

A proposed strategy to reform the electricity sector in Egypt

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Summary

The reform of the electricity sector requires commitments to expand and modernize the sector's infrastructure, considering the excessive dependence on fossil fuels and the imperative of securing resources; Most countries have realized how important it is to have a balanced energy mix that includes alternative energy; The phasing out of fossil fuel subsidies has become a core commitment of the international community.

This topic explains the institutional building of the optimal economic frameworks to support the development of this sector in a sustainable manner, in addition to the necessity of implementing effective economic frameworks for the energy sector, discussing reforms of the support system, restructuring the electricity sector, managing the demand side of energy, and implementing regulatory mechanisms based on the improvements of many Operational Performance Dimensions to Assist Countries in Transition; By undertaking a different mix of institutional reforms in its electricity sectors, and regional cooperation on cross-border energy trade.

Keywords: Electricity democracy, sustainable energy mix, institutional reform in the electricity market, financing nuclear projects.

The first axis: a model for restructuring the electricity sector

First: The Electricity Democracy System

Is meant to democratize energy; Restructuring the electrical system by increasing decentralization next to central power stations and the desire of national governments to control utilities, and the shift to partnership in the management of public electricity utilities for the public interest, that is, decentralizing electricity generation from central systems to small producers and citizens, in order to give a democratic character on the electricity grid and create opportunities to open up local ownership of electricity systems.

The process of democratizing electricity allows the citizens of any country either as individuals, cooperatives or communities to control electricity generation, transmission and distribution systems, but with a centralized system for the realization of national benefits, and the introduction of a democratic system characterized by the increased capacity for choice and control by the state in a way that promotes the pursuit of Universal access to sustainable and environmentally friendly electricity.

The democratization of energy is a very important factor in the transition to a more just society, and the rearrangement of the way in which entire economies and societies operate; as the ability to exploit, generate and distribute power from governments to individual individuals and communities; It is also a direct response by citizens and private companies to solve their electricity challenges; The government's political interventions toward renewable energy is not enough to spur interest from ordinary citizens.

The government needs to act through laws, policies and create awareness aimed at enabling citizens to have greater control over electricity services and stimulate more interest in renewable energy sources. Renewable energy systems represent a better option for both democratizing electricity and clean energy, and working on Empowering local communities and their citizens to generate their own energy; the response of individual investors and local communities to infrastructure development should be

Determined by the following:

- 1- Restructuring and privatization, where the government's gradual shift from centralization is considered important for the private sector to play a auxiliary role and overcome current problems, while the government maintains a strategic presence and exercises its regulatory mission with the support of working institutions well-established with the Anti-Competition and Monopoly Law, and its purpose is to encourage the private sector To enhance its productivity and contribution to the GDP.
- 2- A coherent policy framework that gives clear attention to issues of organizational planning and control, i.e. effective governance.
- 3- Eliminating unfair subsidies for high-income earners that have led to an unsustainable financial burden.
- 4- Clear criteria for monitoring performance, independent organization, and civil society participation.

Second: Energy Demand Side Management

The concept of demand-side management refers to the use of effective incentive measures to guide energy users to change the way electric energy is consumed, improve end-use efficiency, and optimize resources to achieve minimum costs.

The principles of demand side management are as follows:

- 1- Drafting and amending laws, regulations, and policies to ensure the implementation of administrative measures, such as energy efficiency standards "National Energy Policy Law" and "Public Service Management Policy".
- 2- Reforming and improving the electric price system, adopting a flexible price, and improving the electricity grid loading rate.
- 3- The government will create support for demand side management by building multi-incentive mechanisms and adopting pricing and economic methods to enhance the motivation of energy companies and electricity customers.
- 4- Appropriate incentives to support the training of power engineers for the need for increasingly professional knowledge such as low carbon and smart power grid technologies.

Supply side options	demand side options
<ul style="list-style-type: none"> - High speed reciprocating motors. - Install advanced measurement systems to reduce losses. - Purchase of renewable equipment for power plants. - Repair and move existing stations. - Switching fuels and diversifying sources of power generation. - Reducing environmental pressures. 	<ul style="list-style-type: none"> - Increasing the industrial electricity tariff, and implementing a plan to raise prices for the cost of electricity resulting from the generation of thermal plants. - media campaign to diversify the electricity network and cogeneration. - More efficient equipment replacement. - Rehabilitation of existing power stations in the public sector. - Rationalize electricity consumption.

Table No. 42 Demand-side management initiatives for electricity

Source: Lin, J., He, G., & Yuan, A. (2016). Economic rebalancing and electricity demand in China. *The Electricity Journal*, 29(3), 48-54.

5. Good government and due process of law through inclusion of relevant stakeholders in decision-making processes and effective consultations with local communities; Where "good governance" is defined by a low level of corruption, transparent government procedures, and the provision of effective and responsive legislation.

6- The current sustainability measures are related to the principle of "responsibility", which considers the state responsible for protecting the natural environment and reducing the social and environmental costs associated with energy production and use.

7- Implementation of public policies and educational campaigns that target social awareness and effective use of natural resources.

8- Geological disposal of radioactive nuclear waste; By increasing funding levels for research and development in nuclear waste as a fixed part of the Ministry of Energy's budget.

The second axis: targeted plans to secure sustainable national energy in Egypt

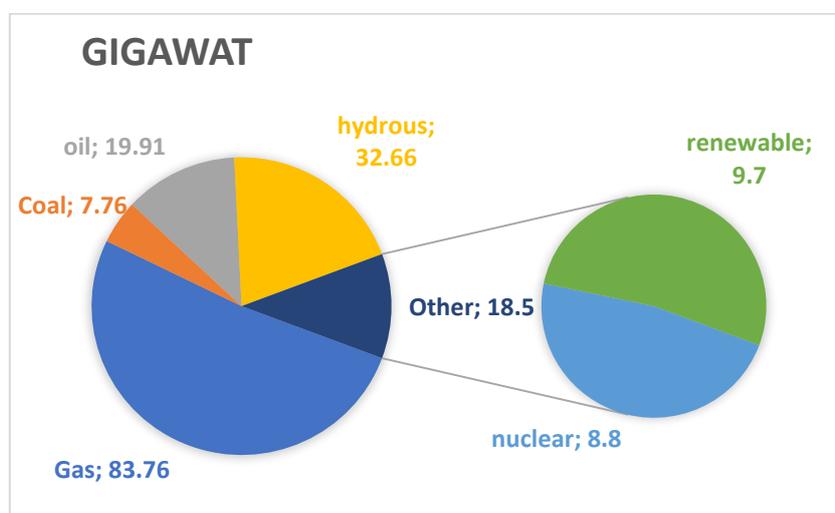
First: The methodology of energy transfer and transformation into a sustainable energy mixture

The basic idea of securing national energy is evident in diversifying the primary energy mix by increasing the proportion of less costly and less volatile energy resources; This is based on a generation mix of oil, gas, coal, hydropower and nuclear resources, and the goal of most electricity policy plans is economic dependence and self-reliance in the energy sector in order to maintain social and economic development, and then nuclear energy is a primary source of electricity, so it can be considered an alternative away from imported fuels and a shift to a diversified, low-carbon blend to promote development; Where the current global trend expresses a common desire to transform energy systems, and therefore nuclear energy will certainly not

be able to meet the requirements of the new load alone, and the optimum combination of wind and solar energy must be chosen for the energy system, which is necessary to balance supply and demand in Egypt.

Diversification of the energy mix requires the following: A - Attracting public and private sector investments. b- Intensifying uranium exploration efforts. c- The full use of domestic resources will help diversification of fuels to integrate these resources into the primary energy mix; It also requires defining a share for each alternative energy technology, which is shown in the following figure:

Figure No. 47 The proposed electricity generation mix 2030 in Egypt for the year 2030



Source : Gralla, F., John, B., Abson, D. J., et al. (2016). The role of sustainability in nuclear energy plans—What do national energy strategies tell us?. *Energy Research & Social Science*, 22, 94-106.

Among the visions calling for this, the mixture of the initial stages should consist of relatively more mature renewable

energy technologies, such as solar photovoltaic energy and wind energy, and then embarking on the establishment of a regulatory body specialized in nuclear safety; With the aim of regulating the nuclear energy industry with regard to radiation safety and managing the operation of the network infrastructure to ensure a reliable flow of electricity, and from the implications of that idea, the New Nuclear Facilities Program will introduce a variety of manufacturing and construction activities in the national economy with a great potential to localize industry and services in conjunction with the development of knowledge and local capabilities. Therefore, Egypt must adopt strong measures towards diversifying its energy sources, which depend on short and long-term planning to meet energy demand through the following factors:

- Institutional reform and strengthening of regulatory controls to improve transparency and efficiency.
- Measures to ensure targeted support design and methodology that require eligible consumers.
- Providing the electricity network based on the smart grid to conserve energy and increase efficiency.
- Rationalizing electricity tariffs to obtain sufficient investments for a low-cost fuel mixture, protecting the rights of the poor and setting appropriate support for their consumption, which requires the government to connect disadvantaged areas with electricity and provide the poor.

Second: Designing effective incentive mechanisms to support the energy structure in Egypt

Public policy initiatives are characterized by diversifying energy sources and promoting efficient methods of co-generation, as well as posing significant risks to national security if the country relies on a single source in production;

From this principle, the state will increasingly need the active participation of the public and private sectors to ensure sustainability. According to that vision, the changes included a much smaller role for the government in determining the energy mix to support competition and enhance stability and efficiency in electricity markets, by taking some of the following measures:

- 1- The government plays a smaller role in making supply and demand decisions that are largely determined by the markets.
- 2- Providing a supervisory body to improve monitoring of electricity markets and implement regulations to ensure integrity and impartiality in line with policy reforms.
- 3- Enhancing the ability of the national grid to adjust the balance between supply and demand of electricity in real time and in emergency situations.
- 4- Integration of regional markets, where integration helps regional governments to overcome institutional constraints and increase their ability to make credible political commitments and facilitate the introduction of competition into monopolistic electricity markets while respecting the national borders of each country.
- 5- Implement effective organizational governance characterized by coherence, independence, accountability, transparency, predictability, and effective organizational supervision, in addition to improving operational efficiency.
- 6- In the electricity sector, priority is given to restructuring the tariff system and resetting prices at low costs, to restore adequacy of revenues and generate internal funds for capital investment.

7- Infrastructure development provided that the government's role is limited to making decisions and setting policies and enhancing service provision through a competitive and transparent private sector.

8-- Electricity prices are set by the government and vary by group of consumers as they are higher for consumers who have more energy and a higher social level; This means that they pay a higher margin per kilowatt-hour at higher usage levels; By adopting a flexible pricing policy and appropriate pricing systems for household bills based on their income level.

9- Exempting the poor from higher electricity prices, so the increase in electricity costs is politically determined and promoted through budgetary considerations.

We conclude from this that the lack of diversity in the energy mix will have direct repercussions on nuclear and national security, as the framework of the nuclear energy conservation and expansion policy as a national security necessity depends on building confidence in energy safety, providing information on the impact on health, environment and security, and proving the occurrence and stopping of accidents and nuclear safety, in addition to the ability of the government, operators, regulators, nuclear experts, and nuclear waste management agencies to assume their responsibilities in protecting citizens from nuclear risks.

Here, it must be stated that the goal of the strategy to secure energy supplies in Egypt is to reach a competitive energy that would protect the consumer, protect the environment, supply safety, technical safety, and sustainable development. This strategy focuses on national energy independence and ensuring sustainable improvement of the economy's ability to compete in the Egyptian electricity market. And the nuclear stations will be the basis for the balance of the electricity system.