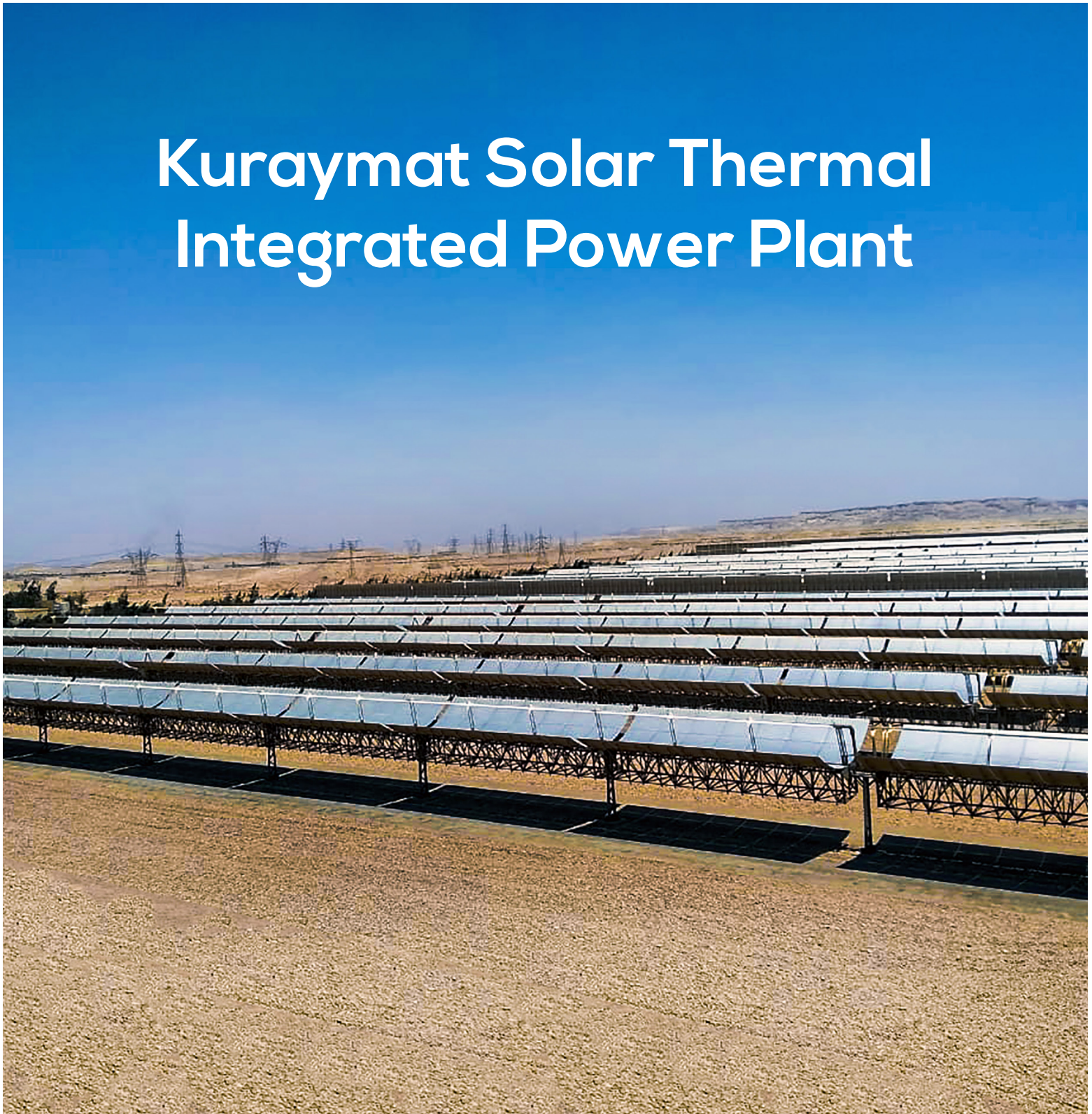

**500MW**
**Projects Under Construction**




**1700MW**
**Projects Under Development**

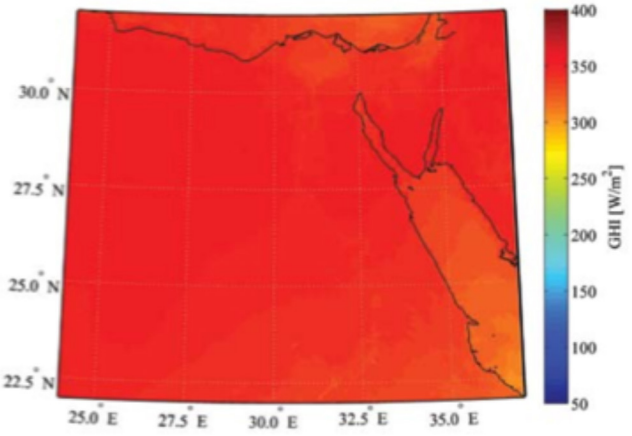


# Kuraymat Solar Thermal Integrated Power Plant

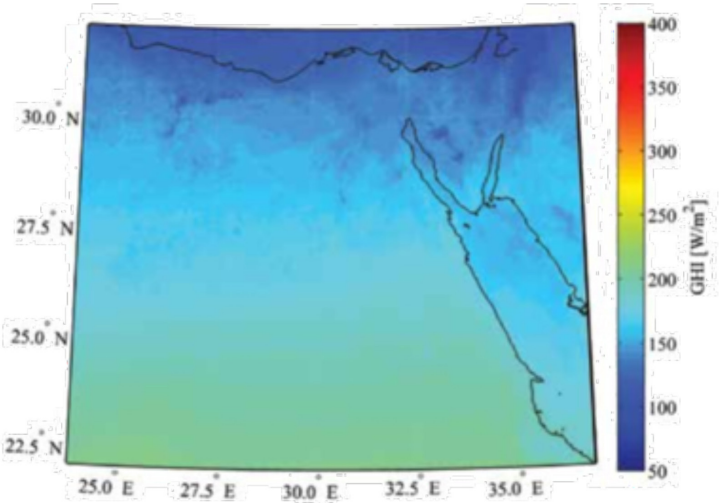



Source: Egypt Solar Atlas

## Average Solar Radiation



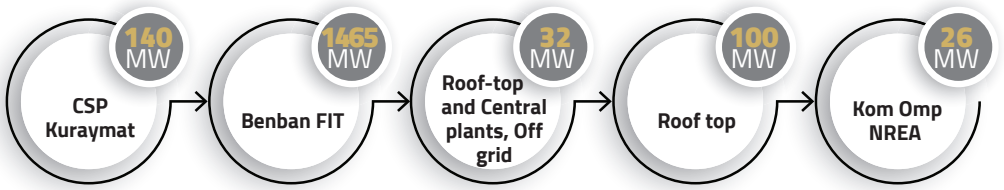

**Average of solar irradiance in July**
**Max. radiation**



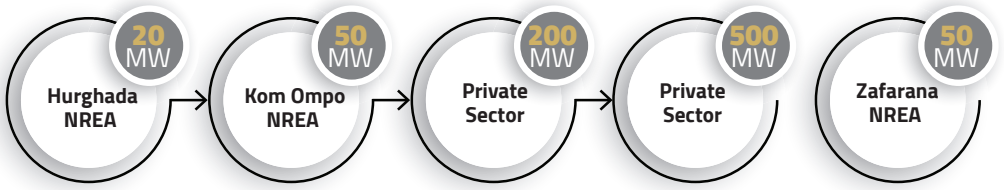

**Average of solar irradiance in December**
**Min. radiation**

Source: Egypt Solar Atlas

**1763MW**
**Installed Capacities**




**820MW**
**Projects Under Development**



## Grid Connected Small Scale Solar Systems Project " Egypt-PV"

Within the framework of joint cooperation to disseminate solar energy applications, NREA works with the Egypt-PV small solar cell systems project, which is implemented by the Industrial Modernization Center (IMC) in cooperation with the United Nations Development Program (UNDP) and funded by the Global Environment Facility (GEF).

The project is designed to promote the use of small solar cell systems with capacities less than 500 kilowatts, with a view to opening markets and creating replicable models, in addition to providing technical and financial support for these projects.

Accordingly, the project provided technical and financial support for the installation of about 130 pilot stations for electricity generation from solar cell systems in various sectors: government, industrial, residential, tourist and commercial, where nearly 100 projects were completed and other projects are still under implementation, and the results indicate the ability of some to achieve savings in the consumption of electric energy, the proportion of nearly 75% in some sectors which indicates the ability of solar cell systems to provide appropriate solutions for the supply of electricity in different sectors.

Depending on the strategy of diversifying the targeted sectors, the project contributed to the implementation of a solar cell plant in one of the largest hotels in the capital to meet consumption needs of the hotel, which led many other hotels in the governorates of Aswan, Sinai and the Red Sea to install these systems.

Besides, the project contributed to the implementation of a solar cell station in the Educational Buildings Authority, and developed a pilot model for educational facilities implemented in two international schools, one in New Cairo and the other in the city of Sixth of October, in addition to being a pilot project to be followed by other schools, it provides a realistic model for increasing awareness of the topics of renewable energy and the environment for students.


In the same framework, the project contributed to installing a solar station in one of the major commercial chains, as well as in two housing complexes on the roofs of 75 villas, as well as providing technical and financial support to the National Center for Housing and Building Research and the administrative capital to install similar stations with a total capacity of 15 megawatts.

Capacity: **150 kWP**
Location: **Hurghada**
Sector: **Tourism**
Payback: **5 Years**

The total capacities that the project participated in implementing, whether through technical or domestic support, reached about 10 megawatts with total investments amounting to 129 million Egyptian pounds, of which 16 million pounds are non-refundable grants, which contributes annually to reducing about ten thousand tons annually of carbon dioxide emissions, and avoids Natural gas consumption by 1.5 million cubic meters.

In order to spread the successful experiences and benefit from the accumulative experiences, project studies were documented and published to specialists to confirm the technical and financial feasibility of solar cell systems, which led to a high level of interest from the consumption sectors in general, and the industry and tourism sectors in particular, along with a high level of customer awareness of the technical and financial aspects of projects .

The project had prepared a guiding list of solar cell system installation companies that included about fifty companies with the aim of ensuring the quality of products and installations, and as a guide to the list of companies registered with the authority, the project relied on preparing them on previous experiences of these companies. The project also trained about 200 engineers to design and implement systems Solar cells and preparation of an implementation guide linked to a simplified model of calculations for such stations.

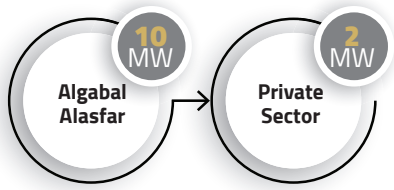
In addition, the project is working with the authority to establish an electronic platform for services of small and medium solar cell systems PV Hub, with the aim of linking the authority, the electricity distribution companies, the Electricity Regulatory Facility, consumer protection and solar system installers, and automating the procedures related to small and medium solar cell projects In addition to monitoring the development of the market and inventory of installed capabilities, evaluating the performance of legislations and working with their development.

Capacity: **383 kWP**
Location: **New Cairo**
Sector: **Educational**
Payback: **5.5 Years**

Moreover,the project operate with NREA to establish an electronic platform for small and medium PV systems and their related services. The aim of these electronic platforms is to link NREA with transmission co.,EgyptERA and solar installers and to mechanize procedures related to small and medium PV projects. In addition, the platform monitor the evolution of markets, take inventory of the installed capacities and evaluate the legislation performance.

# We Invest on Capacity Building to Improve the Human Factor

**12MW**
**Installed Capacities**

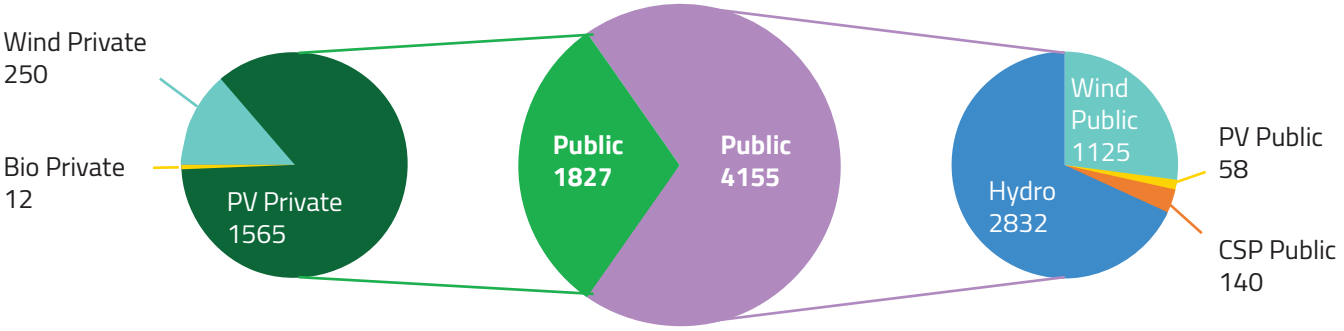



**3MW**
**Projects Under Construction**


**51MW**
**Projects Under Development**

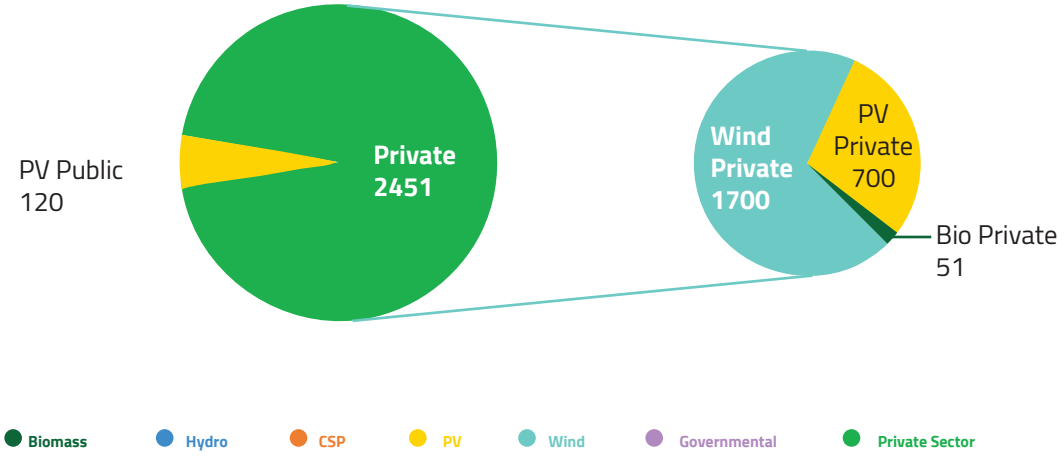

**300MW**
**Planned Projects**

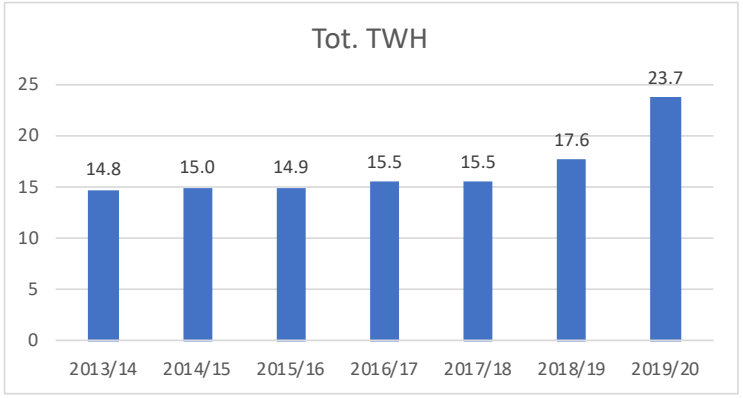
## Installed




## Under Construction


## Under Developmetn




Tot. TWH
25
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15
10
5
0
14.8
15.0
14.9
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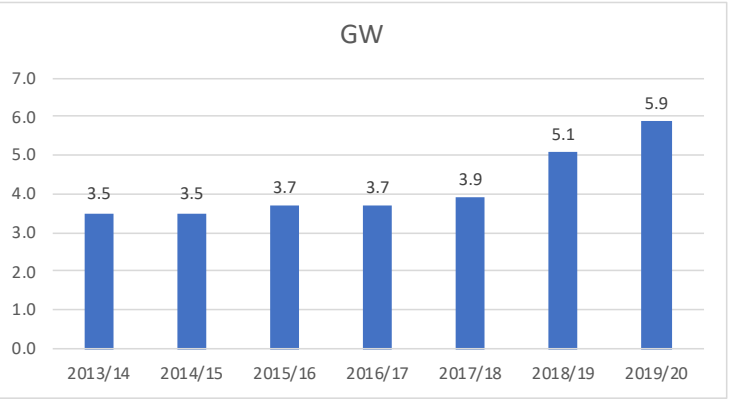
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20


GW
7.0
6.0
5.0
4.0
3.0
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1.0
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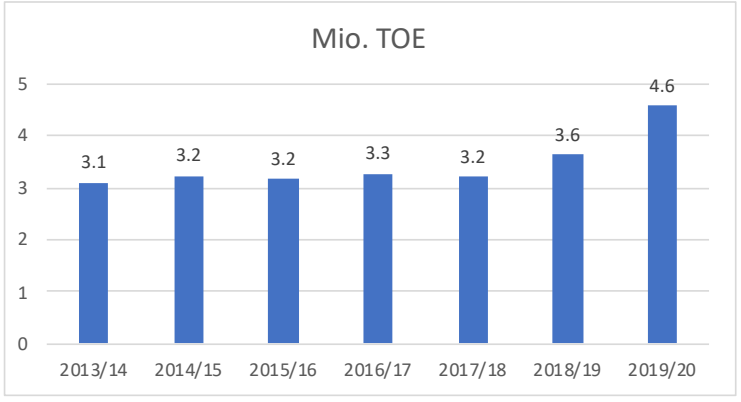
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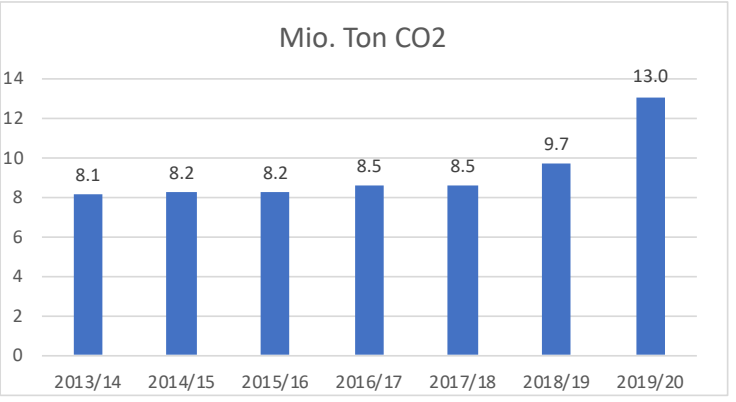
3.2
3.3
3.2
3.6
4.6
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20


Mio. Ton CO2
14
12
10
8
6
4
2
0
8.1
8.2
8.2
8.5
8.5
9.7
13.0
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20

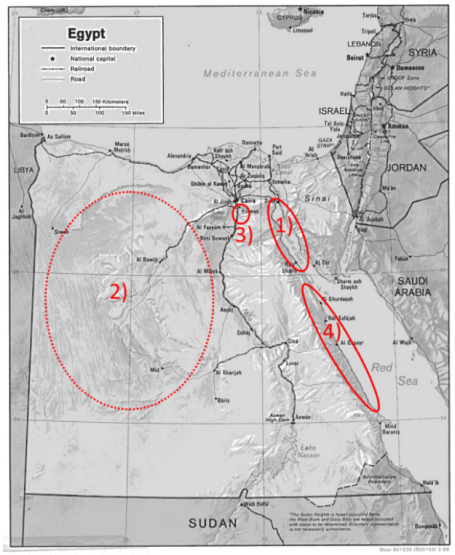

20% of workers in renewable energy are women

## Geothermal Energy

Ganope co

New & Renewable Energy Authority
هيئة الطاقة الجديدة والمتجددة

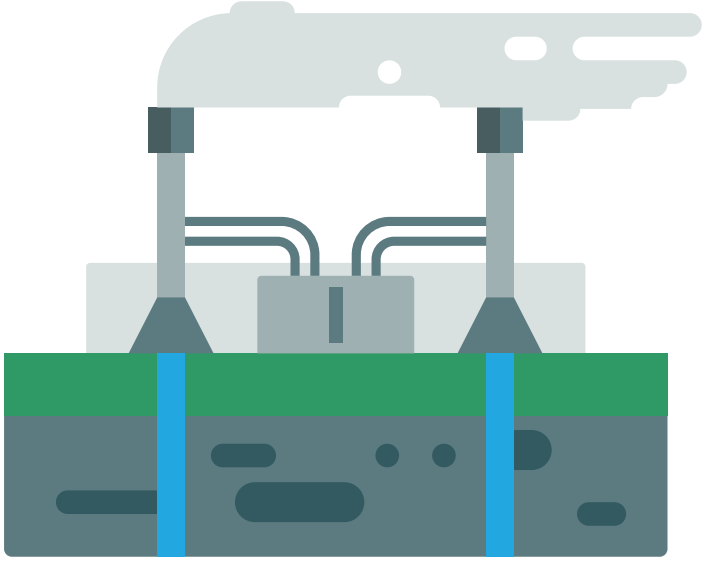
Helwan Observatory




A memorandum of understanding was signed between NREA, Ganope co. and Helwan Observatory to conduct a economic and technical feasibility study for the possibility of stablishing geothermal projects and Atlas for promesing sites.

The identified sites are:

1- Gulf of Suez
2- Western Sahara
3- Red sea
4- South valley



## Electrical Vehicles ( e-Mobility )

**Dec.** The minister of Trade and Industry Decree no. 255 for the year 2018 on regulating export of used cars.

**Dec.** Presidential Decree no. 419 for the year 2018 on exemption of e-vehicles from custom duties.

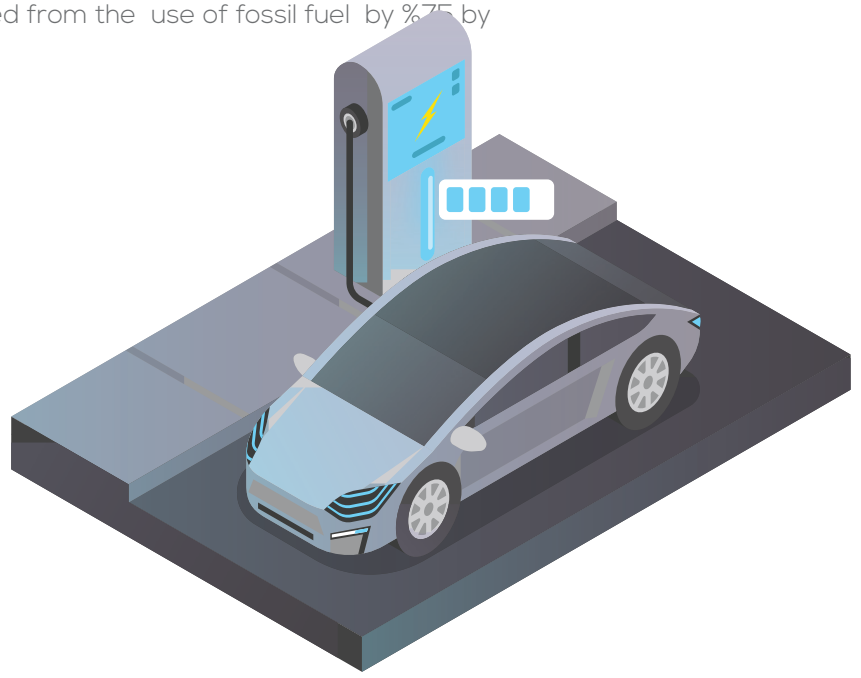
NREA cooperate with different international bodies (ie: World bank, GIZ and KfW) to consider the possibility of E-Vehicles entry to the market and determine the share of renewable energy. The cooperation would include the project feasibility study, market research, infrastructure, and charging stations.
The Minister of Military Production will have been developed E-Vehicles industry strategy by the year 2040 in cooperation with china.

### Pillars of industalization strategy and promoting the use of E-vehicle :-

- Establish local manufacturing.
- Acquire e-vehicle industalization technology with %65 by the end of 2030.
- Egypt will be at the forefront of E-vehicles exporters by the end of 2040.
- Increase the market share of e vehicle in the Egyptian markets by the end of 2030 and %5 by the year 2040.
- Increase the rate of the industrial output to %50
- Reduce the health and environmental risks resulted from the use of fossil fuel by %75 by the year 2040.
- Prepare infrastructure.
- Establish public and private charging units.
- Increase grid capacity to cope with high loads.
- Improve current vehicles.
- Substitute obsolete cars.

### Strategy phases:

- 1st phase (2019-2024).
- 2nd phase (2025-2030).
- 3rd phase (2031-2040).

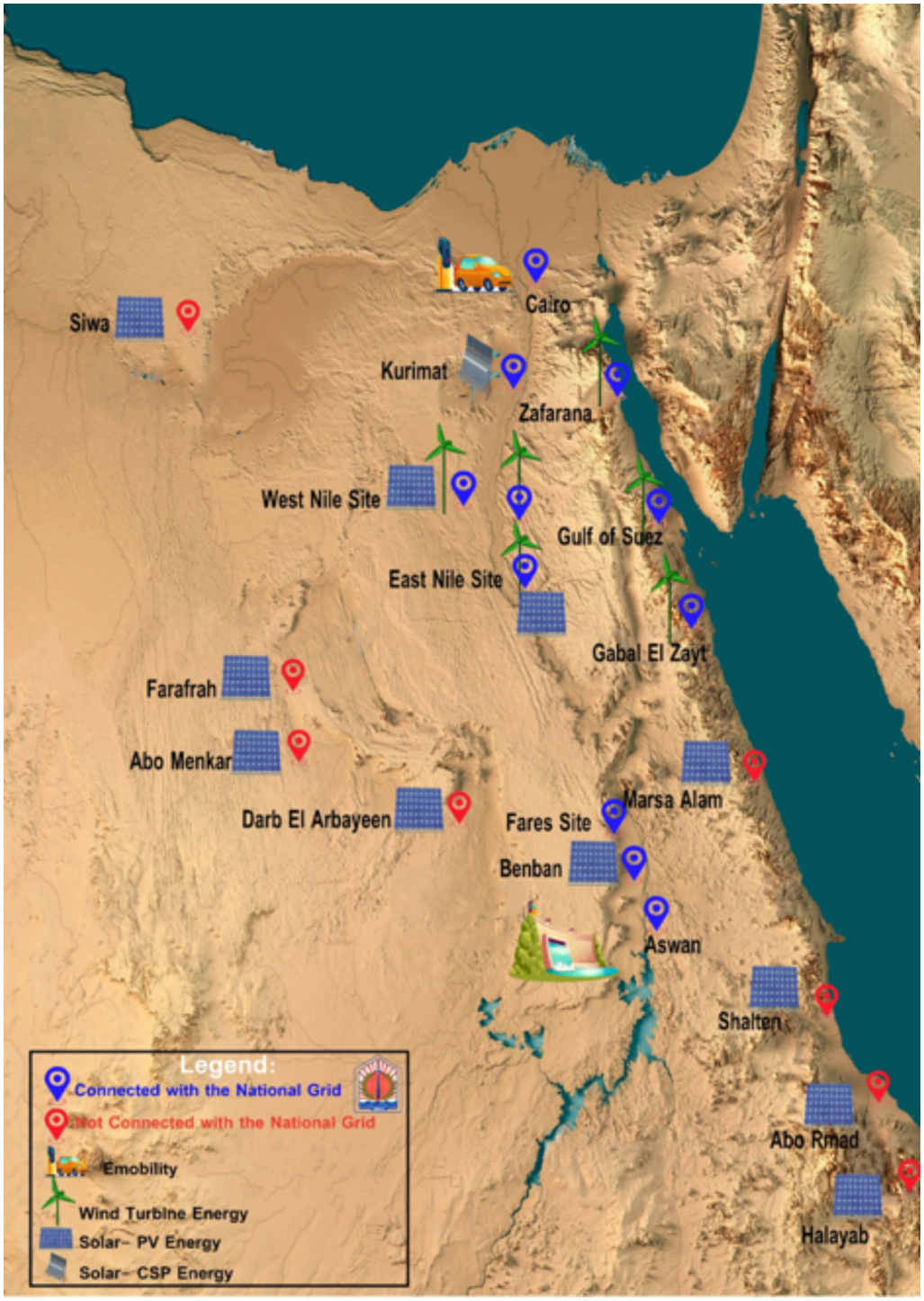


## Private Sector Projects

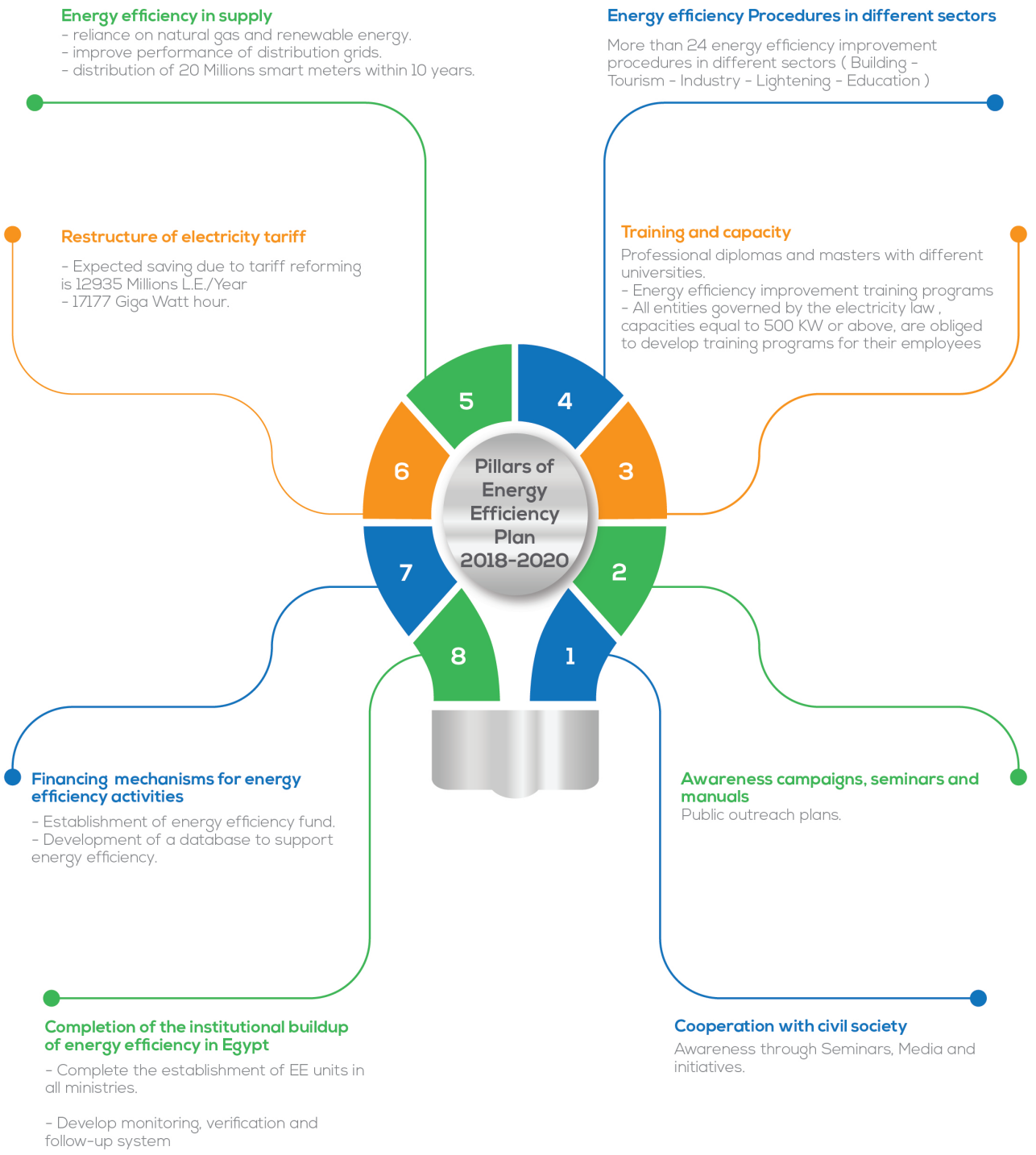
| | Installed | | | | Under Construction | | Under Development | | |
|---|---|---|---|---|---|---|---|---|---|
| Technology | Wind | PV | | Bio | Wind | Bio | PV | Wind | Bio |
| | | FIT | NetMetering | | | | | | |
| Project Name | Ras Gareb Project | Benban Solar Complex | NetMetering | Bio Energy | West Bakr Project | Bio Energy | Private Sector | Private Sector | Private Sector |
| Capacity (MW) | 250 | 1465 | 100 | 12 | 250 | 3 | 200 | 500 | 51 |
| Plant Name | | | | | | | Al Nowais | Siemens | |
| Capacity (MW) | | | | | | | 500 | 500 | |
| Plant Name | | | | | | | | Private Sector | |
| Capacity (MW) | | | | | | | | 200 | |
| Plant Name | | | | | | | | Private Sector | |
| Capacity (MW) | | | | | | | | 500 | |
| Sum | 250 | 1465 | 100 | 12 | 250 | 3 | 700 | 1700 | 51 |
| **Sub Total** | **1827** | | | | **253** | | **2451** | | |
| Total | **4531** | | | | | | | | |

| | Installed | | | Under Construction | Under Development |
|---|---|---|---|---|---|
| Technology | Wind | Solar | | Wind | PV |
| | | PV | CSP | | |
| Project Name | Zafarana Wind Complex | Roof-top and Central PV plants Off Grid | Kuraymat Concentrated Solar Cell | Gulf Of Seuz 1 | PV Plant Hurghada |
| Capacity (MW) | 545 | 32.00 | 140 | 250 | 20 |
| Development Parties | Germany - Denmark - Spain- Japan | United Arab Emirates | Japan -Spain | EU - Germany- AFD | JICA |
| Project Name | Gulf Of Zeit Wind Complex | PV Plant Kom Ombo | | | PV Plant Kom Ombo |
| Capacity (MW) | 580 | 26.00 | | | 50 |
| Development Parties | EU - Germany - Spain - Japan | France (AFD) | | | Arab Fund |
| Project Name | | | | | PV Plant Zafarana |
| Capacity (MW) | | | | | 50 |
| Development Parties | | | | | Germany (KFW) |
| Sum | 1125 | 58.00 | 140 | 250 | 120 |
| Sub Total | 1323 | | | 250 | 120 |
| Total | **1693** | | | | |

## Renewable Energy Projects Sites



# Working on automating NREA Services

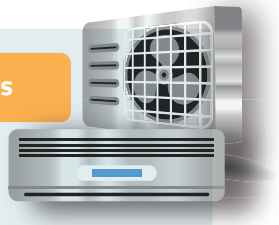

Energy efficiency in supply
- reliance on natural gas and renewable energy.
- improve performance of distribution grids.
- distribution of 20 Millions smart meters within 10 years.
Energy efficiency Procedures in different sectors
More than 24 energy efficiency improvement procedures in different sectors ( Building - Tourism - Industry - Lightening - Education )
Restructure of electricity tariff
- Expected saving due to tariff reforming is 12935 Millions L.E./Year
- 17177 Giga Watt hour.
Training and capacity
Professional diplomas and masters with different universities.
- Energy efficiency improvement training programs
- All entities governed by the electricity law , capacities equal to 500 KW or above, are obliged to develop training programs for their employees
5
4
6
3
Pillars of Energy Efficiency Plan 2018-2020
7
2
8
1
Financing mechanisms for energy efficiency activities
- Establishment of energy efficiency fund.
- Development of a database to support energy efficiency.
Awareness campaigns, seminars and manuals
Public outreach plans.
Completion of the institutional buildup of energy efficiency in Egypt
- Complete the establishment of EE units in all ministries.
- Develop monitoring, verification and follow-up system
Cooperation with civil society
Awareness through Seminars, Media and initiatives.


EOS
Egyptian Organization for Standard and Quality
G.O.E.I.C
General Organization for Export and Import Control
Private Sector
Local and Foreign Manufacturers
NREA Testing Labs

## Electrical Home Appliances Testing Labs

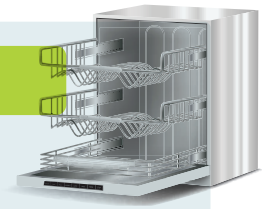
NREA's Home appliances testing labs granted its accreditation from the Egyptian Accreditation Council, EGAC.

**Air Conditioners** +1900



**Refrigerators** +3800

**Dish Washers** +150



**Performed Tests**

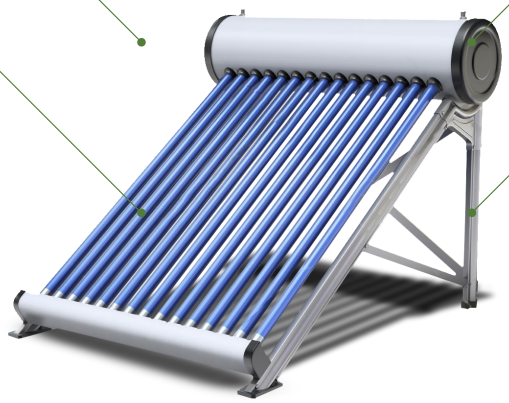
**Washing Machines** +3400

**Solar Water Heaters** +77

**Electric Heaters** +600

The SWHs Testing Lab was established in jan. 2017 to be aligned with the latest international standards ISO 9806 and EN12976. it›s the biggest lab in the MENA region. It participates in the Solar Heating Arab Mark and Certification initiative (SHAMCI) and also participates in an initiative to use of Solar Water Heaters in industrial sector in cooperation with UNIDO. The lab provide technical service for local companies working in that field.

# Solar Water Heaters Tests

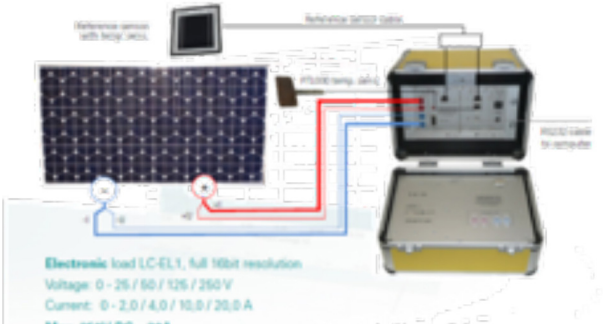


- External Thermal shock
- Exposure test
- Impact resistance test
- Pressure drop test
- Static pressure test
- Internal Thermal shock test
- Effeicency test for water collectors
- Freez test
- Mechanical load test
- Effeicency test for air collectors
- Rain penetration test
- Performance system test

PV lab tests the efficiency of PV components ; whether locally manufactured or imported in accordance to the latest Standards (IEC Standard 61215). It also provides consultancy services to the installed PV solar power plant, in addition to conducting Research and Development.

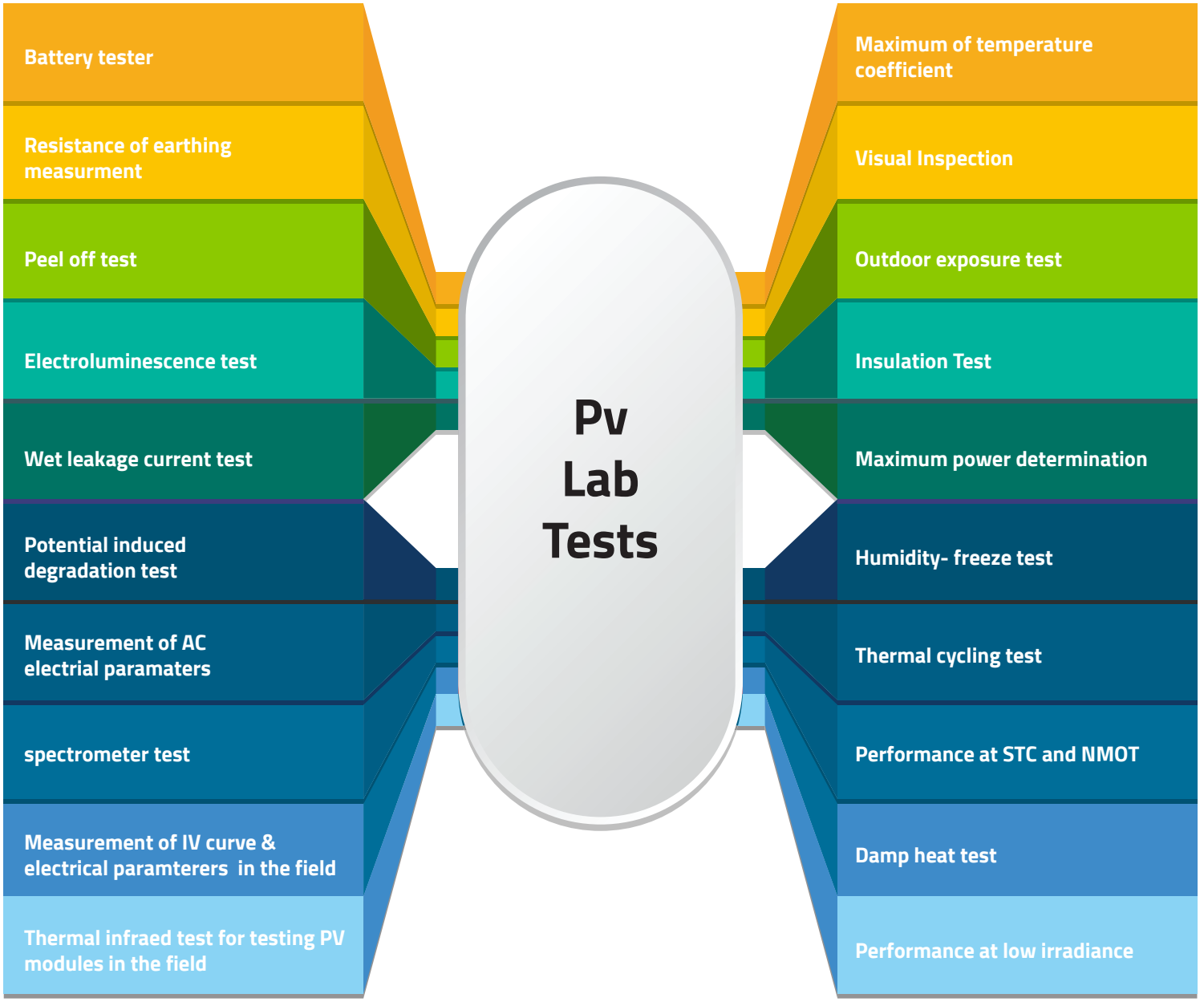
## Some of PV Lab Devices

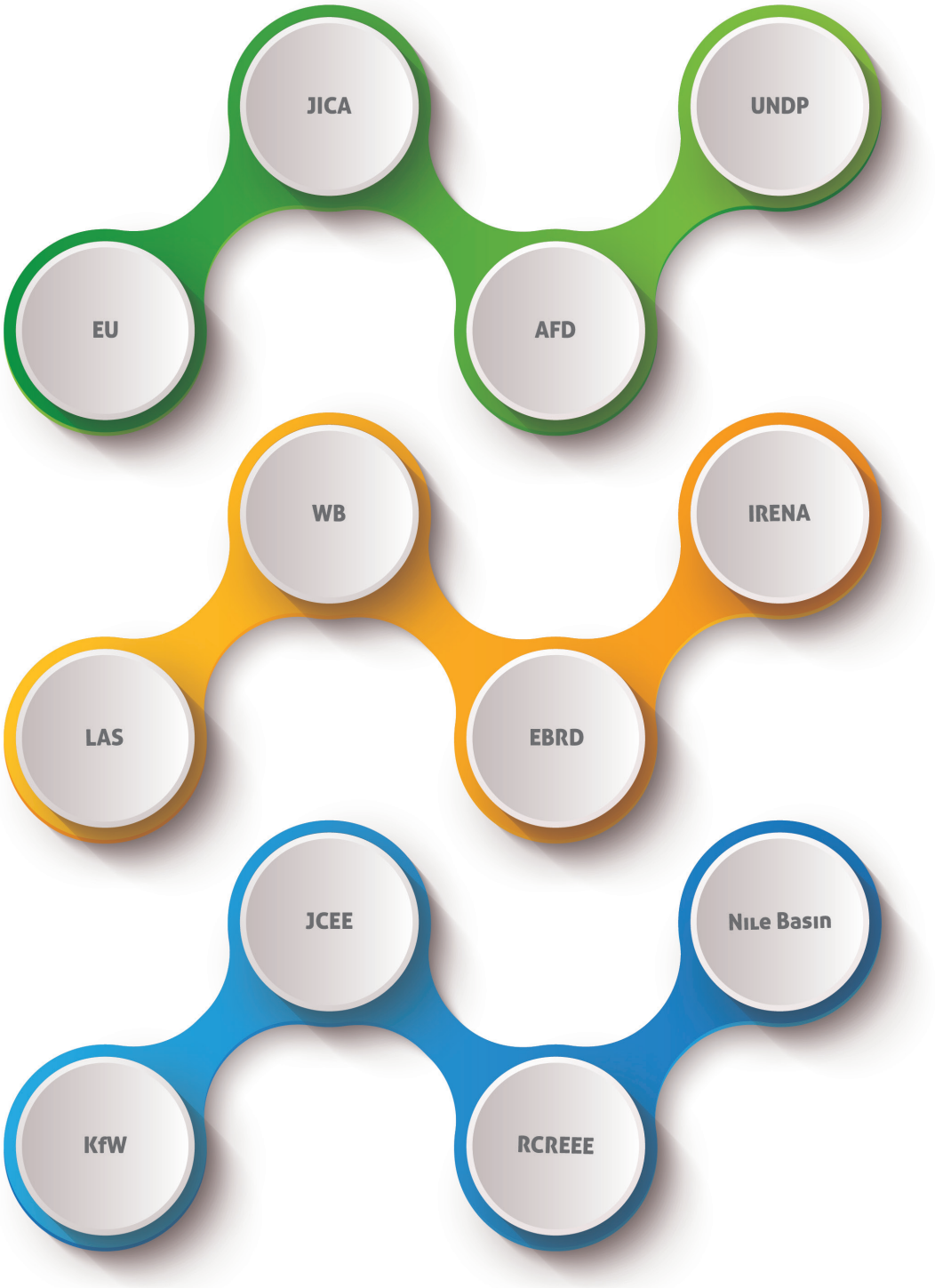
Sun simulator




Measuring the electrical Characteristics of the PV module drawing the I.V curve.


Electroluminenance test

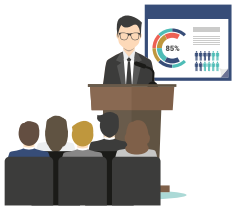

Battery tester
Resistance of earthing measurment
Peel off test
Electroluminescence test
Wet leakage current test
Potential induced degradation test
Measurement of AC electrial paramaters
spectrometer test
Measurement of IV curve & electrical paramterers in the field
Thermal infraed test for testing PV modules in the field
Pv Lab Tests
Maximum of temperature coefficient
Visual Inspection
Outdoor exposure test
Insulation Test
Maximum power determination
Humidity- freeze test
Thermal cycling test
Performance at STC and NMOT
Damp heat test
Performance at low irradiance


JICA
UNDP
EU
AFD
WB
IRENA
LAS
EBRD
JCEE
Nile Basin
KfW
RCREEE



Within the framework of NREA›s concern to develop the training services complying with the international standards, NREA received the ISO 2015-9001. This came as a culmination of it›s efforts exerted during the previous years.

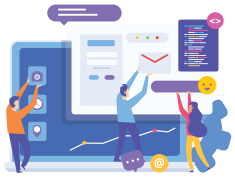
-Promoting NREA›s labs.
- Site visits arrangements.
- helding workshops and conferences.
- Training programs
- Arranging awareness campaigns




Training programs provided for basin countries.
435 trainee since 2011 to date.

Raising capacity building.
3293 employee since 1999 up tp date.


Specialized training courses in cooperation with (SOLARASIL Academy - GIZ - National Alliance for Knowledge)
316 trainee till 2020.



Newsletter page
www.nrea.gov.eg/media/news

Facebook Page
facebook.com/NREAegy


Training courses for university students.
4125 trainee since 2006 up to date.

# Health and safety first

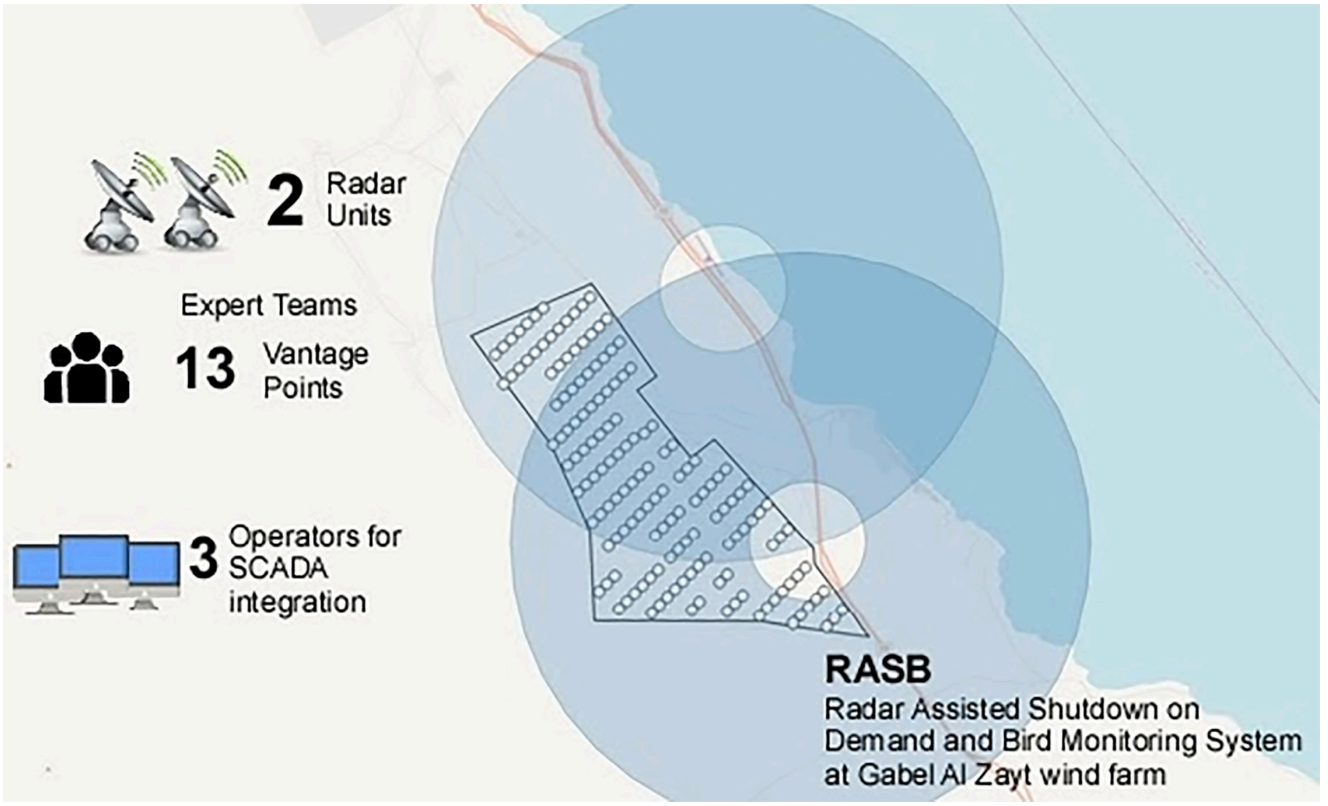
Within the framework of the NREA's commitment to environmental standards for renewable energy projects, a monitoring system has been established for migratory bird paths in the Jabal Al-Zayt region, which includes the wind energy complex with a total capacity of **580** MW. And the number of turbines reaches **290** turbines

- In order to preserve the birds during their transit, monitoring is carried out using two radars that allow monitoring birds from **12** km away before they reach the site and then determining their path and closing the site›s turbines as they pass through them, thus preventing collisions with the turbines, while restarting them after they leave the wind station, and that Since **2016**.

**Shutdown parameter:**

- Endangered species
- Groups of 10 or more hovercraft
- The risk of impending collision
- Sandstorms

## Application of the RASB system at 12 observation points and 2 radar units



| | |
|---|---|
| NREA | New and Renewable Energy Authority |
| AfD | L'Agence Française de Développement |
| BOO | Build , Own and Operate |
| CSP | Concentrated Solar Power |
| EBRD | European Bank for Reconstruction and Development |
| e-Mobility | Electro Mobility |
| EPC | Engineering Procurement & Construction |
| EU | European Union |
| FIT | Feed in Tariff |
| GWh | Gega Watt hour |
| IPP | Independent Power Producer |
| UNDP | United Nations Development Program |
| IRENA | International Renewable Energy Agency |
| JCEE | Egyptian - German Joint Committee on renewable energy, energy efficiency and environmental protection |
| JICA | Japan International Cooperation Agency |
| KfW | German government-owned development bank |
| k-tco2 | 1000 ton carbon dioxide |
| k-toe | 1000 ton oil equivalent |
| LAS | League of Arab States |
| MW | Mega Watt |
| PV | Photovoltaic |
| RCREEE | Regional Center for Renewable Energy and Energy Efficiency |
| WB | World Bank |


New & Renewable Energy Authority

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