Egypt Energy Transition

Investment in Green Projects

To the: Green Tech Business Mission
16th of May, 2022
Contents :

1- Situation in Summer 2014

2- Actions Taken to Overcome Generation Shortage

3- Upgrading Transmission Grid

4- Transition to Renewable Energy

5 – Investment Opportunities in Green Projects

6- Preparation for EGYPT’s hosting of COP27

7- Egypt is an Energy Hub for International Interconnections and Corridors
1- Situation in Summer 2014
Massive Electrical Power Outage
Electricity Deficit in Egypt till 2014

Egypt's power outages continue to intensify
#Energy
Analysis says that while the current crisis has been expected since the Mubarak era, it will take at least a couple of years to reverse the situation.

Massive power outage hits Egypt
Officials say nearly 30% of the country's electricity cut for several hours, Cairo trains halted during rush hour.

Major power outage hits Cairo and governorates
Electricity blackout hits large areas of Cairo and other towns on Thursday morning, minister blames 'technical problems'.
Challenges lead to the Importance of setting a new strategy of electricity Sector

Low Availability factor of power plant
Fuel Shortages & Load Shedding
Transmission Constrains and losses

Massive Electrical Power Outage
2- Actions Taken to Overcome Generation Shortage

Upgrading Generation Power Plant
Energy is considered a matter of national security.

The political leadership has placed the issue of electric energy within its main agenda as it is the main pillar for development in various fields of economic and social life.
Actions Taken to Overcome Generation Shortage

Load Shedding reached 6000 MW (Summer 2014)

An Immediate Action has been Taken to Overcome Generation Shortage

1. **Fast Track Plan**
   - Added Capacity: 3636 MW
   - Installed in 8.5 Months

2. **Completion of Under construction Power Plant**
   - Added Capacity: 4250 MW

3. **3 Mega Project Power Plants**
   - Added Capacity: 14400 MW installed in 2.5 years

4. **Energy Efficiency**
   - Added Capacity: 1840 MW without using an Extra Fuel.
Fast Track Plan

EPC + Finance

Added Capacity 3636 MW
Total Cost 2.7 Billion $
Commercial Operation In 8.5 Months

We Contracted with what was available in the Market for immediate installation (GE, Siemens, Ansaldo Energia)

West Damietta PP 500 MW
West Assuit PP 1000 MW
Mobile Units (40 x 25MW) Total 500 MW Distributed in Upper Egypt

Attaqa PP 640 MW
Port Said PP 84 MW
Sharm Elshiekh PP 288 MW

Hurghada PP 288 MW
Mahmoudia PP 336 MW
Completion of Under construction
Power Plants

Added Capacity 4250 MW
Total Cost 3.3 Billion $

Start Date | End Date
--- | ---
Sep. 2009 | March 2017

- Wind Farm (200 MW) 200 MW Completed totally
- SUEZ P.P (650 MW) 250 MW Completed
- North Giza P.P (2250 MW) 1250 MW Completed
- 6th October P.P (600 MW) 600 MW Completed totally
- Banha P.P (750 MW) 250 MW Completed
- Ain Sokhna (1300 MW) 1300 MW Completed totally

Totally Added Capacities in **One Year** (From January - December 2015)
Fast Track Plan + Completed Power Plants = 6886 MW
Mega Project Power Plants in cooperation with SIEMENS & Local Partners

Three Mega Power Plants
with Total capacity 14400 MW installed in 2.5 years
Work Started in the three Power Plants: (end 2015).

EPC + Finance Cost of 6 Billion Euro.
Mega Project Power Plants
in cooperation with SIEMENS & Local Partners

Egypt’s Energy Mega Projects
Siemens together with its local partners Orascom Construction and El Sewedy have developed and constructed 3 Turnkey Power Plants over 3 years.

- 133,000 Trips around the world
- 145,000,000 Hrs

- 7x Cables Used
  - 6,800,000 m
  - From North to South

- Back Filling
  - 84% Volume of the Great Pyramids of Giza
  - 4,207,000 m³

- Concrete Used
  - 85x The weight of the Sphinx
  - 845,700 m³

- 7x High Dam Production
  - 14,400MW
  - Power of 2.x Power Plants

- Steel Structure
  - 11x Weight of the Eiffel Tower
  - 78,000 t

The Combined Effort
- 24,600 Workforce
- 24,000 Main Hours
- 29,000m³ Concrete
- 845,700m³ Back Filling
- 4,207,000m³ Cables
- 3,750,000m³ Sand

The Achievements
- 14.4GW
- 254 Days
- 45% Increase in Egypt’s Power Capacity
- 68,000 Jobs Related to Health & Safety
- 3 Years Of Planning, Development, Construction & Installation

Ministry of Electricity & Renewable Energy (EGYPT)  Issue Date: 24/5/2022
Energy Efficiency
Converting simple cycle power plant into combined cycle power plant

- **Shabab P.P** adding 500 MW (Total capacity: 1500 MW)
- **Assuit P.P** adding 500 MW (Total capacity: 1500 MW)
- **West Damietta P.P** adding 250 MW (Total capacity: 750 MW)
- **6th October** adding 340 MW (Total capacity: 940 MW)
- **Extension W. Damietta** adding 250 MW (Total capacity: 750 MW)

- Converting simple cycle power plant into combined cycle power plant by adding **1840 MW without using an Extra Fuel.**
• The Reduction in CO2 Emissions in 2020/2021 comparing 2014/2015 about 26.2%

• The Reduction in Fuel Consumption 2020/2021 comparing with 2014/2015 about 16%
Installed Capacities Added from the End of 2014 till the End of 2021

Total Capacities Added About (29.8 Gigawatt) Equivalent to 14 Times the installed capacities from the High Dam
Ministry of Electricity & Renewable Energy (EGYPT)  Issue Date: 24 /5/2022

Generation performance during the Period from 2014 Deficit – April 2022 Surplus

Available Capacities not exceed 24.4 GW

Load shedding reached 6000 MW (summer 2014)

No Load Shedding since June 2015

August 2021 Peak Load 33.8 GW
During 7 years total investment cost of the Generation Power Plants over national Grid exceeds: 22 billion $
EGYPT By NIGHT (Satellite View)

During Year 2014

Now
3- Upgrading Transmission Grid
Upgrading the extra high voltage main transmission network.

- Investigate the impact of the growing demand on the transmission system infrastructure by 2025 and define the corresponding grid development measures.
- Set a target network topology as a guideline for the short term transmission planning phase.
Electricity Sector took An Urgent Majors to Upgrade Transmission Network to Keep Pace with the Generation Capacities increasing and the new Technology Added from Different source of Generation.

EGYPTIAN GRID 2025

Transmission Lines

Substations

Control Centers
Situation for 500KV Transmission Network By End of 2021

3078 km total length of 500 KV Grid

Adding more than 4125 KM
More than 130% the existing length in 2014

7203 km Total Length of 500 KV Grid
**Total Ultra & High Voltage Transmission Lines**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>2014 KM</th>
<th>2021 KM</th>
<th>Added KM</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 KV</td>
<td>3078</td>
<td>7203</td>
<td>4125</td>
</tr>
<tr>
<td>220 KV</td>
<td>17360</td>
<td>21396</td>
<td>4036</td>
</tr>
<tr>
<td>66 K.V.</td>
<td>19300</td>
<td>21003</td>
<td>1703</td>
</tr>
</tbody>
</table>

Development Since 2014

- 500 kv: 3078 KM, 7203 KM, 4125 KM
- 220 kv: 17360 KM, 21396 KM, 4036 KM
- 66 kv: 19300 KM, 21003 KM, 1703 KM
Situation for 500KV Substations By End of 2021

**SUBSTATIONS IN 2014**

- **10 SUBSTATIONS**
  - SS 500 K.V existing before 6/2014
  - 9800MVA Total 500 KV capacities

**SUBSTATIONS BY END 2021**

- **31 SUBSTATIONS**
  - SS 500 KV existing before 6/2014
  - SS 500 KV implemented /under implementation
  - 42300 MVA Total 500 KV capacities

Adding **21 substations** with total capacities of **32500 MVA** about **230 %** the existing in 2014
**Total Ultra & High Voltage Substations Capacities**

### Development Since 2014

<table>
<thead>
<tr>
<th>Voltage</th>
<th>2014 MVA</th>
<th>2021 MVA</th>
<th>Added MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 KV</td>
<td>9800</td>
<td>42300</td>
<td>32500</td>
</tr>
<tr>
<td>220 KV</td>
<td>40278</td>
<td>67553</td>
<td>27275</td>
</tr>
<tr>
<td>66 K.V</td>
<td>44397</td>
<td>63773</td>
<td>19375</td>
</tr>
</tbody>
</table>

### Diagram

- **MVA**
  - 2014
  - 2021

- **Voltages**
  - 500 kv
  - 220 kv
  - 66 kv

- **Added MVA**
  - 32500
  - 27275
  - 19375
During 7 years total investment cost of the Transmission network over national Grid exceeds: 4.6 billion $
# New and upgrading Control Centers in Transmission networks

## Completed After 2014

<table>
<thead>
<tr>
<th>No</th>
<th>Control Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Middle Egypt Regional Control Center</td>
</tr>
<tr>
<td>2</td>
<td>Upper Egypt Regional Control Center (upgrade)</td>
</tr>
</tbody>
</table>

## Under Construction

<table>
<thead>
<tr>
<th>No</th>
<th>Control Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Canal Regional Control Center (upgrade)</td>
</tr>
<tr>
<td>2</td>
<td>Cairo Regional Control Center (upgrade)</td>
</tr>
<tr>
<td>3</td>
<td>Alex Regional Control Center (upgrade)</td>
</tr>
<tr>
<td>4</td>
<td>Delta Regional Control Center</td>
</tr>
</tbody>
</table>

## Existing Before 2014

<table>
<thead>
<tr>
<th>No</th>
<th>Control Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>National Control Center</td>
</tr>
<tr>
<td>2</td>
<td>Cairo Regional Control Center</td>
</tr>
<tr>
<td>3</td>
<td>Backup Control Center</td>
</tr>
<tr>
<td>4</td>
<td>Alex Regional Control Center</td>
</tr>
<tr>
<td>5</td>
<td>West Delta Regional Control Center</td>
</tr>
<tr>
<td>6</td>
<td>Canal Regional Control Center</td>
</tr>
<tr>
<td>7</td>
<td>Egypt Regional Control Center</td>
</tr>
</tbody>
</table>
New Administrative City Control Center

This Control Center features advanced Software and Hardware equipment that will make Egyptian Grid efficient and adaptive to the new technologies and energy sources of the future and maintaining secure energy supply.

Project Expected to be Completed by the End of year 2022 With Total Investment Cost about 840 Mil. L.E
4- Transition to Renewable Energy
### Potentials from Wind & Solar Based on (Wind & Solar Atlas)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Areas (km²)</th>
<th>Capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suez Gulf (wind)</td>
<td>1220</td>
<td>3550</td>
</tr>
<tr>
<td>East Nile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>841</td>
<td>5800</td>
</tr>
<tr>
<td>Solar</td>
<td>1290</td>
<td>34900</td>
</tr>
<tr>
<td>West Nile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>3636</td>
<td>25350</td>
</tr>
<tr>
<td>Solar</td>
<td>606</td>
<td>17400</td>
</tr>
<tr>
<td>Benban (Solar)</td>
<td>37</td>
<td>2000</td>
</tr>
<tr>
<td>Kom Ombo (Solar)</td>
<td>7</td>
<td>260</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7637</strong></td>
<td><strong>≈90,000</strong></td>
</tr>
</tbody>
</table>

Yellow shaded cells represent the available areas as a whole.

Land has been deducted from 7600 Km² to **5200 Km²** for Development projects resulted in **reduction** in RE capacities from 90 GW – 77 GW
• Targeting : **20 % Renewable Energy** from Peak load by year 2022.

• **Targeting by year 2035 :**
  
  • **42 % Renewable Energy** from total Installed Capacity .

  • **18% Improvement in Energy Efficiency.**
Egypt’s Energy Mix by 2035

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
<td>21.13</td>
</tr>
<tr>
<td>Wind</td>
<td>14.04</td>
</tr>
<tr>
<td>CSP</td>
<td>5.52</td>
</tr>
<tr>
<td>Hydro</td>
<td>1.98</td>
</tr>
<tr>
<td>Conventional</td>
<td>57.33</td>
</tr>
</tbody>
</table>

- **2035 Strategy has Been Revised** and excluding COAL option from the Energy Mix and replaced it by Renewable Energy using (BOO) Scheme “will be shown later”
Egypt’s Energy Mix by 2035

Electricity production by plant type
Updated Scenario 4b

“Most likely” case shares

2013/2014

2025/2026

2029/2030

2034/2035
As a result of internal and external changes related to the energy sector, global economic changes, the emergence of new technologies such as green hydrogen, global trends regarding climate change and the green economy, and the decrease in the prices of renewable energies.

There is an urgent need to update the strategy to determine the possibility of increasing the participation of renewable energy in the Egyptian energy mix through excluding COAL option from the Energy Mix and replaced it by Renewable Energy.
Recent Updated Results From Renewable Energy

- In coordination with the European Union Commission in Cairo, it was agreed to provide technical support to update the scenarios of the integrated and sustainable energy strategy until 2035.

- A contract was made through the Commission with an international advisory office, which includes the same consultants who previously worked in preparing the original strategy in 2016.
# Incentives For Investments In Renewable Energy

Considering the Renewable Energy in our Energy Strategy until year 2035 to encourage private investments:

<table>
<thead>
<tr>
<th>Incentives For Investments In Renewable Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land has been allocated</strong> for renewable energy project: Solar and Wind has been allocated <strong>5200 Km2</strong></td>
</tr>
<tr>
<td>Availability of information concerning <strong>Solar Atlas and Wind (Available for all investors)</strong>.</td>
</tr>
<tr>
<td><strong>Environmental Impact Assessment Studies</strong>.</td>
</tr>
<tr>
<td><strong>Long Term bankable PPAs</strong>.</td>
</tr>
<tr>
<td><strong>Custom duties</strong> for all imported materials and equipment do not exceed <strong>2%</strong>.</td>
</tr>
<tr>
<td><strong>Sovereign Guarantees</strong> issued by Ministry of Finance.</td>
</tr>
</tbody>
</table>
Private sector investments will play major role in achieving the target through a framework mechanisms.

**Framework for Renewable Energy Development Mechanisms**

- **Auctions**
- **FIT Scheme**
  - 32 PPA Signed
  - with total capacities of **1465 MW**
- **Renewable Energy Projects Mechanism till 2022**
- **New and Renewable Energy Authority NREA**
  - EPC + Finance Scheme
- **BOO Scheme**
  - Latest Prices for
    - Solar: **2 cent $ / KWh**
    - Wind: **3 Cent $ / KWh**
## Recent Projects Contracts

<table>
<thead>
<tr>
<th>Company</th>
<th>Capacity (MW)</th>
<th>Technology</th>
<th>Price (cent $ / K.w.h)</th>
<th>Investment Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masdar</td>
<td>200</td>
<td>Wind</td>
<td>3</td>
<td>280</td>
</tr>
<tr>
<td>Acwa Power</td>
<td>200</td>
<td>PV</td>
<td>2.47</td>
<td>186 (Competitive Tenders)</td>
</tr>
<tr>
<td>Amea Power</td>
<td>500</td>
<td>PV</td>
<td>2</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Wind</td>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>ENGIE - Orascom-Toyota</td>
<td>500</td>
<td>Wind</td>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>Siemens – Gamesa</td>
<td>500</td>
<td>Wind</td>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>ACWA Power</td>
<td>1100</td>
<td>Wind</td>
<td>2.85</td>
<td>1400</td>
</tr>
</tbody>
</table>

**Total**                  | **3500**      | **4.4 Billion $** |
Benban Solar Park

Success Story of Private Sector Investment in Renewable Energy

Currently this project is considered largest in Middle East and Africa
Benban Solar Park
The largest in Middle East and Africa

<table>
<thead>
<tr>
<th>No. of Projects</th>
<th>Capacity (MW)</th>
<th>Total (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>50</td>
<td>1350</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Overall Installed Capacity</td>
<td></td>
<td>1465</td>
</tr>
</tbody>
</table>

Signed PPA: 32

Total Area for Solar Park: 37.1 Km Square

Total Investment: 2 Billion $

Workers:
- Job Created: More than 10000 during construction
- Direct Jobs: 2000
- Indirect Job: 1500 - 2000

CO2 emission: 2 million tons / year
Benban Solar Park
The largest in Middle East and Africa

The 4 largest Solar Power Plants in the World

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Solar Park</th>
<th>Capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>India</td>
<td>Bhadla</td>
<td>2245</td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>Huanghe</td>
<td>2200</td>
</tr>
<tr>
<td>3</td>
<td>India</td>
<td>Pavagada</td>
<td>2050</td>
</tr>
<tr>
<td>4</td>
<td>Egypt</td>
<td>Benban</td>
<td>1465</td>
</tr>
</tbody>
</table>

For the readiness of the infrastructure of the site it can be expanded to 2000 MW.
The Interim President of the WBG, Kristalina Georgieva announced that **Benban Solar Project (1465 MW) in Aswan** wins best project prize worldwide. An award that reflects the bank’s support for the economic reform program in Egypt and government plans to enhance the role played by the private sector in achieving comprehensive development.

November 2020 **Benban Solar Park wins the Arab Government Excellence Award as the best project to develop infrastructure from Arab League**
Benban Solar Park
The largest in Middle East and Africa

Commercial Operation for all 32 project
in area of (37 km²)

Benban Solar Park Layout

Satellite View: November 2019

Total installed Capacities 1465 MW and for the readiness of the infrastructure of the site it can be expanded to 2000 MW
Benban Solar Park
The largest in Middle East and Africa

Benban Solar Park connection to the grid

- 1 substation - 500 KV
- 4 substations - 22/22/20 K.V
### Private Sector Commercial Operation Date in Benban Solar Park

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>MW</th>
<th>Actual Operation</th>
<th>Expected Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFINITY</td>
<td>50</td>
<td>20 Feb. 2018</td>
<td>23 Feb. 2018</td>
</tr>
<tr>
<td>FAS</td>
<td>50</td>
<td>1 Aug. 2018</td>
<td>1 Jan. 2019</td>
</tr>
<tr>
<td>AL CAZAR</td>
<td>50</td>
<td>1 Feb. 2019</td>
<td>15 Jan. 2019</td>
</tr>
<tr>
<td>MMB</td>
<td>50</td>
<td>1 Mar. 2019</td>
<td>INFINITY BENBAN SOLAR PARK</td>
</tr>
<tr>
<td>TAQA ARABIA</td>
<td>50</td>
<td>5 Mar. 2019</td>
<td>1 Apr. 2019</td>
</tr>
<tr>
<td>INFINITY BENBAN SOLAR BARK</td>
<td>50</td>
<td>1 Mar. 2019</td>
<td>5 Mar. 2019</td>
</tr>
<tr>
<td>DELTA</td>
<td>50</td>
<td>1 April. 2019</td>
<td>30 Mar. 2019</td>
</tr>
<tr>
<td>PHOENIX</td>
<td>50</td>
<td>1 April. 2019</td>
<td>28 Feb. 2019</td>
</tr>
<tr>
<td>ASWAN PV</td>
<td>50</td>
<td>1 April. 2019</td>
<td>1 Apr. 2019</td>
</tr>
<tr>
<td>RISING SUN</td>
<td>50</td>
<td>28 Feb. 2019</td>
<td>31 Mar. 2019</td>
</tr>
<tr>
<td>SP ENERGY</td>
<td>50</td>
<td>31 Mar. 2019</td>
<td>28 Feb. 2019</td>
</tr>
<tr>
<td>SUN RISE</td>
<td>50</td>
<td>28 Feb. 2019</td>
<td>28 Apr. 2019</td>
</tr>
<tr>
<td>ACCESS EGYPT</td>
<td>50</td>
<td>28 Apr. 2019</td>
<td>30 Mar. 2019</td>
</tr>
<tr>
<td>ACCESS BUILDING</td>
<td>50</td>
<td>30 Mar. 2019</td>
<td>28 Feb. 2019</td>
</tr>
<tr>
<td>AL FANAR</td>
<td>50</td>
<td>1 May. 2019</td>
<td>1 May. 2019</td>
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<tr>
<td>DARAW</td>
<td>50</td>
<td>2 May. 2019</td>
<td>20 May. 2019</td>
</tr>
<tr>
<td>HORUS</td>
<td>50</td>
<td>1 June. 2019</td>
<td>1 June. 2019</td>
</tr>
<tr>
<td>UPPER EGYPT</td>
<td>50</td>
<td>3 June. 2019</td>
<td>10 June. 2019</td>
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<tr>
<td>ASWAN 21 EDF</td>
<td>50</td>
<td>18 Aug. 2019</td>
<td>15 April. 2019</td>
</tr>
<tr>
<td>EGCID EGYPTICAN COMPANY FOR SOLAR ENERGY</td>
<td>50</td>
<td>15 Aug. 2019</td>
<td>30 July 2019</td>
</tr>
<tr>
<td>TK</td>
<td>50</td>
<td>30 July 2019</td>
<td>1 Aug. 2019</td>
</tr>
<tr>
<td>ZAPARANA</td>
<td>50</td>
<td>31 Aug. 2019</td>
<td>31 Aug. 2019</td>
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<tr>
<td>ALCOM</td>
<td>50</td>
<td>30 July 2019</td>
<td>30 July 2019</td>
</tr>
<tr>
<td>KOMOMBO</td>
<td>50</td>
<td>31 Aug. 2019</td>
<td>31 Aug. 2019</td>
</tr>
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<td>ACWA</td>
<td>50</td>
<td>30 July 2019</td>
<td>30 July 2019</td>
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<tr>
<td>WINNERGY</td>
<td>50</td>
<td>31 July 2019</td>
<td>31 July 2019</td>
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<tr>
<td>ARINNA</td>
<td>50</td>
<td>31 July 2019</td>
<td>31 July 2019</td>
</tr>
<tr>
<td>RA SOLAR</td>
<td>50</td>
<td>1 Aug. 2019</td>
<td>1 Aug. 2019</td>
</tr>
<tr>
<td>ARC</td>
<td>50</td>
<td>15 Sep. 2019</td>
<td>15 Sep. 2019</td>
</tr>
</tbody>
</table>

**NOVEMBER 2019**

**ALL OF BENBAN SOLAR PARK PROJECTS (37KM²)**

**ENTER THE COMMERCIAL OPERATION BY 32 PRIVATE COMPANIES**

**USING FIT (PHASE 1 & 2)**

**WITH TOTAL INSTALLED CAPACITY 1465 MW**
As a result of electricity sector procedures to promote small scale generation from renewables

- Solar projects, up to 1 megawatt, would be exempted from the integration fees on the electrical grid.
- Hotels in Sharm El-Sheikh will also be powered by solar energy, through the spaces inside each hotel separately, using the net metering system.

Total Capacities of (Net Metering + Roof Top PV) = 120 MW)
Wind Energy (Current Installed Capacities)

- **New & Renewable Energy Authority (NREA)** With Total Capacities: 1125 MW
  - Zafarana wind farm: 545 MW
  - Gebl Ziet wind farm (1, 2, 3): 580 MW

- **Private Sector (FDI)** With Total Capacities: 500 MW
  - Consortium (Toyota, Orascom, ENGIE): 250 MW
  - Lekela Project: 250 MW

**Wind Total Installed Capacities:** 1625 MW
Hydropower Installed Capacities

High Dam: 2100 MW
Aswan Reservoir 1: 280 MW
Aswan Reservoir 2: 270 MW
Esna Barrage: 86 MW
Naga Hamadi Barrage: 64 MW
Assyut Barrage: 32 MW

Total Hydropower Installed Capacities: 2832 MW
### Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Capacity</th>
<th>Commercial Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Renewable Energy Installed Capacities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Hydro – Wind – Solar)</td>
<td>6128 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td><strong>Solar Project – PV</strong> (Under Construction)</td>
<td>820 MW</td>
<td>2022 / 2023</td>
</tr>
<tr>
<td><strong>Wind Projects</strong> (Under Construction)</td>
<td>1200 MW</td>
<td>2022 / 2023</td>
</tr>
<tr>
<td></td>
<td>1850 MW</td>
<td>2023</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>Approx. 10 GW</strong></td>
</tr>
</tbody>
</table>

- Installed Capacities of renewables (Hydro – Solar – Wind): 6128 MW (Approx. 20% of peak load)
- By End 2023, installed Capacities of Renewables reach approximately 10000 MW
5- Investment opportunities in Green Projects

1- Green Hydrogen Projects
2- EGYPT Green Energy Corridor
3- The Strategic Plan for Water Desalination from Renewable energy
4- Electric Vehicles
5- Waste to Energy
6- Private companies licensee in the field of electricity Generation & Distribution
Green Hydrogen

- Preparing The National Hydrogen Strategy
- Cooperation with International Companies
Preparing The National Hydrogen Strategy
Preparing The National Hydrogen Strategy

• 5\textsuperscript{th} March 2022 : MOU has been signed between EBRD, Ministry of Electricity and Renewable Energy, Ministry of Petroleum & Mineral resources to establish a national low-carbon hydrogen strategy, The strategy is expected to be completed before COP27 in November 2022.
## Preparing The National Hydrogen Strategy

<table>
<thead>
<tr>
<th>Task</th>
<th>Milestone</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Kick-off meeting</td>
<td>1 weeks from NTP</td>
</tr>
<tr>
<td></td>
<td>Inception Report – draft</td>
<td>3 weeks from NTP</td>
</tr>
<tr>
<td></td>
<td>Inception Report – final</td>
<td>5 weeks from NTP</td>
</tr>
<tr>
<td>1-4</td>
<td>Report on tasks 1 to 5 – draft</td>
<td>2 months from NTP</td>
</tr>
<tr>
<td></td>
<td>Report on tasks 1 to 5 – final</td>
<td>3 months from NTP</td>
</tr>
<tr>
<td></td>
<td>Case studies – single reports</td>
<td>4 months from NTP</td>
</tr>
<tr>
<td>5</td>
<td>Case studies – investment appraisal report – draft</td>
<td>4.5 months from NTP</td>
</tr>
<tr>
<td></td>
<td>Case studies – investment appraisal report – final</td>
<td>5 months from NTP</td>
</tr>
<tr>
<td>6</td>
<td>Workshop</td>
<td>5.5 months from NTP</td>
</tr>
<tr>
<td>-</td>
<td>Conclusion</td>
<td>6 months from NTP</td>
</tr>
</tbody>
</table>

NTP: Notice to Proceed
Cooperation with International Companies
August 2021 Germany’s Siemens Energy has signed a memorandum of understanding (MoU) with the Egyptian Electricity Holding Company (EEHC) to jointly develop hydrogen-based industry in Egypt with the capability for export based on the letter of intent. The agreement builds on a letter of intent signed in January 2021 between Siemens Energy and EEHC.
Green Hydrogen
Siemens

Partnership has to manage the scale up of a new industry
- H2 Roadmap for Egypt until 2030

Pilot project
- 100-200 MW project for early technology deployment
- Establish partner landscape
- Establish and test regulatory environment and certification schemes
- Setup off-take relations and logistics concepts
Start early 2022
24-36 months implementation

Scale-up
- 400-800 MW project size to maximize scale effects on existing (proven) technology
- Proof competitiveness for large scale export in global market
- Leverage large scale investment to foster local know-how build up
- Establish long term off-take relations
Start late 2024
24-36 months implementation

Industrialization
- 1.5 - 3 GW project size to establish large scale local industry
- Achieve cost competitiveness against conventional energy carriers based on Next-GEN technology and
- Leverage local value addition
Start 2027+
24-36 months implementation

Siemens Presentation (Egypt Hydrogen) about the Hydrogen Road Map for Egypt until 2030
Siemens Vision Aim To Transform Egypt to be Green Energy Hub

- **Green Industries**: Egypt to lead green ammonia exporting in the region
- **Transportation** (Green Mobility)
- **Green H2 Valley**: First scalable green H2 valley to be come the center of Green energy in the region to serve the different applications.
- **H2 co-firing** will help Egypt to reach CO2 emission reduction targets (10-30% Co-firing capability available for current H class Fleet.)
Green Hydrogen
Siemens

GT Upgrades H2 Co-firing

Steel Industry (Direct Reduced Iron)
March 2021 a cooperation agreement was signed between

- Egyptian electricity holding company.
- Aboukir ports construction and Management company
- Egyptian National gas Holding company.
- Belgian Consortium DEME, FLUXYS, PORT OF ANTWERP

To prepare a feasibility study in different locations in Egypt to establish a green hydrogen production project (HYPORT-EGYPT).

A pilot project with a capacity of 200 megawatts will be launched to produce green hydrogen, after which it will enter the commercial scope.
14 October, 2021: The Sovereign Fund of Egypt had signed agreement with Orascom, Scatec and Fertiglobe to jointly develop a 50-100 MW green hydrogen plant as feedstock for green ammonia production.
Green Hydrogen
Sovereign Fund of Egypt, Orascom, Norwegian company (Scatec), Fertiglobe

- The 1st 100 MW project to come online in the world, positioning Egypt as the world’s leader in green hydrogen
- Producing green ammonia to be used in industrial application and as marine fuel
- Partnership with Sovereign Fund of Egypt and Scatec Target Completion in October 2022 in time for COP27

Green Ammonia Project: Largest Green Hydrogen Project in the World with 1st Green Ammonia Application to be Showcase Project for COP27
A memorandum of understanding was signed between the General Authority for the Economic Zone of the Suez Canal, the Sovereign Fund of Egypt, the New and Renewable Energy Authority, the Egyptian Electricity Transmission Company, and Maersk International to establish a project to produce green fuel for ship bunkering supplies in the Suez Canal Economic Zone.
Green Hydrogen
MAERSK

Transmission grid: Point of departure - Siting critical for overall transmission costs

Required electricity demand for different phases

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2.1</th>
<th>Phase 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>Production: Max RE 0.75 GW Consumption: 0.32 GW Size: 200 ktpa e.methanol</td>
<td>Production: Max RE 3.75 GW Consumption: 1.6 GW Size: 1 mtpa e-methanol</td>
</tr>
<tr>
<td>2023</td>
<td>COD</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>COD</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td>COD</td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td>COD</td>
<td></td>
</tr>
</tbody>
</table>

Exp. peak demand by 2025 is 62 GW rising toward 2030 to 75 GW

We would like to discuss
- Phase 1: Can the grid provide capacity?
- Phase 2: What are the options for power evacuation?
A memorandum of understanding was signed, aiming to establish projects to produce green fuel and green ammonia in the Sokhna.
Green Hydrogen
AMEA POWER

TIMELINES

- Finalize consortium partnership agreements
- Engage specialized engineering and consultancy firms to develop the technical studies
- Agree on the solution for the interconnection system with Ammonia Plant under development
- Develop the SPV structure and contractual agreements
- Shortlist EPC Contractors

- Define minimum technical specifications for the project and battery limits of different sectors
- EPC contractual negotiations
- Financing arrangements
- Conduct Due Diligence process with lender advisors
- Finalize Project Agreements
- Basic engineering design to obtain preliminary permits and licenses required

THREE PHASES TO DE-RISK THE PROJECT AND BENEFIT FROM LEARNING CURVE IN EQUIPMENT COST AND PERFORMANCE IMPROVEMENT

- Construction of the renewable power projects for injection into EETC grid, in remote locations away from Green Hydrogen / Ammonia Infrastructure
- Tie in with EHC Ammonia Plant under development and expected to be completed within Q2 2025
- Execution of the hydrogen production facilities, as well as the corresponding storage facilities, as applicable
- Tie in with the port infrastructure required to export ammonia to the vessels
An agreement concerns EDF Renewables. The subsidiary of the giant Electricité de France (EDF) intends to collaborate with the General Authority of the Suez Canal Economic Zone (SCZone), the Sovereign Wealth Fund of Egypt (TSFE), the Egyptian Electricity Transmission Company (EETC), the New and Renewable Energy Authority (NREA) and the Zero-Waste Egypt Alliance. The agreement signed in the presence of several members of the Egyptian government aims to produce hydrogen and its derivatives from the port of Ain Soukhna in the Gulf of Suez.
Green Hydrogen
EDF

Project Description: Project phases and Timelines

**Phase 1**
- Export agreement for 100% of total production until 2030.
- Paving the way for decarbonization of maritime industry.

- Electrolysers: 200 MW
- NH₃ prod.: ~600 mt/day
- PV: 350 MWdc
- Wind: 280 MW
- NH₃ storage: 7,000 MT
- Operation date: Q1 2026

**Phase 2**
- Scale up to fulfill the maritime market initial growing demand of green fuel.
- Investment in the bunkering terminal.

- Electrolysers: up to 500 MW
- NH₃ prod.: ~1,600 mt/day
- PV: 650 MWdc
- Wind: 400 MW
- NH₃ storage: 15,000 MT
- Operation date: Q1 2030

**Phase 3**
- Commercialization of green fuel for ships bunkering.

- Electrolysers: up to 1,000 MW
- NH₃ prod.: ~3,000 mt/day
- PV: 1,100 MWdc
- Wind: 800 MW
- NH₃ storage: 30,000 MT
- Operation date: Q1 2035

CONFIDENTIAL
Green Hydrogen
Masdar, Hassan Allam Utilities

- The first MoU was signed between the Suez Canal Economic Zone (SCZone), the Sovereign Fund of Egypt, the Egyptian Electricity Transmission Company (EETC), the New and Renewable Energy Authority (NREA), the UAE’s Abu Dhabi Future Energy Company (Masdar), and Hassan Allam Utilities Company

- The second MoU was signed between the Sovereign Fund of Egypt, EETC, the New and Renewable Energy Authority, Masdar, and Hassan Allam Utilities Company
Green Hydrogen
Masdar, Hassan Allam Utilities

Masdar – HA Utilities proposed Roadmap for 2 GW electrolyser capacity by 2030

<table>
<thead>
<tr>
<th>Pillars</th>
<th>Market</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
<th>2029</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Develop Egypt’s Green Bunkering</td>
<td><img src="Egypt" alt="Flag" /></td>
<td><img src="Europe" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
</tr>
<tr>
<td></td>
<td>e-methanol for the maritime sector</td>
<td>~200 MW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Leverage local infrastructure to export green H2 to Europe</td>
<td><img src="Europe" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
</tr>
<tr>
<td></td>
<td>green ammonia for export to Europe</td>
<td>600 MW</td>
<td></td>
<td></td>
<td>900 MW</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Supply green H2 for local industry</td>
<td><img src="Egypt" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
<td><img src="Green_Hydrogen" alt="Flag" /></td>
</tr>
<tr>
<td></td>
<td>Green hydrogen for local industry</td>
<td>300 MW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MW Electrolyzer installed capacity
xx Commercial operation date
Green Hydrogen
Masdar, Hassan Allam Utilities

The offer submitted by the MASDAR includes the implementation of a 4 gigawatt electrolyzer in the Suez Canal Economic Zone by 2030 and aims to achieve three objectives:

- Supplying ships with green fuel.
- Exporting green ammonia to Europe.
- Providing green ammonia for local industry.
GE CEO presented the possibility of the company's contribution to Blend Hydrogen in Natural gas turbines. Which leads to raising the efficiency of the electricity production units, Reduce carbon dioxide emissions

Strategic Cooperation Agreement Between GE and Egyptian Electricity Holding Company (EEHC) will be signed 2 June 2022
It was agreed that the company would convert one of the electricity generating units in Sharm El-Sheikh to work with hydrogen and apply this technology to it.

• The company bears the cost of artwork for the transfer.
• The company will manage the hydrogen used as fuel.
• The project is the first of its kind in Africa This will be announced during COP 27.
• A study is underway to sign a memorandum of understanding for this project.
EGYPT Green Energy Corridor

Due to expansion of Green Projects
EGYPT Green Energy Corridor aims to facilitate integration of large scale Renewables into the Grid to Supply:

- National Development projects.
- Green Hydrogen projects.
- Water Desalination Projects.
- Interconnection Projects.
A- Available lands for establishment

Renewable Energy projects (Wind / Solar)
## Available lands for the establishment of projects to generate electricity from Renewable Energy (Wind / Solar)

<table>
<thead>
<tr>
<th>Region</th>
<th>Available Areas (Km²)</th>
<th>Capacities that could be Generated (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wind Energy Projects (Km²)</td>
<td>Solar Energy Projects (Km²)</td>
</tr>
<tr>
<td>Suez Gulf 9 – 9.5 m/sec</td>
<td>80</td>
<td>-----</td>
</tr>
<tr>
<td>West Nile 8 m/sec</td>
<td>1807</td>
<td>66</td>
</tr>
<tr>
<td>East Nile 7 – 7.5 m/sec</td>
<td>645</td>
<td>981</td>
</tr>
<tr>
<td>Fares 1</td>
<td>-----</td>
<td>7</td>
</tr>
<tr>
<td>Fares 2</td>
<td>-----</td>
<td>4</td>
</tr>
<tr>
<td>Kom Ombo</td>
<td>-----</td>
<td>32</td>
</tr>
<tr>
<td>Benban</td>
<td>-----</td>
<td>5.5</td>
</tr>
<tr>
<td>Zafarana 7 – 7.5 m/sec</td>
<td>-----</td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2532</strong></td>
<td><strong>1102</strong></td>
</tr>
</tbody>
</table>
# Map of the available lands for Solar Energy in Aswan Governorate

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the plot</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fars 1</td>
<td>AS-FAR1-50-3</td>
<td>1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td></td>
<td>AS-FAR1-300-4</td>
<td>6 Km²</td>
<td>300 MW</td>
</tr>
<tr>
<td></td>
<td>AS-FAR1-120-5</td>
<td>2.4 Km²</td>
<td>120 MW</td>
</tr>
<tr>
<td>Fars 2</td>
<td>AS-FAR2-210-1</td>
<td>4.2 Km²</td>
<td>210 MW</td>
</tr>
<tr>
<td>Kom Ombo</td>
<td>AS-KOM-500-2</td>
<td>10 Km²</td>
<td>500 MW</td>
</tr>
<tr>
<td></td>
<td>AS-KOM-500-3</td>
<td>10 Km²</td>
<td>500 MW</td>
</tr>
<tr>
<td></td>
<td>AS-KOM-500-4</td>
<td>10 Km²</td>
<td>500 MW</td>
</tr>
<tr>
<td></td>
<td>AS-KOM-100-5</td>
<td>1.9 Km²</td>
<td>100 MW</td>
</tr>
</tbody>
</table>

Max Capacity Generated : **2280 MW**
### Map of the available lands for Solar Energy in Aswan Governorate

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the plot</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benban (Existing solar park with free Plot)</td>
<td>AS-SB-(6-1)</td>
<td>1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(22-3)</td>
<td>1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(26-4)</td>
<td>1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(27-4)</td>
<td>1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(31-4)</td>
<td>0.5 Km²</td>
<td>20 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(40-4)</td>
<td>0.5 Km²</td>
<td>25 MW</td>
</tr>
<tr>
<td></td>
<td>AS-SB-(41-4)</td>
<td>0.5 Km²</td>
<td>25 MW</td>
</tr>
</tbody>
</table>

Max Capacity Generated: 270 MW
Map of the available lands for Solar Energy in Zafaraana Area

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the Area</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2 Km²</td>
<td>100 MW</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1.5 Km²</td>
<td>80 MW</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1.3 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1.1 Km²</td>
<td>50 MW</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.6 Km²</td>
<td>30 MW</td>
</tr>
</tbody>
</table>

Max Capacity Generated: 310 MW
May be reached (350-400 MW) by using new technologies (bifacial)
Map of the available lands for Wind Energy in Suez Gulf Area

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the Area</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
<th>Wind Speed m/s</th>
<th>Tip Height Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suez Gulf</td>
<td>1</td>
<td>80 Km²</td>
<td>400 MW</td>
<td>8.4 m/s</td>
<td>120 m</td>
</tr>
</tbody>
</table>

Available Area: 400 MW
80 Km²
8.4 m/s
Tip Height: 120 m

Available Land
BOO Projects
NREA Projects

Projects
### Wind Energy

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the Area</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
<th>Wind Speed m/s</th>
<th>Tip Height Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Nile Demarcation</td>
<td>300 Km²</td>
<td><strong>1200 MW</strong></td>
<td>8 m/s</td>
<td>150 m</td>
<td></td>
</tr>
</tbody>
</table>

### Solar Energy (PV)

<table>
<thead>
<tr>
<th>Zone Name</th>
<th>The name of the Area</th>
<th>Land Space Available for Generation (Km²)</th>
<th>Max. Capacity that can be generated (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Nile Demarcation</td>
<td>50 Km²</td>
<td><strong>2500 MW</strong></td>
<td></td>
</tr>
</tbody>
</table>

- Decree No. 116 of 2016 is updated with decree No. 126 of 2022
- The total area allocated to NREA is 3550 Km²
B- Analytical data from the Global Wind Atlas Program (Egypt)
Analytical data from the Global Wind Atlas Program (Egypt)
Analytical data from the Global Wind Atlas Program (Egypt)

At 100 Meter – Hub Height

Wind Density | 664 watt/ m²
Wind Speed | 9.63 meter / Sec
Hub Height | 100 meter
Analytical data from the Global Wind Atlas Program (Egypt)

At 150 Meter – Hub Height

Wind Density: 924 watt/m²

Wind Speed: meter/Sec 10.25

Hub Height: 150 meter
Analytical data from the Global Wind Atlas Program (Egypt)

At 200 Meter – Hub Height

Wind Density 1086 watt/m²
Wind Speed 10.69 meter/Sec
Hub Height 200 meter
C- Preliminary Study for Additional Areas for wind power
Preliminary Study for Additional Areas for wind power

Additional Areas for wind power from range 8-11 m/sec at (100 m Hub height)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Location</th>
<th>Average Wind Speed (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Onshore West of Minia</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Onshore East of Minia 1</td>
<td>7.5</td>
</tr>
<tr>
<td>3</td>
<td>Onshore East of Minia 2</td>
<td>7.5</td>
</tr>
<tr>
<td>4</td>
<td>Onshore Gulf of Zayt</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Onshore Zafarana</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Onshore Elkharga 1</td>
<td>8.5</td>
</tr>
<tr>
<td>7</td>
<td>Onshore Elkharga 2</td>
<td>8.5</td>
</tr>
<tr>
<td>8</td>
<td>Onshore Fayoum</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Onshore East of Sohag</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>Onshore West of Sohag</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>Onshore West of Nile near Aswan</td>
<td>9.2</td>
</tr>
<tr>
<td>12</td>
<td>Onshore Western desert, South of Wahaat Region</td>
<td>8.5</td>
</tr>
<tr>
<td>13</td>
<td>Onshore East of Suez Gulf, Ras Sedr region</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>Onshore West of Aqaba Gulf, Dahab region</td>
<td>9.5</td>
</tr>
<tr>
<td>15</td>
<td>Onshore Berenice</td>
<td>8.8</td>
</tr>
<tr>
<td>16</td>
<td>Offshore Inside Suez Gulf, From South of Ain Sokhna to Gulf of Zayt</td>
<td>10.5</td>
</tr>
<tr>
<td>17</td>
<td>Offshore Inside red sea, from Gulf of Zayt to Safaga</td>
<td>9.8</td>
</tr>
</tbody>
</table>

- Total Potential Area (km²) : 173 thousand Km²
- Total of Min. expected Wind Capacity (GW) : 347 GW
The Strategic Plan for Water Desalination from Renewable energy in Cooperation with Ministry of Housing

- The Land required to be approved for allocation have been Identified.
- Utilize Renewable Energy to Supply Desalination plants.
## Desalination plan requirements (2020 – 2050)

<table>
<thead>
<tr>
<th>Sn</th>
<th>Plan Pillars</th>
<th>2020-2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2050</th>
<th>Total (Thousand m³/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pillar No. (1)</td>
<td>382</td>
<td>375</td>
<td>220</td>
<td>212</td>
<td>189</td>
<td>120</td>
<td>1498</td>
</tr>
<tr>
<td>2</td>
<td>Pillar No. (2)</td>
<td>335</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>335</td>
</tr>
<tr>
<td>3</td>
<td>Pillar No. (3)</td>
<td>First Priorities</td>
<td>2370</td>
<td>585</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2955</td>
</tr>
<tr>
<td></td>
<td>Second Priorities</td>
<td>-</td>
<td>-</td>
<td>825</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>825</td>
</tr>
<tr>
<td></td>
<td>Third Priorities</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>415</td>
<td>130</td>
<td>130</td>
<td>675</td>
</tr>
<tr>
<td>4</td>
<td>Pillar No. (4)</td>
<td>50</td>
<td>421</td>
<td>412</td>
<td>553</td>
<td>440</td>
<td>340</td>
<td>2216</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3137</td>
<td>1381</td>
<td>1457</td>
<td>1180</td>
<td>759</td>
<td>590</td>
<td>8504</td>
</tr>
</tbody>
</table>

- In addition to 0.7 M m³/day currently under discussions with Ministry of Water Resources & Irrigation.
Existing and ongoing desalination plants

- **Existing desalination plants**: 82
- **Ongoing desalination plants**: 14
- **Existing and ongoing desalination plants**: 96

- **Total capacities**
  - **Existing desalination plants**: 917,000 m³/d
  - **Ongoing desalination plants**: 518,000 m³/d
  - **Existing and ongoing desalination plants**: 1.435 M m³/d
Plan objective:

Ministry of Housing, Utilities, and Urban Communities has developed the Strategic Plan for Desalination to cover the seawater desalination for providing drinking water needs from 2020 to 2050.
4th- Investment Opportunity

Government Support to Invest in Electrical infrastructure of Electric Vehicles
An incentive tariff has been approved (by the Egyptian Cabinet) for EV charging.

The Approved tariff:

<table>
<thead>
<tr>
<th>Voltage Level</th>
<th>Tariff Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 22 k.w (AC)</td>
<td>169 piaster / kwh (without the use of the place occupancy fees)</td>
</tr>
<tr>
<td>Up to 50 K.w (DC)</td>
<td>189 piaster / kwh (with the use of the place occupancy fees)</td>
</tr>
<tr>
<td>Household</td>
<td>375 Piasters / kwh</td>
</tr>
</tbody>
</table>

In addition, the government has also provided a package of incentives to encourage the investment in this field, including:

- Charging Tariff
- Customs Exemption
5th- Investment Opportunity

Waste to Energy

in Cooperation with Ministry of Environment
Waste to Energy

- Energy-from-Waste is the process of generating energy in the form of electricity and/or heat.

- According to the Ministry of Environment: 20% of the total collected Municipal Solid Waste (MSW) will be forwarded to the technologies of W2E (about 4.2 million tons of MSW to W2E)

- Expected Electricity that could be Generated from Waste according to the cabinet Decree (300 MW for the coming 5 years)
The issuance of Decree No. 41 # 2019 - Waste to Electricity

1. Reducing the amount of waste buried in sanitary landfills
2. Providing the areas of land that are allocated for the establishment of sanitary landfills
3. Avoiding accumulations inside the governorates that lead to environmental damage and emissions
4. Producing electrical energy suitable for self-use at the station and for connection to the network
6th- Investment Opportunity

Private companies licensee in the field of electricity Generation & Distribution
Private companies licensee in the field of electricity Generation & Distribution

- Private sector can invest in the filed of Generation and distribution level (medium and low voltage)
- 70 Private companies are licensee in the field of electricity generation.
- 68 Private companies are licensee in the field of electricity distribution.
6- Preparation for EGYPT’s hosting of the 27th Conference of Parties on Climate Change COP27
EBRD suggested (Energy Wealth Initiative: A COP27 initiative) of a green Energy Transition in regards of retirement of low efficiency power plant units by decommissioning of 5GW from thermal power plant units and implement 10 GW renewable energy with total investments of 10 Bn $ (EBRD will provide 500 Mil $ as grant and soft loan)
Preparation for EGYPT’s hosting of the 27th Conference of Parties on Climate Change COP27

Energy Wealth Initiative: A COP27 initiative

The EWI seeks to establish a green energy transition platform for Egypt in order to:

- **10 GW** New wind & solar
  - Accelerate the deployment of renewable energy to lower the cost of energy supply and develop a regional market for decarbonised fuels.

- **5 GW** Decommissioned
  - Accelerate the retirement of inefficient fossil-fuel plants to abate carbon emissions and free up Egypt’s domestic gas resources for sale at global energy prices, hereby improving the balance of payments.

- **$10,000 Million** Investment
  - Invest at scale in renewable energy, storage and infrastructure, underpinned by ambitious GHG emission reduction commitments to access climate finance from MDBs, private sector and donors.

- **$500 Million** Grant & climate finance
  - Support a just transition (so that the EWI benefits are shared, while protecting vulnerable regions and people) and develop local supply chains and grid strengthening for renewable energy equipment.

Investments, technology transfer, capacity building, reskilling and new job opportunities for youth, gender and social inclusion.
7- Egypt is an Energy Hub for International Interconnections and Corridors
Egypt is ready to participate in Global Interconnection

Egypt has the following potentials:

• Excellent location between three important continents (Europe – Africa – Asia).

• Existing interconnection with neighboring countries.

• Huge renewable energy potential (wind - solar).

• Electrical energy surplus.

• Strong extra high voltage transmission network

• Strong local manufactured electrical systems.
Egypt is an Energy Hub
for International Interconnections and Corridors

Electrical Interconnection Integration

Egypt

Lebanon
Syria
Palestine
Jordan
Iraq
Libya
Kuwait
Bahrain
Qatar
Oman
Emirates
Gulf Interconnection

Spain
Cyprus
Libya
Palestine
Sudan
Egypt
Central Africa
Congo
Inga dam

Morocco
Algeria
Tunisia
Morocco
Arab Maghreb interconnection

Turkey

Italy

Greece

Spain

Morocco

Arab Maghreb interconnection

Inga dam

Electrical Interconnection Integration

- 400 and 500 kilovolts alternating current lines
- 220, 150, and 132 kilovolts alternating current lines
- 90 kilovolts alternating current lines
- Proposed 400 and 500 kilovolts alternating current lines
- Proposed 220 kilovolts alternating current lines
- Proposed 500 and 600 kilovolts direct current lines

Ministry of Electricity & Renewable Energy (EGYPT)
Issue Date: 24/5/2022
Egypt /Jordan Interconnection (450MW)
Existing + Strengthen connection

- March 2021, A framework agreement was signed between Egypt /Jordan to increase interconnection capacity to 1000 M.W.
Egypt Electrical International Interconnections

Egypt / Sudan Interconnection (300 MW).
(Existing + Strengthen Connection)

- (Phase 1): In April 2020 Energized with exchanging up to 80 MW and will reach 300 MW in the next year.

- (Phase 2): Intended to be raised to 1000 MW.
Egypt Electrical International Interconnections

**Egyptian /Libyan Interconnection (150MW).**
(Existing + under Study Strengthen Connection)

A study of strengthening the Egyptian - Libyan electrical connection was prepared to increase the exchange capacity to **2000 MW** through two alternatives as follows:

- Supporting the connection to the voltage of 400 KV.
- Strengthening the connection on the voltage of 500 KV.
Egypt Electrical International Interconnections

Egypt / Saudi Arabia to Allow Exchanging of 3000 MW

- 5th of October 2021 a package of contracts has been signed for the electrical interconnection project between Arab Republic of Egypt & Kingdom of Saudi Arabia
- Total Investment cost from both sides : 1.8 Bil $
Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

Allow supply **3000 MW of** Green Energy to Europe.
Egypt- Greece Interconnection

- Copelouzos – Elica Proposal

Technical description of the Project and overall budget

Main equipment - Budget

1. Converter Stations
   - Voltage Source Converter Stations of 3,000 MW are envisaged to be installed at both ends of the link near WADI EL NATROON EHV Center in Egypt and near AHARNES EHV Center (Attica - Greece). Now alternative locations for Attica, such as Mesogia EHV center and/or Agios Stefanos EHV center are evaluated, instead of ACHARNES, in order to avoid local congestion. The Converter type is Voltage Source Converter (VSC).

2. Submarine cables
   - The submarine cable is of extruded type (XLPE insulation), synthetic armoring, voltage ±500 kV and Al conductor.

3. Interconnection Lengths
   - Overhead line 500km length between WADI EL NATROON Converter Station and EL SALLUM and up to the sea shore underground cable length: 10 km
   - The new alternative routing between EL SALLUM and Keratea has a length of 921 km and EL SALLUM to N.Makri of 954 km.
   - Underground cables lengths in Attica are 18.7 km and 29.8 km

4. Overall Budget
   - Estimated Budget: € 3.569bn

Proposed Route
Cyprus, Greece and Egypt signed a trilateral Memorandum of Understanding (MoU) to connect their respective electricity grids in Athens on Tuesday 19 Oct. 2021.
Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

Bilateral MoUs had been signed between (Egypt- Greece) and (Egypt- Cyprus) in the field of Electrical Interconnection on 14,16 Oct. 2021
Egypt- Greece Interconnection

- It was agreed to appoint a consultant to prepare a pre-feasibility study for the project.
- Several international companies have expressed their desire to discuss opportunities for cooperation in financing the project between Egypt, Cyprus and Greece:
  - Gridworks
  - Tractebel
  - EDF
  - Copelouzos - Elica
  - Bechtel
  - Nexans
- World Bank has expressed interest in the project and propose a grant to cover the cost project consultancy services.
April 2022 the **first meeting between the management of IPTO and the EETC**, laying the foundations for the cooperation that the two sides have begun in the last year to prepare the major energy project.

An informative meetings held between the Heads of Administrators of the two countries
• On April 13, 2022, the World Bank technical team met with EETC and IPTO leadership teams to discuss possible ways to support both entities to develop the Project.
• The World Bank can offer potential support to the Project in a sequential way.
# Egypt- Greece Interconnection

## Tentative Ambitious Schedule for Egypt-Greece Interconnection Project

<table>
<thead>
<tr>
<th>Activity</th>
<th>Start Period</th>
<th>Duration</th>
<th>By</th>
<th>Periods (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Economic Assessment (Separate Study)</td>
<td>1</td>
<td>4</td>
<td>WB (in-house using grants)</td>
<td></td>
</tr>
<tr>
<td>Start of Procurement to Hire International Consultant for Bankable Feasibility Study</td>
<td>2</td>
<td>2</td>
<td>EETC/PTO</td>
<td></td>
</tr>
<tr>
<td>The Contract for Feasibility Study is Signed</td>
<td>4</td>
<td>1</td>
<td>EETC/PTO (Loan and Grant)</td>
<td></td>
</tr>
<tr>
<td>Consultant Prepares the Scope of Work and PTO/EETC Issues RFP for E&amp;S Studies and Geotechnical/Geological Seabed Surveys for Route Selection</td>
<td>9</td>
<td>3</td>
<td>Consultant/EETC/PTO</td>
<td></td>
</tr>
<tr>
<td>Env and Social Studies</td>
<td>12</td>
<td>5</td>
<td>E&amp;S Consultant</td>
<td></td>
</tr>
<tr>
<td>Geotechnical/Geological Seabed Survey for Route Selection (Sample Route Survey)</td>
<td>12</td>
<td>5</td>
<td>Seabed Survey Contractor</td>
<td></td>
</tr>
<tr>
<td>PTO/EETC agree on commercial framework and financing structure for the Project (Traditional EPC with off the balance sheet financing from 15%, SPV, or other)</td>
<td>17</td>
<td>2</td>
<td>MEE/PFO - MEE/RME/EETC</td>
<td></td>
</tr>
<tr>
<td>Consultant drafts the bidding documents based on the selected commercial framework of the project, and develops detailed implementation schedule</td>
<td>18</td>
<td>5</td>
<td>Consultant</td>
<td></td>
</tr>
<tr>
<td>Tendering/Selection of the EPC Contractor/Private Sector Partner, completion of bid evaluation, contract negotiations and signing</td>
<td>23</td>
<td>7</td>
<td>Consultant/EETC/PTO</td>
<td></td>
</tr>
<tr>
<td>Financial Close (For PPP Model)</td>
<td>30</td>
<td>8</td>
<td>Selected Developer</td>
<td></td>
</tr>
<tr>
<td>Construction (HVDC Cable and Converter Stations)</td>
<td>38</td>
<td>90</td>
<td>EPC Contractors</td>
<td></td>
</tr>
</tbody>
</table>

* It is recommended to balance the scheduling crashing needs with the project budget to avoid unnecessarily expensive bids.

**Development Stage (Up to Issuing RFP Based on Selected Commercial Framework)**
*Timeline ~ 2 Years*

**Overall Timeline ~ 5.5 Years (including 2.5 years for construction)*

**Implementation Stage (Tendering, Financial Closure, Construction)**
*Timeline ~ 3.5 Years*
### A Conception Figure After Completing the Interconnection between Egypt and Neighbor Countries

<table>
<thead>
<tr>
<th>Line</th>
<th>Path / Interconnection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Egypt / Sudan (220 – 500 kv)</td>
</tr>
<tr>
<td>2</td>
<td>Sudan / Ethiopia 500 kv</td>
</tr>
<tr>
<td>3</td>
<td>Egypt / Cape town 500 kv</td>
</tr>
<tr>
<td>4</td>
<td>Egypt / Jordan (400 kv – 500 Kv)</td>
</tr>
<tr>
<td>5</td>
<td>Egypt / Jordan / Iraq</td>
</tr>
<tr>
<td>6</td>
<td>Jordan / GCC Gulf Cooperation Council</td>
</tr>
<tr>
<td>7</td>
<td>GCC Gulf Cooperation Council / Yemen</td>
</tr>
<tr>
<td>8</td>
<td>Yemen / Djibouti</td>
</tr>
<tr>
<td>9</td>
<td>Djibouti / Ethiopia</td>
</tr>
<tr>
<td>10</td>
<td>Egypt / Crete / Greece</td>
</tr>
<tr>
<td>11</td>
<td>Egypt / Cyprus</td>
</tr>
<tr>
<td>12</td>
<td>Egypt / Cyprus / Greece</td>
</tr>
<tr>
<td>13</td>
<td>Egypt / Libya (220 kv – 500 kv)</td>
</tr>
<tr>
<td>14</td>
<td>Egypt / KSA</td>
</tr>
</tbody>
</table>

GCC Gulf Cooperation Council

To Cape town
THANK YOU