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Role of Energy Services Companies in Promoting Energy and Environmental Sustainability in the GCC Region

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Abstract. Energy Service Companies (ESCOs) play a vital role in enhancing energy efficiency and environmental sustainability in the oil-rich, Gulf Cooperation Council (GCC) region. With high energy demand and abundant fossil fuel resources, the GCC faces sustainability challenges that ESCOs address by offering tailored energy solutions to public and private sector entities. Globally, the ESCO market has shown significant growth, with China commanding a dominant share and the US experiencing steady revenue growth between 2014 and 2018. Conversely, the ESCO market in Europe has seen relatively less development. This research adopts a literature review methodology to analyze ESCO practices, challenges, trends, and overviews within the GCC. Super-ESCOs like Etihad and Tarshid ESCO lead energy efficiency initiatives in Dubai and Saudi Arabia, respectively, reflecting a regional change towards sustainability. In the GCC, ESCOs face obstacles such as Lack of awareness, funding limitations, complex contracts, and client hesitancy, etc. Despite challenges, initiatives like Dubai's Etihad, Saudi Arabia's Tarshid, Ras Al-Khaimah's RAK, Sharjah's SEWA, Oman's APSR, and Abu Dhabi's ADES Energy Service's ESCOs demonstrate tangible energy savings and CO_2 reductions. This study aims to provide insights into ESCO dynamics, identify barriers, and highlight the importance of ESCOs in advancing energy efficiency in the GCC. Also, it reveals the critical role of ESCOs in addressing sustainability challenges and advancing energy diversification in the region.

Keywords: ESCOs in GCC region, Energy efficiency, renewable energy, sustainability, greenhouse gases.

INTRODUCTION

The global goal is to enhance the reduction rate of energy intensity to 4% annually, requiring a tripled investment in energy efficiency, aligned with energy supply investment. Four key drivers for increasing investment in energy efficiency were identified: demand, capacity to develop projects, financing capacity, and available finance [1]. Studies frequently show that ESCOs develop at overcoming traditional barriers to energy efficiency projects, such as heavy upfront costs and perceived risks. Their technical skill in identifying and implementing tailored energy-saving techniques enables clients to achieve significant reductions in usage. ESCOs play a crucial role in various energy efficiency initiatives, including resource conservation, the adoption of renewable energy sources, reducing carbon emissions, and optimizing energy usage.

During the 1970s energy crisis, when entrepreneurs explored creative techniques to deal with growing energy prices, the notion of ESCOs was introduced in North America for the first time in the twentieth century. While ESCOs can assist in overcoming some of the challenges to energy efficiency, such as a lack of knowledge, high initial costs, split incentives, and regulatory limits, the development and execution of ESCO services in the GCC region face various problems and obstacles including low energy prices, small market size, lack of standardization, and insufficient institutional assistance [2]. The successive overall spread of ESCOs has been significant, and exploring their significance in oil-rich regions such as Dubai presents an appealing area for research, given the energy dynamics and barriers that such places face. Investigations in the GCC region indicate a thriving ESCO sector with huge unexplored potential [3]. It is necessary to assess the current practices and performance of ESCOs in the region, identify the major issues and barriers, and investigate the opportunities and prospects for future growth and innovation. ESCOs are designed to assist public and private sector entities in reducing their energy consumption and improving overall efficiency. ESCOs focus on providing comprehensive energy efficiency solutions. They provide unique business models that incorporate energy assessments, project design, funding, implementation, and performance monitoring [4]. Also, the purpose of ESCOs is to help reduce energy use for public and private sector institutions. ESCOs play a major role in appreciating energy efficiency and conservation. ESCO offers a wide range of energy solutions, including energy audits, retrofitting, performance contracts, and financing, to help clients increase their energy efficiency and lower their energy expenditures [5]. An ESCO is a corporation that is involved in building, installing, and financing whole, performance-based projects, typically 5-10 years in duration, focused on improving the energy efficiency or load reduction of buildings owned or operated by customers [6]. The ESCO concept was highlighted, including energy services and efficiency improvements paid for based on performance, with historical origins dating back to the 1770s with Boulton and Watt's steam engine agreements [1]. While it’s often said that the origins of ESCOs can be found in late nineteenth-century Europe [7], especially in France, where a variety of businesses provide energy-related services utilizing the ESCO concept. These organizations, referred to as "operators" or "managers," ran or managed energy networks for their customers. ESCOs can also benefit from rising trends and technologies in the energy sector, including digitization, smart metering, renewable energy, and energy storage [8]. Following the investigation of ESCOs and their impact on energy efficiency and sustainability both internationally and within the GCC region, the purpose of this study is to look into the role of ESCOs in promoting energy and environmental sustainability in the GCC context. The research will analyze the current practices and functioning of ESCOs in the region, emphasizing how these companies are directing the unique challenges and energy dynamics of these markets. Additionally, it looks to identify the challenges and barriers that obstruct the development and implementation of ESCO services, such as low energy prices, limited market size, and regulatory constraints. By addressing these objectives, the study aims to offer a thorough understanding of the potential for ESCOs to drive significant advancements in energy efficiency and sustainability within the GCC region.

ENERGY EFFICIENCY OUTLOOK OF THE GCC REGION

Energy efficiency is crucial to achieving sustainability goals and lowering greenhouse gas emissions. However, energy efficiency remains a major concern in the oil-rich GCC, where energy demand is high, and fossil fuels are plentiful. The region faces high energy demand driven by rapid economic growth, population increase, and dry conditions, particularly in countries like Saudi Arabia and Kuwait, where energy use per capita and overall consumption are significantly high. For instance, residential buildings in Kuwait consume the most energy per capita, whereas Saudi

Arabia consumes the most overall energy. Cooling loads account for the highest energy demand in all GCC countries, ranging from 58% in Oman to 75% in Bahrain, and 63% across the region. As a result, the need for electricity supply is increasing [9]. Energy efficiency represents approximately 40% of the greenhouse gas reduction potential that may be realized at a cost of less than EUR 60 per metric ton of CO_2 equivalent [10]. This makes energy efficiency an important focus in the Gulf region, where abundant oil and gas resources coexist with pressing environmental issues and high energy consumption. To address these challenges, entities within the UAE and other GCC countries have been actively working towards energy efficiency solutions, with a notable interest in the role of ESCOs. ESCOs provide significant benefits by improving and enhancing energy efficiency through performance-based contracting, which helps clients overcome both technical and capital barriers to energy efficiency upgrades. Additionally, ESCOs ensure access to innovation, advanced technical solutions, and financial support, which are crucial for meeting the increasing energy demands and achieving long-term sustainability [11]. The ESCO market in the UAE reflects a diverse range of operations, including 38% pure ESCOs, 25% Facility Management, 19% Product Manufacturers, and 9% Product Retailers. About 50% of UAE ESCOs are interested in opening or have already established branches in MENA, with Saudi Arabia leading the way (70%), followed by Egypt and Oman. However, other GCC countries, such as Bahrain, Kuwait, and Qatar, have shown limited interest in ESCOs, which points to varying levels of market engagement across the region [9]. The current landscape of ESCO research lacks a thorough examination of practices specific to the GCC region, which is distinguished by its status as an oil-rich area. Although some studies cover particular states or regions within the GCC, they often fall short of providing the detailed insights required to fully understand the unique challenges and opportunities present in the GCC's energy landscape. As such, a detailed study is necessary to analyze ESCOs' current practices, performance metrics, and the obstacles they face, such as low energy prices, small market size, lack of standardization, and insufficient institutional backing [2]. Additionally, ESCOs promote divergence by encouraging the use of renewable energy sources such as solar and wind, and by advancing energy-efficient technologies, thus reducing dependence on fossil fuels and enhancing environmental sustainability. The Natural Resource Governance Institute (NRGI) strives to enable people in oil- and mineral-rich countries to make educated decisions about their energy futures that safeguard the planet, boost their economy, and create more equitable communities [12]. As GCC countries grow quickly in infrastructure due to economic progress, energy required in the region is expected to double by 2035, driven by increasing population growth. Promoting the role of ESCOs could be a key strategy to increase energy efficiency and address the increasing energy demands in the GCC region.

OVERVIEW OF ESCO

The overview of ESCOs gives a short explanation for significant concepts, giving readers a solid understanding of essential industry terminology. By leveraging innovative technologies and financial models, ESCOs play a pivotal role in driving sustainable energy practices and facilitating the transition toward a more energy-efficient future. The National Association of Energy Service Companies (NAESCO) defines ESCOs as companies that work with institutional energy users in both the public and private sectors to provide cost-effective energy efficiency retrofits for a wide range of client facilities, from college campuses to water treatment plants.

Functions of Escos

ESCO functions include energy audits, project design and implementation for efficiency upgrades, financing, integration of renewable energy, performance contracting, monitoring and validating energy savings, and guaranteeing results. The U.S. Department of Energy collaborates with governments to promote energy efficiency through ESCOs. These functions vary based on contracts, project scope, and client needs, aiming to deliver high-quality energy services and customer satisfaction [4].

Escos Business Models

ESCOs offer their customers a variety of contract types based on who pays for the project, who guarantees the savings, and who shares the benefits. The most common types of ESCO contracts are as follows.

Super ESCOs

Super ESCOs as shown in Fig.1 are government-supported entities designed to assist energy efficiency projects by overcoming market barriers that hinder the development of traditional ESCOs. They often engage in larger-scale projects, sometimes using public funds to influence private investment and focus on creating a market environment conducive to energy efficiency investments [13].

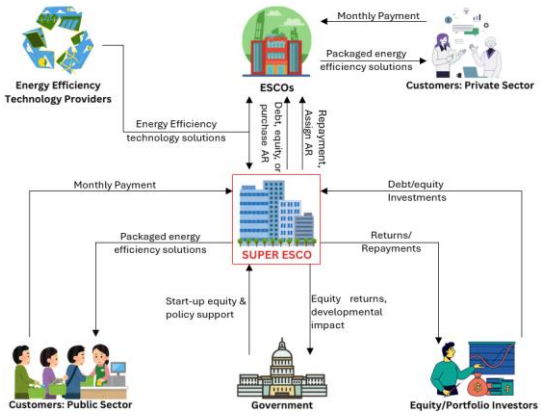

Figure 1 Super ESCOs [18]

Guaranteed Savings

ESCO guarantees a specific level of energy savings which helps reduce the client's energy bills. The ESCO assumes the technical risk, and the client typically finances the project either through a bank loan or their funds. The savings achieved beyond the guarantee remain with the client [13]. For example, if a client invests in a project with a guaranteed savings of $100,000 annually, but the actual savings are only $90,000, the ESCO would pay the client $10,000 to cover the shortfall.

Shared Savings

In the shared savings model, both the ESCO and the client share the financial benefits of the energy savings throughout the contract. The ESCO may finance the project costs and is responsible for the implementation and maintenance. The actual savings are then divided between the ESCO and the client according to a pre-agreed ratio [13]. For example, if an ESCO implements a project that reduces energy costs by $100,000 annually, and the agreed-upon split is 50/50, the ESCO and the client each receive $50,000 per year from the savings.

Energy Savings Insurance and Credit Risks Guarantee

This technique uses third-party insurance or guarantees to cover the performance risks of energy-saving projects. Energy Savings Insurance (ESI) ensures that promised energy savings are delivered and covers losses if the project does not meet expected savings. Credit risk guarantees

safeguard the ESCO from the chance of customer default, guaranteeing that payments are received even if the client fails financially [4].

ESCO'S MARKET IN GCC

The ESCO market in the GCC countries is part of a growing global trend towards increasing energy efficiency and sustainability in the energy sector. These companies are gaining traction in the GCC region as there is a strong push towards energy optimization and reducing carbon emissions, aligning with the broader economic diversification goals away from oil dependence. The 2020 annual report for the Regulatory and Supervisory Bureau RSB's ESCO accreditation scheme, highlighted significant disruptions due to the COVID-19 pandemic, affecting the operations and financial projections of ESCOs globally. A survey indicated that over 80% of accredited ESCOs were impacted, with more than 60% expecting revenue reductions exceeding 20%. Despite these challenges, optimism remained high, with 90% anticipating a return to normal by 2021. The year also saw growth in accreditation, with 11 ESCOs fully accredited and 13 provisionally, alongside 17 new accreditations approved. Additionally, ESCOs reported initiating 47 new projects, contributing to a cumulative investment of AED 987 million in Dubai's sector since 2014, reflecting ongoing resilience and expansion in the face of adversity. The 2021 ESCO survey[14], provides insights into the ESCO market in the UAE, revealing that 57% of ESCOs are relatively new, having operated for less than five years, while 43% have been in the market for over five years. In terms of business nature, 38% are dedicated ESCOs, 25% originated from facility management, 19% are product manufacturers, and 9% function as product retailers. Geographically, these companies are primarily active in Dubai, Abu Dhabi, and Ras Al Khaimah, with half planning to expand into the MENA region, especially Saudi Arabia. Despite mixed performance evaluations over the past two years, with 57% rating the market as below average, 60% anticipate positive growth in the next three years.

ESCOs in the GCC Region

The development of ESCOs in the GCC is closely tied to the regulatory environment. Changes in policy and regulation can either drive or hinder the growth of ESCOs. ESCOs in the Gulf region are gaining prominence as the area continues to diversify its energy sources beyond oil and gas. These ESCOs play an important role in implementing energy efficiency initiatives in all six GCC countries. Such as Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman. As Shahateet M, [15] recommended benefiting from the experience of ESCOs in developed countries and applying it in the Arab World. The region holds substantial natural resources, but due to rising domestic energy demand, there is a significant push towards renewable energy and energy efficiency to maintain sustainable growth. ESCOs in the GCC can benefit from the experience gained in more developed countries, applying best practices and advanced technologies to the unique challenges and opportunities in the Arab World. This transfer of knowledge and experience is crucial as it helps the GCC countries achieve their energy diversification and sustainability goals while enhancing their economic resilience. Table 1 shows some of the accredited ESCOs in the GCC region.

Table 1 Current ESCO Accredited Companies in the GCC region

Current ESCO Accredited Companies in the GCC region [16]	
Al Etihad Energy Services	Tarsheed (NESCO)
Technical and Trading (TTE) Energy Services	ESCO (Al Hassan Ghazi Ibrahim Shaker Company)

Al Futtaim Engineering (L.L.C)	Quantum ESCO
Al Shirawi Facilities Management LLC	Shaker Group of ESCO
ENOVA Facilities Management Services LLC	Smart4power of energy efficiency
Farnek Services L.L.C	HASA Energy
Hansa Energy Solutions LLC	Danish Energy Management (DEM)
Johnson Controls International L.L.C.	CLUSTER
Nationwide Management Services LLC	Ista Qatar
Pactive Sustainable Solutions	GORD Advisory
S.K.M Air Conditioning LLC	Energy Efficiency Group (EEG)
Sharaf Electronics LLC	Esco Kuwait
Siemens Industrial LLC	Energy Systems Company
Signify International B.V.	Protect Pme Energy
Smart Automation Energy	Questech Energy Efficiency Services LLC
Taka Solutions/ Taka Energy Services LLC	RESET MENA
Adeeb Electrical & Electronics Services Company	Tabreed Energy Services
AGFS Consultancy L.L.C	TECON CO L.L.C
Consistent Engineering Consultants	Universal Voltas LLC
Emirates Electrical Engineering LLC	ista Middle East FZE, Dubai Branch
FJCare Technical Services L.L.C	Meinhardt Engineering & Architectural Consultants
Geco Mechanical & Electrical Ltd. Co	NZE Solutions LLC
IBECE Integral Building Energy Conservation Engineers	

Super ESCOs in the GCC Region

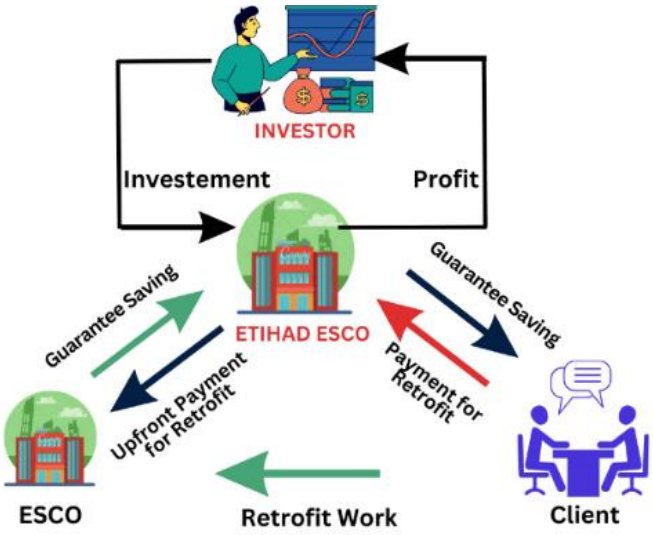

Figure 2 ETIHAD Super ESCO

Super ESCOs in the GCC region as shown in Fig.2, play a pivotal role in driving energy efficiency initiatives, supported by government backing to overcome market barriers that typical ESCOs face as shown in Figure 3. These entities facilitate large-scale projects by leveraging meticulously outlined ESCOs in the GCC, tracking their inception, operational regions, roles, and financial strategies including project financing and on-bill mechanisms. Additionally, it compares the focus on retrofitting versus solar projects. It identifies market segments each ESCO serves, providing a comprehensive snapshot of their strategic engagements and impacts on energy efficiency in the region. Table 2 provides detailed information about various ESCOs operating in different GCC regions. Each ESCO has unique goals and contributions to energy efficiency initiatives in their respective areas. Etihad, established in 2013 in Dubai, functions as an ESCO entity engaged in project financing and on-bill financing, targeting 1.4 TWh savings by 2030 through retrofit and solar projects. RAK, founded in 2017 in Ras Al-Khaimah, operates as a facilitator without

financing, aiming for 55 TWh savings by 2030 primarily in government and commercial sectors. Tarshid, established in 2017 in Saudi Arabia (KSA), functions as an ESCO business that specializes in 100% retrofit projects in the government sector. SEWA, initiated in 2018 in Sharjah, functions as a facilitator without specific financing targets. APSR launched in 2019 in Oman, and ADES, established in 2020 in Abu Dhabi, both serve as facilitators, although specific project details are not provided for these entities. Each ESCO has distinct goals, financing approaches, and market segments addressed, contributing uniquely to energy efficiency initiatives in their respective regions.

Table 2 Super ESCOs in the GCC Region

Names of Super ESCOs	Inception	Region	Role	Project financing	On bill	Target Savings 2030	No. Of tenders	Value Projects awarded	Savings from projects	Retrofit vs solar	Market Segments addressed
Etihad	2013	Dubai	ESCO entity	Yes	Yes	1.4 TWh 4.9 BIG	100+	218$ M	32$ M/Year	80% Retrofit 20% Solar	91% Res. 5% Govt 4% Comm Bidding
RAK	2017	Ras Al-Khaimah	Facilitator	No	No	55 TWh 48 BIG	18	7$ M	2$ M/Year	85% Retrofit 15% Solar	30% Govt 70% Comm Bidding
Tarshid	2017	KSA	ESCO entity	Yes	-	-	200+	266$ M	-	100% Retrofit	100% Govt Bidding
SEWA	2018	Sharjah	Facilitator	No	-	-	-	-	-	-	-
APSR	2019	Oman	Facilitator	No	-	-	1	-	-	-	100% Govt Bidding
ADES	2020	Abu Dhabi	ESCO entity	Yes	Yes	2.7 TWh 2.0 BIG	1	-	-	-	100% Govt Bidding
Etihad (Dubai Electricity and Water Authority DEWA), RAK (Ras Al Khaimah), Tarshid (National Energy Services Company KSA), SEWA (Sharjah Electricity, Water and Gas Authority), ASPR (Authority for Public Service Regulation Oman), ADES (Abu Dhabi Energy Services),											

Prospects and Challenges

ESCOs face challenges like complex contracts, client hesitancy, and funding limitations, which delay their ability to implement energy-efficient solutions [14]. Despite these barriers, the outlook remains optimistic as global focus shifts towards environmental sustainability. ESCOs solve these difficulties by simplifying contracts, finding different funding sources, and increasing client participation through clear communication of benefits, thereby gradually reducing barriers to improving energy efficiency across several sectors. Table 3 shows how ESCOs direct Obstacles to get Energy Efficiency (EE).

Table 3 ESCOs Address Barriers to Achieve Energy Efficiency

How Barriers Are Addressed by ESCOs to Achieve Energy Efficiency [17]	
Restricted internal budget for project investments	Mobilise commercial funding by making loan repayments from project cost savings, maintaining positive cash flow throughout the project.
Lack of information and expertise in technology	Provide technical expertise to identify, judge, and implement initiatives.
Small project size restricts access to commercial financing.	Combine similar or alike projects for smaller buildings to enhance the project's "ticket size" and improve funding.

High project development and transaction costs	Use standard, basic tools for energy auditing, options exploration and evaluation, and energy service agreements.
Inadequate interest or motivation among energy users	Display benefits of efficient tools and facility modernization, mobilize external financing, facilitate installation, and offer basic turnkey arrangements
The perception among lenders of high risk and a limited capability to estimate energy savings	Offer performance-based contracts, clearly define project benefits and costs, demonstrate low risk for previously completed projects, and conduct thorough measurement and verification.
Lack of understanding among lenders about business models	Showcase the success of business concepts and boost the legitimacy of performance contracts.

CONCLUSION

ESCOs, which began in Europe and gained global prominence during the 1970s energy crisis, provide customized solutions to enhance energy efficiency and reduce costs. In the GCC region, ESCOs encounter unique challenges, such as low energy prices and limited institutional support. This study addresses these issues by exploring ESCO practices, impacts, and prospects within the GCC. Globally, the ESCO market has grown steadily, reaching USD 33 billion in 2020, with China holding nearly 60% of the market share. The US market has seen a 3% annual growth in revenue from 2014 to 2018, with sectoral contributions varying, such as the healthcare sector's increase from 6% to 11%. In Europe, the ESCO market represents only 10% of the global total, indicating a slower development rate. In the UAE, Dubai has promoted ESCOs through programs like Etihad ESCO, achieving 452 million AED in investments, saving 194 million kWh of energy, and reducing water usage by 132 million imperial gallons by 2017. Abu Dhabi's ADES aims for substantial savings, targeting 2.7 TWh of electricity and 9 million cubic meters of water by 2030. Saudi Arabia's Tarshid initiative, valued at $11 billion, focuses on retrofitting government buildings to cover 70% of the country's energy efficiency initiatives. Meanwhile, Oman, Qatar, and Kuwait are developing their ESCO markets to address rising energy consumption and inefficiency. Overall, ESCOs in the GCC are committed to sustainable energy practices, contributing to global energy efficiency goals while navigating regional challenges.

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