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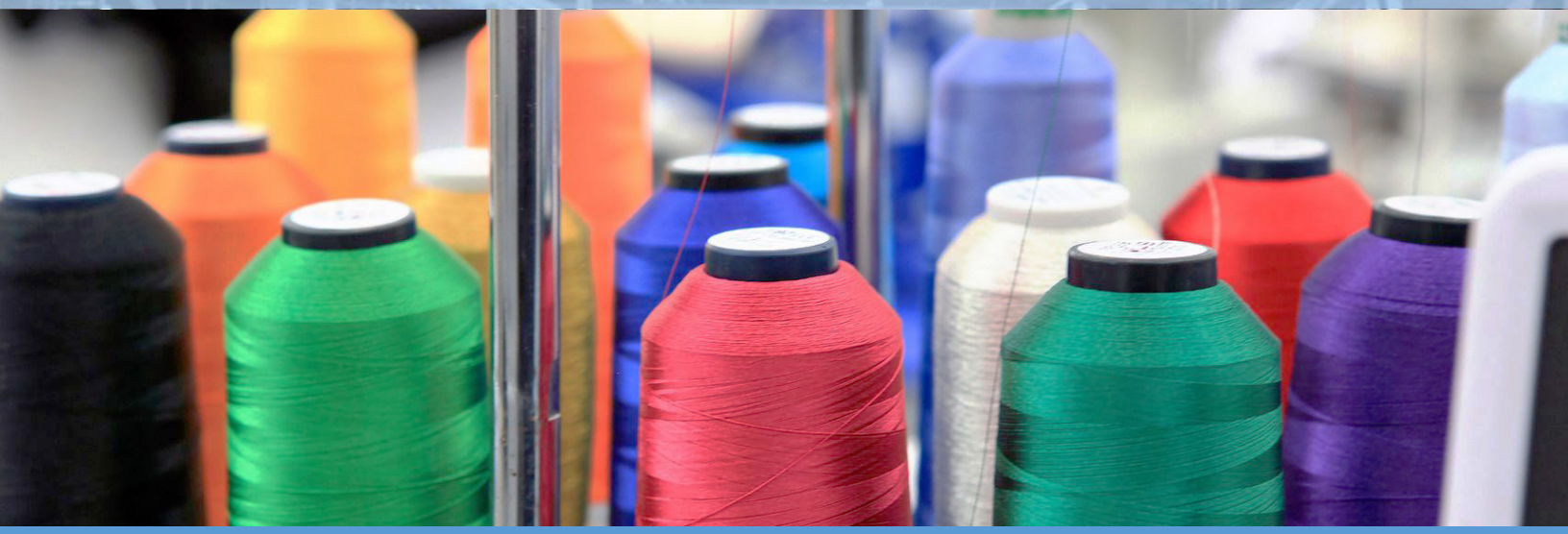
INDUSTRIAL ENERGY EFFICIENCY PROJECT



Integration of Energy Efficiency into Textile Sector Strategy

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مركز تحديث الصناعة
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الهيئة العامة للتنمية الصناعية
Industrial Development Authority

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1. Introduction

1.1 Background

The Ministry of Trade and Industry (MTI) has developed and launched the Ministry's strategy for 2020 in November 2016. Concurrently, an Industrial Energy Efficiency Strategy and Policy (IEESP) Report was developed for the ministry by the United Nations Industrial Development Organization (UNIDO) within the scope of the Industrial Energy Efficiency (IEE) Project in Egypt, funded by the Global Environmental Facility (GEF) and implemented by UNIDO in cooperation with the Egyptian Environmental Affairs Agency (EEAA), MTI and the Federation of Egyptian Industries (FEI).

The MTI initiated the development of strategies for five sectors selected by the Ministry namely; Automotive, Chemical, Construction and building materials, Engineering feeding industries and Ready-made garments/textile (RMG/T) and textiles. The development of these sectors' strategies is led by the EU programme for Trade and Domestic Market Enhancement (TDMEP) and coordinated among various donors and stakeholders.

Following the formulation of the IEE policy recommendations in 2015, the Ministry of Trade and Industry requested UNIDO to provide technical inputs to integrate the IEE SP recommendations into the sectorial strategies being developed under a broader stream of resource efficiency.

To date, this exercise was already undertaken for the sectors of chemicals and building materials.

1.2 Objective of the Report

The objective of this report is to integrate IEESP into the textile and RMG/T sectorial strategy developed by MTI.

1.3 Methodology

The RMG/T and textiles sector's IEE strategy relies on the approach, findings and recommendations previously developed in the IEE strategy, taking into account the constraints and opportunities based on which it has been developed. The IEE strategy was tailored to the Textiles sector based on:

- Review of relevant documents
- Specifying applicability according to the defined criteria in the IEE strategy; including dominant size of firms in the sector, energy intensity, export orientation, etc…
- Attending sector strategy meetings, and discussing relevant elements with the members of the relevant stakeholders.

The textiles and RMG sector strategy is also directly linked to the main goals of the MTI 2020 Strategy, Higher Council of Textile and FEI textile Chamber

Vision as well as those of the MSMEs and Entrepreneurship National Strategy (2017-2022), as detailed in Annex I

As this energy efficiency sector strategy is part of the overall strategy of the Ministry of Industry targeting year 2020, it will work on a short term five years plan.

2. Textile Sector Profile

This section provides basic information on the current situation of the textile sector in Egypt. Figure (1) represents the main key segments of the textile industry.

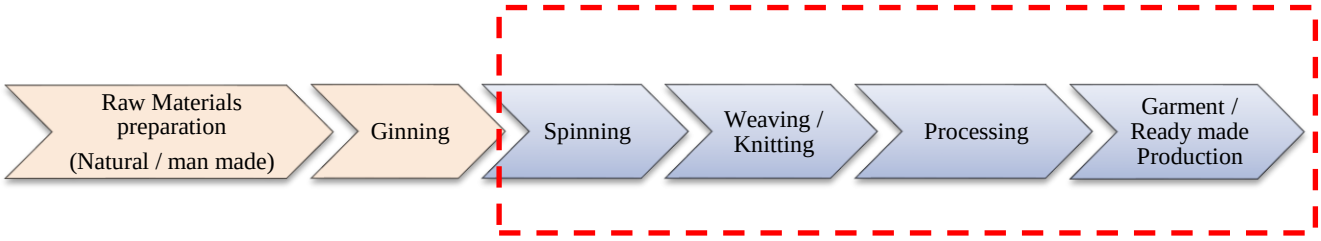

Figure (1): Textiles Industry Key Segments

The supply chain up to ginning is overseen by the Ministry of Agriculture. Article 33 in the Egyptian Agriculture Law, 53/1966 amended by Law 231/1988, mentioned that "it is not permissible to operate any scutcher except after obtaining a permit from the Ministry of Agriculture". The state-owned cotton scutchers are under the Holding Company for spinning and weaving overseen by the ministry of Public Business sector and in coordination with the Ministry of Agriculture.

As this strategy is addressed to the MTI, it focuses on industries under the responsibility of MTI. Accordingly, the profile covers the Spinning, Weaving / Knitting, processing / finishing and RMG/T subsectors, as represented in dotted line in Figure (1).

The data presented in the profile section of this report is based on the CAPMAS census data of 2017 for the textile sector, which classified it into three sections; textile industries, other textile and RMG. The main textile section is including spinning, weaving and processing subsectors. The other textile industries includes textile products such as carpets, fur, ropes, etc. the presented data in the profile section are based on the textile section and RMG/T, as the number of enterprises in the textile and RMG/T sections is relatively higher than the other section, regardless of its share in GDP, which will not significantly affect the report data. However, the collective data of the whole sector presented in other parts of the report might include all textile sections unless it is otherwise mentioned.

2.1 Contribution to the Egyptian Economy

Egypt is a vertically integrated center for the natural textiles industry in the Middle East, with the entire production process, from the cultivation of cotton to the production of yarns, fabrics and RMG/T, carried out domestically. Some man-made textiles are also produced locally such as artificial silk, viscose and polyester. The sector plays an extremely central role in the Egyptian economy (GAFI, 2013), as it contributes 3% of the Egyptian GDP, 30% of industrial work force, and 10% of total exports, (MTI, 2018).

2.2 Ownership

According to CAPMAS, 2013, Egyptian textile and RMG/T firms are mainly private consisting of 28 public textile facilities, 10,452 private textile, and 48,444 private RMG/T facilities[1].

2.3 Age of Establishments

The age of a facility is one of the major factors affecting its energy efficiency. Figure (2) shows the percentage of textile and RMG enterprises per year of establishment.

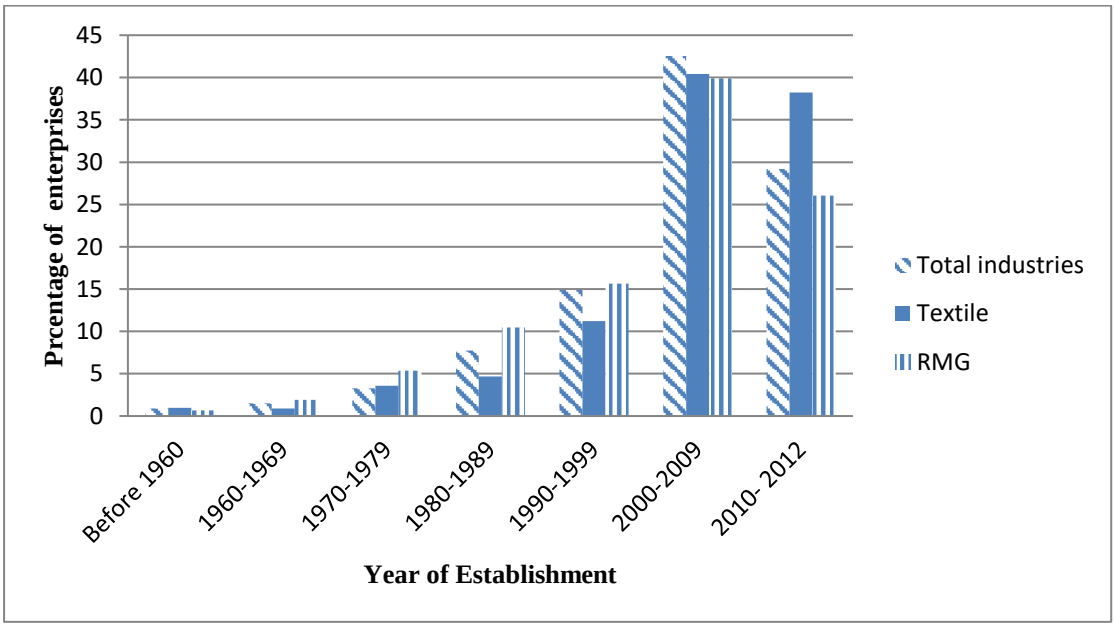

Figure (2): Percentage of Enterprises Per Year of Establishment

Source: CAPMAS, 2014

The figure shows that the textile industry is relatively newer than the RMG, as about 80% of the textile enterprises have been established from 2000 to 2012. It is noticeable that many textile and RMG facilities have been established more recently when compared to the whole industrial sector. In principle, this could be taken to indicate that the largest percentage of this sector's facilities is not considered old. However, this does not necessarily mean they use modern

[1] This does not include carpets, fur and ropes manufacturing enterprises.

technologies, due to the practice of importing used equipment which started with the dismantling of the industry in Eastern Europe in the 1990s.

Also, it is worth mentioning that the QIZ[2] protocol could have affected the establishment of textile facilities after year 2010, as there are over 900 registered QIZ companies, of which the vast majority produce textiles and clothing items[3].

2.4 Size Distribution

As highlighted in the IEE Strategy Report, the Egyptian industry is highly polarized in terms of size. The concept of small and medium-sized enterprises differs from a country to another according to their specific economic and social conditions. The definition also varies according to its purpose; the criteria of defining the projects could be the labour, capital equity, added value, etc.

In this report, the main criterion suitable for categorizing the different projects is the number of employees, as this is the information publically available and periodically published. A survey is made to the different definitions of local and international organizations as shown in the table (1).

Based on this survey, Environics has categorized the ***Micro enterprises*** as ones that have less than 10 employees according to the Egyptian central bank decree, dated 3 December 2015, the International Labor Organization[4], World bank / IFC[5] and the European Union[6].

Law 141 / 2004 concerning the development of small enterprises categorizes projects with employees not exceeding 50 as ***Small enterprises***. Again, the IFC and the European Union have the same categorization. Consistently, the Egyptian Labor Law number 12/2003 have higher requirements for organizations having more than 50 workers, which indicates the importance of this number to define its categorization of enterprises.

Medium enterprises are defined according to the Egyptian central bank decree dated 3 December 2015 as enterprises which employees do not exceed 200. The IFC defined these enterprises as those which employees do not exceed 250. It is understood that enterprises exceeding these figures are ***Large enterprises***.

[2] Qualified Industrial Zones (QIZ) are designated geographic areas, within Egypt, that enjoy a duty free status with the United States. Companies located within such zones are granted duty free access to the US markets, provided that they satisfied the agreed upon Israeli component, as per the pre-defined rules of origin.

[3] http://www.amcham-egypt.org/trade-resources/egypt-us-business-data/qualifying-industrial-zones

[4] Small and medium-sized enterprises and decent and productive employment creation report, International Labor Conference, 104th Session, 2015

[5] IFC, MSME Country Indicators, 2010

[6] Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises

Moreover, given the categories of data published by CAPMAS for the census 2017, Environics categorizes medium to large enterprises as those having from 100 to less than 500 employees and the very large enterprises are ones having more than 500 employees.

Table (1): Enterprise categorization according to number of employees.

Organization		Category according to number of employees
Local Authorities		
1	Law 141 / 2004 concerning the development of small enterprises	Small: < 50
2	Egyptian Central Bank decree, dated 3 December 2015	Micro: < 10 Small and Medium: up to 200
3	Ministry of Foreign Trade	Micro: <5 Small: 5-49 Medium: 50-99
4	Small, Medium and Small Enterprises Development Agency	Micro: <5 Small: 5-49 Medium: 50-99
5	Ministry of Industry	Small and Medium: 10-100
6	Federation of Industries	Small and Medium: < 100
7	Ministry of Administrative Development	Small: < 20
8	Ministry of Local Development Law 110/19975	Craft projects: > 9
9	Central Agency for Public Mobilization and Statistics	Small and Medium: 50 - 100
10	National Planning Institute	Small and Medium: 10-49
International Organizations		
1	International Labor Organization	Micro: 1–9 Small: 10–99 Medium: 100–249
2	World bank / IFC	Micro: 1–9 Small: 10–49 Medium: 50–249
3	European Union	Micro: 1–9 Small: 10–49 Medium: 50–249

The distribution of specific sub-sectors according to facility labor employment is detailed in section 2.8

2.5 Geographical Distribution

The geographic distribution of textile and RMG/T enterprises across Egyptian governorates is given in Table (2).

Table (2): Geographic Distribution of Textile and RMG/T Enterprises

	Number of Establishments			
	Spinning	**Weaving**	**Processing**	**RMG/T**
Cairo	104	156	59	4900
Alexandria	63	74	33	2084
Port Said	8	0	2	152
Suez	1	1	0	124
Damietta	4	7	1	303
Dakahlia	138	65	6	1600
Sharqia	94	93	12	5254
Qaliobeya	222	623	66	2415
Kafr El Sheikh	66	183	5	771
Gharbia	231	1284	79	2416
Monoufia	118	185	3	2491
Behaira	164	184	2	3249
Ismailia	3	8	1	278
Giza	56	86	54	4004
Beni Suif	3	4	3	360
Fayoum	12	2	3	650
Menia	6	6	2	675
Asyut	5	11	3	312
Sohag	16	174	8	416
Others	2	3	4	895

Source: *CAPMAS, 2017*

The RMG/T is the subsector most distributed across Egyptian Governorates, followed by the weaving subsector. The spinning subsector is more concentrated while the processing subsector is the most concentrated in some governorates as around 85% its facilities are located in 6 governorates; Cairo, Alexandria, Giza, Gharbia, Qaliubia and Sharkia.

2.6 Textile Industry Growth

A number of events over the years have had negative impacts on the sector in Egypt. With the abrogation of the regulated agricultural rotation in 1993, Egypt's production of cotton has been neglected. In 1994, Egypt has issued Law number 210, which reorganized the cotton trade in Egypt. This Law caused a rise in cotton prices, as a result of the cotton trade liberalization, which led to the closure of some spinning and weaving companies. This rise in prices seems to have benefited traders more than farmers who were even more discouraged to continue production. This Law was amended with decree number 4 for year 2015, in an attempt to repair some of the losses caused by Law 210 /1994 by adding some cotton types to be traded by the ministry of agriculture.

Egypt’s entry to the WTO in 1995 initiated the liberalization of the sector after which Egypt lifted a 30-year import ban in 1998 for textiles and in 2002 for clothing, both in compliance with its WTO commitments. Nevertheless, the ban

was initially replaced by prohibitive tariffs. Only later—in 2000, 2004, and 2007—were substantial tariff reductions introduced.

Egyptian producers were unable to compete with lower cost overseas producers, especially those from China, losing market share at home, reflected in the dramatic decline in domestic textile and RMG sales. The substantial growth of the sector's imports is not the sole cause for production and domestic sales decline; there are also the effects of privatization and government's neglect of public spinning and weaving companies[7].

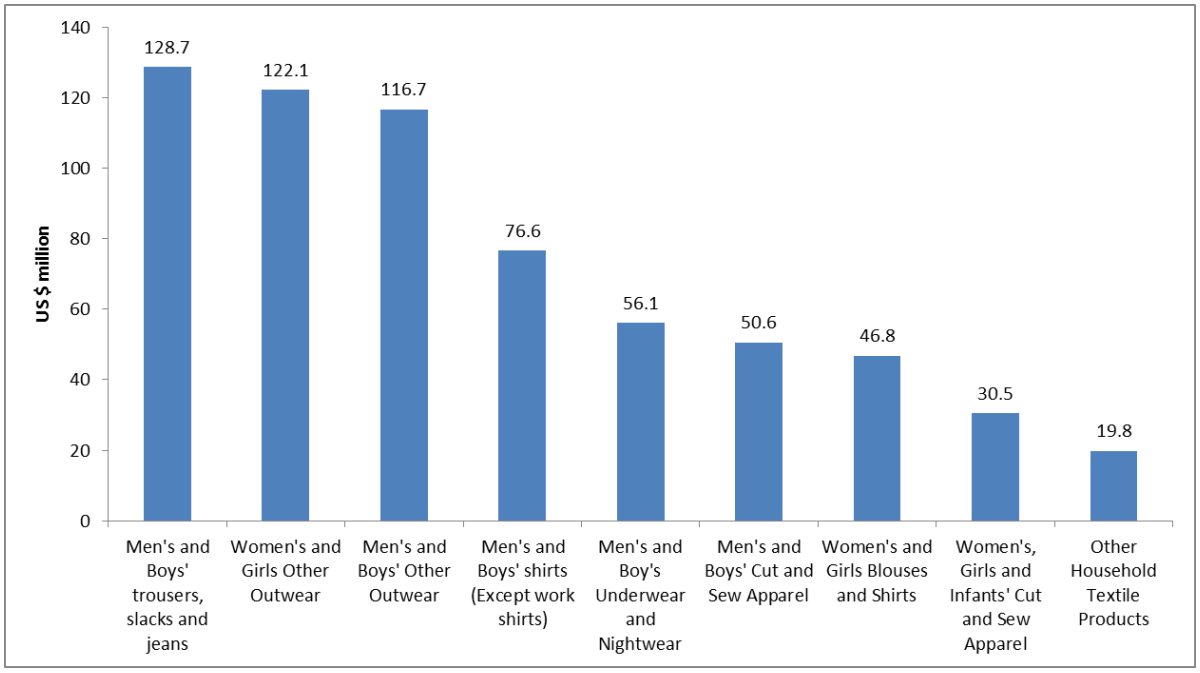

Figure (3): Egypt Top QIZ Exports at 2016

Source: American chamber of commerce in Egypt, trade and investment profile 2017

In 2004 / 2005 Egypt has signed the protocol of the qualifying industrial zones(QIZ)[8] which exempts Egyptian products entering the US market from customs, given some conditions. This increased the chance of Egyptian textile exporting to US, which is considered the largest importer of textile products. . Figure (3) shows the Egypt top QIZ exports at 2016, in which textile and RMG exports made up 93% of all of Egypt's QIZ exports excluding carpets.

According to the MTI strategy (2016 – 2020), the Egyptian economy has been directly affected by world's economic developments, evidently seen in exports, direct and indirect foreign investments, tourism and remittances. Moreover, the Egyptian economy had been influenced by the decline in economic growth forecasts, especially of EU countries and USA. These countries are not only Egypt's most significant commercial partners, but until recently were the main sources of direct foreign investment.

[7] ILO and ECES, effects of the global crisis on the Egyptian textiles and clothing sector: a blessing in disguise, May 2010

[8] http://www.qizegypt.gov.eg/QIZ_Data.aspx

Currently, Turkish and Indian investments in Egypt have become an integral part of the textile sector landscape. Much of the Turkish investment in Egypt is concentrated in the textile and ready-made garments (RMG) sector. India seeks to enter the textile industry in Egypt, through bilateral cooperation in the field of textiles[9].

MTI strategy (2016 – 2020) planned to establish new full cities that will be allocated and qualified for the Textile City Clusters in Menia, Dakahlia, Sohag and Assuit, and for Ready-made Garments Cluster, in Delta. The creation of the new cities aims at developing the textile industry in Egypt and attracting foreign investments. The Chinese investments are promising as China is one of the highly competitive countries in this sector, and is seeking to invest in international markets such as the Egyptian market.

Moreover, Law number 5 for year 2015 concerning preference of the Egyptian products in the governmental contracts, has added of the current growth trend, and the Egyptian textile industry is currently accountable for 16% of the Industrial growth[10]

2.7 Textile Products Exports Orientation

Egypt's geographic location has placed it within reach of major international markets including those of Europe, the Arab region, Africa and South Asian countries. The flourishing textile industry of Egypt is perceived to be very promising; due to the country's competitive cost of labor and its vast expertise in the textile manufacture industry.[11]

According to the available data from the Central Bank of Egypt, the orientation of textile fabrics and Ready-made clothes products exports are represented in figures (4) and (5).

[9] https://www.eoicairo.in/eoi.php?id=INVEST
[10] National Council on textile, Egypt Textiles Development Strategy "vision 2025", December 2015
[11] ibid

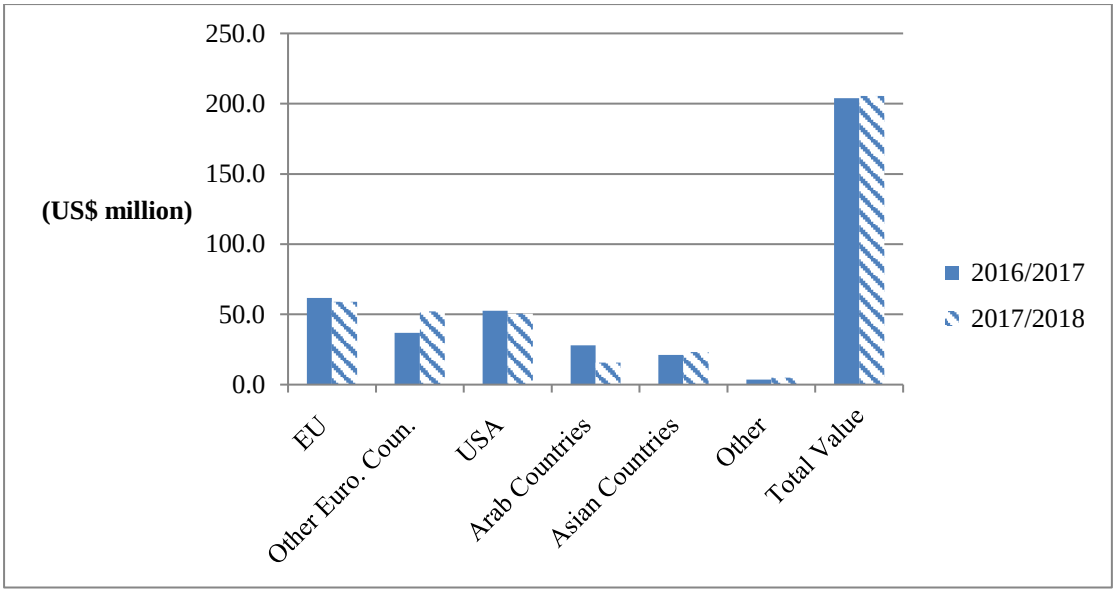

Figure (4): Textile fabrics Exports Geographical Distribution During 2016/2017 and 2017/2018[12]

Source: Central Bank of Egypt, external sector data report, 2018

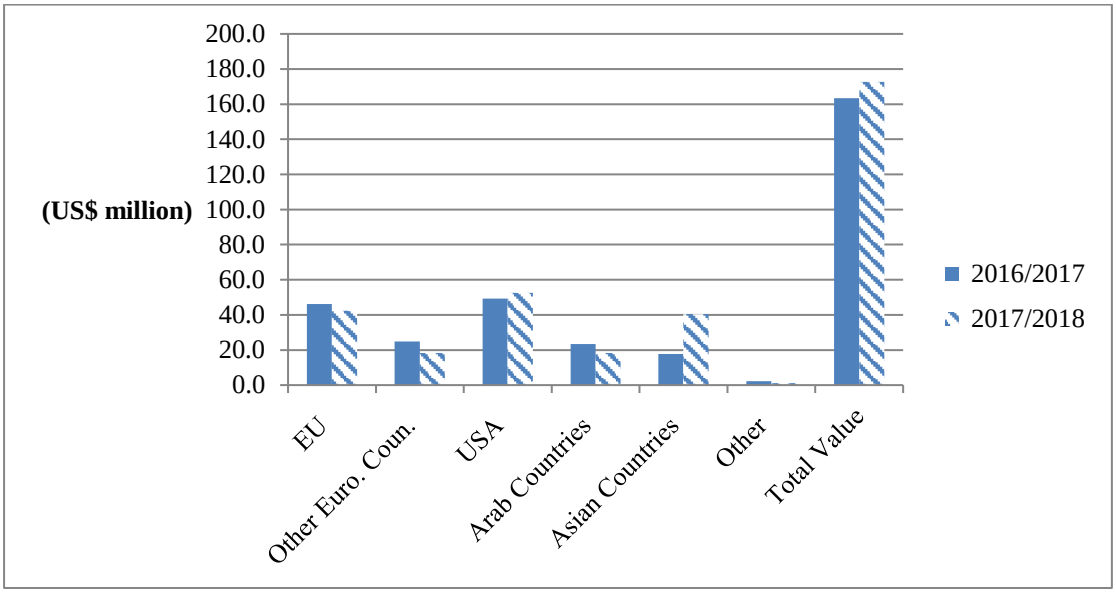

Figure (5): Readymade clothes Exports Geographical Distribution During 2016/2017 and 2017/2018[13]

Source: Central Bank of Egypt, external sector data report, 2018

The above figures show that most of Egyptian textile and Ready Made clothes exports are directed to the United States, the European Union and other European countries.

However, for all practical purposes, only a small share of the Egyptian manufacturers are in the exporting business. According to the CAPMAS 2014 economic survey, the total number of textile exporting facilities are less than

[12] Provisional
[13] Provisional

250 facilities which is less than 0.5 % of the total number of facilities. Of these 163 are exporting RMG/T facilities representing 0.3% of the total RMG/T facilities. However, for these it is imperative that they abide by the environmental requirements for exports.

2.7.1 Environmental Requirements for Textile Exports

The analysis of export requirements to the EU and the US (as the major destinations of the Egyptian textile exports), indicates certain features and trends potentially relevant to the aim of improving energy efficiency in this sector. There are some similarities between the requirements of the two destinations, especially in relation to protecting human health from chemical substances, but there are also major differences.

In the EU, textile imports fall under the EU's chemical legislation, REACH (EC 1907/2006), requirements, which aims to protect human health and the environment through better and earlier identification of the intrinsic properties of chemical substances and sets requirements for manufacturers in the EU and EU importers of chemicals and products containing chemicals. This is done by the four processes of REACH, namely the registration, evaluation, authorization and restriction of chemicals which apply to existing and new substances.

In comparison to EU, where the REACH regulations guide the use of chemical substances in the textile sector, under the US the concept is present but is more distributed across many acts. The main requirements for textile imports by US fall under 4 categories: "Consumer Product Safety Commission" requirements for flammability, (2) labeling contents and the country of origin, (3) Informed Compliance publications which provide guidance to the public on a variety of trade-related matters and (4) a guide "Importing Into the U.S.".[14] The U.S. Customs and Border Protection has mandates for "controlling, regulating, and facilitating the movement of carriers, people, and commodities between the United States and other nations; protecting the American consumer and the environment against the introduction of hazardous, toxic or noxious products into the United States"[15]. REACH has its impact on the US market as there are efforts by the US government to help US exporters comply to EU's REACH to sustain export value.[16] . Both the EU and the US do not have regulations that oblige importers to control environmental impacts at the exporter's home country as their regulations are mainly concerned with safety of products placed on their domestic markets. The Saudi market was reported to require even more sophisticated products that use special dying chemicals more expensive than those required by the US and the EU.

The rising concern of global climate change has raised ample discussions on the use of tools such as international carbon pricing systems or Border Carbon Adjustments (BCAs), especially relevant to reduce "carbon leakage" from countries committed to carbon reduction to production elsewhere consumed in

[14] https://help.cbp.gov/app/answers/detail/a_id/205/~/regulations-for-importing-textiles
[15] https://www.cbp.gov/sites/default/files/documents/Importing%20into%20the%20U.S.pdf
[16] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2265068/

these same countries. However, based on a World Bank report[17], these systems would arguably perform best in terms of environmental integrity, but face political, administrative, and possibly also legal challenges since:

- BCAs have to extend the carbon pricing regime to entities outside the implementing jurisdiction. If BCA has no jurisdictional access to third-party companies, ensuring accurate measurements of emissions might be problematic.
- Application of trade measures to climate change and carbon leakage regulation remains largely untested and risky.
- Trade disputes can spill over to many areas of international relations, making BCA a very expensive policy for all parties concerned.

A lower level of requirements, but not less critical to exporters, is that of certificates required by importers. At this level, entry to the market of the specific destination is not preempted but dependent on clients' preferences and conditions. However, the boundaries between the two levels are not always clear cut. For example, OEKO-TEX certificate requires that companies comply with the relevant conditions of the REACH regulations on harmful substances.

Interview with a manager in ISO (in Egypt) revealed that for textile exporters, ISO 14001 is very important concerned with an organization's environmental management systems, however, its focus is mainly about the existence of systems rather than to ensure compliance to environmental laws and significant environmental aspects[18].

Other certificates required by importers go beyond the basic "product orientation" towards a higher "process orientation" and tackle environmental performance, environmental management ensuring that manufacturing processes are environmentally friendly. In general these certification levels are required by clients and are normally not enforced by the country itself, with some notable exceptions, e.g. Turkey and Ukraine[19].

These include OEKO-TEX STeP which is a modular structure that allows a comprehensive analysis of all relevant company areas such as quality, chemicals and environmental management, environmental performance, health and safety and social responsibility. Environmental management covers resource management and conservation, part of which is energy. Such a certification level allows operating brands and retail companies to achieve competitive positions on the market and also qualifies retailers to use the MADE IN GREEN consumer label (which is a traceable consumer label for products made with materials tested for harmful substances, made in environmentally friendly facilities and made in safe and socially responsible workplaces.) which adds a competitive advantage to the products.

[17] http://documents.worldbank.org/curated/en/636161467995665933/pdf/99533-REVISED-PUB-P153405-Box393205B.pdf

[18] ISO 14001:2015, *Environmental management systems — Requirements with guidance for use*

[19] These requirements could be used as non-tariff barriers to protect the local industry

The Global Organic Textile Standard (GOTS) certificate, was developed through collaboration by leading standard setters with the aim of defining requirements that are recognized world-wide and that ensure the organic status of textiles from harvesting of the raw materials through environmentally and socially responsible manufacturing all the way to labeling in order to provide credible assurance to the consumer[20].

Bluesign certificate, is an emerging standard for environmental health and safety in the manufacturing of textiles. The Switzerland-based organization, officially known as Bluesign Technologies AG, provides independent auditing of textile mills, examining manufacturing processes from raw materials and energy inputs to water and air emissions outputs. Each component is assessed based on its Eco-toxicological impact[21].

Finally, the ISO 14067 standard emphasizes the organizational commitment to reducing the impact of its daily operations on the environment with carbon footprint analysis and directs companies to carbon reductions strategies.. The standard is currently being revised as 14067-2018. Together with the Energy Management system standard ISO 50001, it is the most relevant to energy efficiency.

2.7.2 Compliance of Egyptian Exporters with Environmental Requirements

According to interviews with OEKO-TEX Certification Company, Ready-Made Garments Export Council of Egypt, the Industrial Modernization Center (IMC) as well as a number of Textile manufacturers, exporting to the EU require attaining the OEKO-TEX 100 or other equivalent certificates to confirm the use of chemical substances complying with the REACH regulations.

During a phone interview, a textile manufacturer and exporter to Europe who has knowledge of the US market, remarked that the American market is known to be lenient in comparison to the European market which is known to be stricter and more demanding in terms of import requirements. Accordingly, factories that export to US are not always accepted to export to European retailers due to stricter measures. Another interviewee, however, specified that like those of the EU, US retailers required extra certifications are for labor issues and use of certain chemical substances.

Communications with a number of representatives of exporting textile manufacturing companies confirmed that each client has a set of specific environmental and social standards based on which transactions and deals are made. These requirements differ between clients even within the same country, but mainly tackle labor issues and rights and the health and safety conditions of the working environment. Importers also audit local suppliers on upstream the supply chain, and not only the exporter's facility.

[20] http://www.global-standard.org/
[21] https://www.bluesign.com/

When asked whether any retailer has specific environmental requirements related to the production process, most interviewees stated that this is not common. One simply remarked that "retailers want to work and there are already many restrictions", However, one interviewee mentioned that a Swedish retailer have required a proof of environmental compliance, checking environmental impacts related to the process. The interviewee mentioned that he could not supply due to these requirements.

It has been reported by the OEKO TEX Egypt Office representative that only two factories in Egypt obtained the more sophisticated certificate (for well-known brands in the US) which is the "STeP by OEKO TEX" or other equivalent certificates. However, this certification seems to be currently gaining momentum in Europe, for example in a country like Portugal[22] supplying textiles to the rest of the EU.

Moreover, and as per an interview conducted with an Egyptian textile supplier to three famous clothes retailers (two out of the three are high-end brands), there are no requirements regarding carbon footprint reporting, certification or measures. Checking these three brands' websites revealed that their efforts concerning carbon emissions reduction and greening the industry were focused in certain regions and Egypt was not among them. The efforts of one of these, a UK brand, are limited to owned facilities which are mainly offices and do not extend to suppliers. Another high- end brand (out of the three) aims at reducing carbon footprint among other environmentally responsible behavior but are restricted in that matter to

"increasing efficiency of transport vehicles and reduce their carbon footprint through regular reviews and adjustment to match the most appropriate means of transport for individual situations"

Another major local supplier for a famous American brand that strongly claims carbon footprint reduction efforts was not found to own any certificates or measurements that distinguish it from other competitors from the carbon footprint perspective. Environmental certificates owned by this supplier are limited to 14001:2015.

2.7.3 Conclusion

Egyptian exporters seem to be currently responding adequately to the stringent product-oriented environmental requirements of their destination markets. However, not all of them are aware of the evolving standards which are expanding to process-related environmental conditions after having already expanded to process-related social conditions. All interviewees have the same perception that a retailer's interest does not go beyond capacity to produce required quality and quantity of goods, the use of substances as well as labor issues and working environment health and safety conditions. In general, this is currently true. However, the trend seems to be clear, as a few years ago, labor conditions were not relevant, and in a few years down the line environmental process-related conditions might as well be.

[22] Personal communication with Mr Leven Verraest, Senior Consultant, Werner International

At present, the more expensive a market is the more it is demanding not only in terms of quality but also in environmental standards. Currently, the size of the market in which these conditions are required might not be large enough for Egyptian exporters to be in a position to compete in it, but it is expected to grow, and it is timely to be prepared for these future conditions.

While data cannot be generalized on the carbon foot print front, the absence of any information that points to requirements for related certifications from Egyptian textile exporting manufacturers implies that international brands aiming at reducing carbon footprints do so without controlling their outsourced suppliers and without intervention in the production process. Nevertheless, given past trends in similar standards, it could be safely expected that the scope of control will eventually expand.

2.8 Textile and RMG/T Industry Subsectors

Textile industry is divided in this report into four subsectors; namely spinning, weaving, processing and RMG/T sectors. RMG/T is the dominant subsector which represents 87% of the total textile plants in Egypt with 62% of the total textile sector employment as shown in figure (6).

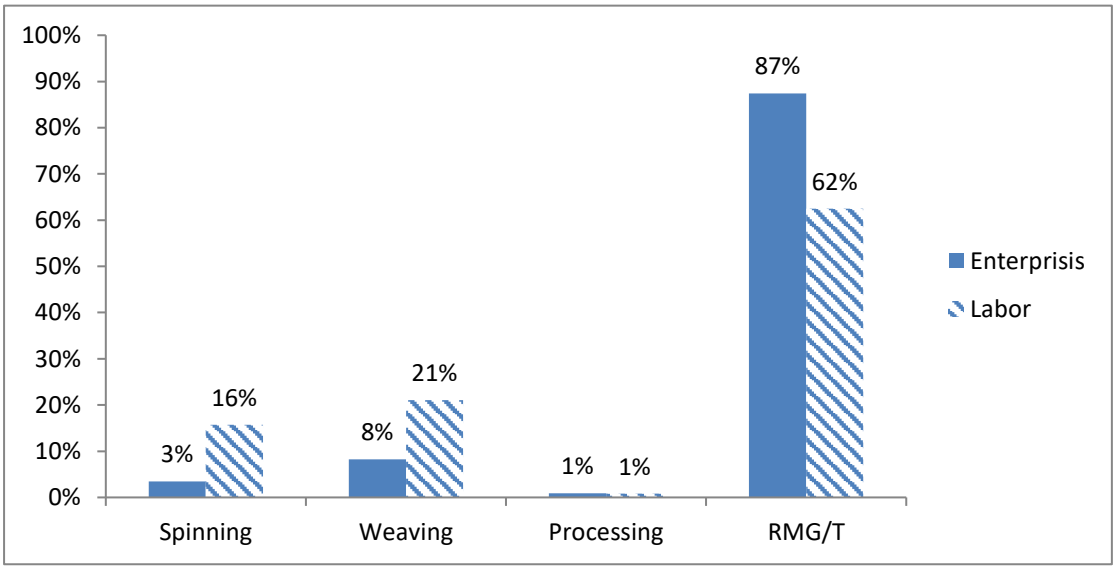

Figure (6): Percentages of Textile Subsectors as Enterprises and Labor

Source:CAPMAS, 2017

The processing enterprises in Egypt represent the smallest subsector in number, according to CAPMAS there are 346 factories represent 1% of the total textile enterprises, with a 1% of the total sector employment. It is worth mentioning that processing is likely to be integrated into other textile sectors such as spinning or weaving, which explain the lower number of the stand-alone processing establishments.

2.8.1 Spinning

Spinning is the process by which cotton or Man-Made staple fibers are transformed into yarn. The spinning technology in Egypt includes, Open-end rotor spinning, ring and Compact spinning[23]. According to CAPMAS census of 2017, the spinning establishments in Egypt are mainly concentrated in Gharbia, Qalyubia, Monufia and Beheira, followed by Dakahlia and Cairo. Figure (7) shows the categorization of the spinning enterprises according to number of employees.

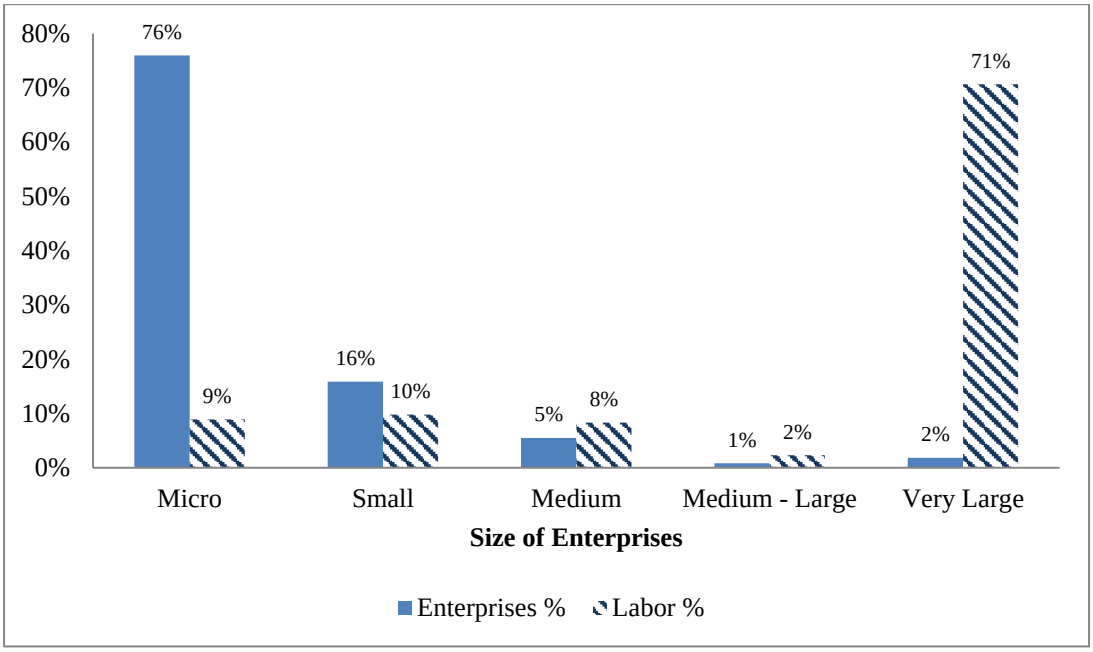

Figure (7): Spinning Enterprises Categorization (CAPMAS, 2017)

The figure shows that the micro spinning enterprises are the largest in number, while the very large ones have the lowest number of enterprises but most of the employees. This is likely to affect the targeting process, in which the strategy should be applied through a tailored approach towards both categories.

According to the textile export council (TEC), affiliated to MTI[24], The Egyptian exports from natural fiber spinning products are 19.9 USD millions, and the man-made staple fibers are 80 USD millions, which represent 3% and 11% of total textile exports during 2016 respectively.

[23] M. El-Sayed and S. Sanad, THE IMPACT OF NEW SPINNING TECHNOLOGIES ON THE EGYPTIAN COTTONS, 2007, Cotton Research Institute, Agricultural Research Center, AUTEX Research Journal, Vol. 8, No4

[24] http://textile-egypt.org/markets_and_trade/statistics_and_market_information#

2.8.2 Weaving / Knitting

The traditional methods of manufacturing fabrics are weaving, knitting and braiding. Nonwoven fabrics are made by bonding or interlocking fibers or filaments by Mechanical, Thermal, Chemical or Solvent means.

Knitting is carried out by interlocking a series of yarn loops, usually using sophisticated, high speed machinery. This process is almost completely dry, although some oils may be applied during the process for lubrication. These are removed by subsequent processing and enter the wastewater stream.

The most popular weaving machines are the conventional automatic looms which gained world-wide popularity because of their advantages of versatility and relatively moderate prices. According to IMC, Egypt's share of shuttle-less looms was 0.48% of world capacity in 2003. In 2004, only 0.06% of the world's new looms were installed in Egypt and in the period between 1995 and 2003, Egypt installed only 0.7% of the world's new looms. (IMC, 2008)

According to CAPMAS, census 2017, the weaving factories in Egypt, are concentrated in Gharbia, Qalyubia, Monofia and Beheira, followed by Kafr El Sheikh, Sohag and Cairo. Figure (8) shows the categorization of the weaving enterprises according to the number of employees.

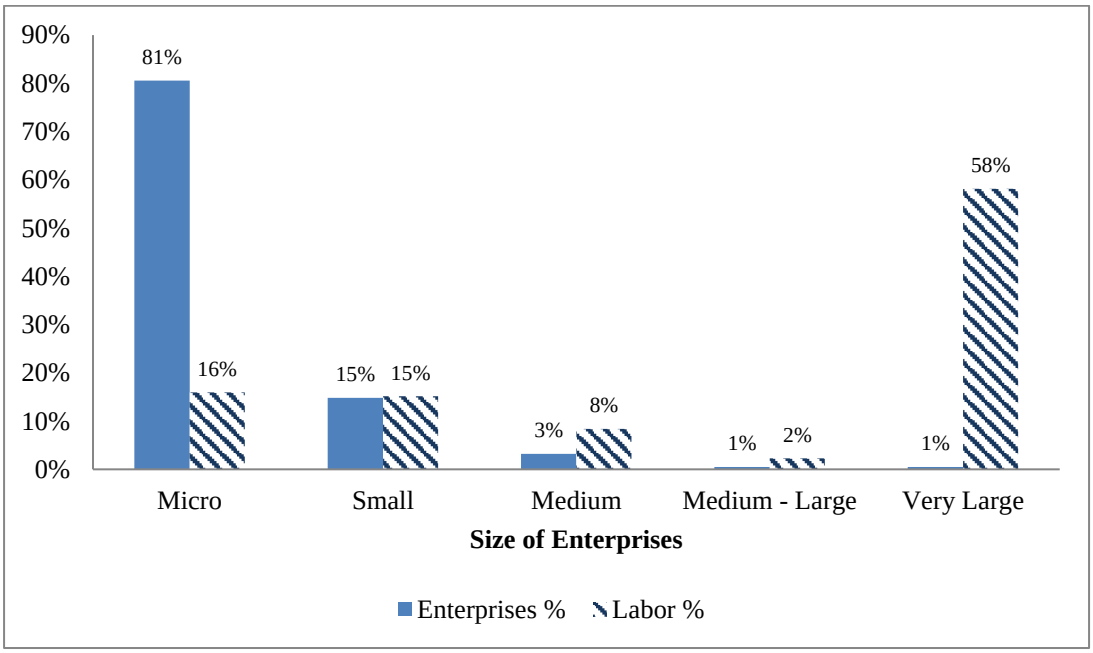

Figure (8): Weaving Enterprises Categorization (CAPMAS, 2017)

Similar to spinning, figure (8) shows that the micro weaving enterprises are the largest in number, while the very large ones have the majority of labor.

According to the TEC[25], The Egyptian exports from woven fabrics are 66 USD milions, and the knitted fabrics are 35.7USD milions , which represent 9% and 5% of total textile exports during 2016 respectively.

2.8.3 Processing

It is the process by which yarn and fabrics are:
- Bleached, mercerized, Scoured, De-sized
- Dyed
- Printed and Finished according to need

Figure (9) shows the categorization of the processing / finishing enterprises according to the number of employees.

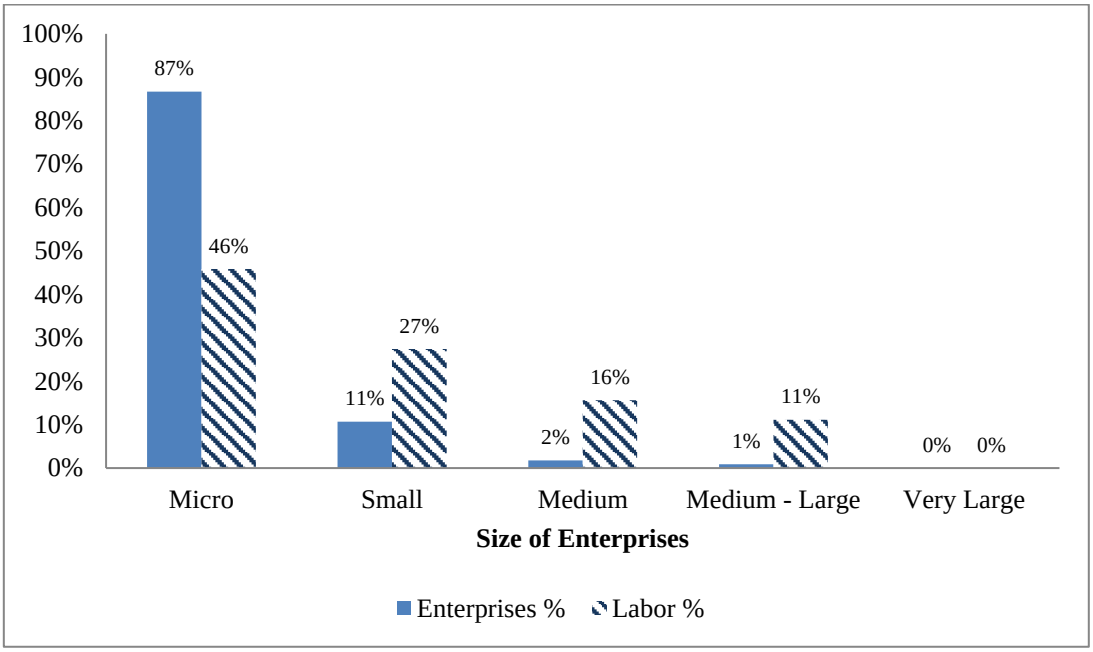

Figure (9): Processing Enterprises Categorization (CAPMAS, 2017)

The figure shows that the micro processing enterprises are the largest in number of enterprises, there are no large processing enterprises which might indicate that this subsector does not attract large investments, and also that large processing plants are part of integrated plants.

While electrical power dominates the energy consumption pattern in spinning and weaving, thermal energy is a major input for chemical processing. Thermal energy in textile mills is mainly consumed in two operations, heating of water and drying of textile materials[26].

[25] http://textile-egypt.org/markets_and_trade/statistics_and_market_information#
[26] S. Sharma, Energy Management In Textile Industry, International Journal of Power System Operation and Energy Management ISSN: 2231 – 4407, Volume-2, Issue-1,2

Natural fibers typically require more processing steps than synthetic fibers. Processing methods may differ based on the final properties desired, such as tensile strength, flexibility, uniformity, and luster. According to the IFC, scouring, dyeing and finishing are the most energy intensive wet processes (IFC, EHS Guidelines for Textile Manufacturing, 2007).

2.8.4 Ready-made garments / textiles

RMG/T is the manufacturing process that transforms fabrics into finished textile products / clothes. According to CAPMAS census of 2017, the RMG/T in Egypt, mainly concentrated in Sharqia, Cairo, Giza and Behaira followed by Monoufia, Qaliubia and Alexandria. The following figure (10) represents the percentage of employees and RMG/T enterprises distributed as micro, small, medium, medium to large and very large.

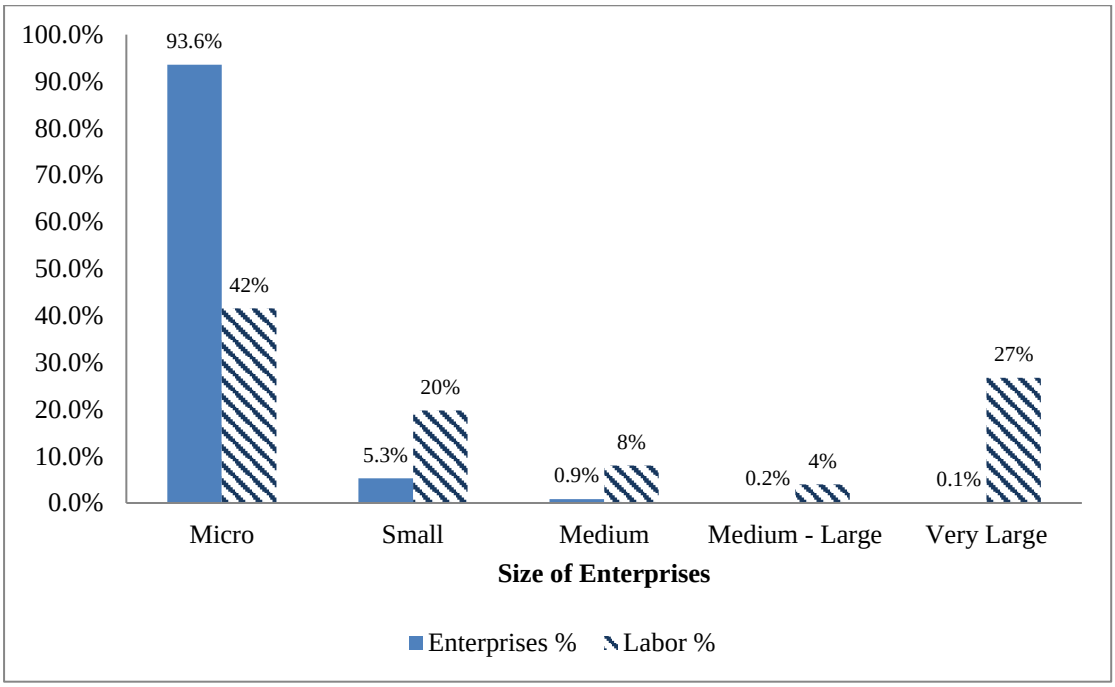

Figure (10): RMG/T Enterprises Categorization, CAPMAS 2017

The RMG/T is considered the largest subsector in the textile industry in Egypt in both facilities and number of employees as mentioned previously in figure (5). It is shown from figure (10) that the micro enterprises are the largest in both establishments and labor number.

According to TEC[27] the values and percentages of RMG/T exported products from the total textile products in 2016 are shown in table (4) below.

[27] http://textile-egypt.org/markets_and_trade/statistics_and_market_information#

Table (3): Value and percentage of RMG/T exported products from the total textile products in 2016

RMG Exported Products	Value, USD thousand	Percentage of Total Textile Exports
wool products	59,378	8%
cotton products	368,446	49%
Man-Made Filaments products	69,976	9%

2.9 Conclusion

The textile and RMG/T represent a major sector in the Egyptian Economy; it contributes 3% of the Egyptian GDP, 30% of industrial work force, and 10% of total exports. It is one of the most geographically distributed sectors, and it also currently accounts for 16% of the Industrial growth. Textile is separated into four subsectors, spinning, weaving, processing and RMG/T sectors. RMG/T is the dominant subsector as it represents 87% of the total textile plants in Egypt with 62% of the total textile sector employment. The textile industry is relatively newer than the RMG, as about 80% of the textile enterprises have been established from 2000 to 2012. The rising foreign investments in Egypt, mainly from China, India and Turkey, is likely to raise the standard in the Egyptian markets as well as raise the export opportunities.

EU, USA, Asian countries and Arab countries are the main destinations for textile and RMG products exports. Two thirds of the exports are RMG, and cotton made RMG/T represents alone 50% of exports.

Due to a number of factors, the upstream part of the sector, spinning and weaving, has suffered from a major decline. These not only included the liberalization of cotton trade and the abrogation of the agricultural rotation, which affected the availability of cotton for processing and the liberalization of cotton trade which in addition to reducing cotton availability on the local market and increasing prices to local manufactures, increased uncertainties for the farmer, but also the competition in the local market with low-cost imports, including smuggled goods and second-hand garments, both especially suited to the decline in standard of living of large sections of the population.

This has had major impacts on the sector to the extent that banks consider it high risk[28]. However, part of the sector has risen to the challenges of increasingly stringent export requirements especially to the EU, and major retailers. This represents the more sophisticated segment of the sector, competing with other manufacturers from textile exporting countries, while the other part of the sector competes in the home market with low cost imports.

[28] Personal communication with textile and RMG manufacturers

There are indications that major investments are expected to flow in the modernization of the sector, not only from foreign direct investments (mainly from China, India and Turkey) but also through a major investment plan in the state-owned enterprises.

If foreign investments are considering Egypt as a base for exports, this might be beneficial for existing facilities as major buyers (or buying offices) will set foot or return to Egypt, which could help increase exports (given the facilities' readiness to meet the buyer's requirements). However, in case they consider selling to the local market, it has been expressed a number of times that Egyptian facilities are not prepared for such competition, part of the sector might demise and get replaced in the local market by the new comers.

3. Energy Use in Local and International Textile industry

The textile industry is generally considered a non-energy intensive industry. However, given the relative size of the textile sector in Egypt, comprising a large number of enterprises, it consumes a significant amount of energy. According to the Electricity Regulatory and Consumer Protection Authority[29], the textile industry comes in fifth place in electricity consumption among industries in 2012/2013, consuming 2486.16 million KWh, representing 7.03 % of the total electrical energy used in manufacturing industries, and 1.77 % of the total electrical energy consumed in all purposes in Egypt[30]. In comparison, the textile and apparel industry accounts for about 4% of total manufacturing final energy use in China, but less than 2% in the USA[31].

3.1 Potential Energy Savings in Local Industry

This could be related not only to the relative size of the sector, but also the higher specific consumption, i.e. the amount of energy consumed for the unit product. According to ESCWA report, the specific consumption of energy in textile industry in Egypt is 2270 Kg of oil equivalent (kgoe)/ton, which is around 30% higher than the average global consumption 1725 kgoe/ton [32]. This figure should not be interpreted as an energy savings potential, as the energy consumed in textile production depends on several factors, including the manufacturing process and the conditions of each plant. However, it still gives an indication that substantial savings could be achieved.

Energy saving potential is better expressed in actual cases implemented in Egypt Cleaner production measures have been implemented since 1990s by the Egyptian textile industry to improve productivity, resource efficiency and environmental compliance.

The project "Support for Environmental Assessment and Management (SEAM) (1994 – 2004)" implemented by the Egyptian Environmental Affairs Agency (EEAA) showed that significant financial savings and environmental improvements can be made by relatively low-cost and straightforward interventions which payback period was almost immediate[33],including energy conservation and process optimization.

The successful case studies presented by the SEAM project regarding the energy savings are mainly achieved by process optimization measures. Some of these successful case studies are: El Nasr for Spinning and Weaving Co., located in Mahalla El-Kobra which achieved Savings in steam (16%) and electricity

[29] The Electricity Regulatory and Consumer Protection Authority defines the textile sector as it includes spinning, weaving, processing, carpets, rugs, ropes and nets.
[30] Electricity Regulatory and Consumer Protection Authority, General Administration of the Information and Documentation Center, Annual report 2012/2013
[31] Global efficiency intelligence LLC, https://www.globalefficiencyintel.com/new-blog/2017/infographic-textile-apparel-energy-water-pollutions
[32] E/ESCWA/SDPD/2005/1(Part I), Improving energy efficiency in energy-intensive industries
[33] http://www.eeaa.gov.eg/seam/indust.htm

(22%), Dakahleya Spinning and Weaving Co., located in Mansoura reduced costs of steam, water and electricity by 38- 39%. Additionally, Misr for Spinning & Weaving Co., located In Mahalla, and Giza Spinning, Weaving, Dyeing & Garments Co., achieved 14% savings in steam consumption each.

On the other hand, one of relatively new (after 2010) successful cases for the energy savings in the Egyptian textile industry is Alexandria Fiber Company which electrical power and steam are the main energy sources in their plant located in Amereya. In 2013, the company implemented measures including using of capacitor banks to improve the quality of the electrical supply, adding steam traps for a steam saving, isolation of the heads of the cooling pumps, replacing the old motors and changing the type of lighting. The savings from these measures were about 400,000 EGP/year and the maximum payback period was two years[34].

Another case is that of El Shehab Company for dyeing and finishing located in 10th of Ramadan industrial zone which replaced the old and traditional mercerization with the new closed cycled one. This replacement not only achieved compliance with the environmental law but also benefited in reducing electricity consumption by 40%. The payback period for this replacement was 35 months[35].

Another case of an Egyptian textile plant, in which the plant invested 733,963 USD for replacing old equipment used for the dyeing and finishing operations at 2017 aiming for saving energy, installing more efficient boilers and optimizing steam use. The energy savings in this case was 174 MWh/year, and the payback periods were only 3 months[36].

Another Egyptian textile plant uses both power and steam energy sources. A number of measures were implemented to save the energy such as applying efficient lighting systems, preventing compressed air leaks, recovery of steam condensate by collecting the condensate from the steam system and feed it back into the boiler feed tank. The monthly reduction in power consumption was 3.9% which achieved direct savings of 919,500 EGP/year[37].

In 2018, The MED Test II project as a part of SwitchMed programme, undertook a case of a company located in the Obour Industrial zone, and produces Jeans wear. For a total annual savings of 80,402 euros and an estimated investment of 122,000 euros, the average payback period is 1.5 years. The energy consumption will be reduced by 29.9% of the baseline, resulting in 51 ton of CO_2 emissions eliminated, achieved by applying a maintenance program for the sewing machines as well as improving the lighting system.
These cases clearly indicate the high potential for energy savings in the Egyptian textile sector, and the substantial benefit in reducing energy costs

[34] Dalia M. M. Yacout, Mervat A. Abd El-Kawi and Mohamed .Salah Hassouna, Energy Management in Synthetic Fiber Industry "Case Study: Alexandria Fiber Co." Journal of American Science 2013;9(2)
[35] http://www.eco-fei.org/textile-sector/
[36] https://ebrdgeff.com/egypt/wp-content/uploads/2017/06/Textile-Industry-copy.pdf
[37] Yacout D.M.M., Abd El-Kawi M.A. and Hassouna M.S., Applying Energy Management in Textile Industry, Case Study: An Egyptian Textile Plant, International Energy Journal 14 (2014) 87-94

which helps facing the successive increases in energy prices without affecting production capacity.

3.2 Distribution of Energy Consumption

The consumption of energy in textile and RMG varies widely. Fuel is used mainly in the steam production, ranging between 10 to 40 kg per kg fiber, but constitutes a negligible percentage in the RMG sub-sector as it does not use much thermal energy[38].

The percentage of energy cost, in Egyptian textile and RMG industry, of total value added is shown in Table (5).

Table (4): Energy cost percentage of total value added for Egypt.

	Energy Cost Percentage of Total Value Added		
	Fuel	Electricity	Total
Textile	4.91	7.17	12.08
RMG	0.54	1.38	1.92

Source: CAPMAS, 2014

It is shown from the table that the total energy cost percentage, in textile and RMG industry, is around 12 % and 2% respectively of the total value added cost. Energy is used for production, lighting, HVAC, etc. Generally, the production takes the largest share (average 77%) of the total electricity consumption. Lightening and HVAC take about 5 and 17%, respectively[39]. The energy cost in production is second after raw materials cost[40].

Figure (11) represents the electricity consumption in textile and RMG sectors in Egypt according to the consumption rates in 2012/2013. It is clear from the figure that textile enterprises are consuming much more electricity than RMG enterprises despite the large number of RMG enterprises.

[38] C. Visvanathan, *Energy and Environmental Indicators in the Thai Textile Industry*, Asian Institute of Technology.
[39] H. Ozturk, Energy usage and cost in textile industry, 2004
[40] R. Senthil Kumar, Process Management in Spinning handbook.

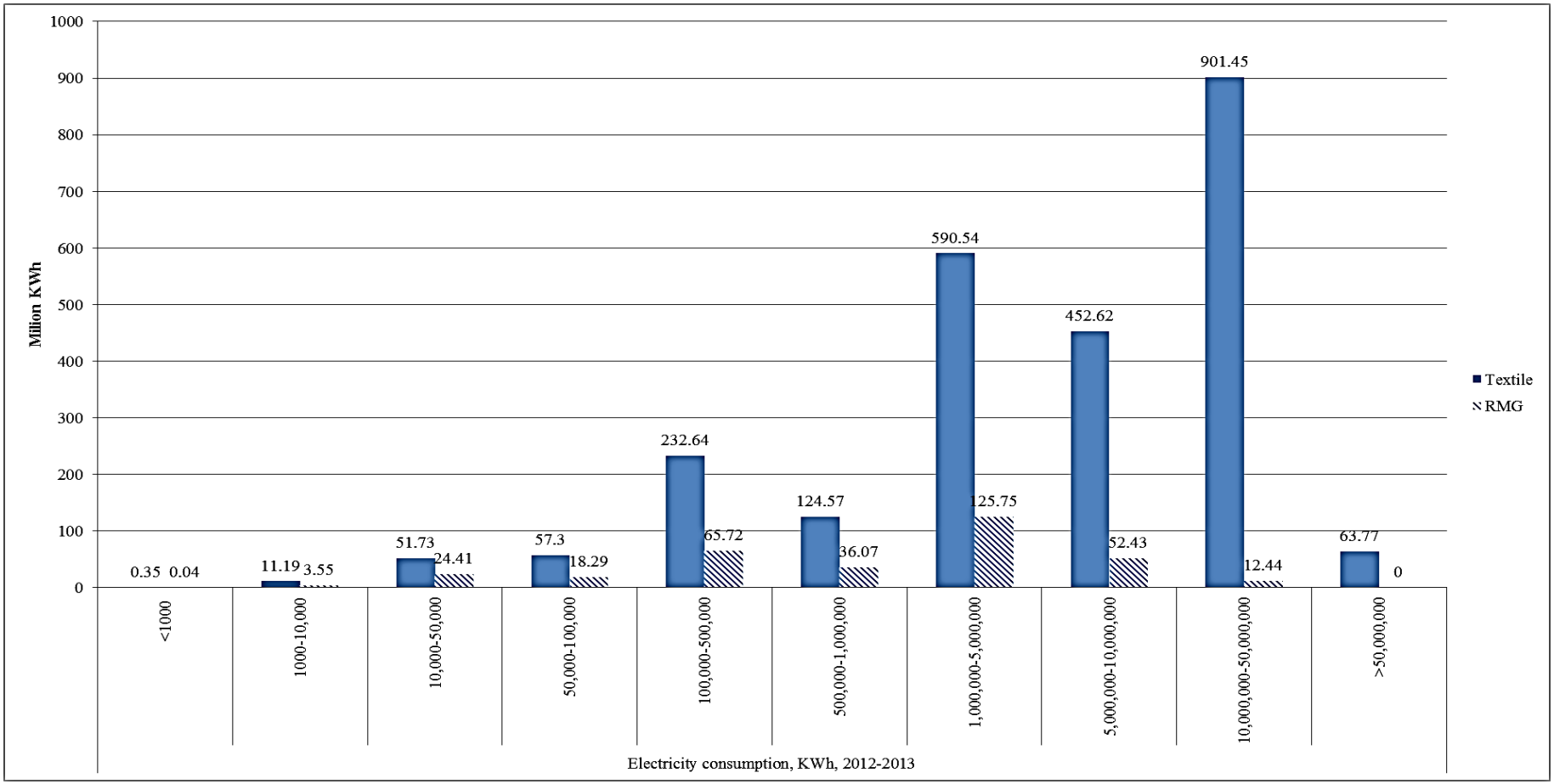

Figure (11): Electricity consumption in textile and RMG sectors according to the consumption rates in 2012/2013[41].

[41] Electricity Regulatory and the Consumer Protection Authority annual report 2012/2013

Across the textile industry value chain, about 34% of energy is consumed in spinning, 23% in weaving, 38% in wet processing and another 5% for miscellaneous purposes. Electrical power dominates energy consumption pattern in spinning/weaving, while thermal energy is a major input for wet processing[42].

The energy consumption in textile industry depends on the circumstances of each plant, and the conditions of each country. However, the examples of the energy consumption in different countries, discussed below, indicates a discernable pattern.

According to studies conducted in eight different plants, used for the development of BREF Textile Document[43], the consumption of electricity in spinning sub-sector is between 0.5-1.5 kWh/kg of yarn. In another study in Turkey[44], for cotton textile processing enterprise, the overall energy consumption was calculated as 1.5-1.7 kWh/kg finished textile.

Table (7) shows the energy consumption share of different components of the value chain in some textile processes in India. The Indian textile industry is one of the major energy consuming industries and is reported to have low energy efficiency.

Table (5): the energy consumption share of each specialized technical field in some textile processes in India45

Specialized Technical Field	Energy consumption Share %
Spinning	18.4
Weaving	11.4
Knitting	6.1
Dyeing	25.0
Clothing manufacturing	9.2

It is clear from the above table that "dyeing", as a major process of the wet processing, has the highest percentage of energy consumption. While spinning and weaving still constitute significant percentages, knitting and clothing manufacturing are the lowest energy consumers.

[42] http://www.fibre2fashion.com/industry-article/3377/energy-conservation-in-textile-industries-savings

[43] Integrated pollution prevention and control, reference document on best available techniques for the textiles industry, July 2003

[44] N. Kiran-Ciliz. Reduction in resource consumption by process modifications in cotton wet processes. Journal of Cleaner Production, 11:481–486, 2003

[45] S. Sharma, Energy Management In Textile Industry, International Journal of Power System Operation and Energy Management ISSN: 2231 – 4407, Volume-2, Issue-1,2

A study conducted in various textile sectors of Mauritius[46] confirms the same distribution. In this study, the total energy cost for textile sub-sectors was calculated for different textile plants, presented in table (8). The table shows that the energy cost for wet processing is relatively higher than other subsectors followed by spinning and then weaving.

Table (6): Total energy cost for textile sub-sectors in Mauritius [47]

Textile subsector	Total Energy cost $/kg
Spinning	0.19-0.20
Weaving	0.12-0.13
Dyeing and finishing	0.30-0.45
Knitting	0.02
Cloth manufacturing	0.07-0.12

Another study was conducted for several textile plants in Iran, includes spinning, weaving, processing, to determine the consumption of energy in each plant. Fuel used in Iran's textile industry is in the forms of fuel oil, gas oil, LPG, and natural gas mostly for steam generation in steam boilers. Electricity is the power source for machinery, air conditioning and humidification systems, compressed air systems, lighting, office equipment, etc. Spinning plants are based on the ring spinning technology and mostly use electricity and only use fuel for producing steam used in the air conditioning systems in cold seasons. The two weaving plants with a production capacity of more than 6000 ton/year of cotton, polyester or blended fabrics (cotton/polyester, polyester/viscose, etc.) were studied. Both of these plants have preparation (warping and sizing of warp yarns) and weaving subsections. The dyeing, printing and finishing plants studied have a complete preparation process. The total final energy intensity for the different studied plants shown in Table (9).

Table (7): Energy Intensities for different plants in Iran (GJ/ tonne fabric)[48]

Spinning		Weaving		Wet processing	
plant A	36.2	Plant C	25.2	Plant E	121.2
Plant B	24.2	Plant D	14.9	Plant F	89.5

The three studies above consider energy contribution to different processes across the value chain in three different formats; percentage consumed in the specific process of total energy costs, the energy costs per unit of product and

[46] Republic of Mauritius, is an island nation in the Indian Ocean about 2,000 kilometers off the southeast coast of the African continent.

[47] J.N.Vohra, Scope of Energy saving in textile mills of Punjab, B.Text, M.Tech, F.I.E., C.Eng (I), L.M.I.M.A.

[48] A. Hasanbeigi, A. Hasanabadi and M. Abdorrazaghi, Energy Efficiency Technologies and Comparing the Energy Intensity in the Textile Industry, ACEEE Summer Study on Energy Efficiency in Industry, 2011

energy intensity. Although these studies were conducted in different countries, they show a similar pattern.

This pattern can be summarized that although the textile sector as a whole can be considered non-energy intensive, when subsectors are considered, wet processing is seen to require large quantities of thermal energy to produce steam as a source of heating to the high temperatures essential in dyeing and finishing. It is an energy intensive process and has the highest share of energy. Spinning and weaving follow in terms of mainly electric energy consumption, while knitting and RMG are consistently the lowest energy intensity sub-sectors.

4. Energy-Efficiency Technologies and Measures in the Textile Processes (BAT)

Textile measures and savings in both BREF[49] and IFC[50] documents are related to the type of fibers, the used techniques and the machinery employed. According to BREF, wet processes such as wool scouring, yarn dyeing and finishing, knitted and woven fabrics dying, etc., are considered energy intensive processes because thermal energy is highly consumed in the processing subsector in addition to the use of electrical power in motors and equipment operation. Some other techniques are specifically focused on optimizing the use of energy (e.g. heat-insulation of pipes, valves, tanks and machines, segregation of hot and cold waste water streams and recovery of heat from the hot stream).

The next sections will illustrate some examples[51] for energy savings, and show that many of the various energy-efficiency opportunities in textile plants are cost-effective. The capital cost found in the tables can only be considered as a rough guide, as this cost can vary from one country to another.

4.1 Spinning Process

In a spinning industry, energy is consumed mainly in the form of electricity. The ring spinning machines has the highest energy consumption during yarn manufacturing[52] among the other spinning types such as compact, rotor and air jet spinning. The energy savings in spinning can be achieved through technological upgrading as well as setting the optimal condition for the electricity usages in spinning. For the ring spinning operations, electricity is consumed in the spindles, packaging, drafting, and operating the lifting and cleaning mechanisms. Table (10) shows examples of measures/technologies for the spinning process.

[49] Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques for the Textiles Industry (BREF), July 2003

[50] Environmental, Health, and Safety Guidelines for Textile Manufacturing

[51] *Sources:* 1) *BREF*
2)A. Hasanbeigi, Energy-Efficiency Improvement Opportunities for the Textile Industry, Berkeley National Laboratory, September 2010

[52] Ashvani Goyal and Dinesh Kumar, Energy-Efficiency Improvement in the Spinning Industry, UGC sponsored National conference on "Global challenges-Role of sciences & Technology in Imparting their solution, 2016

Table (8): List of measures/technologies for the spun yarn spinning process.

Energy-efficiency Technologies and Measures	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Preparatory process			
Installation of electronic Roving end-break stop-motion detector instead of pneumatic system	3.2 MWh/year/machine	180/roving machine	< 1
High-speed carding machine		100,000/carding machine	<2
Ring Frame			
Use of energy-efficient spindle oil	3% - 7% of ring frame energy use		
Replacement of lighter spindle in place of conventional spindle in Ring frame	23 MWh/year/ring frame	13,500 /ring frame	8
Synthetic sandwich tapes for Ring frames	4.4 - 8 MWh/ring frame/year	540 -683/ring frame	1 - 2
Optimization of Ring diameter with respect to yarn count in ring frames	10% of ring frame energy use	1600 /ring frame	2
False ceiling in Ring spinning section	8 kWh/ year/spindle	0.7/spindle	1.2
Installation of energy-efficient motor in Ring frame	6.3 -18.83 MWh/year/motor	1950 - 2200 /motor	2 - 4
Installation of energy-efficient excel fans in place of conventional aluminum fans in the suction of Ring Frame	5.8 - 40 MWh/year/fan	195 - 310 /fan	< 1
The use of light weight bobbins in Ring frame	10.8 MWh/year/ring frame	660 /ring frame	< 1
High-speed Ring spinning frame	10% - 20% of ring frame energy use		
Installation of a soft starter on motor drive of Ring frame	1 – 5.2 MWh/year/ring frame		2

Table (9): List of measures/technologies for the spun yarn spinning process (Cont.)

Energy-efficiency Technologies and Measures	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Windings, Doubling, and finishing process			
Installation of Variable Frequency Drive on Autoconer machine	331.2 MWh/year/plant	19500/plant	< 1
Intermittent mode of movement of empty bobbin conveyor in the Autoconer/cone winding machines	49.4 MWh/year/plant	1100/plant	< 1
Replacing the Electrical heating system with steam heating system for the yarn polishing machine	19.5 MWh/year/machine	980/ humidification plant	< 1
Air conditioning and Humidification system			
Replacement of nozzles with energy-efficient mist nozzles in yarn conditioning room	31MWh/year/humidification plant	1700/ humidification plant	< 1
Installation of Variable Frequency Drive (VFD) for washer pump motor in Humidification plant	20 MWh/year/humidification plant	1100/ humidification plant	< 1
Replacement of the existing Aluminium alloy fan impellers with high efficiency F.R.P (Fiberglass Reinforced Plastic) impellers in humidification fans and cooling tower fans	55.5 MWh/year/fan	650/ fan	< 1
Installation of VFD on Humidification system fan motors for the flow control	18 -105 MWh/year/fan	1900 -8660/ fan	1 - 2
Installation of VFD on Humidification system pumps	35 MWh/year/ humidification plant	7100/ humidification plant	2.7

Table (10): List of measures/technologies for the spun yarn spinning process (Cont.)

Energy-efficiency Technologies and Measures	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Energy-efficient control system for humidification system	50 MWh/year/ humidification plant	7300 to 12,200 humidification plant	2 - 3.5
General measures for Spinning plants			
Energy conservation measures in Overhead Travelling Cleaner (OHTC)	5.3 - 5.8 MWh/year/ OHTC	180 -980/ OHTC	0.5 - 2.5
Energy-efficient blower fans for Overhead Travelling Cleaner (OHTC)	2 MWh/year/fan	100/fan	< 1
Improving the Power Factor of the plant (Reduction of reactive power)	24.1 MWh/year/plant	3300/plant	1.8
Replacement of Ordinary 'V – Belts' by Cogged 'V – Belts'	1.5 MWh/year/belt	12.2/belt	< 1

4.2 Weaving process

Generally, measures to save energy in weaving plants can include:

- Maintenance of loom
- Loom utilization should be more than 90%. A 10% drop in utilization of loom machines will increase specific energy consumption by 3-4%
- The electric motor of the loom can be replaced by an energy-efficient motor.
- The type of weaving machine can significantly influence the energy use per unit of product, while noting that not all looms can produce all types of fabrics. Hence, no general suggestion for loom types can be given.

Also, the quality of warp and weft yarn directly influences the productivity and hence efficiency of the weaving process. Therefore, using yarns with higher quality that may have a higher cost will result in less yarn breakage and stoppage in the weaving process and can eventually be more cost-effective than using cheap, low quality yarns in weaving.

Recoverd sizing fats can be used to improve the weaving behavior of the warp. However, sizing agents are usually only recovered in integrated mills which have a weaving and a finishing section at the same site.

Moreover, evaluation and enhancement of the energy efficiency of compressed air system in the Air-jet weaving plant can save electricity for air jet looms.

4.3 Energy-efficiency technologies and measures in wet-processing

Wet processing, including pre-treatment (e.g. bleaching and scouring), dyeing and finishing is the most energy-intensive component of textile production. The energy is consumed for the production of steam, hot water and for drying operations. Several factors are affecting the energy consumption in wet processing, including the types and quantity of used chemicals as well as the processes conditions such as temperature. The water consumption will also affect that of energy. Table (11) shows examples of measures/technologies for the wet-processing.

Table (11): List of measures/technologies for the wet-processing

Energy-efficiency Technologies and Measures	Fuel saving	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Preparatory Process				
Combine Preparatory Treatments in wet processing	up to 80% of Preparatory Treatments energy use			
Cold-Pad-Batch pretreatment	up to 38% of pretreatment fuel use	up to 50% of pretreatment electricity use		
Bleach bath recovery system	US$38,500 - US$118,400 saving		80000 -246,000	2.1
Use of Counter-flow Current for washing	41% - 62% of washing energy use			
Installing heat recovery equipment in continuous washing machine	5 GJ/tonne fabric			
Introducing Point-of-Use water heating in continuous washing machine	up to 50% of washing energy use			
Interlocking the running of exhaust hood fans with water tray movement in the yarn mercerizing machine		12.3 MWh/year/machine		< 0.5
Energy saving in cooling blower motor by interlocking it with fabric gas singeing machine's main motor		2.43 MWh/year/machine		< 0.5
Energy saving in shearing machine's blower motor by interlocking it with the main motor		2.43 MWh/year/machine		< 0.5
Enzymatic removal of residual hydrogen peroxide after bleach	2,780 GJ/year/plant			
Use of integrated dirt removal/grease recovery loops in wool scouring plant	2 MJ/kg of greasy wool		615,000 - 1,230,000/system	2 - 4

Table (12): List of measures/technologies for the wet-processing (cont.)

Energy-efficiency Technologies and Measures	Fuel saving	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Dyeing and Printing Process				
Installation of Variable Frequency Drive on pump motor of Top dyeing machines		26.9 MWh/year/machine	3100 /machine	1.5
Heat Insulation of high temperature/ high pressure dyeing machines	210 – 280 GJ/year/plant		9000 - 13,000 /plant	3.8 - 4.9
Cooling water recovery in batch dyeing machines (Jet, Beam, Package, Hank, Jig and Winches)	1.6 - 2.1 GJ/tonne fabric		143,000 - 212,000/system	1.3 - 3.6
Cold-Pad-Batch dyeing system	16.3 GJ/tonne of dyed fabric		1215000/ system	1.4 - 3.7
Discontinuous dyeing with airflow dyeing machine	up to 60% of machine's fuel use		190500 - 362,000/machine	
Installation of VFD on circulation pumps and color tank stirrers		138 MWh/year/plant	2300/plant	< 1
Dye bath Reuse	US$4500 saving/ dye machine		24,000 - 34,000/dye machine	
Equipment optimization in winch beck dyeing machine		30% of machine's electricity use		
Equipment optimization in jet dyeing machines	1.8 - 2.4 kg steam /kg fabric	increased 0.07 - 0.12 kWh/kg fabric	221,000 /machine	1.4 - 3.1
Single-rope flow dyeing machines	2.5 kg steam /kg fabric	0.16 - 0.20 kWh/kg fabric		< 1
Microwave dyeing equipment	96% reduction compared to beam dyeing	90% reduction compared to beam dyeing	450000/ machine	

Table (13): List of measures/technologies for the wet-processing (cont.)

Energy-efficiency Technologies and Measures	Fuel saving	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Use of steam coil instead of direct steam heating in batch dyeing machines (Winch and Jigger)	4580 GJ/year/plant		165500/plant	
Equipment optimization in winch beck dyeing machine		30% of machine's electricity use		
Careful control of temperature in atmospheric wet batch machines	27 - 91 kg steam/hour			
Jiggers with a variable liquor ratio	26% reduction compared to conventional jigger			
Heat recovery of hot waste water in Autoclave	554 MJ/batch product			
Insulation of un-insulated surface of Autoclave	15 MJ/batch product			
Reducing the need for re-processing in dyeing	10% -12%			
Recover heat from hot rinse water	1.4 - 7.5 GJ/tonne fabric rinsed		44,000 - 95,000	< 0.5
Reduce rinse water temperature	10%			
Drying				
Selection of Hybrid Systems	25% - 40%			
Avoid Over drying				
Reduce Idling Times and Use Multiple Fabric Drying				
Maintenance of the dryer				
The use of radio frequency dryer for drying acrylic yarn	US$45,000 saving/plant		200000/plant	
The use of Low Pressure Microwave drying machine for bobbin drying instead of dry-steam heater		107 kWh/tonne yarn	500000/plant	< 3
High-frequency reduced-pressure dryer for bobbin drying after dyeing process		200 kWh/tonne product	500000/machine	

Table (14): List of measures/technologies for the wet-processing (cont.)

Energy-efficiency Technologies and Measures	Fuel saving	Electricity saving	Capital Cost (US$)	Payback Period (Year)
Finishing Process				
Conversion of Thermic Fluid heating system to Direct Gas Firing system in Stenters and dryers	11000 GJ/year/plant	120 MWh/year/plant	50000/plant	1
Introduce Mechanical De-watering or Contact Drying Before Stenter	13% - 50% of stented energy use			
Avoid Over drying				
Close Exhaust Streams during Idling				
Close and Seal Side Panels				
Proper Insulation	20% of stented energy use			
Optimize Exhaust Humidity	20 - 80% of stented energy use			
Install Heat Recovery Equipment	30% of stented energy use		77,000 - 460,000/system	1.5-6.6
The Use of Sensors and Control Systems in Stenter	22% of stented fuel use	11% of stenter electricity use	moisture humidity controllers: 20,000 – 220,000 ; dwell time controls: 80,000 – 400,000	moisture humidity controllers: 1.5 - 5 ; dwell time controls: 4 - 6.7
General energy-efficiency measures for wet-processing				
Automatic steam control valves in Desizing, Dyeing, and Finishing	3250 GJ/year/plant		5100/plant	
The recovery of condensate in wet processing plants	1.3 - 2 GJ/tonne fabric		1000 - 16,000	1 - 6
Heat recovery from the air compressors for use in drying woven nylon nets	7560 GJ/year/plant		8500/year/plant	
Utilization of heat exchanger for heat recovery from wet- processes wastewater	1.1 – 1.4 GJ/tonne finished fabric		328820 / system	

4.4 Energy Management Systems

Technological upgrading has positive impacts on energy performance. However, energy management goes beyond it and requires a facility management system which promote and sustain good practices. The ISO 50000 series represents the industry standard with respect to Energy Management Systems (EnMS).

Box 1

ISO 50001

The purpose of this International Standard is to enable organizations to establish the systems and processes necessary to improve energy performance, including energy efficiency, use and consumption. The ISO 5001 Standard

- Specifies energy management system (EnMS) requirements, upon which an organization can develop and implement an energy policy, and establish objectives, targets, and action plans which take into account legal requirements and information related to significant energy
- It does not prescribe specific performance criteria with respect to energy.
- It is based on the Plan - Do - Check - Act (PDCA) continual improvement framework and incorporates energy management into everyday organizational practices
- It can be tailored to fit the specific requirements of the organization, including the complexity of the system, degree of documentation, and resources.

Successful implementation depends on commitment from all levels and functions of the organization, and especially from top management. It has been designed to be used independently, but it can be aligned or integrated with other management systems.

The EnMS was recently reflected in Egyptian legislation, although rather timidly. Moreover, because it appears in an "electricity law", it is a matter of debate whether it covers all sources of energy. Article 48 of Electricity Law 87/2015 and article 64 of its executive regulations (Decree 230/2016), mandates facilities with contracted power more than 500 KW to assign energy efficiency personnel and to maintain an energy register in the facility and if the contracted power is more than 10 MW the decree assigns specific responsibilities to this personnel as follows:

- Maintain and update the energy register periodically

- Monitor energy consumption in the facility and propose energy efficiency measures
- Conduct technical and economic feasibility studies for the implemented energy efficiency measures
- Following up on energy efficiency projects in the facility
- Prepare the annual energy performance and indicators reports
- Provide training and awareness to the employees on energy efficiency measures
- Monitor and check the effectiveness of the implemented energy efficiency projects

Additionally, article 65 of the executive regulation requires that the energy register must include all the information regarding the energy uses in the facility, especially information regarding the electrical energy which is:

- Electrical load measurements distributed to lightening and mechanical power
- Statement of equipment and driving forces of each equipment
- Daily average working hours during the month for each equipment or lightening device
- Monthly consumption of electrical energy equipment distributed to lightening and mechanical power
- Monthly amount of the saved electrical energy
- Statement of equipment and lighting devices used in the facility categorized according to the energy efficiency label
- Statement of electricity sources (conventional energy – renewable energy) and share of each source
- Monthly training records on the energy efficiency field
- Studies and researches conducted in the facility to support energy efficiency technologies
- Facility's energy efficiency plan

Article 75 of electricity Law states that each person who violates the provisions of Article 48 of the present Law or the Executive Decrees thereof shall be subject to a fine of no more than Fifty Thousand Egyptian Pound, which penalty shall be doubled in case of repetition.

According to information compiled from the Egyptian electricity distribution companies reports in 2012/2013[53]by the project "Improving Energy Efficiency of Lighting & Building Appliances" implemented through cooperation between the Ministry of Electricity and the UNDP, only a small number of textile companies would fall within the ranges specified by the law and its executive regulations. According to these reports, there were 202 Textile and RMG facilities that have a contracted power of more than 500 KW and only 5 facilities with contracted power more than 10 MW. In addition, 4 textile companies are connected to the high and extra high voltage transmission network.

[53] http://www.eeiggr.com/reports.html

4.5 Conclusion

Energy efficiency is the management of energy in a cost effective manner to reduce energy consumed in the manufacturing process, and thus the energy contribution to production cost. Economic benefits are higher than direct financial savings to industry from energy reduction, as the same reduces local emissions of pollutants and carbon emissions to the atmosphere. These economic benefits are seldom taken into account in facility level decisions. However, the preceding sections indicate that financial benefits can take facilities a long way towards higher energy efficiency. This is especially true when productivity improvements are accounted and with the continuous rise in energy tariffs during the last few years, expected to continue over the next few years.

The Egyptian industry has a substantial potential for energy savings. In general several approaches can be taken to achieve a higher energy efficiency. Some of which are a simple as management procedures include adequate machine maintenance, but could also include partial replacement of some machine parts as well as the complete replacement of the current machinery with new technology. As shown in the tables above, energy efficiency interventions widely differ in terms of investments and pay back, and could be categorized as per figure (12) below. Rational planning would suggest that the first interventions to be considered are those requiring low investments and having a short payback. Savings achieved this way could further be re-ploughed to other interventions requiring a higher initial investment, but still a short payback.

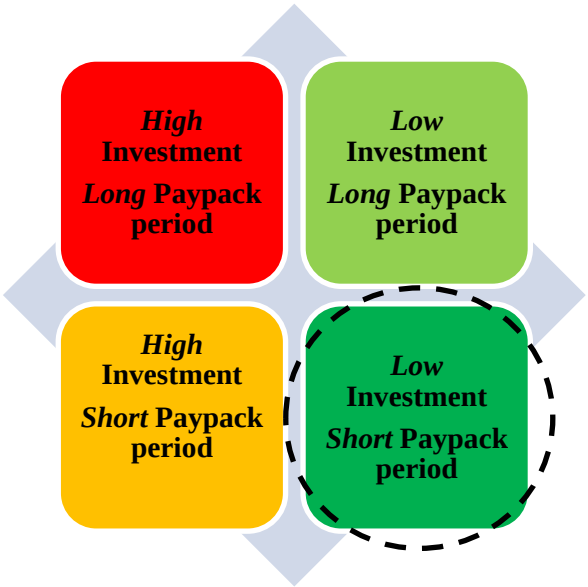

Figure (12): Available options for Energy Savings Technologies

A full replacement of machinery is obviously demanding in terms of investment, and its high capital costs could have a relatively long payback period, and therefore the energy savings which result from the replacement of current equipment may not justify the cost in many cases. However, when other benefits of replacement are taken into consideration, such as water and materials saving, less generated waste, higher product quality, etc., the replacement of technologies becomes more economic. The major modernization drive, which seems to be taking place in the Egyptian textile sector, represents a good opportunity to improve its energy performance.

5. Industrial Energy Efficiency Strategies and Policies

This is an application of the IEE industry strategy and policies issued in a dedicated report (UNIDO, 2015) which should be consulted in conjunction with this application on a specific sector. Accordingly, it is attached to the current report which avoids repetition as much as feasible with the 2015 IEESP report. However, the general framework is summarized below.

5.1 Vision

Alternative visions were thoroughly discussed[54] and IEE vision was agreed to be:

"The Egyptian industry continuously achieves the optimum energy efficiency level economically viable for the Egyptian society"

The **optimum energy efficiency level** implies that a facility's technical opportunities as well as financial and organizational ability to reduce its energy consumption should be fully exploited, but it is not required to go further. This can only be perfected at the facility level, and therefore requires the establishment for the relevant internal decision making and planning system.

"**Economic viability**" needs to be seen in light of the fact that decisions are taken at the industrial entity level based on perceived costs and benefits to the enterprise (energy saved, monetized and non-energy benefits if any).

Prices are currently incrementally adjusted to the financial cost of supply, and for some energy commodities, especially those which cross border trade represents a substantial share, it might also go further to be adjusted to the marginal costs being the international market prices or the opportunity costs of foregone exports. Economic costs would even go further than this level to include environmental and social costs. However, it will be difficult during the adjustment period to consider those.

Accordingly, it will be too early to bring on board what is economically viable for the Egyptian society, as stated in the vision. This is only achievable on the longer term and focus on the foreseeable future will be on the financial viability as perceived by the industrial facility.

5.2 Strategic Objectives

According to the IEE report, three key strategic objectives address the three main pillars of the Industrial Energy Efficiency ecosystem. As shown in figure 13, these are:

1. Drive industrial sector demand for Industrial Energy Efficiency
2. Ensure responsive supply:
3. Enable government institutions to plan, regulate and monitor IEE ecosystem

[54] With a specially established think tank and a series of stakeholder workshops

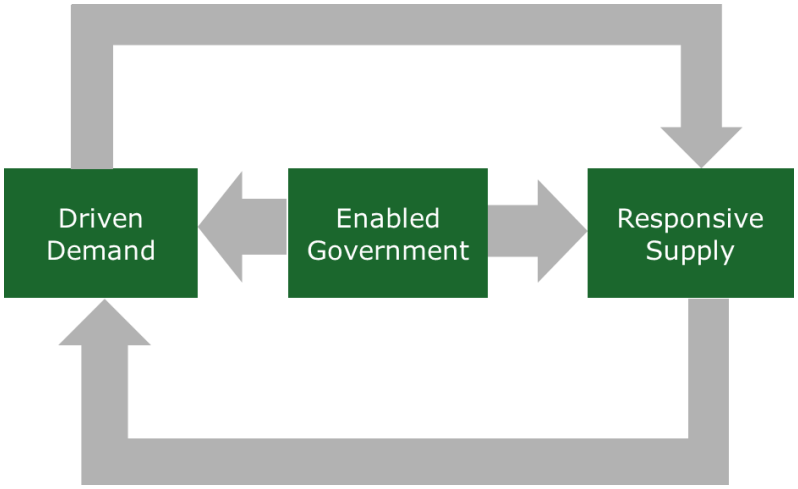

Figure (13): Strategic Objectives

Without any of these pillars, the market for energy efficiency is not expected to adequately perform. Demand is, however, the main market trigger. Experience shows that the supply, of goods, services or even soft finance, does not sustain a market in which robust demand is not ensured.

For the strategy to achieve the objectives, it will have to be sensitive to the characteristics of the different target groups within the industrial sector, namely;

- Large- intensive
- Large- non intensive
- Small-intensive
- Small – non intensive.

Driving demand for Industrial Energy Efficiency will differ according to size. Some of the small industries, having less than 50 employees, have outdated technologies, limited skills…etc. This implies the need for extensive support to be able to replace equipment, as well as the need for training to be able to apply IEE interventions. On the other hand, a number of large inductions have the technical, financial and organizational capacity to undertake energy efficiency inteventions, and the role of a policy would be to incite them to act.

For the second objective concerned with ensuring **responsive supply**, the services provided by the different parties will differ according to the category given their different needs and nature. For example, small and medium enterprises (SMEs) need more support in training and capacity building than larger companies who have in-house expertise or can afford to hire/ outsource experts.

Regarding the third objective which is to **enable the government**, the government's role will change slightly according to the different categories. For example, there should be a consensus between the government and large industries given the political power they have arising mainly from their size relative to the market and number of employees. On the other hand, more government support is expected to be provided to small industries to be able to

optimize their energy consumption and reach their energy saving potential. In other words, while energy savings on a national level would imply a government focus on energy intensive industries, the government is responsible towards helping smaller industries as well to overcome the impact of subsidy reform through energy efficiency.

5.3 Policies

Sets of policies were proposed to address each strategic objective while taking into account the following common challenges:

1. Government Funding, mainly reflected in limited ability to subsidize EE investments.
2. Data Challenges including; actual measurements, availability and accessibility if measured, reliability and consistency.
3. Informal Sector, as this sector can hardly be targeted directly before it is formalized. Currently, the ministry of industry is considering viable approaches to formalize these entities. When formalized, they might add to the pool of micro-enterprises which have their own challenges.
4. Micro-Enterprises are challenging to address due to their large numbers, limited technical capacity, and non-bankability.

In order to increase implementability, given the existing challenges, policies for which the following requirements are critical were not considered for the current phase:

- Extensive micro-data for implementation
- Strong regulatory capacity for implementation and enforcement
- Substantial state financing, subsidies for implementation

Moreover, key success factors for the IEE strategy were identified. A major factor is that for EE to be sustained, it should become a core business issue, and thus becomes a regular part of a facility's responsibilities. This means that it should positively affect profit margins, give a competitive advantage and open up a new market or preserve current markets. Another factor which seems to be critical for sustainability is establishing a formal mechanism for data collection at the facility level.

Accordingly, a main premise at the core of policies proposed to trigger demand is to ensure that an energy management system (EnMS) is implemented by facilities through a variety of means and leverages by the government. EnMS would require the compilation and reporting of data, as well as Energy Efficiency planned and implemented as planned. An EnMS has the advantage of being an internal and comprehensive system managed by the company itself and entailing periodical audits, data reporting, among others.

Moreover, given current challenges, government funding should be rationalized. Sectors should also be prioritized; and finally, any suggested measure has to be as much as possible compatible with the facility's capacity and aptitude.

The policy proposed for SMEs bridges the gap between their present need for EE, especially magnified by the energy subsidy reform, and the actual demand

for it by extending technological (in terms of equipment and services) and financial support. As for energy intensive SMEs, a dedicated program will promote energy efficient technologies.

5.4 Phasing

Phasing was thus essential to take into consideration the size and energy intensity categorization of industrial facilities as a reference. Policies are phased such that they target at first the most organizationally, technologically and financially competent and capable (i.e. predominantly large energy intensive) industrial sub-sectors. Looking forward, the majority of policies proposed are continuously expanding in terms of size (from large to small) and energy intensity (from intensive to less intensive).

The goals for a first stage of policy implementation to adapt to the abovementioned constraints, is to

- Achieve substantial energy savings through EE,
- Establish an EE culture in industrial and regulatory bodies; and
- Widen the scope of policies for the following years through relieving major constraints especially with regards to inadequate data and capacity.

The drive towards EnMS perfectly serves the near term goals of IEE mentioned above, in terms of energy savings, cultural change and data/information availability. Policies which effect is limited to technological improvement are less likely to sustain energy performance on the long term.

6. Application on the Textile Sector

6.1 Relevant Characteristics of the Sector

Based on the sector overview in the previous sections, the characteristics seen to potentially have a major influence on the energy efficiency strategy for the sector are summarized as follows:

- **For all sub-sectors, micro enterprises are dominant**
  Depending on the specific subsector, the percentage of enterprises larger than 10 employees vary from 6.5% in RMG to 13% in processing, 20% in weaving and 25% in spinning. Enterprises smaller than 10 employees employ 58%, over 45%, over 80% and over 90% of ech sub-sector's work force respectively .

- **The sub-sectors are not equally energy intensive**
  In fact, the RMG sub-sector is non-energy intensive (as energy represents only 2% of its value added). Spinning and Weaving are moderately intensive, while wet processing (dyeing and finishing) is the most energy intensive. According to interviewees, energy costs (Gas and Electricity) represented around 35% of the sales price, and this was before the latest rise in energy tariffs in June 2018.

- **The processing sub-sector is competitive**
  This prevents processors from transferring the burden of increasing energy process through their proces, and thus see their margins squeezed

- **Substantial energy savings could be achieved**
  Both national and international experiences support this fact as well as that some of these savings could be achieved through low cost interventions and have short pay back periods.

- **Non-energy benefits could also be substantial**
  Modernizing equipment increases productivity, however these are high cost interventions likely to require substantial financing.

- **The sector is polarized**
  While a small proportion of the sector's enterprises has risen to the export challenges, the substantial part of the sector is in a trap of low quality. low productivity and low margins.

- **The Textile sector is considered high risk by the banks**
  This limits its access to funds at reasonable rates, which represents a serious constraint to modernization

- **The export requirements are moving towards resource conservation**
  However, in general, Egyptian exporters do not cater to the segment of the market in which this is a current requirement.

- **A major investment wave is upcoming**
  The existing plans to revive the state-owned textile complexes, and the potential FDI in the sector are opportunities for improving its performance including that concerning energy efficiency. However, it is also a threat for the low productivity/low margins segments of the sector

6.2 Categorization of IEE Policies

The policies proposed in the IEE report, targeting driving demand, ensuring responsive supply and enabling government. The exhaustive description of these policies in the attached IEE report include the following points which will not be repeated in the current report.

1- Policy Summary
   Which includes a description and rationale, an account of beneficiaries and risks as well Relation to other policies
2- Policy Goals
3- Policy Owner
4- Policy Activities
   Which compose a road map to reach the policy implementation stage.
5- Policy stakeholders
   Which includes those who would support (Hands-on), and those who would facilitate (Not directly involved), as well as those who will evaluate
6- Policy indicators :
7- Policy timeframe and phasing strategy
8- Enabling Conditions
   Which includes the requirements for Infrastructure, Human capacity, Financial resources and budgeting and Government support

Some of the policies are cross cutting all sectors, and these will be briefly addressed below. On the other hand, and based on the sector overview and the main factors some of the policies proposed in the IEE strategy and policy document do not apply to the textile and RMG sector, while others could be specifically tailored to this specific sector. Table (12) clarifies the policies falling in these different categories.

Table (15): IEE Policies, relevance to the textile sector

Drive industrial sector demand for Industrial Energy Efficiency	Ensure responsive supply	Enable Government
General Cross Cutting Policies relevant to the Sector		
Policy 3: Establish system for grid-connected combined heat and power (CHP) Policy 4: Phasing out selected equipment	Policy 7: Ensure Quality of Energy Management System Consulting Services through certification Policy 9: Minimum Energy Performance Standards (MEPS)	Policy 13: Ensure proper & effective governance mechanism of all related IEE policies and procedures Policy 12: Mandatory reporting for registered facilities as a condition to renew their license
Policies irrelevant to the Sector		
Policy 1: Include EnMS in export requirements Policy 2: EnMS as condition for state procurement		
Policies to be tailored to the Sector		
Policy 5: Reach out to SMEs through intermediaries Policy 6: Ensuring efficient energy performance of new facilities, operations and processes	Policy 8: Link Qualified consulting Services to rising demand on Energy efficiency technologies Policy 10: Create an awareness mechanism that leverages integrated information related to IEE Policy 11 Soft financing of IEE projects - Capitalize on FEI fund - Tap on existing projects - Augment cooperatives fund - Attract additional Donor funds	

6.2.1 Policies Irrelevant to the Sector

A number of policies proposed in the IEE are found to be irrelevant to the Textile and RMG sector. These are mainly policies targeting large energy intensive facilities. In fact, the main focus of the IEE strategy was on these facilities in an initial phase. It is, however, noted that the policies found irrelevant are related to creating demand for existing plants. This is a direct result of the IEE report focus on energy intensive sectors, of which textile and RMG industry is not one. This leaves an important gap in approaching this sector, which will be addressed in section 6.2.3 below.
The irrelevant policies are as follows:

- ***Policy 1: "Incorporate EnMS in export procedures"***

This policy requires sectors exporting energy intensive goods to have an operative energy management system (EnMS), to report energy data as well as develop an EE plan to be approved and implemented.

Incorporating EnMS for export is proposed to be carried out through imposing export duties on targeted energy intensive products which are waived on products produced from facilities having their EnMS and plans implemented**.**

Reasons for exclusion

Although wet processes could be considered energy intensive, they basically provide a service within the value chain and their product is not independently tradable.

Especially when it comes to exports, two thirds of textile exports are RMG, which manufacturing is far from being energy intensive. Accordingly, incorporating energy efficiency as a factor in export would require a robust system of supply chain assessment for which Egypt's regulatory infrastructure is not ready. Integrated plants would not represent such a problem, but energy efficiency related policies cannot be applied solely to integrated plants.

- ***Policy 2: "Incorporate EnMS as a condition for state procurement"***

This policy entails incorporation of EnMS as a condition for state procurement. All buyers, including government, have the right to stipulate certain conditions on the materials or product they buy. The larger a buyer represents as a share of the market, the more power he has to impose these conditions on suppliers. When this major buyer is the government, it also has to make sure that these conditions are not unnecessarily biased and provide a leveled field to all suppliers.

Conditions are proposed to include that such material are sourced from manufacturing facilities with an operative EnMS system, which report energy data and implement their plans to pursue EE.

Reasons for exclusion

In contrast to the case of e.g. building materials, government is not a major buyer of textiles and RMG and is not in a situation to impose its conditions through its market power. If, for example, at one point garment discounts are included in the ration card, this will give the government the power to impose requirements on those who will benefit from this large and untapped market.

6.2.2 General Cross Cutting Policies

These are policies to be adopted by the MTI, irrespective of the specific sector, as they are effectively cross cutting all industrial sectors. These mainly address issues external to facilities, and related to supply of services and goods. These

are namely, Minimum Energy Performance Standards (MEPS) for equipment used across sectors, e.g. boilers, compressors and motors, to ensure that the efficiency of equipment on the market is not below certain thresholds. This is to be coupled with the phasing out of inefficient equipment cross cutting all industrial sectors. Similarly, the certification of consultants ensures that quality service is provided to industry in general, rather than a specific sector. Finally, it is unlikely that any of these, and other policies, will be affectively implemented without a proper allocation of responsibilities to capable and committed entities.

In the IEE strategy and policies report, the certification of technical consultants was considered different enough from that of management oriented consultants to justify that these are set as two different policies. In fact, while the latter is cross cutting, the former is related to the potential focus of the sector EE strategy and might be tailored accordingly.

These policies are briefly described below, but are described in higher details in the IEE strategy and policies report

- ***Policy 3: "Establish system for grid-connected combined heat and power (CHP)"***

Establishment of operational system for grid-connected combined heat and power (CHP) should be encouraged in all large energy intensive industries. The operational system should be established such that the electricity prices encourage CHP and resolve any issues that might arise with regards to grid management; metering and accounting systems, etc.

The policy builds on the base provided by the electricity law 87/2015, which obliged authorized electricity transmission and distribution companies to buy or pay the value of electricity produced from recovered energy with less than 50 MW capacity (clause 45). For capacities larger than 50 MW, electricity prices and contracts will be set on a case by case basis as electricity companies are not obliged by law to purchase electricity. Moreover, Decree no. 230/2016 issued by the Ministry of Electricity and Renewable Energy, specifies the method of calculating feed-in tariffs of selling electricity to the grid.

- ***Policy 7: "Ensure Quality of Energy Management System Consulting Services through certification".***

This policy entails the establishment of a certification mechanism for consulting firms and individuals in the field of Energy Management Systems. This is proposed to encompass a renewal processes to the certification holders in order to ensure that they are actively operating in this field. The proposed mechanism also allows for categorizing the consulting firms based on a point system that aids in having structured clusters of different levels of consultancies.

EnMS consulting firms should be able to submit an executive summary of auditing reports to the certifying body for the number of industrial facilities served allowing for data gathering and analysis to build knowledge on sectorial trends and know how.

Some of this information, while respecting confidentiality, will be available on the information base established by FEI (policy 10).

The policy builds on previous efforts, including the training and certification of a number of national consultants on EnMS and ISO 50001 supported by the UNIDO IEE project in Egypt. These consultants have already worked with various industries in establishing EnMS systems and they are qualified to work with the textile industry. Several other training initiatives have taken place. Through a USAID project, some time ago, training of energy managers have been rooted in Egypt according to the ASMEE (American Society of Mechanical and Electrical Engineers) standards, and currently through an EU funded project, EUREM, a large number of individuals are being trained.

- ***Policy 9: "Minimum Energy Performance Standards (MEPS)"***

This policy requires Minimum Energy Performance Standards (MEPS) to be developed with a focus on equipment that comply with the following prioritization criteria:

- Have high potential energy saving
- Are used across a large number of industries

In order to give local industries the opportunity to adapt to new regulations, it is also recommended to avoid equipment for which there is local production in the first phase of implementation.

A number of current initiatives fit perfectly in this policy. For example, the Egypt National Cleaner Production Centre (ENCPC) has worked on the Industrial Electrical Motor Driven Systems (EMDS) Efficiency Program in Egypt, funded by IFC. Moreover, the IEE project in Egypt has already delivered training in Energy Efficiency in motors and compressors. UNIDO is currently in the final stages of launching a project focused on the efficiency of motor systems.

- ***Policy 4: "Phasing out selected equipment".***

In conjunction with the MEPS policy above, this policy imposes replacement of selected installed cross-cutting equipment based on specified criteria including nameplate performance specification, size and age.

The primary approach to replacement is based on size and age, i.e. equipment larger than a set capacity and older than a set age is replaced unless the owner of the equipment proves that it has an acceptable efficiency. Minimum Energy Performance Standards (MEPS) are the reference against which equipment replacement is compared, such that equipment which efficiency is less than e.g. 80% that of the MEPS (depending on the case) should be replaced. The

percentage should be set such that, when replacing the majority of equipment, an acceptable payback period (less than 5 years) is achieved. This policy is dependent on Policy 9 and cannot be implemented independently.

Policy 12: "Mandatory reporting for registered facilities as a condition to renew their license"

This policy is more of a long term plan which aims at creating robust data (i.e. reliable and consistent) to enable effective decision making through mandatory reporting for registered facilities as a condition to renew their license. Data collection includes general data and information, data on industrial production, data on energy consumption.

Noting that license renewal is every 5 years, it is a requirement that yearly data must be submitted on time. As such, industrial facilities will be obliged to deliver the required data and face risks of having their license revoked if they do not deliver or deliver inaccurate data.

Policy Owner and Stakeholders

The policy will be the responsibility of the new and renewable energy unit within IDA as it is the official custodian of all energy efficiency related data. It is, however, proposed that internally teams for renewable energy and energy efficiency be identified as their scope of work, and thus their required qualifications, will be different.

In both cases, the unit will be responsible for identifying data to be collected, creating data template, collecting data in a timely and consistent manner, verifying accuracy of data collected, formatting and storing this data, issuing periodical reports and ensure their dissemination to all concerned entity and renewing industrial facilities' licenses when all data collection conditions have been met and coordinating with the national energy system.

Supporting entities will include the IMC that will be responsible for developing communication plans and developing surveys to measure satisfaction; the Central Agency for Public Mobilization and Statistics (CAPMAS) to support the database creation and ensure that the database at IDA is compatible with that of CAPMAS, as well as; the Ministry of Industry, Ministry of Electricity and Renewable Energy, Ministry of Petroleum and Mineral Resources and the Supreme Energy Council for identifying data required for their decision making processes to the IDA. Finally, ENCPC will develop templates for the sdata report to be collected from the different facilities, integrating the inputs from different organizations data

Phasing Policy

The first phase will focus on Building Capacity and Capable System by:

- Hiring the right caliber of employees
- Provide training to bridge any existing gaps
- Build IT infrastructure
- Include data reporting as a criterion to acquire the license

Accordingly, phasing will be based on sectors whose data is being collected through audits. In other words, given that the system will be built in the first phase, data collection should start with a small number of sectors, and then move to targeting all sectors in later phases.

- ***Policy 13: "Ensure proper & effective governance mechanism of all related IEE policies and procedures"***

For this sector, as well as others, a proper and effective governance mechanism of all related IEE policies and procedures is to be ensured. This policy proposed the establishment or an Energy Efficiency Task Force within the "Policy and Strategy Unit" of the MTI to specifically handle this issue.

Other than the need to coordinate the many actors involved in the formulation and implementation of policies, a concerted effort for follow up, monitor, evaluate and re-orient, as needed, should be exerted. For each policy, stakeholders involved and steps to be taken as well as indicators are already proposed jn the IEESP report. Moreover, the task force will also have the responsibility to ensure that those taking responsibility in different organizations are adequately trained to undertake their duties.

At a more operational level, IDA should play a critical role to overcome the current scarcity of micro data, and ensure that data is progressively compiled and analyzed to better understand the sector's status and trends and feed back to policy formulation, refinement and updating. Data will be generated through a number of policies including policy 7above, as well as 5, 6, 8 and 11 below (to which 12 will be added in a longer term), and will have no value if not compiled, analyzed and results provided to those concerned.

6.2.3 Policies Tailored to the Textile sector

As this energy efficiency sector strategy is part of the overall strategy of the Ministry of Industry targeting year 2020, it will work on a short term five year plan. As mentioned earlier, the aim during this period will not be to have a total coverage of all the energy efficiency opportunities in the sector, and the focus will be to:

- Achieve substantial energy savings through EE,
- Establish an EE culture in industrial and regulatory bodies; and
- Widen the scope of policies for the following years through relieving major constraints especially with regards to inadequate data and capacity.

Tailoring of these policies is done on two levels; first, and as noted in section 6.2.1, the policies to trigger demand in the IEESP targeted large energy intensive facilities of which the textile sector as a whole is not one. Accordingly, means to incite demand for EE will be considered. Moreover, and as per section 6.1 above, the sub sector deserving to have the highest priority during this initial period is that of wet processing as this subsector,

- Has the highest energy intensity;

- Already suffers from increasing energy prices; and
- Allow to couple upgrading of energy performance with water conservation and chemical management, which are both as important.Irrespective of export requirements, Box 2 below shows that Egyptian regulations have clear requirements concerning the use of chemicals in the textile industry.

Box 2

Egyptian Standards for Textile and RMG products

The Egyptian mandatory requirements on textile and RMG products are according to the Egyptian Standard No. 7266/2011– Safety and health criteria and labeling for textile products.

The Standard address the control of Restricted Hazardous Chemicals. The substances listed below are subject to restrictions to infant and children (up to age 12) products, direct skin contact products, and indirect skin contact products.

- Carcinogenic dyes
- Azo dyes
- Brominated flame retardants (PBB, TRIS, TEPA)
- Formaldehyde
- Phthalates
- Cadmium
- Nickel release
- Lead

According to ES 7266-4, imported Garment products into the Egyptian market must have the corresponding labeling information on the items and its packaging. This standard applies to all types of clothes and all raw materials. It also covers the requirements on control of restricted hazardous chemicals and product information on labeling.

Decree 961/2012 mandates that the Inspection report on the imported textile and RMG products should be issued by an inspection company recognized by International Laboratory Accreditation Cooperation (ILAC) Test are also performed by the General Organization for Import & Export Control (GOIEC) approved local laboratories. GOIEC will continue the random inspections at border.

Different authorities in Egypt are responsible for inspection and supervision of the industrial products and raw materials used in the local market to ensure the compliance with the Egyptian standards. These are the Industrial Control Authority (ICA), the General Organization for Export and Import Control (GOEIC) and the Supply investigation authority

Accordingly, a number of policies will specifically address this sector as a priority sector. On the other hand, energy consumption in Spinning and Weaving is mostly electric, and the requirements of the electricity law (see section 4.4) are relevant in this respect. Focus in terms of electricity consumption will therefore be on the larger facilities, some of which will be integrated plants. The challenge would be to transpose the general requirements of the Electricity law to a formally established EnMS which is seen as necessary to sustain improvement in energy performance.

Finally, the RMG/T characterized by being the least energy intensive, and having the highest number of establishments is recommended not to be addressed as such. However, integrated RMG/T facilities would still be targeted on the more energy intensive components of the value chain. Moreover, RMG exporting companies supplied by other up-stream companies could be used as an entry point to promote energy efficiency along their supply chain, i.e. in both wet processing as well as spinning and weaving. It is useful in this respect to inform the industry of the evolving export requirements with respect to resource conservation/energy efficiency.

The general EE strategy specified that focus in the initial stage will be on the large and medium energy intensive industries to capitalize the low hanging fruits followed by the small and micro enterprises. In the textile case, in which the sector is already facing difficulties and which establishments will even face higher difficulties resulting form local competition of more modern facilities, more government support is expected to be provided to small industries to be able to optimize their energy consumption and reach their energy saving potential. In other words, while energy savings on a national level would imply a government focus on large energy intensive industries, the government is responsible towards smaller industries to help them overcome the impact of subsidy reform through energy efficiency.

Based on the discussion above, the following policies will be applied. Most of the policies will address existing plants. However, given the expected drive for sector modernization due to the current plans to modernize state owned enterprises, the foreseen increase in FDI, as well as the potential reaction of existing facilities to upgrade to face the resulting increasing competition in the local market and/or exploit additional opportunities for exports, should be exploited to ensure that new investments are energy efficient.

- **Addressing New Facilities**

With respect to new and upgraded facilities, it is immaterial to focus on one or the other sub-sectors. A policy to address energy efficiency in this group is proposed to apply to all to ensure that energy efficiency should be a major criterion to consider for permitting new facilities, as per policy 6 of the IEE document.

- ***Policy 6: "Ensuring efficient energy performance of new facilities, operations and processes"***

This policy should ensure that efficient energy performance of new facilities, operations and processes through limiting license provision to facilities employing production technology at least at par with that of the most efficient of local manufactures/technologies. This will be reflected in two main components, the first is the selection of equipment and the design of production process, and the second is the implementation of operational and planning procedures ensuring a sustained and continuously improving energy management.

In addition to abiding to the MEPS of selected equipment (policy 9 above). there are many ways to ensure the right selection of technology. First, The applicant would be required to compare alternative technologies in terms of energy productivity or specific energy consumption, and be required to adopt the one with the highest productivity (lowest specific energy consumption) unless "convincingly" justified. This will require that request for offers from suppliers, or EPC contractors, specify energy efficiency of equipment as an evaluation criterion. For companies, shopping (rather than tendering), the information platform (policy 10 below) should provide an effective vehicle for information about suppliers.

For both applicants and reviewers, international best practices could represent a good reference for production technology when complemented by a survey of best performing local plants. This survey will only be needed for the initiation of the system, as data will be subsequently generated and compiled through its implementation (as well as other policies).

In order to sustain a good energy performance, the applicant should clearly commit to establish an EnMS (noting that the EE plan will not include significant interventions such as equipment change for some time), and to periodically reporting on specific energy consumption.

This policy is complemented by policies 7 and 8 which ensure quality consulting services for energy management systems and EE technologies respectively through certification. It is, however, unrelated to policy 11 for funding EE. This is not only for new plants, but also for modernizing facilities which, according to the general textile strategy, should be supported through a special fund.

Implementation of the policy will be through IDA which will modify licensing criteria for new facilities to include EE assurance. Pre-policy, ENCPC will support in surveying the best performing textile industries for system initiation as well as setting templates for EE plans, and energy reporting in cooperation with IDA.

- **Existing Facilities**

Existing facilities are meant to be those operational and currently not subject to a major modernization, Their actions could include replacement of specific equipment, optimization of operating procedures. A number of the policies will also benefit "New" facilities, as they become relevant when "New" facilities have reached an operational stage. As mentioned above the primary focus will be on processing operations, whether in independent or in integrated plants, during an initial stage.

Policy 8: "Link Qualified consulting Services to rising demand on Energy efficiency technologies."

The policy aims to provide the market with qualified technical consulting firms / individuals in different engineering fields (mechanical – electrical – chemical-engineering). It is, however, tailored to the conditions of the textile sector and specifically to that of the processing operations for the reasons clarified above.

The first component of this policy in the IEE strategy and Policy document is to facilitate the registration of Energy Consulting firms in the different engineering fields (technical consulting firms) through developing well designed criteria that ensures coherence and compliance.

The second component of the policy is concerned with establishing an accreditation mechanism for energy consulting firms and individuals in the main engineering fields (electrical – mechanical – chemical) in order to ensure the supply of quality engineering consulting services to the industrial sector. A renewal processes to the accreditation holders from the engineering consulting firms is also proposed including a point system in order to ensure that they are actively operating in their respective fields.

For the textile sector, this process will be utilized to translate the EE needs of wet processing facilities to actual demand. The program through which this is achieved is discussed in details in section 7, but could be summarized as fielding consultancy firms wishing to be accredited to undertake a set number of audits of facilities of various sizes and locations, report on their findings and in cooperation with the audited facilities develop an EE action plan. Possible collaboration with RMG exporting companies to improve the energy performance of their suppliers will be considered. In this respect, the awareness campaign of evolving export requirements concerning energy performance, of policy 10, will be essential.

The process should result in

- Better understanding of the sub-sector's energy performance, feeding back through the intermediary of IDA to the information platform of policy 10;
- Outline of a number of bankable projects, feeding into funds made available through policy 11;
- Support to large facilities to comply with the energy management requirements of the electricity law; in addition to

- Accredited firms able to sustain a virtuous cycle of improvement.

Policy Owner and Stakeholders

This policy will be implemented by NQI which will be responsible for management of the registration and renewal processes, formulation with a steering committee the training syllabus outline in order to avail it for training centers to be delivered, managing the processes of the technical assessment with the Industrial Training Center (ITC), accrediting the technical consultants in one or more specific engineering field(s) (mechanical – electrical – processes), classifying consultants based on a point system and manage the database of registered consultants and produce analysis.

The pre-certification auditing campaign will represent a gap analysis and training needs which will guide the training design.

The ITC will collaborate with NQI to qualify the training centers that will be eligible to deliver a specific technical training and set the consultant's assessments and generates the results. Moreover, the Industrial Modernization Center of MTI will formulate a technical committee that will help NQI set the accreditation standards and criteria, comply with policy standards to prohibit, in due time, a consulting service to take place without being accredited and communicate periodically with all IMC and FEI beneficiaries with the latest updated consultant list and manage the satisfaction feedback and survey. Some of this information, while respecting confidentiality, will be available on the information base established by FEI (policy 10)

Phasing Policy

Due to the need for a focused strategy to ensure timely and efficient implementation, this policy was proposed by the IEE strategy and policies report to be first applied to consulting firms and individuals in the field of Combined Heat and Power (CHP) and waste heat recovery followed by electric motor system and compressors as they are already addressed by ENCPC (see Policy 9 below).

In addition to those, consultancy firms will be accredited for energy efficient wet processing technologies, as these are the most relevant to the textile sector.

- ***Policy 10: "Create a mechanism that leverages integrated information related to IEE"***

Providing information to relevant stakeholders is critical in many respects. However, the diversity of stakeholders, their conditions and interests implies that although information might be the same, different messages and channels will be used. This policy is geared towards raising the efficiency of awareness actions though unifying the information platform to be used by one or more actors for raising awareness on the benefits of energy efficiency in the textile industry. The information to be compiled and constantly updated would be targeting

- Direct stakeholders, which include the facilities of the sector with its various sizes and activities to which information about IEE financing options (of which some examples are included in Annex B), technologies and financial

feasibility as well as relevant policies, experiences and benchmarks would be conveyed together with evolving requirements for exports. Information about equipment suppliers and service providers will also be relevant to this group.

- Indirect stakeholders including banks, equipment suppliers and energy consulting services are both subject and target of awareness.

- Industrial associations, as both indirect stakeholders and potential support to dissemination

Access to this information platform would be secured free of charge for all actors, not only for direct use of facilities and consultants, but also for indirect use of those active in awareness activities. As effort and resources should be dedicated to initiate, update and maintain this platform, an initial infusion would be needed from FEI own resources to be replaced as soon as feasible by revenues from advertisements of equipment suppliers and/or service providers.

Policy Owner and Stakeholders

The owner of this platform is FEI as the federation is set to enhance the performance and productivity of the sector members in addition to providing tools that facilitate the overall commercial and business effectiveness.

It is expected from FEI to dedicate a unit concerned with
- Information compilation and analysis
- Initiation and maintenance of the platform,
- communication and awareness according to a communication plan set annually with milestones, key activities, including publications, round-table discussions,
- Response to inquiries; as well as
- cooperation with relevant stakeholders ensuring participation and retrieval of relevant information from all stakeholders

The need for Cooperation

The FEI has its own in-house expertise which should provide technical inputs, in terms of technological options as well as records and analysis of local experiences[55]. However, the cooperation of other nodes of expertise, such as ENCPC and IMC in the MTI, will be beneficial as a means to collect relevant information generated through the proposed process through which policy 8 will be initiated. Contacts with other nodes of communications such as investors associations and the cooperative unions will be as important in ensuring the participation of its members and collecting and gathering feedback from its beneficiaries and collectively compiling information for general dissemination through the FEI.

The means to encourage collaboration and information sharing by facilities, and associations, should be considered. A possible approach would be to have a

[55] Based on the Consultant's experience, the cases which have the most impact on local industries, are those implemented, and operated, by their local peers.

yearly award for energy efficiency in facilities of the sector, mainly those of processing but also those of spinning and weaving.

Another important source of information on the longer term would be the data generated through policy 12 requiring reporting of energy data/information. Together with Policy 6 focused on newly established facilities, it could provide a good basis for local benchmarking and local best available technologies.

Accordingly, a number of programs will be initiated to implement this policy

- Information base, established and constantly updated
- Awareness to processing plants,
- Awareness to exporters ; and
- Given the limited number of facilities having contracted power above 10 MW, direct contact to these facilities will be established, and interaction will be ensured through the process described in policy 7. Successful implementation of EnMS in these facilities will be later used in a n awareness campaign targeting those which contracted power is above 500kW.

The information made available to larger facilities will be qualitatively different from that provided to small and micro facilities. The means to reach the latter facilities is also different. While larger facilities would have the means to directly access the information base, smaller and micro facilities might require intermediaries as per policy 5 below.

Phasing Policy

In general, there should be no phasing of this policy. However, if resources to populate the knowledge base and disseminate its contents are limited, priority should be given to the wet processing sub-sector. This is based on the expectation that these facilities will be the ones most in need for improving their energy efficiency, thus ensuring a quicker "return on investment".

Policy 5: "Reach out to SMEs through intermediaries"

Small and medium industries have certain characteristics that necessitate targeting through a tailored approach. They possess limited financial, technical and organizational capacities. Given their large numbers and wide geographic distribution, it is proposed that industrial associations be mobilized to provide tailored support to these industries.

Accordingly, this policy aims to build-up and strengthen the capacities of these industrial associations such that they can independently support their members on matters regarding IEE. These organizations thus become the interface through which SMEs receive assistance. The government will follow-up on the progress of these associations and provide them with direct assistance, at least in the following:

- Ensure unrestricted access to the FEI information base (policy 10);
- Develop guidance sheets for no cost/low cost interventions, based on representative sample of small and micro enterprises, which could be preliminarily based on the outputs of policy 8 to be augmented by information acquired through policy 11;

- Support facilities, as much as feasible, to mobilize funding;
- Provide guide to replies to Frequently Asked Questions;
- Provide access to certified consultants (policy 8); and eventually
- Establish an award scheme for best performing enterprises

Policy Owner and Stakeholders

The Agency for Development of Micro, Small and Medium enterprises (MSMEDA) was established by Decree 947/2017. This new entity should mobilize different capacities inside and outside the MTI, to support industrial associations, including cooperatives.

The Agency should use the network closer to the ground, to which support will be given, to ensure continuous and more effective two-way communications with the target facilities. These will include FEI, and its chambers, other industrial associations as well as production cooperatives, whether sectoral or geographic as the case may be. These will have a dual role; to communicate needs of support of their members to the Agency and to support their members in implementing IEE, either directly or through mobilizing other actors as follows.

FEI with the Environmental Compliance Office (ECO) should extend their financial and technical services to include more facilities and sectors as per policy 11. The Ministry of Finance and/or the Central Bank of Egypt could establish a cooperation protocol with Cooperative Union to provide it with funds to finance its members on carrying out IEE based of clear terms and conditions. As for ENCPC it will undertake necessary audits and research to develop and update guidelines and assist in assessing award nominees. Finally IDA would receive and verify and process of the data including data from audits for financing and audits for awards and maintain databases and feed energy data into its local database (to support decision-making) and provided the results of its analysis to the IEE information platform (policy 10 above)

Phasing Policy

This policy will be phased over SMEs according to their energy intensity, starting with the most energy intensive. In the case of textiles, initial focus is proposed to be on processing facilities.

Relation to other Policies

Financing mechanisms as elaborated in policy 11a which capitalize on the FEI fund to subsidize IEE projects including financial schemes (soft financing) for SMEs, and policy 11b which addresses the fund for cooperatives for IEE purposes. This policy is also complemented by policy 8 which ensures quality consulting services for EE technologies, through certification.

Policy 11a: "Capitalize on FEI fund to subsidize Industrial Energy Efficiency Projects"

This policy aims to capitalize on the Federation of Egyptian Industries funds in order to subsidize Industrial Energy Efficiency Projects with special focus on small and medium enterprises (SMEs). In order to ensure that these funds are being put to best use, a ceiling can be set (i.e. maximum amount of money per facility). This ceiling will be more attractive to smaller facilities (as larger ones may need larger amounts).

Policy Owner and Stakeholders

FEI would be responsible for managing the fund, defining criteria for fund disbursement, evaluating the eligibility of the different facilities, finance the projects and monitor and evaluate outcomes, as well as provide data to IDA for storage and analysis. The Ministry of Finance would infuse and/or direct funds to FEI.

Phasing Policy

The first stage implementation of this policy will focus on, but not be exclusive to, SMEs with the highest energy intensity, namely processing plants, as they are the most sensitive to price increases. Once the policy proves its success it will be rolled out to SMEs with lower energy intensity requirements, which will be spinning and weaving.

Policy 11b: "Augment cooperatives fund to finance IEE projects"

This Policy will augment the funds available to the Central Productive Cooperative Union in order to finance industrial energy efficiency projects. In order to increase this fund, it is proposed that the Ministry of Finance establishes a cooperation protocol with the Cooperative Union to finance its members in order for them to undertake EE projects and interventions based on certain terms and conditions. The flow of funds will only be sustained if data is provided, audits are undertaken and transparent criteria are set which include a relatively long payback (more than 2 years[56]) period.

Policy Owner and Stakeholders

MSMEDA will be responsible for proting and coordinating a cooperation protocol with the Cooperative Union to finance the EE projects and interventions of its members based on certain terms and conditions (according to policy description). The IMC and Industrial technological development sector of MTI (including ENCPC) will undertake necessary audits to assess progress and communicate it to MSMEDA. As for IDA, it will receive, verify and process the data (including data from audits), communicate goals met to MoF and maintain databases and feed energy data into a local database (to support decision-making) and ultimately into the national energy information system.

[56] This was of 3 years in the IEESP report. However, the conditions of the sector justify a shorter payback period.

The Ministry of Finance will infuse and/or direct funds to cooperatives union fund sourced from the national budget and/or directed from donors and international banks. Other sources of funds could be investigated including Corporate Social Responsibility contributions from large enterprises of the sector.

Phasing Policy

As for other policies, the initial focus will be on processing plants followed by those of spinning and weaving. Moreover, the amount of finance to be made available to the Union will gradually increase over time in accordance to the interest expressed by the SMEs and the success of projects undertaken by them.

7. Action Plan for the Textile Sector

This section only considers the policy actions tailored to the sector, accordingly those irrelevant to the sector do not show below. Although the general cross cutting policies are by definition relevant to the sector, it is assumed that MTI would implement them irrespective of the sector. As there will be no additional actions, and accordingly costs, related to the specific sector, these are not considered below.

Although each policy is presented independently, it is clear from the outline below that substantial efficiency could be achieved if all are considered collectively. Auditing is a case in point, as for policy 6, it will be needed to establish a baseline reference to which proposed technologies for new facilities are to be compared, and for policy 11 a/b, it will be required to identify bankable projects. Moreover, auditing is proposed to be integrated in the certification process of consulting firms and individuals, which could not only feed in the previously mentioaned policies but also as a source of information to enrich the information platform discussed below in policy 10.

As explained in previous sections, the processing sub-sector takes precedence as it is the one with the highest energy intensity and independent processors, providing services to other producers (spinners, weavers or RMG manufacturers) are already suffering from the rise in energy prices in a competitive environment. The sector with the lowest priority is that of RMG, and spinning and weaving preced it in trerms of priority of actions. This is expressed in Table 13 below, but is not repeated in the subsequent detailed descriptions.

Table (16): Summary of Actions

Policy #	Owner	Activity	Spinning	Weaving	Processing	Textiles and RMG	Comments
5	MSMEDA	Best Practices for Micro and Small enterprises	•	•	•		▪ Based on actual cases ▪ Distributed through intermediaries
		Awards	?	?	•		▪ With intermediaries ▪ "?" not very costly, and will generate knowledge
6	IDA	New licenses	•	•	•	•	▪ Modify license conditions , IDA issues circular ▪ Beneficiaries of special fund, Reporting
8	NQI (ITC)	Registration/ Certification	?	?	•		▪ To ensure quality service, used for system initiation … and sustenance ▪ "?" depends on capacity
	IMC/ ENCPC	Auditing			• As part of certification		Bi annual Program (as a start) - Training - Bankable projects to 11 - Information to 10 - Dissemination to 10
10	FEI (Multiple Support)	Information	•	•	•	•	Continuous From literature, auditing (8), new licenses (6) and suppliers, who can finance system
		Communication	• Electricity Law	• Electricity Law	• Potential improvement	• Export Requirements	
11	MTI (FEI/CPU)	EE Funding			•		Funded facility will ▪ Implement No/low cost ▪ EnMs and Data reporting

Policy 6: Ensuring efficient energy performance of new facilities, operations and processes

SECTION 1: PROGRAM DEFINITION

Program Name:	Ensuring efficient energy performance of new facilities, operations and processes
Program Owner:	IDA
Scope of the program:	Large and medium facilities (small facilities could be considered at a later stage)
Rationale behind it:	Ensuring efficient energy performance of new facilities, operations and processes through limiting license provision to targeted facilities unless: • the production technology employed is at least at par with that of the most efficient of local manufacturers, or at least energy efficiency is thoroughly considered and technology selected justified. • If the promoter is committed to establish its EnMS (noting that the accompanying EE plan will not include significant interventions such as equipment change for some time)
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	Expand R&D Budget Enhance Energy & Resources Efficiency

SECTION 2: PROGRAM OPERATIONAL CONDITIONS

	High	Medium	Low
Priority:		√	
Risks Associated	Risk	Likelihood	Impact
	The lack of information on the "best in class" locally makes the reference for decision making lacking . A survey could be considered, or a thorough analysis be required from the project promoter .	High	Low (after mitigation)
Stakeholders / Implementation Partners:	**Policy Owner** IDA **Supporting stakeholders** ENCPC/ECO-FEI **Facilitating stakeholders (not directly involved)** NQI ITC **Evaluating stakeholders** MTI Policy and Strategy Unit		

Budget, Initial Investment	EGP 300,000 for survey prior to policy implementation EGP 25,000 for updating EIA guidelines EGP 50,000 for setting, and consultation, on requirements for planning and reporting
Budget Operation	EGP 150,000/year (10% increase per year) for data base maintenance
Donor:	None needed
Pre-requisites	Pre-policy implementation, ENCPC will support in setting systems for EE plans and data acquisition mechanism, which would be similar to other sectors. A survey of the most advanced textile facilities (in each sub-sector) could be considered, given budget availability, to inform decision maker of the local best in class reference. Although processing takes precedence in addressing existing facilities, the program for new facilities include spinning and weaving,

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying: (In yearly quarters)	Q1 2019
End date: (In yearly quarters)	On going

Task break down:	**Duration**	**Owner**	**Precedence**
Research local market	3 month (Q4 2018)	IDA/ENCPC	
Update EIA guidelines and EE conditions imposed	Q3 2019	IDA	
Database maintenance	Continuous	IDA	Database established (**already accounted for in Chemical and Building Material sectors**)

Milestones:	Data base established (Q1`2019) EE requirements announced (Q2 2019) EE requirements applied

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Facilities rejected a license due to failure to abide by EE requirements	Annually	IDA	N/A	0%
% facilities submitting correct data	Annually	IDA	N/A	100% (3 years after policy is in force)

Planned Outcomes	• Sector upgrade: Introduction of EE technologies to the market, improving the sector's energy performance • Raising awareness: Signaling to the other market players that the best technologies are available and operative locally. This can be supported by case studies.

Policy 5: Reach out to SMEs through intermediaries

SECTION 1: PROGRAM DEFINITION

Program Name:	Reach out to SMEs through intermediaries
Program Owner:	The Agency for Development of Micro, Small and Medium projects MSMEDA
Scope of the program:	Small and Medium industries
Rationale behind it:	Industrial SMEs are distributed geographically, are large in number and possess limited financial, technical and organizational capacities. Given these constraints this policy aims to build-up and strengthen the capacities of industrial organizations (Chamber of textiles and RMG as well as production cooperatives) such that they can independently support their members on matters regarding EE.
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	Expand R&D Budget and Enhance Energy & Resources Efficiency

SECTION 2: PROGRAM OPERATIONAL CONDITIONS

	High	Medium	Low
Priority:		√	
	Risk	Likelihood	Impact
Risks Associated	The agenda of the Agency is full and energy efficiency might not be a priority. Energy efficiency should be considered under resource efficiency and waste minimization which are pressing issues to improve productivity.	Moderate	Moderate
Stakeholders / Implementation Partners:	**Policy Owner** The Agency for Development of Micro, Small and Medium projects **Supporting stakeholders** Production cooperatives and Federation of Egyptian Industries (FEI) Ministry of finance **Facilitating stakeholders (not directly involved)** MTI Industrial technological development sector (including ENCPC) IDA **Evaluating stakeholders** The Agency for Development of Micro, Small and Medium projects (MSMEDA) MTI Policy and Strategy Unit		
Budget Initial investment	• EGP 300,000 for first audits Could be considered in conjunction with audits in for policy 11 a and b below Award program replaces it later as a source of information		

	• EGP 75,000 Develop award program • EGP 120,000 training for personnel capacity building
Budget Operation	• EGP 1,000,000 Awards granted for first and second rounds (2 years), To be replaced by CSR contributions of large companies in the sector afterwards • EGP 100,000 Publishing and dissemination To be replaced by CSR contributions of large companies in the sector afterwards • EGP 250,000 for System management (mainly salaries)
Donor:	None needed

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying: (In yearly quarters)	Q2 2019
End date: (In yearly quarters)	On going

Task break down:	Duration	Owner	Precedence
1. Conduct audits to develop best practices guidelines	2months (Q4 2018)	ENCPC	
2. Publish first version of guidelines (Distributed through industrial associations)	Q1 2019	MSMEDA	Activity 1
3. Engage financiers	Q1/2 2019	Agency/Ministry of Finance	
4. Develop award programs, including criteria, application templates and data required	Q1 2019	Agency	
5. Publicize and grant awards	Yearly	Agency	Activity 4
6. Disseminate case studies (through industrial associations)	Yearly	Agency	Activity 5

Milestones:	• Funding system operational (Q3 2019) • First awards granted (Q4 2019)

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Guidelines issued for all textile sub-sectors	Annually	Agency	N/A	100% of industrial sectors (in 3 years)
Number of award applicants	Annually	Agency	N/A	More than 20% yearly increase
Number of facilities requesting finance	Annually	Production cooperatives and FEI	N/A	100% annual increase (for the first 5 years)

Planned Outcomes	• Awareness: Heightened awareness regarding potential for EE with SMEs • Improved conditions: Alleviating burdens on SMEs due to energy price hikes • Capacity building: Strengthening the role of industrial associations • Better insight on SMEs: By obtaining energy data regarding SMEs industries from awards, audits and financed projects.

	• Institutional strengthening: Stronger reliance on, and affiliation to, industrial organizations

Policy 8: Link Qualified consulting Services to rising demand on Energy efficiency technologies

SECTION 1: PROGRAM DEFINITION

Program Name:	Link Qualified consulting Services to rising demand on Energy efficiency technologies
Program Owner:	National Quality Institute (NQI)
Scope of the program:	Technical consultants and consulting firms
Rationale behind it:	This policy is needed due to the foreseen rise of demand that will put pressure on the quality of the services performed in the different engineering fields.
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	Expand R&D Budget and Enhance Energy & Resources Efficiency

Section 2: Program Operational Conditions

	High	Medium	Low
Priority:	√		
	Risk	Likelihood	Impact
Risks Associated	Limited NQI capacity to manage all sub-sectors (especially likely given demands related to other industrial sectors)	Likely	Possible Mitigation is to limit focus at the outset on the processing sub-sector
Stakeholders / Implementation Partners:	**Policy Owner** National Quality Institute (NQI) **Supporting stakeholders** ITC IMC FEI **Facilitating stakeholders (not directly involved)** Donor Funded projects Technical training centers **Evaluating stakeholders** Ministry of trade and industry-Policy unit (or Egyptian Accreditation Council) (EGAC))		
Budget: Initial Investment	EGP 100,000 Design of registration and certification system EGP 50,000 design training and prepare material EGP 50,000 equipment and training needed in NQI to manage system		
Budget Operation (yearly)	All based on 2 iterations per year EGP 150,000 Training EGP 1,500,000 Audits accompanying training EGP 50,000 workshop to discuss results EGP 50,000 transpose information to other uses (awareness, financing, …)		

Donor:	None needed
Pre-requisites	

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying: (In yearly quarters)	Q4 2018
End date: (In yearly quarters)	On going

Task break down:	Duration	Owner	Precedence
1. Establish the registration mechanism	1month Q4 2018	NQI	
2. Build the operating model of the accreditation prerequisites and processes, including templates and forms and renewal process	3months Q1 2019	NQI	
3. Communicate system to service providers and beneficiaries	Q2 2019 onwards	NQI	
4. Training registered entities wishing to be accredited	Periodical (starting twice a year) Q3 2019	NQI/ENCPC	
5. Audit program as field training (scope selected to feed into policies 5 above and potential bankable projects to 11a/b below)	Periodical in conjunction with training	IMC/ENCPC	
6. Certified individuals or firms apply for renewal	Suggested to be every 2 or 3 years	NQI	
7. Information acquired feeds into policy 10, as database and as disseminated material (within confidentiality constraints) 8. Information complements IDA's database, as needed	Periodical in conjunction with training	FEI IDA	

Milestones:	• Accredited Consulting Firms & Individuals

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Number of consulting services providers registered	Annually	NQI	N/A	N/A
Number of consulting services providers accredited in specific technical field	Annually	NQI	N/A	N/A
satisfaction rate of beneficiaries	Annually	IMC/FEI	N/A	>75%
% of non-renewed consulting firms of total registered firms	Annually	NQI	N/A	<< the registration growth rate (to maintain a rich pool

				of consultants)

Planned Outcomes	• Pool of qualified technical / engineering consultants: A regulated market with accredited consultants to ensure that the service offered is up to standards • Satisfaction due to receiving quality services: Mapping the beneficiaries satisfaction ensuring continuous feedback mechanism to avoid defaults • Input to bankable projects • Input to information base and dissemination

Policy 10: Create an awareness mechanism that leverages integrated information related to IEE

SECTION 1: PROGRAM DEFINITION

Program Name:	Create an awareness mechanism that leverages integrated information related to IEE
Program Owner:	Federation of Egyptian Industries (FEI)
Scope of the program:	Banks, government, industrial sector, with its various sizes and activities, and energy consulting services, in addition to all owners indicated across the other policies
Rationale behind it:	There is a need to tackle the general lack of information and awareness regarding Energy Efficiency, as well as provide a common knowledge platform
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	Expand R&D Budget and Enhance Energy & Resources Efficiency

Section 2: Program Operational Conditions

	High	Medium	Low
Priority:	√		
	Risk	Likelihood	Impact
Risks Associated	None		
Stakeholders / Implementation Partners:	**Policy Owner** Federation of Egyptian Industries (FEI) **Supporting stakeholders** IMC **Facilitating stakeholders (not directly involved)** IDA, NQI, EOS, MOF, ERA, Banks, Industrial Sector, Energy Consulting Services **Evaluating stakeholders** FEI MTI's Policy and Strategy Unit		
Budget: Initial Investment	• EGP 150,000 initial awareness campaign • EGP 50,000 develop communication plan Information base should have been already established based on the Chemical and building Material Sector , which uses FEI existing platforms. If this is not the case, an additional investment will be needed		
Budget Operation (yearly)	• EGP 25,000 Incremental costs of adding information of the textile sector to an existing information base • EGP 50,000 dissemination of information On the longer term, cost will be borne by advertising equipment suppliers		
Donor:	None required		
Pre-requisites			

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying: (In yearly quarters)	Q1 2019
End date: (In yearly quarters)	On-going

Task break down:	**Duration**	**Owner**	**Precedence**
Compiling and filtering information received	Q1 2019	FEI	Information Platform established and Information generation activities undertaken
Developing a communication plan, focusing on different interests of sub-sectors (e.g. the requirements of the electricity law are most relevant to spinning and weaving, while export requirements are to RMG, especially as related to supply chain)	Q2 2019	FEI	
Implement communication plan	Continuous form Q3 2019	FEI	
Monitor the impact of awareness mechanism	Q1 2020	FEI	

Milestones:	•

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Number of data requests	3 months	FEI	N/A	N/A
Number of independent hits	3 months	FEI	N/A	Yearly growth rate >50% during the first 3 years

Planned Outcomes	• More integrated systems which mutually support towards boosting energy efficiency would allow all players to perform their roles more effectively. • This includes greater integration between Energy Consulting Services, Equipment suppliers and training entities as well as government in terms of planning, regulating, and monitoring. • Increased support from the banking sector as they become more aware of the different needs, technologies and nature of the energy efficiency. • Increased awareness across different industrial facilities: A decreased awareness gap between the different industrial facilities regarding the potential savings, technologies, services, financing and focus areas.

Policy 11a: Capitalize on FEI fund to subsidize Industrial Energy Efficiency Projects

SECTION 1: PROGRAM DEFINITION

Program Name:	Capitalize on FEI fund to subsidize Industrial Energy Efficiency Projects
Program Owner:	Federation of Egyptian Industries (FEI)
Scope of the program:	Industrial Energy Efficiency Projects with special focus on small and medium enterprises (SMEs).
Rationale behind it:	Some IEE projects may come at a cost that would be considered high for some facilities. This makes facilities, especially small ones hesitant to make the investment without external support of subsidization of some sort. Therefore this policy opens the doors to industrial facilities to get on board and overcome their energy challenges.
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	Expand R&D Budget and Enhance Energy & Resources Efficiency

Section 2: Program Operational Conditions

	High	Medium	Low
Priority:			
	Risk	Likelihood	Impact
Risks Associated	This policy may face risks that pertain to the implementation side	Likely	Low with mitigation, a strong monitoring and evaluation process must be put into place to guarantee that funds are managed in a transparent manner.
Stakeholders / Implementation Partners:	**Policy Owner** Federation of Egyptian Industries (FEI) **Supporting stakeholders** Ministry of Finance		
Budget: Initial Investment	• EGP 25,000,000 infusion from ministry of finance • EGP 50,000 refine funding system in consultation with beneficiaries		
Donor:	None needed		
Pre-requisites	A funding system is effectively operational already in FEI		

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying (In yearly quarters)	Q4 0218
End date: (In yearly quarters)	On going

Task break down:	Duration	Owner	Precedence
Refine the mechanism for evaluating and selecting from applicants	6 months	FEI/Ministry of Finance	
Build a database of approved service providers	6 months	FEI	
Manage fund disbursement	Continuous	FEI	
monitoring and evaluation	Continuous	Ministry of Finance/MTI policy and strategy unit	
Put forward a fund-raising and lobbying party to further increase the funds available	Continuous (start Q4 2019)	FEI	

Milestones:	• Refined funding mechanism approved

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Disbursed funds	Bi-annually	FEI	N/A	N/A
% Energy saved due to implementing IEE projects from FEI loans	Annually	FEI	N/A	N/A

Planned Outcomes	• Increased reach of SMEs through intermediaries: This policy should enable FEI to channel energy efficiency subsidization efforts to deserving small and medium enterprises that otherwise would not be able to afford the investment.

Policy 11b: Augment cooperatives fund to finance IEE projects

SECTION 1: PROGRAM DEFINITION

Program Name:	Augment cooperatives fund to finance IEE projects
Program Owner:	The Agency for Development of Micro, Small and Medium projects
Scope of the program:	Textile and RMG cooperatives
Rationale behind it:	This Policy will augment the funds available to the cooperatives in order to finance industrial energy efficiency projects for its members. In order to increase this fund, it is proposed that the Ministry of Finance establishes a cooperation protocol with the Cooperative Union to finance its members in order for them to undertake EE projects and interventions based on certain terms and conditions
Which MTI Strategy 2020 Strategic Objectives it supports:	Increase industrial growth Increase the contribution of industrial product to GDP Increase the growth rate of export Provide decent and productive job opportunities
Which of the ten dimensions does it support:	7. Expand R&D Budget and Enhance Energy & Resources Efficiency

SECTION 2: PROGRAM OPERATIONAL CONDITIONS

	High	Medium	Low
Priority:	√		
	Risk	Likelihood	Impact
Risks Associated	The fund may be used to finance projects other than energy efficiency projects or remain under-utilized. Thus, apart from specifying the amount of finance to be made available to the Union, the protocol states that the amount will gradually increase over time in accordance with the interest expressed by the SMEs and the success of projects undertaken by them.	Likely	Low (with mitigation, A strong monitoring and evaluation process must be put in place to guarantee that funds are managed in a transparent manner)
Stakeholders / Implementation Partners:	**Policy Owner** The Agency for Development of Micro, Small and Medium projects **Supporting stakeholders** Production cooperatives Ministry of Finance IMC and MTI's Industrial technological development sector (including ENCPC) **Facilitating stakeholders (not directly involved)** NQI /ENCPC **Evaluating stakeholders** The Agency for Development of Micro, Small and Medium projects		
Budget: Initial investment	• EGP 300,000 for initial audits , to assess financial needs Could be considered in conjunction with audits in policy 5 above • EGP 50,000, establish protocol terms and conditions • EGP 50,000, set up mechanism for evaluation and selection • EGP 50,000 set up monitoring and evaluation system • EGP 50,000 training and capacity building of personnel • EGP 10,000,000, Preliminary funding for EE investments in MSMEs		
Budget Operation	EGP 250,000/ year for system management (mainly salaries)		
Donor:			

SECTION 3: IMPLEMENTATION TIMELINE

Start date for deploying: (In yearly quarters)	Q2 2019
End date: (In yearly quarters)	On going

Task break down:	Duration	Owner	Precedence
1. Assess financial needs through targeted audits	3months (Q 4 2018)	ENCPC	
2. Establish the protocol's terms and conditions	Q1 2019	Agency (in cooperation with cooperatives and Ministry of finance)	None
3. Set up the mechanism for evaluating and selecting applicants			
4. Establish a monitoring and evaluation system			
5. Operationalize cooperation protocol	Q2 2019	Agency	Activity 1-4
6. Manage fund disbursement	Continuous	Cooperatives	Activity 1-4
7. Monitor disbursement and compliance with terms	Periodical	Agency	Activity 1-4

Milestones:	• Implementable system for funding EE in MSMEs through cooperatives • Funds allocated through Ministry of finance • Funding system announced

SECTION 4: MONITORING & EVALUATION

Key Performance Indicator	Frequency of Measurement	Data Owner	Baseline	Target
Increase in disbursed funds	Measured every quarter to track growth in reach	Ministry of finance	N/A	N/A
Increase in loan applications	Measured every quarter to track growth in reach	Cooperatives	N/A	N/A
% Energy saved due to implementing IEE projects from Cooperatives Union	Every 6 months	Cooperatives	N/A	N/A

Planned Outcomes	• Increased reach to SMEs: This policy enables cooperatives to provide a channel for the finance associated with energy efficiency projects to deserving small enterprises that otherwise would not be able to afford the investment nor would be successful at applying for grants to finance it. Some small enterprises do not deal with banks, limiting their financing options. • Overcome the challenge with non-bankable facilities: This policy establishes a framework for financing outside the traditional banking infrastructure. To this end it is able to reach and provide support to the non-bankable segment of SMEs and facilities that face challenges and obstacles in their access to finance. • Improved conditions: Alleviating burdens on SMEs due to energy price hikes • Institutional strengthening: Stronger reliance on, and affiliation to, industrial organizations • Better knowledge on small industries: Micro-data of the different small industries will be acquired

Annexes

Annex (A):

Textile Sector Energy Efficiency in the context of Wider Strategies

The MTI strategy for 2020 is the main umbrella under which this energy efficiency strategy for the textile sector is developed. Accordingly, the compatibility of the two documents has to be ensured. In addition, the MTI has developed more specific strategies through the support of a number of donors, including the Industrial Innovation strategy, the SME strategy and the Technical and Vocational Education and Training (TVET) strategy. These are the general industrial strategies, in parallel to which several sector strategies were, or are being, developed.

Energy Efficiency is also compatible with strategic documents other than those developed by MTI. Although these are all currently integrated in the sector strategy developed by MTI, ensuring the compatibility with e.g. the Textile Chamber's textile sector strategy is important as it reflects the interest of its members. This annex addresses the compatibility with these multiple documents in preparation for the tailoring of the industry wide IEESP to the specificities of the textile sector.

A.1. Industry-wide Strategies

The MTI 2020 strategy proposes a number of measures for achieving the 2020 objectives and goals. The vision driving the strategy is encapsulated in the following statement:

"Industrial development becomes the growth locomotive driving forward the sustainable inclusive economic growth in Egypt, responsive to domestic demand and supporting exports growth, so that Egypt becomes a vital player in the global economy, capable of coping with global fluctuations."

The main goals of the 2020 strategy are:

1. Increase the annual industrial growth rate to 8%.
2. Increase the contribution of industrial product to Gross Domestic Product from 18% to 21%.
3. Increase the micro, small and medium enterprises sector's contribution to GDP.
4. Increase the growth rate of exports to 10% annually.
5. Provide 3 million decent and productive job opportunities.
6. Institutional development

Energy Efficiency contributes to the above main goals as shown in table (A-1).

Table (A-1): Contribution of Energy Efficiency to MTI 2020 Strategy

MTI 2020 Strategic Goals	In Relation to Energy Efficiency
Increase the annual industrial growth rate to 8%.	To be within energy constraints, need to increase energy efficiency
Increase the contribution rate of industrial product to Gross Domestic Product from 18% to 21%.	Energy efficiency should reduce costs and consequently increase value added of industrial products and thus their contribution to GDP
Increase the growth rate of exports to 10% annually.	Similar to production growth, to be within energy constraints, need to increase energy efficiency. Moreover, lower costs resulting from energy efficiency would increase competitiveness. Finally, carbon foot print might become a competitive factor, although seemingly not in the short term.
Provide 3 million decent and productive job opportunities.	Part of these jobs could be in energy management. It will represent a small amount in the range of thousands of jobs and most of these jobs will result from industrial growth.

A.2. A Sector Specific Strategy

The Egyptian National Council on Textile strategy for 2025[57] fits well into the MTI 2020 strategy. The vision driving the sector strategy is

"Egypt to become the leading exporting MENA country in the Textiles industry, focusing on high and medium value added products catering to the world's largest retailers and manufacturers with reliable and agile delivery".

The driver for the sector seems to be totally focused on exports and the main pillars of the textile strategy are:

1. Establish the Higher Council on Textiles
2. Facilitate access to finance for new investments through a Special fund
3. Attract FDI into primary textiles and fiber production to achieve backward vertical integration of Industry,
4. Foster Human Capital Development to supply skillful labor base
5. Ensure sufficient industrial land and infrastructure

[57] texmedclusters.eu/Fr/telecharger.php?code=641

6. Improve logistics and exports' lead time development
7. Expand the industrial base through developing and enhancing the competitiveness of local industry
8. Facilitate imports of raw and production inputs
9. Reform of Government policy and restructuring of State-Owned enterprise

The way energy efficiency could be linked to Egyptian Chamber for Textiles Industries Strategy Pillars "Vision 2025" is shown in table (A-10) below.

Table (A-2): Support of Energy Efficiency to Egyptian National Council on Textile strategy

Egyptian National Council on Textile Development Strategy Pillars	Support of Energy Efficiency
- Special fund to Facilitate Access to finance for new investments	- Ensure that all equipment and machines used in newly established plants or in upgraded plants are energy efficient - Incorporation of energy efficiency will increase competitiveness in terms of cost reduction, and compliance with potential international standards related to carbon emissions.
- Foster Human Capital Development to supply skillful labor base	- Integrate Energy Efficiency concept in capacity building plans and training provided to labor by training centers such as TVET, ITC, etc.
- Expanding the Industrial Base through Developing and Enhancing the Competitiveness of local industry	- Similar to the new investments, incorporation of energy efficiency will increase competitiveness in terms of cost reduction, and compliance with potential international standards related to carbon emissions.
- Reform of Government policy and restructuring of State-Owned companies	- This will also involve new investments to which energy efficiency criteria will apply

A.3 MSMEs and Entrepreneurship National Strategy

Support to the development of Micro, Small and Medium-sized Enterprises (MSMEs) and Entrepreneurship has become an over-arching priority for the Government of Egypt (GOE). In November 2016, MTI has launched a National Strategy to "Enhance Industrial Development and Exports" that laid the Ministry's plans for developing the industrial sector (five sectors were prioritized). Within the same document one pillar focused on developing MSMEs and linking the goals with the different prioritized sectors. The main policy areas of the MSMES strategy are:

1. Legal and Regulatory Environment. Objective: reducing the administrative burden and simplifying the regulatory environment for MSMEs, and Institutionalized mechanism for coordination and implementation of strategy
2. Access to finance. Objective: strengthening access to finance including financing products diversification, and innovative tools
3. Entrepreneurship Policies. Objective: Improving entrepreneurship's conducive environment and policies
4. Exports and integration into value-chains. Objective: expanding the capacity of MSMEs to integrate in local and global value chains
5. Business Development Services. Objective: Creating access to BDS
6. Cross Cutting Themes: Objective: Addressing women's entrepreneurship, environment, and technology.

The second pillar of the MSMEs Strategy related to access to finance can be directly linked to Policies 10 and 11 of the IEE Strategy by proposing raising the awareness of industries to the funds offered by the Central Bank of Egypt to support EE initiatives and provision of soft loans.

The fourth objective of the MSMEs strategy related to expanding the capacity of the MSMEs to integrate local and global value chains can be linked to Policy 5 of the IEE strategy as these support organizations should encourage sustainable business performance and assist MSMEs in being recognized for that.

As for Policy 10 of the IEE Strategy which proposes creating an awareness mechanism that leverages integrated information related to IEE, it can be linked to objectives 3, 5 and 6 of the MSMEs strategy by providing a link in the proposed web portal to the IEE platform to offer support to industrial startups, and including in the BDS database the service providers concerned with IEE knowledge and technology transfer that are relevant to SMEs.

The IEE Strategy could be linked to the MSMEs objectives as shown in Table (A-11).

Table (A-3): Linking IEE Polices to MSME Strategy Pillars

MSME Strategy Pillars / Actions	Cross-link with IEE strategy		
	Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness mechanism that leverages integrated information related to IEE***	***Policy 11: Strengthen industrial organizations to provide IEE support***
2. Access to Finance: • The SME strategy states that commercial banks are reluctant to provide tailored financial services/programs for SMEs because of the high risk and costs associated with it. • Thus, the Central Bank of Egypt (CBE) announced a new program to improve SMEs access to credit which aims at availing EGP 200 bn of bank credit over 4 years with competitive rates.		• The CBE program should be made known on the IEE platforms and encourage facilities to apply for these loans to finance EE measures. The banks offering financial services to SMEs should take advantage of the awareness mechanism suggested in policy 10 to regularly promote their products and services.	• A portion of CBE's EGP 200 bn should be channeled through the existing FEI fund to expand it. FEI - Environmental Compliance Office (ECO) will in turn provide its members access to soft loans. Support will ??? be extended to establish a dedicated ??? managed by the cooperative ????
3. Entrepreneurship Policies[58]: • Support start-ups through incubators, boot camps and business plan competitions		• As a support to startups, information on existing service providers will be disseminated through a web portal. This web portal should	

[58] Difference between entrepreneurship policies and MSMEs policies: entrepreneurship policy is defined as policy measures taken before and up to three years after the start of business, MSME policy concerns measures after the first three years and is defined as publicly funded measures.

MSME Strategy Pillars / Actions	Cross-link with IEE strategy		
	Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness mechanism that leverages integrated information related to IEE***	***Policy 11: Strengthen industrial organizations to provide IEE support***
• Information dissemination on existing service providers through web portal (This will include the activity of collecting information on existing providers, their services and procedures).		have a link to the IEE platform to offer support to industrial startups.	
4. Internationalization and Inter-firm Linkages: • Non-exhaustive suggested actions: • Develop proactive capacity of existing MSME support organizations to assist MSMEs with export marketing opportunities, including ensuring a supply of trained private sector "brokers" to provide services to MSMEs.	• Support organizations should encourage sustainable business performance and assist MSMES in being recognized as such. • For example, assisting them in obtaining the required certification e.g. ISO for energy or environmental management.		
5. Business Development Services: • Non-exhaustive suggested actions: • Creating Database of existing MSME Business Development Services (BDS) providers including their qualifications, areas of expertise, services provided and cost, to be shared with partners.		• Include in BDS database the service providers concerned with IEE knowledge and technology transfer that are relevant to SMEs such as IMC	
6. Cross Cutting Themes: Non-exhaustive		• Include in BDS database the service providers concerned	

MSME Strategy Pillars / Actions	**Cross-link with IEE strategy**		
	Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness mechanism that leverages integrated information related to IEE***	***Policy 11: Strengthen industrial organizations to provide IEE support***
suggested actions: ***Environment (Clean Economic Growth & Climate Change):*** • Facilitative access to BDS including technology transfer, especially in the new growth sectors like renewable energy, logistics and recycling		with IEE knowledge and technology transfer that are relevant to SMEs such as IMC	

A.4 Promotion of Small and Medium Enterprises Industrial Innovation Strategy

The Industrial Innovation Strategy was developed under the leadership of the Ministry of Trade and Industry with the objective of driving innovation in the industrial sector and competitiveness forward. This strategy takes the goals of Egypt's Sustainable Development Strategy (Egypt's Vision 2030) and MTI's Strategy 2020 further, as well as defines 11 key measures that contribute to reach the respective Key Performance Indicators (KPIs) from MTI´s and its affiliated institutions' side.

These measures build on the MTI's efforts by:

- Stimulating Innovation – an innovation culture that creates more ideas and motivates more companies to consider innovation as a promising way to increase competitiveness
- Enabling innovation – provision of improved framework conditions and knowledge to support industry and academia on how to innovate and accelerate innovative ideas
- Facilitating innovation –mechanisms to support industry and academia to turn those innovative ideas into actual products, processes, services and business models
- Commercialize innovation –new products and technologies on the market. The private sector in Egypt needs better support in obtaining access to national and international clients in order to be an integral part of national and global value chains

It is proposed to link this innovation strategy to Policies 5 and 10 of the IEE policies and strategy as detailed in table (A-4). Moreover, some additions as linked to industrial energy efficiency in the innovation strategy are also proposed.

Table A-4: Link between Innovation Strategy and IEE Policies

Elements of the innovation support chain	Measures of the innovation support chain	Cross link to IEE Strategy		Proposed Additions to the Innovation Strategy as linked to IEE
		Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness* mechanism *that leverages integrated information related to IEE***	
• **Stimulating Innovation**	• **<u>R&D</u>** • A Matching Fund is a collaborative fund aiming to develop innovative and competitive Egyptian products by supporting collaborative and applied R&D projects. • It aims to boost the industrial sector in Egypt by exploiting the research power in Egyptian universities and research centers, with the goal of developing innovative and competitive Egyptian products. • Takes the product from the ideation stage, through the proof-of-concept and prototyping stages, until it becomes a complete product ready to be introduced to the market.			• It is highly encouraged that the in-house R& D collaborate with members from academia and work towards acquiring the Matching Fund. However, it is suggested that innovation should not be restricted to products but also processes and technologies as there is plenty of room for innovation in these as well.

Elements of the innovation support chain	Measures of the innovation support chain	Cross link to IEE Strategy		Proposed Additions to the Innovation Strategy as linked to IEE
		Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness* mechanism *that leverages integrated information related to IEE***	
	• **<u>Awareness</u>** • The innovation strategy suggested Awareness for Innovation **(InnoAware)** as a measure to raise awareness about the importance of innovation for the competitiveness of the Egyptian Industry.		• Extend awareness campaigns **(InnoAware)** to innovation in resource use (e.g. rationalized water and energy use, reusing waste heat/ products, integrating RE in the facility.	
	• **<u>Knowledge sharing</u>** • The innovation strategy suggested developing and maintaining an online portal **(InnoPort)** to inform different industrial stakeholders (particularly SMEs) about innovation and related topics.		• The information sharing / awareness platform suggested under Policy 10 could be featured under the **InnoPort** (the central information portal owned by the MTI to increase knowledge about industrial innovation) as it would have a wider reach and more useful information to the company not just energy efficiency. The IEE platform should be accessible from the InnoPort and vice versa.	• Knowledge should also be reachable for those who are not "tech-savvy" i.e. available through periodical publications in Arabic and not just the website

Elements of the innovation support chain	**Measures of the innovation support chain**	**Cross link to IEE Strategy**		**Proposed Additions to the Innovation Strategy as linked to IEE**
		Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness* mechanism *that leverages integrated information related to IEE***	
	• **<u>Awarding</u>** • The innovation strategy suggested the **InnoAward** which acknowledges innovative companies and their efforts in order to create awareness for innovation and motivate companies to innovate.	• Policy 5 includes creating awards for the best energy performance in SMEs. • Innovation in improving energy performance may be promoted and SMEs undertaking the most innovative EE interventions and achieving measurable savings should also be awarded. The award can be granted along with the suggested **InnoAward**.		• The suggested InnoAward could include EE as one of the criteria upon which an award is granted
• **Enabling innovation**	• **<u>Industry and academia</u>** • The innovation strategy promotes collaboration between industry and academia.	• The collaboration between industry and academia should be reflected when forming guidelines on EE to be handed out to SMEs. Guidelines on EE handed out to SMEs should encourage critical thinking that enable innovation in energy efficiency and not only dictate specific, rigid measures to reduce consumption.		

Elements of the innovation support chain	Measures of the innovation support chain	Cross link to IEE Strategy		Proposed Additions to the Innovation Strategy as linked to IEE
		Policy 5: Strengthen industrial organizations to provide IEE support	***Policy 10 : Create an awareness* mechanism *that leverages integrated information related to IEE***	
• **Facilitating Innovation**	• **<u>Technology and Innovation Centers (TICs)</u>** • The innovation strategy suggests under the **TICs Support Scheme** strengthening the role and capacity of Egyptian TICs as an important service provider for Egyptian companies.			• The **TICs Support Scheme** will improve the ability of TICs to support enterprises in the broad field of innovation and thus can offer facilities assistance technical and otherwise along with ENCPC/IMC.

A.5 Relation to Ministry's TVET Strategy

The MTI Vocational Education and Training Strategy specifies that the productivity and vocational training department conducts training for more than 80,000 workers in upper and middle management, supervisors and foremen in industrial facilities. Training is currently being carried out in the fields of Industrial and production engineering, management systems and economic, technical and financial affairs.

Therefore, training in EnMS has to be introduced along with the other management systems. It is proposed to provide training to students who have not yet joined the workforce as well as for those who already joined the workforce and their companies. Upper and middle management should also be aware of the importance of having an EnMS in place. This will be particularly beneficial for the companies that are implementing an EnMS.

The productivity and vocational training department has an industrial apprenticeship system for more than 44 jobs. This system is setup by an agency specialized in setting specifications for professions, skill levels and the necessary applied technological knowledge. It is therefore advisable that applied technological knowledge includes energy efficient technologies and processes and means of rationalizing energy use in factory operations.

Annex (B):

Examples of Energy Efficiency Financing Facilities

1. Environmental Compliance Office and Sustainable Development (ECO SD)[59]

Then Environmental compliance office and sustainable development (ECO SD) of the Federation of Egyptian Industries (FEI) is providing a fund for Renewable energy and energy efficiency sector. This fund helps the different facilities to improve the energy efficiency through implementing a full energy management system. This leads to reduce the production costs and increases the competitive capacity of the products in local and international markets.

In this regards, ECO SD is providing the following:

- Preparing specialized technical studies on the applications of energy efficiency improvement for the industrial sectors.
- Providing soft loans (up to 3 million EGP) dedicated for financing the best technologies available.
- Helping with the efforts exerted locally aiming to save energy and improve the efficiency of its utilization by making a preliminary and detailed survey for companies.
- Implementing training sessions for the energy auditors in accordance with the ISO 50001 certificate for energy management.
- Providing integrated solutions and support in choosing the best available technologies.
- Adjusting the thermal performance of the operating boilers and furnaces in order to improve the combustion efficiency.
- Implementing the programs of the "Energy Management Systems". Diagnosing the situation of The energy consumption in the facility and the sources of energy loss, and applying the policies aiming at more efficient energy utilization.
- Performing all the measurements required for implementing the energy saving technologies in cooperation with acknowledged standards authorities.
- Measuring and correct the power factor.

2. Green technology Financing Facility[60] (GEFF)

In 2011, European Bank for Reconstruction and Development (EBRD), expanded its operations to include Egypt and some other countries of Southern and Eastern Mediterranean – SEMED region. EBRD developed the Sustainable Energy Financing Facilities (SEFF), because of the massive need for investment in energy sustainability in most of countries. Therefore, it developed financing facilities specially dedicated to medium- and small-scale energy efficiency and renewable energy investment projects.

Financing is based on the EBRD extending credit lines to local banks that participate in the Facilities. The EBRD's Egypt Sustainable Energy Financing Facility (EgyptSEFF), implemented

[59] http://www.eco-fei.org/
[60] https://ebrdgeff.com/egypt/

by National Bank of Egypt (NBE), has recognized the best projects to highlight the successful completion of the pilot programme.

The second phase of this program was through Green Economy Financing Facility "GEFF", which provides loans to energy efficiency and renewable energy investments in Egypt. This loans could be for a technology, as replacing equipment, or for assisted projects.

- The pre-approved equipment and materials, which, exceeds minimum performance requirements and perform beyond current market practices resulting in clear benefits and environmental improvements. GEFF provides a Technology Selector Tool to help to identify the most suitable high-performing equipment and materials eligible for financing.

For dyeing process, as it considered the most intensive energy process in textile industry, savings could be achieved through improving processes or putting some control systems, etc. For example, a variable-speed drive (VSD) as voltage or current source inverters could be applied to the electric system of the dying equipment. Table (B1) shows some examples of applying the GEFF tool to save energy for the dyeing equipment.

- Assisted Project Loans offers additional benefits such as an attractive investment incentive grant and free technical assistance.

Assisted Projects contributing to an improvement in energy performance should achieve Energy Savings equal to or greater than 20%.

Table (B-1): examples of applying the GEFF tool to save energy for the dyeing equipment[61]

System	Technology	Sub- Technology
Electric system	variable-speed drive (VSD)	Voltage – source inverter Current source inverter
	Transformers	Three phase low voltage dry type transformers
	Compensation system	Power factor correction panel
Energy management system	Sensors and metering	Power sensors and metering
		Pressure sensors and metering
		Temperature sensors and metering
		Mass flow rate sensors and metering
Energy Supply (electricity and thermal)	Solar Water Heaters	Evacuated tube collectors
	PV Solar	Mono/Polycrystalline PV panels
HVAC System	Cooling towers	Axial fan cooling towers
		Centrifugal fan cooling towers
	Chiller	Single or Double-effect absorption chiller
		Mono and multi split units
Lighting system	Lighting control system	Occupacy sensors
	Lamps	LED Lamps

[61] http://ebrdgeff.com/egypt/database/

3. GREEN for Growth Fund (GGF)

The Green for Growth Fund is a unique Public Private Partnership with the goal to promote the development of energy efficiency and renewable energy markets in Southeast Europe and the Middle East and North Africa (MENA) through the provision of dedicated financing[62]. The GGF was initiated as a public-private partnership in 2009 by Germany's KfW Development Bank and the European Investment Bank, with financial support from the European Commission, the German Federal Ministry for Economic Cooperation and Development, the European Bank for Reconstruction and Development, and the Austrian development bank.

The fund will be through the local banks in Egypt such as Cairo Bank, Alex Bank and the national bank of Egypt up to 30 million dollars. The funding will be utilized for measures that support renewable energy (RE) and investments in energy efficiency (EE) measures throughout the country.

The industrial applications of this fund includes textile industry as the textile companies could save energy through the following activities:

- Replacing old industrial boilers
- Replacing old ovens / Dryers
- Replacing pumps, motors and air compressors
- Investing in combined heat and power plants
- Investing in modern production lines

These additional investments can also help save energy:

- Installing energy efficient lighting
- Upgrading cooling chambers/refrigerated cabinets

[62] http://www.ggf.lu/project-portfolio/investments/egypt/#