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Egypt's Three Pillars of Renewable Energy and Economic Growth Opportunities

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A non-periodic publication issued by the Cabinet's Information and Decision Support Center (IDSC). It covers the most prominent topics in the scene from all aspects to present a comprehensive vision regarding such topics relying on experts' perspectives.

IDSC's Commentary

Egypt has been increasingly recognized as a key actor in the renewable energy industry due to its ambitious goal of diversifying the energy mix and promoting sustainability. The country's considerable solar and wind energy potential has recently attracted substantial investments. The Egyptian Government has also launched various initiatives to tap these resources, such as Benban Solar Park, the largest of its kind in the world.

The renewable energy transition will grant Egypt significant opportunities for economic growth. Through investment in the clean energy infrastructure, Egypt will create more job opportunities in numerous fields, namely the manufacturing, installation, and maintenance of renewable energy technologies. It will be empowered to enhance local industries and encourage innovation, deeming it a magnet for further investments and international partnerships. Consequently, Egypt's economic development process will advance, pinpointing its position in the global market.

In addition, renewable energy growth aligns with Egypt's wider-scale economic strategies targeting sustainable development and economic resilience. Reducing energy costs and enhancing energy efficiency will not only meet the current energy needs but also pave the way for a more sustainable future.

Therefore, the new Policy Perspective issue, issued by the Egyptian Cabinet's Information and Decision Support Center (IDSC), highlights Egypt's three pillars of renewable energy and economic growth opportunities. It tackles Egypt's natural resources, renewable energy types, the renewable energy sector legislation, the sector's institutionalization, Egypt's renewable energy plans, and the economic development prospects.

Egypt's Three Pillars
of Renewable Energy and Economic Growth Opportunities

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Introduction

Until 2023, Egypt's total renewable energy capacity reached 6,709 megawatts, representing an increase of approximately 6.12% more than the previous year. There has been a significant rise in renewable energy capacity since 2018, whereas the figures remained fairly consistent from 2010 to 2017. Despite the significance of such Egyptian achievement in renewable energy, these numbers are not accurate. The Egyptian trend towards renewable energy has continued for decades, reflecting an awareness of the importance of natural components in the fields of renewable energy. This relatively entrenched trend has also been characterized by comprehensiveness, helping Egypt assume regional leadership institutionally, legislatively, and executively. De facto, the advancement of the renewable energy sector in Egypt is based on three pillars: natural resources, legislative procedures, and organizational developments and structures. The scope of exploitation and development of the renewable energy sector varies between the local, regional, and international levels. The industry is considered one of the most attractive areas for foreign investment in Egypt.

In this context, the following lines attempt to answer the following two questions: How did Egypt exploit its wealth of renewable energy sources, and what opportunities does this sector hold for the Egyptian economy in the future? To answer these questions, it is necessary to explore

the following pillars: (1) Egypt's natural resources in the field of renewable energy, (2) legislation related to the renewable energy sector, and (3) the institutionalization of the renewable energy sector in Egypt. We shall tackle the answers at the local government level and then navigate the paths of international cooperation that Egypt has followed to enhance the spread of renewable energy projects.

The First Pillar

Egypt's Natural Resources and Renewable Energy Types

Egypt's geography is characterized by a rich diversity of energy sources across its breadth, including both renewable and non-renewable sources. However, we will focus on the renewable sources under study. Egypt is abundant in natural resources ideal for generating wind and solar energy, and it could generate energy from low-carbon hydrogen.

According to the Wind Atlas for Egypt, the country benefits from plentiful winds, particularly in the Gulf of Suez area. It is considered one of the top global sites for harnessing wind energy due to its exceptional stability. This potential is reinforced by the availability of large, uninhabited desert areas that can accommodate the establishment of extended wind farms. Egypt's wind power generation capacity reached about 7 gigawatts in 2022, making it an increasingly important contributor to the renewable energy mix.

Egypt also enjoys a suitable density of solar radiation. In 1991, the first Solar Atlas for Egypt was released, showing that the country experiences between 2900 and 3200 hours of sunshine each year, a normal direct intensity of 1970-3200 kWh/m^2.

It was followed by an updated atlas in 2018 containing data and solar radiation averages for up to 15 years. In other words, Egypt's solar energy systems are relatively old. Since the early eighties, solar photovoltaic systems in Egypt have been used for various applications, such as pumping, lighting, advertising, refrigeration, and water desalination. Some applications have also been used commercially to meet energy needs in remote areas, especially for road lighting and navigation in emergencies.

In addition to wind and solar energy, Egypt has a significant potential for geothermal energy, especially in the Gulf of Suez, the Red Sea area, and some other sites in Egypt's Western Desert, near the Bahariya and Dakhla oases. Getting an above-retail price for thermal energy is very competitive, and the geography of the place creates favorable conditions for geothermal energy resources, medical tourism, and health resorts, for example, geothermal hot springs, which are natural forms of geothermal heat that reach the Earth's surface. So far, 59% of Egypt's current geothermal energy is employed for heating swimming pools and bathing areas, with 22%, 15%, and 4% allocated to district heating systems, greenhouse heating, and space heating, respectively.

Moreover, Egypt has coped with the developments witnessed by renewable energy markets. It has harnessed the components of producing low-carbon hydrogen due to its richness in renewable energy resources and its possession of a strategic infrastructure for production. It has been proven that converting low-carbon hydrogen to ammonia facilitates transport and trade, and Egypt possesses robust ammonia transportation technology.

The Egyptian Government has also signed multiple memoranda of understanding with more than 14 entities during the past two years, all related to the growing green hydrogen market. One is an Egyptian-Indian agreement signed in 2022 worth USD 8 billion to install, build, and operate a facility in the Suez Canal Economic area to produce green hydrogen.

Thus, these components generally reflect great opportunities for Egypt's progress in global renewable energy markets. According to the International Energy Agency's (IEA) annual report of the global renewables industry published in 2022, Egypt's renewable energy capacity will grow by 65% by 2027 primarily due to new offshore wind projects. Some 4.1 gigawatts of renewable energy are going to be added over the next five years per IEA's statements. The total capacity should amount to 10.4 gigawatts from the currently installed 6.3 gigawatts, as forecasted in the latest data issued by the New and Renewable Energy Authority. However, these achievements would not have been feasible without institutional and legislative frameworks as well as policy frameworks.

The Second Pillar

Legislation Related to the Renewable Energy Sector in Egypt

Legislation and strategies for promoting Egypt's renewable energy sector have been enforced for nearly fifty years. Egypt began preparing the wind and solar atlas more than thirty years ago, specifically in 1991, as we mentioned earlier, demonstrating early recognition of the need to convert these natural resources into electrical capacities pumped into the various sectors of the Egyptian economy. The legislative aspect is split into two main dimensions: (1) Laws establishing institutional frameworks to support the renewable energy sector or laws with financial incentives related to the sector and (2) policies, visions, or strategies that outline and implement the State's orientations towards increasing the contribution of renewable energy to the Egyptian economy. They complement each other.

A. Laws:

Law No. 917 of 1977 establishing the Supreme Council of New Energy, followed by the law establishing the New and Renewable Energy Authority in 1986, tops the legislation supporting the contribution of the renewable energy industry to the Egyptian economy. Afterwards, the Ministry of Electricity was transformed into the Ministry of Electricity and Renewable Energy in 2014, a year that witnessed an intense focus on the renewable energy industry. Several strategies have supported renewable energy projects in their various forms and implementation mechanisms along this path.

The Government formulated financial, monetary, and commercial policies to increase renewable energy sources and encourage investment, in addition to boosting and approving financial incentives.

One of the prominent tools in its economic policy is taxes. Renewable energy capital with its components is subject to a value-added tax of only 5% instead of 14% under the Value-Added Tax Law.

As mentioned earlier, 2014 was a pivotal year in terms of legislation supporting Egypt's renewable energy industry. Legislative amendments were introduced to remove obstacles to investing in renewable energy, most notably the approval of the electricity feed-in tariff system in September 2014 to encourage power generation from renewable sources. Thanks to the Renewable Energy Law No. 203 of 2014, the Government began issuing incentives to encourage private sector involvement in the renewable energy sector to support the country's green transformation strategy. A decision was also made to implement the electricity tariff restructuring system as of July 2014 to gradually reduce electricity tariff subsidies and annul them completely within 5 years. This decision supports the projects of the New and Renewable Energy Authority because it would reduce the annual losses incurred by the Authority due to the goal of selling electricity produced from these projects at a low price. In 2014, Law No. 203 was issued on stimulating power generation from renewable energy sources.

The year 2014 also witnessed the amendment of the New and Renewable Energy Authority's regulations to allow it to sell electricity produced from its projects to one of the Egyptian Electricity Holding Company's subsidiaries or private investors and establish companies either on its own or with other partners. The Prime Minister also issued a decision on said retail price for electricity produced from solar and wind power initiatives, targeting capacities of about 4,300 megawatts in the period from 2015-2017 and encouraging consumers to establish electricity generation systems using

photovoltaic cells on the roofs of homes and sell them to the electricity grid. Another law was enforced determining the prices of purchasing electricity supplied to the Egyptian Electricity Transmission Company or electricity distribution companies from electricity generation stations using renewable energy sources.

In 2016, some State-owned areas were allocated to the New and Renewable Energy Authority for use in renewable energy initiatives under the usufruct system. In 2017, laws were enacted to amend the regulatory rules to encourage the exchange and use of electrical energy produced from solar power under the net metering system. In addition, in 2017, the Central Bank of Egypt introduced the renewable energy sector to the SME initiative to encourage banks to finance companies operating in this field, a key step to financing the expansion of renewable energy projects.

B. Strategies:

It is worth noting that the first renewable energy strategy was implemented by the Egyptian Government in 1982, targeting generating 5% of its electricity from renewable sources by the year 2000. In 2013, the Government adopted a twenty-year integrated sustainable energy strategy, targeting the period from 2015 to 2035, which was approved by the Supreme Council of Energy. It indicated that the Government had a long-term vision for planning this sector based on recognizing the financial and technical challenges involved in expanding Egypt's renewable energy projects.

The strategy is also considered a cornerstone to enable the further development of renewable sources and the involvement of all sectors. Therefore, it was amended to extend until 2040, including more tactics to enhance energy supply security and the financial sustainability of the industry. It targeted improving energy and resource efficiency by reducing 18% of total energy demand by 2035; this goal can be achieved by increasing the operational efficiency of power plants. Finally, the Egyptian Government adopted the National Strategy for Low-Carbon Hydrogen Production in early 2024 through the Supreme Council of Energy.

Undoubtedly, Egypt's Vision 2030 focuses on developing the renewable energy sector, as it seeks to create a diversified, competitive, and balanced economy under the framework of promoting sustainable development by using renewable energy sources and raising the efficiency of its non-renewable and renewable resources. It is sound to say that renewable energy planning in recent years has been clear and ambitious. Specific plans have been developed, most notably the Integrated Sustainable Energy Strategy 2035 issued by the Ministry of Electricity and Renewable Energy in 2015. It outlined the features of energy security and echoed Egypt's ambition to become an energy hub connecting Europe, Asia, and Africa by expanding interconnection networks throughout the Arab region and beyond. According to the strategy, renewable energy capacity should contribute 42% of energy capacity by 2035. Willing to expand into other renewable sources, the Ministry of Electricity and Renewable Energy signed in 2016 a memorandum of understanding to establish a general framework for geothermal energy exploitation with the Egyptian Petroleum Holding Company (Ganope) and the New and Renewable Energy Authority.

Additionally, clarity and ambition were evident in the combination of purely local and international efforts. On its part, the State has allocated more than 40,000 square kilometers to renewable energy projects and issued a law on incentives for projects concerned with green hydrogen and its derivatives. Egypt can be one of the main exporters of clean electricity and green hydrogen to Europe through renewable energy projects and improved efficiency of the power transmission network.

Internationally, Egypt has benefitted from major international forums to strengthen its presence among countries supporting the renewable energy sector. For instance, Egypt hosted the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) in 2022 in Sharm El-Sheikh. Egyptian diplomacy succeeded in obtaining financing for several projects, including two huge wind farms with a capacity of 10 gigawatts, which are set to be among the largest in the world and are being implemented through Egyptian partnerships with Arab and international counterparts.

The implementation of these adopted plans boosts the interest in the research and scientific aspects of developing the renewable energy sector. In 2021, the Geothermal Energy Capacity Building Project in Egypt was approved to build the necessary expertise to launch this sector on the ground through study programs for graduates in geothermal energy engineering. It also targeted establishing the first educational pilot plant, geothermal energy laboratories in Egyptian universities, and a national association for thermal energy.

The Third Pillar

The Institutionalization of the Renewable Energy Sector in Egypt

It is essential to navigate the institutional aspect to understand the renewable energy sector in Egypt, as it transforms Egypt's relevant natural resources into mechanisms and visions capable of bringing about positive economic and developmental change. The aspect is divided into two parts: (1) The organizational structures established by the State to manage renewable energy, whether related to planning or production and (2) the executive procedures carried out by bodies in alignment with the tasks for which they were established. The latter is, in turn, divided into two aspects: internal and external or local and international. To understand the local aspect, we must address the strategies and policies adopted in the renewable energy sector. The international aspect is related to projects implemented in coordination with other organizations and countries, whether concerned with financial, technical, or administrative aspects. The size of the foreign component may differ from one project to another and from one period to another.

A. Organizational Structures for Renewable Energy

The institutional framework for renewable energy in Egypt has been in place for nearly four decades. In 1986, the Egyptian Government established the New and Renewable Energy Authority. It targets developing the use of renewable energy and encouraging the local manufacture of relevant equipment. The New and Renewable Energy Authority is the national focal point for efforts to develop technologies and commercialize renewable and environmentally friendly energy sources. It plays a strategic role in implementing the Government's renewable energy plans.

B. Executive Procedures to Support the Renewable Energy Sector:

At the executive level, the first wind farm was established in Hurghada in 1993 with an overall capacity of 5.2 megawatts. Then, international cooperation emerged as one of the most crucial aspects of strengthening the renewable energy sector and increasing its contribution to electricity in Egypt. Since 2001, a chain of large-scale wind farms with a total capacity of 1.2 gigawatts has been established in collaboration with Germany, Denmark, Spain, and Japan. The Egyptian Government invested about EGP 24 billion (about USD 1.5 billion) in the distribution network between 2017 and 2020. Huge financial appropriations are yet needed to modernize the distribution networks. The Government is also working on upgrading 47 distribution monitoring centers nationwide. It has also shown interest in manufacturing; therefore, the State aims to increase local content in products related to renewable energy projects. The Ministry of Electricity and Renewable Energy succeeded in reaching 30% of local content in wind farms in 2018, and it was planned to reach 70% in wind farms and 50% in solar power stations in 2021.

Conclusion

Renewable Energy and the Egyptian Economy Prospects

Egypt's energy industry represents 13% of the gross domestic product and is a key factor driving economic and social development. By the end of 2023, wind energy represented about 2.7% of the installed capacity in Egypt, with a capacity of 1.6 gigawatts and 2.8% of power generation. Solar energy represented 3% of the installed capacity in the country, with 1.8 gigawatts and 1.9% of power generation. Nonetheless, the Government aims to produce 42% of the power generated from renewable energy sources by 2035, including 25% from solar energy, 14% from wind, and 2% from hydropower. To succeed, it is important to recognize the size of opportunities and work to take advantage of them, even when there are challenges to navigate.

A key challenge is competition. Egypt competes with Arab countries such as the United Arab Emirates, Saudi Arabia, Morocco, and Oman. With Egypt, they represent more than 70% of renewable energy growth in the region. In addition, balancing the supply and demand sides governed by rapid population growth and economic expansion creates major challenges in maintaining a steady and continuous energy supply and securing opportunities to develop the sector.

There are challenges also related to the requirements for connecting renewable energy stations to the electricity grid. To face the power generation difficulties in 2024, the Government accelerated the provision of generated energy, as 200 megawatts of solar energy fed the electricity grid. Another 500 megawatts will be provided by a private sector project in 2024, which will contribute to increasing the renewable energy produced on the Egyptian electricity grid. Some renewable sources are still not fully optimized, such as geothermal energy, an alternative, clean, and renewable energy source. It is a high-temperature energy of natural origin stored in magma in the interior of the Earth. It is one of the most prominent types of renewable energy, but it does not receive much attention in the region in general. For example, there are no geothermal power plants in Egypt.

However, there are some estimates that Egypt has the geothermal energy potential required to generate between 95 and 221 million kilowatts per hour. The thermal hot springs area in Hammam Pharaoh in the Gulf of Suez is considered the most suitable area for installing the first geothermal power plant in Egypt. If the calculation of returns considers the environmental and then economic dimension, Egypt will be able to address the lack of financing for new projects, a sticking point for renewable energy projects.

In contrast to these challenges, there are many opportunities. Even though Egypt is the largest consumer of oil and gas in the continent, it has a huge opportunity to shift towards renewable energy. The opportunities are supported by the achievements and the clear, adopted plans targeting a contribution of 42% by 2035, which will rise to 61% by 2040. Among the opportunities is the sector's ability to effectively contribute to driving economic growth, enhancing competitiveness and social justice, preserving the environment, and ensuring Egypt's leadership at the Arab, regional and international levels.

The renewable energy returns are expanding to include strengthening Egypt's international and regional presence, especially with the Government's move towards gradually stopping the operation of gas-fired power plants to make way for new renewable energy investments. The Government hopes that linking our electricity grid with neighboring countries, including Greece and Cyprus - allowing Egypt to export electricity to Europe - will help solve the problem of excess energy.

The Egyptian economy has the potential to support the development

of the renewable energy sector due to its strategic geographical location, low labor costs, skilled workforce, tourism potential, large energy reserves, and extended domestic market. Thus, Egypt can increase its consumption of energy resources and mitigate the volatility of the global oil market. This will strengthen its position by reducing its reliance on hydrocarbon exports. In addition, the list of benefits from some renewable energy sources is expanding beyond electricity generation; for example, thermal energy, in addition to its use in most greenhouses, is also a factor in attracting tourists, whether as recreational sites or for medical treatments. These natural hot springs can be developed into health resorts, boosting tourism and providing economic benefits. In addition to tourism, this energy can contribute to agriculture and industry.

Certainly, interest in the renewable energy sector reinforces the trend towards sustainability and can increase the contribution of this sector. It indicates Egypt's serious and effective integration into the global transformation towards the green economy. Promoting sustainability will also boost interest in increasing manufacturing, exporting advanced expertise, and redistributing financial resources to serve related sectors. It will push Egypt towards ensuring regional Egyptian leadership and raising healthy generations with environmental awareness, and the Egyptian economy will become more attractive to investments. Finally, Egypt has great and diverse potential from different energy sources, which contributed to Egypt's advancement of 5 ranks in the Energy Efficiency Transition Index issued by the World Economic Forum in 2022.

Accordingly, the renewable energy sector is the inevitable basis for meeting the ambition of the Egyptian economy, which is construction, industrial, and agricultural expansions. The Egyptian Government recognizes the need for a sustainable energy mix to meet growing demand and transition to a more environmentally sustainable and diverse electricity sector. It is already home to the third largest electricity market in the MENA region in terms of capacity and production volume, after Iran and Saudi Arabia, and is projected to have one of the highest growth rates among markets in the MENA region. The renewable energy mix will grow after adding green hydrogen. After constructing the first nuclear power plant to generate electricity in the Dabaa project, it is expected that Egypt's (future) renewable energy mix will include wind, solar, hydroelectric, geothermal, green hydrogen, and nuclear sources, which will push towards increasing Egypt's electricity exports to neighboring markets and Europe.

Although the Government has been interested in the renewable energy sector for more than fifty years, the past ten years have witnessed an intensive interest in this sector. It has boosted electricity production and underpinned the sector's important role in protecting and enhancing the performance of the economy as a whole. Egypt has the potential to produce, theoretically speaking, 1000 gigawatts, with 350,000 megawatts of wind energy and about 650,000 megawatts of electricity from solar energy. If Egypt can complete its diverse renewable energy projects at an accelerating rate, as planned, this mix will be capable of re-positioning Egypt among the countries of its regional surroundings and even pinpointing Egypt's importance in global energy markets. The renewable energy sector can help support 'Egypt's image cultivation' and its economy in a different way that attracts the latest technologies and translates them into direct economic returns with positive social and environmental impacts.

List of references:

1. https://www.statista.com/statistics/1215498/egypt-total-renewable-energy-capacity/#:~:text=As%20of%202023%2C%20the%20total,the%20capacity%20remained%20relatively%20stable
2. https://www.trade.gov/country-commercial-guides/egypt-electricity-and-renewable-energy IRENA (2018), Renewable Energy Outlook: Egypt, International Renewable Energy Agency, Abu Dhabi.
3. https://www.gcc.re/news/egypts-renewable-energy-revolution
4. https://enterprise.press/greeneconomys/egypts-renewable-energy-capacity-is-on-track-to-grow-65-by-2027-says-iea/
5. https://www.enerdata.net/publications/daily-energy-news/amea-power-gets-approval-connect-2-gw-renewables-egypt-mid-2025.html
6. http://www.nrea.gov.eg/About/Intro\
7. https://www.petroleumfuture.net/details/11487/egyptgas.com.eg\
8. https://www.youm7.com/story/2016/4/24/%D8%A7%D9%84%D8%A8%D8%AA%D8%B1%D9%88%D9%84-%D9%88%D8%A7%D9%84
9. https://aps.aucegypt.edu/ar/articles/809/renewable-energy-in-egypt-needs-and-priorities\
10. https://www.csregypt.com/%D8%AA%D8%AF%D8%B4%D9
11. http://www.nrea.gov.eg/Investors/Legislation#:~:text=%D9%82%
12. https://www.youm7.com/story/2024/5/23/%D9%85%D8%B5
13. https://ozoneeg.net/2022/08/08/%D8%A7%D9%84%D8%B7%D8%A7%D9%82%D
14. https://al-ain.com/article/geothermal-energy-egypt-dialogue
15. https://www.idsc.gov.eg/Article/details/9011
16. https://www.alarabiya.net/aswaq/exclusive/2024/07/18/-
17. https://sis.gov.eg/Story/271478/%D8%A7%D9%84%D9%85%D8%AC%D9%84%D
18. http://www.nrea.gov.eg/Technology/SolarIntro

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