

INTEGRATING ENERGY MIX

into Egypt's Energy Sector



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In 2015, the United Nations Sustainable Development Summit declared the 2030 Agenda for Sustainable Development, widely known as, the Sustainable Development Goals (SDGs). One of these goals is primarily concerned with “affordable and clean energy”, that would be attainable through diversifying energy mixes all over the world.

In the same line, Egypt formulated its 2030 vision on a set of pillars in order to diversify its economy and shape a new Egypt. Energy is one of the vision’s main pillars that aim to contribute to economic growth and preserve the environment as well as meeting the local demand for energy. It envisions the sector to be a leading renewable energy hub that is capable of adapting to local, regional, and international developments in a sustainable manner.

Egypt has been suffering from an energy shortage that exacerbated in recent years. Hence, the need to diversify the country’s energy resources and shift the reliance from fossil fuels into renewable energies is most needed. In order to meet the 2030 vision expectations, the government embarked on an European Union (EU) initiative to reform the energy sector in Egypt, in addition to an energy strategy modelling to shape a national energy strategy.

ELECTRICITY PRODUCTION

Since 1997, Egypt’s electricity generation has tripled to over 180 terawatt hours (TW/h) in 2015, according to the BP Statistical Review of World Energy. Even though the electricity production has

PEAK LOAD PROJECTION (GW)

SCENARIOS	AVERAGE GROWTH	2013	2018	2020	2030	2035
LOW	5.2%	27	35	42	59	71
MEDIUM	6.2%	27	35	43	62	76
HIGH	7.1%	27	36	46	68	86

Source: TARES

increased, the Egyptian population grew at a much higher rate widening the gap between electricity production and consumption.

In fiscal year (FY) 2016/2017, Egypt’s production of electricity amounted to 188.619 billion kilowatts per hour (kWh), where the production stood at 185.645 in FY 2015/2016, constituting an increase by 1.6%.

Solar energy was the fastest growing energy source in FY2016/2017, an increase by 357.5%. On the other hand, hydropower shrank by 5.1% in FY 2016/2017 compared to FY 2015/2016.

ELECTRICITY CONSUMPTION

The consumption of electricity amounted to 152.99 billion kilowatt hours (BKW/h) in FY 2016/2017 and 155.476 BKW/h in FY 2015/2016, constituting a

decrease of 1.6%.

Households consumed 44.04% of total electricity consumption in FY 2016/2017, while exports made up 0.11% of total consumption during the same period.

EXPECTED EVOLUTION OF PEAK LOAD

An EU funded project, Technical Assistance to Support the Reform of the Energy Sector (TIMES), is an energy strategy modeling that adopts medium/long term energy scenarios to create national energy strategies. TIMES introduced peak load projections based on three different scenarios; low, medium, and high. These scenarios are related to various economic growth estimations. To cite an instance, TIMES expects a low peak load to reach 71 gigawatt (GW) in the low scenario by 2035, 76 in the medium scenario, and 86 in the high scenario.

ELECTRICITY PRODUCTION FY2015/2016 VS FY2016/2017 (BKW/H)

ENERGY SOURCE	2015/2016	2016/2017	ROC(%)
THERMAL ENERGY	169.967	172.989	1.8
HYDROPOWER	13.545	12.849	-5.1
WIND POWER	2.006	2.2	9.7
SOLAR ENERGY	0.127	0.581	357.5
TOTAL	185.645	188.619	1.6

Source: Ministry of and Planning, Monitoring, and Administrative Reform, Annual Report, FY2016/2017.

ELECTRICITY CONSUMPTION FY 2015/2016 VS FY2016/2017 (BW/H)

CONSUMPTION	2015/2016	2016/2017	ROC(%)
HOUSEHOLDS	72.572	67.371	-7.2
INDUSTRY	38.482	41.525	7.9
COMMERCIALS	19.153	18.695	-2.4
PUBLIC UTILITIES	11.922	11.727	-1.6
PUBLIC ENTITIES	6.501	7.001	7.7
AGRICULTURE	6.39	6.497	1.7
EXPORTS	0.456	0.174	-61.8
TOTAL	155.476	152.99	-1.6

Source: Ministry of Planning, and Monitoring and Administrative Reform, Annual Report, FY2016/2017.

SUPPORTING THE REFORM OF EGYPT’ ENERGY SECTOR

In 2016, the EU funded the Technical Assistance to Support the Reform of the Energy Sector (TARES) initiative in Egypt, with the cooperation of the Ministry of Energy and Ministry of Petroleum and Mineral Resources.

TARES was established through the development of the Energy Strategy Working Group, applied the TIMES-Egypt modelling and elaborated through scenario analysis, several potentials, and likelihood options looking ahead to 2035. “TARES identifies between the baseline year, 2010, and a target date, 2035, an overall EE (energy efficiency) policy target might achieve feasibly energy savings up to 20 million tons of oil equivalent (mtoe) on a scenario of energy consumption of 112 mtoe in 2035 corresponding to 18% of the total consumption in 2035. The potential savings affect all sectors including the construction, industry, and transport sectors with 8.6mtoe, 6.76mtoe, and 4.5mtoe, respectively,” according to a press release published on the EU External Action website.

TARES “aims to improve energy policy and regulatory framework and promote energy efficiency and mitigation of greenhouse gas (GHG) emissions. With an overall budget of EGP 590.3m, the Energy Sector Policy Support Program aims to assist Egypt in implementing its far-reaching energy reforms and to foster implementation of its strategic energy partnership with the EU to improve energy security and sustainable development,” the press release explained.

PROPOSED SCENARIOS

There are four scenarios in TIMES energy model that are shortlisted for approval as well as a base-line scenario. This scenario includes a set of factors: oil and gas production, fuel subsidies, availability of coal for power production, nuclear power, renewable energy sources (RES), and energy efficiency.

The fuel subsidies is further categorized into two cases:

- Subsidies kept for the whole time horizon
- 50% phase out in five years, 100% in 10 years (sensitivity on the subsidies)

The scenarios are not primarily focused on costs, but take into consideration other factors, such as diversification of energy supply, energy efficiency, energy cost for the consumer, reduction of GHG emissions, as well as introduction of renewable energy sources.

The first scenario includes three alternatives for renewable energy sources, employing the same rates for energy efficiency. The second one delays nuclear power by five years and employs high-energy efficiency. The third scenario postpones the use of nuclear power to 2035, refrain from coal in power plants and the whole industry, in addition to high-energy efficiency.

The fourth scenario will phase out subsidies in five years, nuclear power will be on a cost optimization basis, and coal will be available starting from 2021/2022.

An approach of a Multiple Criteria Decision Making (MCDA) was applied in ranking the scenarios by a panel of experts. The MCDA approach incorporated factors other than costs in the set of criteria.

EGYPT'S ENERGY MIX STRATEGY

The energy sector in Egypt, namely, electricity, renewable energy, and oil, prepared a study in collaboration with the TARES initiative. The study takes into consideration the technical and economic aspects of producing energy till 2035, as stated on the New & Renewable Energy Authority website.

The Renewable Energy Strategy was amended post the latest events and political developments that took place in Egypt in recent years impacting renewable energy projects. The modification aims to reach 20% out of total produced energy in 2022.

The study includes a set of scenarios for energy mix with different assumptions. It attempts to evaluate the impact of incorporating renewable energies by different percentages in electricity generation mix from a technical and economic aspect in order to choose the optimal scenario.

The Energy Higher Commission ratified the Egyptian Energy Strategy until 2035 in November 2016. Scenario 4B is set to be the guideline in energy planning in Egypt in the coming period. The renewable energy contribution rate is projected to reach 37.2% of total electricity produced in 2035.

