



RENEWABLE ENERGY SOLUTIONS
FOR THE MEDITERRANEAN

DELIVERING RENEWABLE ENERGY INVESTMENTS IN EGYPT: CHALLENGES AND OPPORTUNITIES

RES4MED annual conference

20th April 2015, Rome

The Egyptian economic context

Following the election of Al-Sisi as the President in June 2014, the economy is expected to stabilize and announced economic recovery program is likely to be implemented. Economic growth of 2.2% in the Fiscal Year (FY) '14 is projected to almost double to 4% in FY15.

On March 13-15, 2015, in Sharm El-Sheikh during the Egypt Economic Development Conference (EEDC), the Government highlighted its economic reform program designed to restore fiscal stability and to drive growth, by attracting domestic and international investors across key sectors. The energy sector plays a key role, confirmed by the number of energy deals achieved during the Conference. Among them, it worth to be mentioned the agreement between the European Investment Bank (EIB) and the National Bank of Egypt (NBE) which foreseen a €120 million loan¹ to finance private sector companies as part of the Private Sector Growth and Economic Development project.

Moreover, Egypt has been benefiting from large-scale huge financing. The EU is already co-funding a number of projects in the field of energy and renewables with KfW, AFD and EIB, such as the Gabal El Zeit Wind Farm Projects, which creates exchanges between the different European donors², while from the Gulf, especially from Saudi Arabia, United Arab Emirates and Kuwait (around US\$20 billion) financing is being committed through a mix of central bank deposits, cash and in-kind grants and project aid³.

The energy challenges

Egypt faces a major challenge in providing a sufficient amount of electricity from its primary energy resources, especially oil and natural gas that contributes to 95% of the total energy resources needed for generating electricity in Egypt. Studies show that, even though Egypt possesses a reserve of primary energy resources, Egypt will face a deficit to cover its demand from these resources due to rapid utilization and increase of extraction costs.

Moreover, for long time, Egypt has faced a major challenge in providing enough electricity to its citizens: power blackouts, a daily occurrence for many Egyptians. In early September 2014, the country experienced one of its most severe blackouts in decades system causing disruptions in metro train service, forcing a number of television channels to stop broadcasting and shutting down at least six water treatment plants. Following that event, the President Al-Sisi said the country needs to add 12 GW to its grid over the next five years at a capital cost of around US\$12 billion⁴. Solar and wind power plants are considered an effective way to deploy additional power generation capacity rapidly and to reach their diversification goal.

With an average level of solar radiation between 2.000 to 3.200 kWh per square meter a year, Egypt has significant potential for solar energy. At the same time the wind resources, in particular along the Gulf of Suez, are comparable to those of the most favorable regions in Northern Europe.

Putting renewable energy into perspective

Egypt, with \$226 million of renewable energy investments in 2014⁵, flew the flag for North Africa.

¹ <http://www.eib.org/infocentre/press/releases/all/2015/2015-057-eu-120m-loan-to-support-private-sector-companies-in-egypt.htm>

² Single Support Framework for EU support to Egypt (2014-2015).

³ World Bank, <http://www.worldbank.org/en/country/egypt/overview>

⁴ The Cairo Post, <http://www.thecairopost.com/news/124440/business/sisi-was-frank-about-power-deficit-shrugged-off-biodiesel-expert>

⁵ Global Trends In Renewable Energy Investment 2015, BNEF/Frankfurt School-UNEP Centre

In February 2008, Egypt's Supreme Council of Energy announced an ambitious plan to generate 20% of the country's electricity from renewable sources by 2020, including a 12% contribution from wind energy (approx. 7.200 MW of grid-connected wind farms).

This ambitious goal is expected to be achieved through two distinct project development approaches, one third (approx. 2.400 MW) will be implemented through public investments by the National Renewable Energy Authority (NREA) in cooperation with different international financing institutions and the remaining two thirds (approx. 4.800 MW) by the private investments. Thus, electricity generation plants using renewable energies shall be established according to the following mechanisms and in line with the plants and the programs approved by the cabinet of Ministers:

- State owned Wind Farms through New and Renewable Energy Authority (NREA);
- Competitive Bidding through the private sector;
- Feed in Tariff through the private sector.

State owned Wind Farms through NREA

NREA plans to implement 1900 MW wind projects by 2019⁶. These projects will be implemented through governmental co-operation agreements.

Competitive Bidding through private sector

According to this approach, the grid operators will issue tenders requesting the supply of the power generated from renewable energies resources. It will be executed by the private sector through a long term Power Purchase agreement (PPA) with EETC (electricity Transmission Company). In order to promote local manufacturing, the bid evaluation process will be based on a points-system which offers an advantage to the proposal with higher share of locally manufactured component.

Feed-in-tariffs (FiT)

On September 2014 the Cabinet of Ministers approved the *FiT* for photovoltaic and wind energy power plants, to install a generation capacity of 4.300 MW within 2017 (interim target).

This target includes 300 MW for small PV installations below 500 kW, 2.000 MW for large size PV installations between 500 kW up to 50 MW and the remaining 2.000 MW is from wind energy installations with projects capacities ranging from 20 MW up to 50 MW.

Conclusions

Egypt needs a powerful and reliable energy system to support its long-term, sustainable economic development. The Country has fine-tuned a renewable energy policy to attract \$10 billion investments in wind farms and solar PV power plants within 2020.

⁶ NREA

About RES4MED

RES4MED (Renewable Energy Solutions for the Mediterranean) is a non-profit association of 21 international leaders among utilities, industries, agencies, technical service providers, consultancy and academia, with the mission to support the deployment of renewable energy, both large scale and distributed energy, of energy efficiency solutions and facilitate their integration in the local and regional markets to satisfy local energy needs.

RES4MED, as integrated platform for public-private dialogue on renewable energy issues in the Mediterranean, aims at building a dialogue with Regional Institutions, local Governments and Regulatory bodies by providing a practical outcome oriented approach.

To achieve this mission, RES4MED has built a wide and solid network with the main Institutions, Association, Agencies and Research Centers, among which the Union for the Mediterranean (UfM), the Arab Cooperation on Renewables and Grids, the Regional Center for Renewable Energy and Energy Efficiency (RCREEE), the Association of Mediterranean Energy Regulators (MEDREG), the Association of Mediterranean Transmission System Operators (MEDTSO), International Renewable Energy Agency (IRENA), Institut de Recherche en Energie Solaire et Energies Nouvelles (IRESEN), Société d'Investissements Energetiques (SIE), Agence Nationale pour le Développement des Energies Renouvelables et de l'Efficacité Energétique (ADEREE), etc.

With all these partners, RES4MED started relevant partnerships and joint initiatives aimed at cooperating in specific fields in the Mediterranean Countries. This engagement activity is part of the RES4MED operating model set up for achieving the Association objectives', based on the public-private partnership model.

RES4MED membership

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Academia

Politecnico di Milano – Politecnico di Torino – Bocconi University

Contacts

RES4MED - Renewable Energy Solutions for the Mediterranean

Via Ticino, 14 - 00198 Rome

T +39 06 8552236

secretariat@res4med.org

<http://www.res4med.org/index.php>



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Wholesale electricity price projections and renewables market in Egypt



The Egyptian electricity market is going through a phase of transformation. Market liberalization is approaching; the medium-term subsidy reduction policy, coupled with the current evolution of the gas market, is likely to determine a significant upward impact on electricity prices, both in the short and in the medium/long term. In this context, support to renewables has become a priority in the Government agenda, with the issuance of a robust Feed-in support scheme, further boosting the attention of international investors towards the Egyptian electricity market.

The Egyptian national electricity system is dominated by an incumbent operator, the Egyptian Electricity Holding Company (EEHC), that manages generation, transmission and distribution through its subsidiaries. There is no centralized platform where sellers and buyers can exchange electricity, and the market is configured since 2002 as a power pool where the TSO, a subsidiary of EEHC, manages energy dispatch through the optimization of the generators' costs.

In the 2000s, Egypt experienced a first phase of market liberalization and unbundling, which further accelerated in the last years; a "New electricity law", designed to strengthen the sector's commercial orientation and to boost the liberalization process, is currently awaiting issuance in 2015.

Electricity demand in the country has grown rapidly in the last decade, with gross demand rising from 83 TWh in 2002 to 165 TWh in 2013 (CAGR +6,4%). The main drivers of the increased electricity demand have been the industrial development (+5.3% average annual growth of GDP in the period 2002-2013), the population growth (from 65.9 million in 2002 to 86.9 in 2013) and the expansion of urbanization.

Such growth trend is expected to continue - even though at a slower, but still very significant pace - as population growth will likely maintain a sustained growth and industrial development will recover after the recent downturn.

Historically, electricity demand has been mainly met by gas-fired generation (currently approx. 79%), other major primary sources being oil and hydro (9.3% and 9.1% respectively). Coal and nuclear power are not part of the current generation fleet, but commissioning of coal / nuclear plants is expected in order to achieve a diversification of the generation mix, targeted by the Government for system security purposes. However, gas-fired technologies (especially CCGT) are expected to remain the main source of power generation and by far the most relevant 'price setting' technology.

The prevalence of natural gas as primary source for electricity generation has been determined by the wide potential of gas reserves in the country and the low gas price, and has been mirrored in the fast development of the gas sector: in addition to international investments in exploration and production, several infrastructures for gas export (e.g. pipelines to neighboring countries such as Jordan and Israel and LNG terminals) have been built. As a result, Egypt has been historically a net exporter of natural gas, with a positive net balance peaking in 2009 (+20.2 bcm).

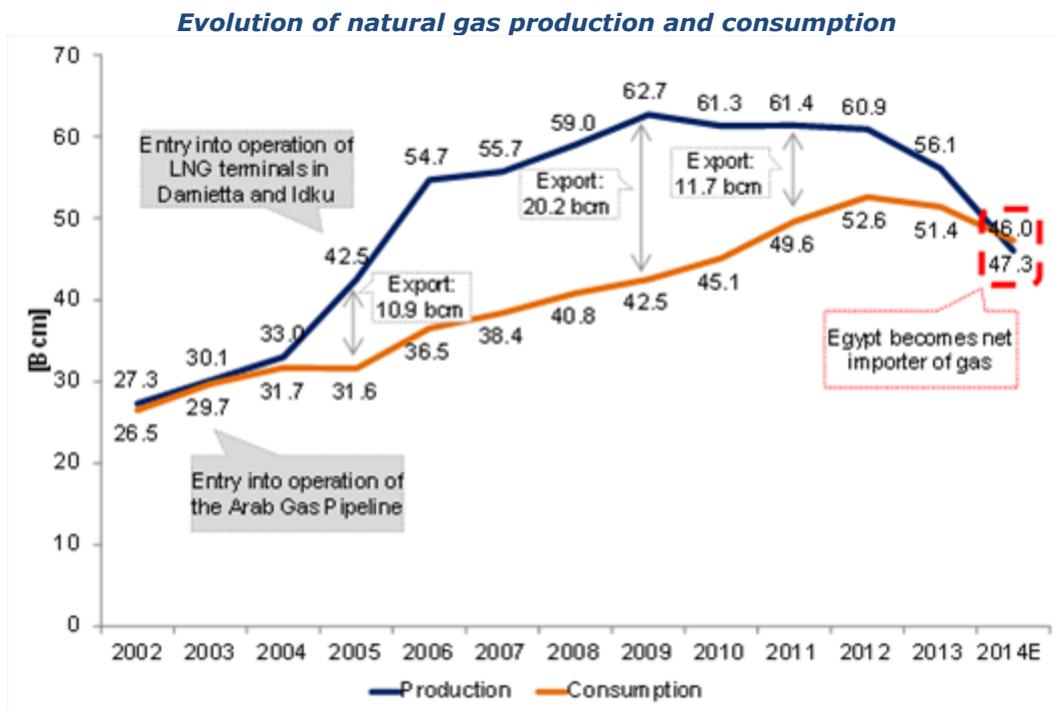
However, the country recently went through a shortage of gas supply, which translated in the consequent need to import gas to meet export commitments and local demand, especially for power generation. Such configuration of the gas balance, combined with the energy subsidies reduction policy put in place by the

Government (committed to a subsidy-free gas price in 2019), is contributing to a progressive alignment of the Egyptian gas price to power producers to international levels.

The country is expected to remain a gas net importer in the medium-term (ten years), even if investments in exploration and production will progressively recover; in order to manage the transition period, the Egyptian Natural Gas Holding Company (EGAS) is trying to compensate for the considerable drop in production by developing a short and medium / long term recovery plan. In the short term (3-5 years), the supply-demand gap will be bridged by contracting LNG imports, while in the medium / long term, the supply strategy will be based on negotiated deals for the import through pipeline (directly or indirectly); such deals will be stipulated between Egypt and Israel (Leviathan and Tamar fields) and Egypt and Cyprus (Aphrodite field). In this phase, the gas price will be aligned to LNG Mediterranean levels. In the long-term, as gas internal production picks up and the gas balance returns to a net exporter configuration, gas prices are expected to decrease and reach a long-term convergence to LNG export prices.

The dynamics of natural gas prices will be key in determining a significant upward pressure also on electricity prices in the medium term, even though in the short term (until 2019) the growth will be smoothed by the persistence of pre-defined tariffs for final consumers. In the longer term instead, electricity prices will show a decrease from medium term values.

Consistently with this context of increasing prices and shortage of primary sources, the Government issued a Renewable Energy Development Program which set the targets to reach 20% of total energy generated from renewables (whose development is currently fairly limited - approx. 700 MW of installed capacity, mostly wind - despite the high potential) in 2020. In 2014, in order to further boost private investments in renewables, the Government approved the issuance of a support scheme for wind and solar based on a Feed-in-Tariff (FIT). The support scheme envisages an ambitious total target of authorized plants at 2017 (4.300 MW), a robust FIT scheme differentiated by technology and the commitment by the TSO to purchase all the energy produced by solar and wind plants participating to the scheme (through 25 and 20 years PPAs respectively). Given the expected increasing electricity price trend, the cost gap of RES compared to other sources, ensuring the exploitation of new primary sources at reasonable system costs (total costs are expected to remain below 1% of GDP).



Source: Pöyry Management Consulting on public data

About Pöyry

Pöyry is an international consulting and engineering company, dedicated to serving clients across the world's energy and industrial sectors. Thanks to our 6,000 experts, working across 150 offices and 45 countries, we deliver more than 10,000 projects annually.

Pöyry Management Consulting is Europe's leading energy consultancy company, providing strategic, commercial, regulatory and policy advice to the energy market.

Our team of over 400 European energy experts, located across 15 offices and 12 countries, offers unparalleled expertise in the rapidly changing energy sector.

Pöyry Management Consulting produces Energy Reports for electricity, gas, carbon and green certificate markets across Europe and the rest of the World.

The Energy Reports are one of the leading sources of price projections in the market and are used extensively by project developers and financial institutions to assess potential new power projects and plant acquisition.



Contacts

Pöyry Management Consulting (Italia) Srl
Viale Restelli, 3/1
I – 20124 Milano, Italy
Telephone: +39 02 3659 6900
Telefax: +39 02 3659 6916

Antonio Nodari
antonio.nodari@poyry.com
+ 39 335 1449066

Paolo Marino
paolo.marino@poyry.com
+ 39 335 6521609

Res4Med
secretariat@res4med.org



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Solar plant investment under Egypt's feed-in-tariff scheme: commercial challenges and opportunities



In an effort to expand national power generation capacity, further security of supply and simultaneously adopt a more sustainable energy mix, the Egyptian Government has set a target to achieve 20% of the country's generated power from renewable energy by 2020.

Introduction to Egypt's Feed-in-Tariff

The Egyptian Government recently introduced a revamped feed-in-tariff (FIT) scheme for electricity projects produced from renewable energy resources (both PV and Wind).

The programme has been designed as a series of regulatory periods, with the first one running from 2015 to 2017. The target is to erect 4.300 MW of renewables in the first period; including 300 MW of small-scale (sub-500kW) PV installations, 2.000 MW of large size PV installations, (500 kW to 50 MW) and a further 2.000 MW of wind installations (capacities between 20 MW and 50 MW).

The Egyptian Electricity Transmission Company (EETC) is committed to purchase the electricity generated through Power Purchase Agreements (PPAs) for 25 years for PV, and 20 years for wind projects at prices set by the Cabinet of Ministers (current values for PV are illustrated in the table below). The prices will be revisited either when the period's target has been achieved or its two years has elapsed.

PV Installed Capacity	Value
<200kW	\$0.118/kWh
200kW - 500kW	\$0.127/kWh
500kW - 20 MW	\$0.136/kWh
20 MW - 50 MW	\$0.143/kWh

To date, a total of 187 local and international applications have been received for the first period: 13 have already qualified for PV installations under 20 MW and 69 have been approved for PV projects above 20 MW; 28 have been prequalified for the wind scheme. It is expected that contracts for all 4.300MW of installed capacity will be awarded by the end of 2016. Applicants who failed to qualify in this round can re-apply in upcoming rounds.

Opportunities for Commercial Solar Investors

1. **Natural Potential:** Egypt has significant natural potential for renewable electricity. Average solar radiation ranges from 2.000 to 3.200kWh per square meter per year.

2. **Significant Returns:** The inverted reward structure of the FIT prioritizes large-scale investments with a very lucrative price (especially when compared to the recent ACWA Power consortium bid to supply 200 MW of PV in Dubai, without support, for just \$0.0584/kWh)
3. **Sovereign Guarantees for projects over 20MW:** Investors proposing installations >20MW can benefit from sovereign guarantees. If the Egyptian Electricity Holding Company (EEHC) is not able to fulfil payments for delivered electricity, the Egyptian Ministry of Finance will cover the payments. This promotes the large scale projects most appealing to institutional investors.
4. **Cheap Land allocation:** The government will allocate state-owned land in exchange for 2% of the produced energy on the basis of the 25-year PPA. The land will be allocated to investors on a first come, first serve basis once their proposal has qualified.
5. **Subsidy Removal:** Currently renewable electricity is more expensive than electricity from Egypt's conventional power plants – because they receive subsidized fuel inputs. The Egyptian government has announced plans to fully remove these subsidies by 2018, which will force generators to purchase oil and gas at full international market values. This could lead to a huge shift in Egypt's power market, where peak demand approximates peak solar potential and the LCOE/kWh of renewable electricity will be much closer to fossil fuel power prices. Furthermore, the Government has stated that renewable electricity will have first right to grid access.
6. **Reduced taxation on imported materials and equipment:** Renewables investors will only pay 2% on any imported materials or equipment used for their FIT-related projects (a significant decrease on the usual duties).
7. **Establishing a renewables hub from Egypt for MENA:** The FIT program is already opening doors to international investors in manufacture and installation renewable technologies, particularly given Egypt's low overhead and labor costs. Indeed, Egypt therefore has significant potential to turn into a hub that could serve the renewables market in neighboring Middle Eastern countries such as Saudi Arabia or the UAE.

Challenges for Commercial Solar Investors

1. **Returns:**
 - a. **FIT consistency:** The tariff is subject to change after two years, even for projects that are already running (i.e. there will be no "grandfathering"). Given the falling trend in PV technology and installation costs, FIT prices are likely to decrease, especially over the 25 year PPA.
 - b. **Default:** Investors proposing plants <20 MW are not eligible for sovereign guarantees. If EEHC were not able to pay investors for the generated electricity, they are no guarantees of returns.
2. **Grid capacity and technical readiness:** The Egyptian Government has promised to ensure all FIT projects are grid connected. However, if the grid were not ready to take up the generated energy there is no clear mechanism in place to protect the investor.
3. **Excess generation:** Slack demand and high solar radiation could lead to excess electricity. If the transmission system operator requests a RE plant to reduce generation to follow demand loads, it is unclear if there will be a compensational mechanism in place – particularly relevant given the best sites for PV are some distance from major demand hubs.
4. **Currency:** The PPAs are nominally denominated in US dollars, but will be largely payable in Egyptian pounds. Most of the currency risk will fall on the investor.
5. **Market Penetration:** History shows that whether promising new technologies move from a niche to a mainstream role depends on events happening at three levels (Geels, 2005). At the most basic level, the new technologies must be fit for purpose. At the middle level, the social and technical systems within which the new technologies operate must adopt to accommodate them. At the top level, the overall economic, social, and political climate, set by those in positions of power, must be conducive to market transformation. If the FIT program is unable to satisfy the objectives listed at the different levels, market penetration will be constrained, and investors will be slower to come forward.
6. **Political risk:** The new Egyptian government is doing its best to ensure the economic and political future of the country. However, there is a residual risk that may deter investors.

Conclusion

The recent FIT announcements could result in a major deployment of renewable technologies in Egypt. Natural potential, sovereign guarantees, cheap land, reduced import duties and other benefits have all attracted significant numbers of investors already, both for the market's own sake and as a springboard into the wider MENA renewables industry. However, some of the functional details behind Egypt's FITs remain unclear. Tariff consistency across periods, technical issues and currency risk are all likely to pose significant barriers for more risk-averse or traditional international investors. Ensuring clarity on these outstanding items would mean an even faster rate of growth in the sector.

About PwC

PwC is recognized as one of the world's leading advisers on energy, sustainability, infrastructure development and restructuring and project finance across all industry sectors, covering the full range of policy, regulatory, transactions execution and privatization and integration services.

With more than 195,000 specialists and 758 offices in 157 countries, we use an integrated multidisciplinary approach, combining broad professional capabilities at an international level with a deep knowledge of the Energy sector. PwC also relies upon teams of economists with backgrounds in the utility industry, finance and research, with many years of experience in the renewable energy sector.

PwC's commitment to the renewable energy industry goes beyond our services. PwC stays in touch with clients through thought leadership and sponsorship activities. As a matter of fact, PwC is actively involved all over the world helping to shape the new energy agenda.

In the framework of RES4MED, PwC activities start from the day-to-day analyses of policies and market trends. Our know-how includes skilled professionals in modeling, strategy, management consultancy, sustainability and climate change.

PwC is active in Egypt too, with over 300 partners and staff, as an integral part of the PwC's growing network in the Middle East region. The firm combines in-depth knowledge of the Egyptian economy, tax regulations, local business standards and customs with extensive coverage, breadth of resources, and quality assurance.

Being part of a worldwide network enables us to combine a coherent global vision with robust local identity.

Contacts

In Egypt

*PricewaterhouseCoopers LLC
Plot no 211, Second Sector, City Center
New Cairo 11835, Egypt
PO Box 170 New Cairo*

*Bernhard Haider
bernhard.haider@eg.pwc.com
+20 (0) 100 019 3628*

In Italy

*PricewaterhouseCoopers Advisory Spa
Largo Fochetti 29, 00154 Roma
Tel. 06 570251, Fax 06 570252400*

*Giovanni Poggio
Giovanni.poggio@it.pwc.com
+ 39 348 999 5663*

*Paolo Gentili
Paolo.gentili@it.pwc.com
+ 39 349 222 7502*

RES4MED

*Res4Med
secretariat@res4med.org*



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The pioneering role of Italgem to a solid capacity building platform: our contribution to RE challenge in Egypt

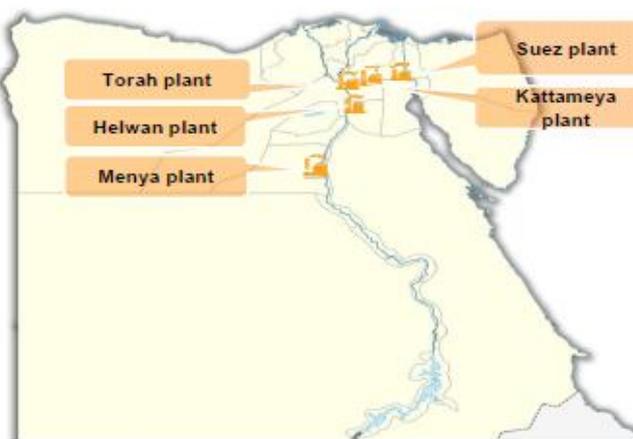


Securing energy supply from renewable and non-renewable sources is a strategic priority for the MENA Region and a key driver to attain a significant development in Countries, such as Egypt, marked by a steady growth and, accordingly, relevant growing needs.

The Egypt Economic Development Conference (EEDC) recently held in Sharm El Sheikh, clearly reflected the Government's will to promote local and foreign investments in crucial sectors such as power in order to face the increasing industrial and domestic demand, fostering power generation from RE sources (mainly wind and solar).

Italcementi Group, through its subsidiary **Italgem**, has played a pioneering role in the Egyptian RE sector since 2007, implementing the 1st FDI in Gulf El Zeit (Red Sea Governorate) to support the energy needs of its Egyptian subsidiary, Suez Cement Group of Companies (a key cement player in the country, listed on Cairo and Alexandria Stock Exchange)

Suez Cement Group of Companies



- ✓ One of the largest cement producers in Egypt. Italcementi Group invested more than 1 billion euro in the Country
- ✓ An industrial network of 5 production facilities located in Suez, Kattameya, Tourah, Helwan and El Minya
- ✓ A total production capacity of more than 12M t/y cement
- ✓ Almost 4,500 fixed employees
- ✓ All plants are ISO 9002, ISO 14001 and OHSAS 18001 certified

Italgem two-phase wind farm project, currently the biggest in the MENA Region, is under construction as per its phase I (120 MW), whereas phase II (200 MW) is under development. The business model will be defined according to the new legislation framework.

Geographical Location



Why Egypt?

- ✓ A Country which has been facing institutional changes and challenges related to business environment
- ✓ An unexpressed renewable energy potential and a huge energy demand
- ✓ A strategic Country for Italcementi Group

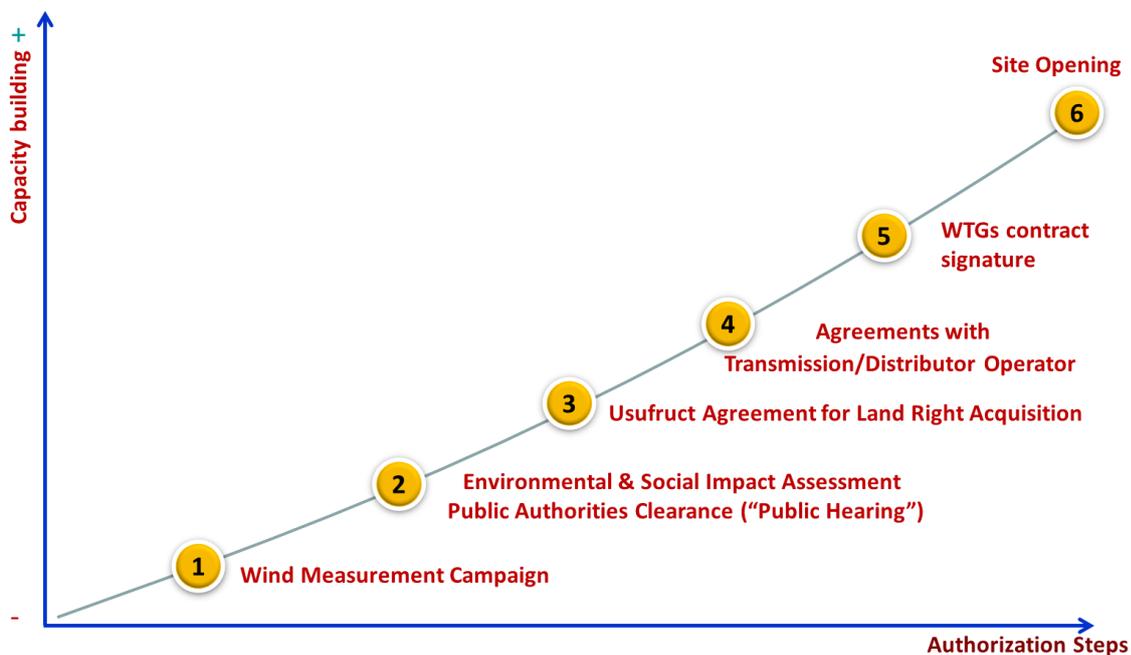
Our Sustainable aims and goals

- ✓ An initiative compliant with the Egyptian Government's RE target (20% of energy production coming from RE by 2020)
- ✓ A project pioneering the private sector commitment in the field of RE in the Country
- ✓ A mutual growth, in terms of capacity building, either for Egyptian Authorities or Italgén

Preliminary Data

Location	Gulf El Zeit, Egypt
Installed Capacity	120 MW (Phase I) + up to 200 MW (Phase II)
Capacity factor	43-55%
Estimated Production	approx. 1,300,000 MWh/y
CO2 Savings	approx. 660,000 t/y
Business model	To be adopted according to the new legislative framework (PM Decree no 1947/2014 - Presidential Decree no 203/2014)

The first-ever permitting process successfully completed. Site opening in November 2014.



A relevant project, strongly supported by the Egyptian Central Government and Local Authorities, with the valuable commitment of domestic operators:



Our main contributions to the development of RE in Egypt

- ✓ Support the Country to meet the ambitious targets set by the Egyptian Government in terms of Renewable Energy generation capacity
- ✓ Reinforce the position of Egypt and, specifically, of the Red Sea Area, as a potential HUB for Renewable Energy in the MENA Region by completing the first Foreign Direct Investment with 320 MW (Phase I + Phase II)
- ✓ Create a "Sustainable platform", based on an outstanding methodology applied for the first time to a big Renewable Energy project, to be used as a solid reference for future ones
- ✓ Enhance the opportunity for further economic development of the Red Sea Governorate in terms of technology, know-how, skilled job positions to be identified among local competence.
- ✓ Confirm the concept of "bankability" as a key issue and a driving force for project developments.

Italgen operates in the international market of the renewable energy sector. It was established in 2001 as a spin-off of Italcementi with the aim of producing and distributing electricity from renewable energy sources either in Italy or abroad.

Its purpose is to combine business with a great commitment to the environment, adopting the Best Available Technologies, in line with the sustainable development policy of Italcementi Group.

An enlarging perimeter with the ambitious goal of reaching 10% of Italcementi Group energy needs covered by Renewable Energy sources



Italy - 56 MW Hydroelectric Power Plants



Italy - 400 km Transmission Lines



Italy, Guiglia - 6 MW Photovoltaic Plant



Bulgaria, Kavarna - 18 MW Wind Farm



Morocco, Laayoune - 5 MW Wind Farm



Morocco, Aït Baha - 3 MWth Concentrated Solar Power Plant