



Energy Efficiency in the GCC: Status and Outlook

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Big changes are taking place in the Gulf Cooperation Council (GCC) region regarding energy efficiency, with reforms being implemented by governments that include electricity and fuel pricing increases and the launch of new energy efficiency programs. What are the potential impacts on GCC businesses and residents? How can businesses best transform these changes into an opportunity to save costs? And how can regional government best prepare and encourage its residents to be more energy efficient? This white paper focuses on the GCC buildings, industrial, and transportation sectors, presenting an overview of energy efficiency developments, as well as some recommendations for businesses and policy-makers.

Any feedback? Please let us know by emailing GCC_energy_efficiency@cebcmena.com.

Introduction

Recent Energy Pricing Changes Across the GCC

In 2011, the MENA region as a whole accounted for 50% of all global pre-tax energy subsidies.¹ At that time, energy subsidies accounted for 15%, 32%, 28%, and 15% of all government expenditures respectively in Kuwait, Saudi Arabia, the UAE, and Qatar.¹ Since that time however, the GCC region has been accelerating a trend to develop more open energy markets with less subsidies in order to ease the burden on government budgets already strained by the prolonged global oil price slump. Some of the most recent regional developments include:

- **UAE:** In November 2016 it was announced that UAE citizens living in Abu Dhabi would pay 34% more for their electricity and expatriates would pay 28% more, starting in 2017.² In Dubai, electricity and water tariffs have already been unsubsidized for expatriates since 2011.³
- **Saudi Arabia:** In January 2016, new electricity and water tariffs increase was announced.⁴ Among those impacted included residential customers who consume greater than 4,000 kWhr per month.⁵ Saudi Arabia is now further considering charging electricity customers cost-reflective rates,⁶ with newly revised tariffs taking into effect in January 2018.⁷
- **Qatar:** Electricity and water rates increases were recently announced in September 2015.⁸
- **Oman:** In January 2017, a cost-reflective tariff (CRT) was applied on the largest industrial, government, and commercial customers that consume greater than 150 MWhr of electricity per year.^{9,10} This CRT varies seasonally and by the hour of the day, impacting approximately 10,000 customers. These 10,000 customers constitute less than 1% of all electricity customers, however they consume more than 35% of total electricity supply. This was Oman's first electricity rate change in over 30 years.¹¹

A cost-reflective time-of-use electricity tariff has been in place since January 2017 for the largest 10,000 electricity consumers in Oman.

- 1 Brookings Center, Low-Carbon Energy Transitions in Qatar and the Gulf Cooperation Council Region, 2014.
- 2 Source: <http://www.thenational.ae/uae/abu-dhabi-residents-face-utility-price-rises>.
- 3 Jim Krane and Shih Yu Hung, Energy Subsidy Reform in the Persian Gulf: The End of the Big Oil Giveaway, Rice University's Baker Institute for Public Policy. April 2016. https://www.bakerinstitute.org/media/files/research_document/Oe7a6eb7/BI-Brief-042816-CES_GulfSubsidy.pdf
- 4 Source: <http://saudigazette.com.sa/saudi-arabia/up-to-50-hike-in-fuel-prices-from-today/>.
- 5 Source: <http://www.arabnews.com/node/943706/saudi-arabia>.
- 6 Murad Anwer and Walid Matar, Reforming Industrial Fuel and Residential Electricity Prices in Saudi Arabia, KAPSARC, July 2017. <https://www.kapsarc.org/wp-content/uploads/2017/08/KS-2017-DP018-Reforming-Industrial-Fuel-and-Residential-Electricity-Prices-in-Saudi-Arabia.pdf>
- 7 Source: <http://www.utilities-me.com/article-5175-saudi-arabia-to-revise-electricity-tariffs-starting-next-month/>
- 8 Source: <http://www.gulf-times.com/story/458727/Kahramaa-hikes-water-electricity-tariffs>
- 9 Authority for Electricity Regulation, Oman. Cost Reflective Tariffs for large Government, Commercial and Industrial Customers, Customer Guide. November 30 2016. [http://aer-oman.org/pdfs/CRT_Customer_Guide\(ENG\).pdf](http://aer-oman.org/pdfs/CRT_Customer_Guide(ENG).pdf)
- 10 Authority for Electricity Regulation, Oman. Statement of Charges 2018 Cost Reflective Tariffs, November 2017. http://aer-oman.org/pdfs/Statement_of_Charges_2018_CRT.pdf.
- 11 Source: <http://timesofoman.com/article/94118/Business/Higher-tariff-for-large-electricity-consumers-in-Oman-from-January-2017>.

- **Kuwait:** Electricity price increases were approved in April 2016 to take place in late 2017-2018, but only after much debate in the Kuwaiti Parliament that resulted in Kuwaiti residents being completely excluded from the rate increase.¹² Commercial sector tariffs were increased in May 2017 and in August 2017, new price increases were announced, including a 500% increase for the government sector.¹³ Industrial and agriculture sector rates are expected to increase in February 2018.¹⁴
- **Bahrain:** In early 2016, it was announced that electricity rates in Bahrain will be gradually increased from 2016 to 2019, eventually doubling to \$0.077/kWh by March 2019 for industrial, commercial, and most residential customers.¹⁵

Current electricity rates across the GCC countries are shown in Figure 1 and Figure 2 below.

Figure 1: GCC Residential Sector Electricity Tariffs (January 2018)⁽ⁱ⁾

Interactive graphic available online at <http://cebcmena.com/gcc-residential-tariffs-latest/>

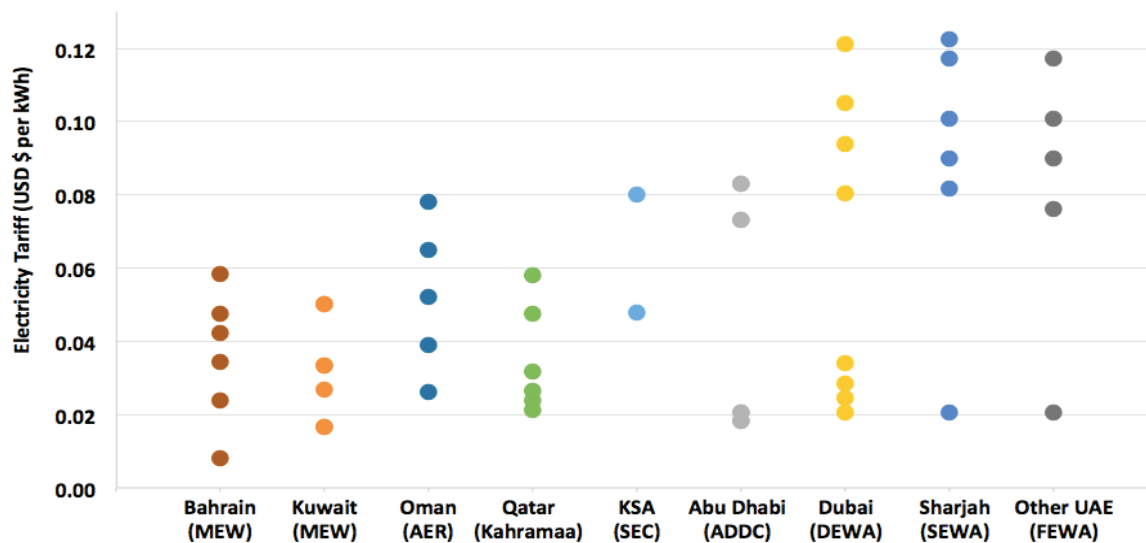
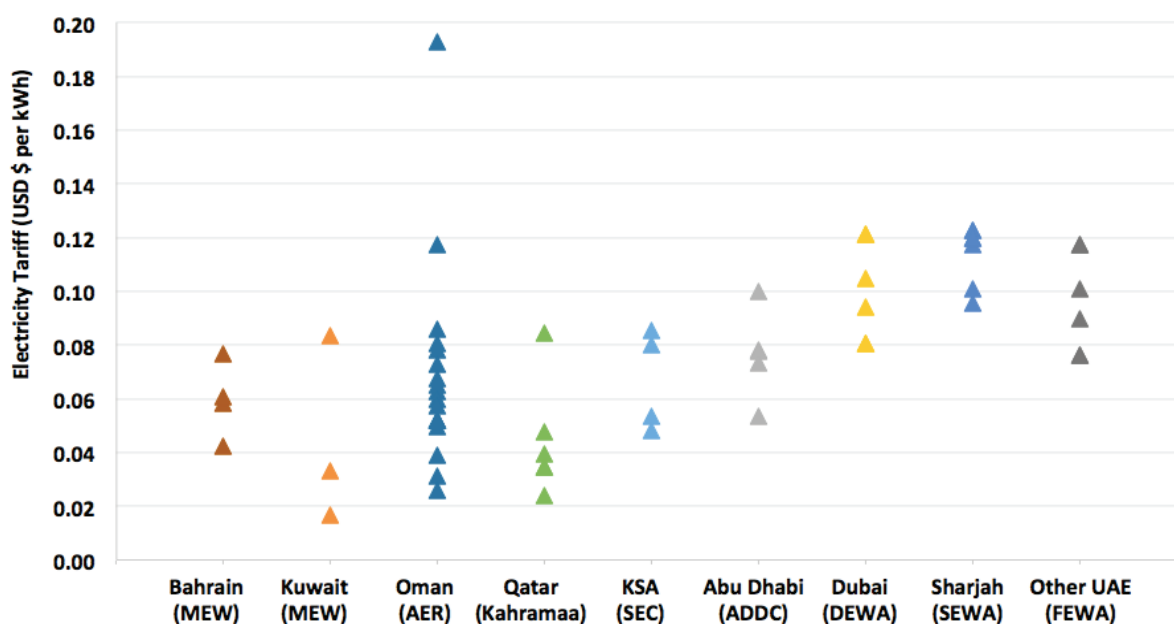


Figure 2: GCC Industrial, Commercial, and Government Sector Electricity Tariffs (January 2018)⁽ⁱⁱ⁾

Interactive graphic available online at <http://cebcmena.com/gcc-commercial-industrial-tariffs-latest>



12 Source: <http://news.kuwaittimes.net/website/new-tariffs-take-effect-15-months/>.

13 Source: <https://www.khaleejtimes.com/region/kuwait/kuwait-water-electricity-prices-up-by-500-per-cent>

14 Source: <http://gulfbusiness.com/kuwait-increase-utility-rates-businesses-expats-may-22/>

15 Source: <http://www.newsofbahrain.com/viewNews.php?ppld=12012&TYPE=Posts&pid=21&MNU=2&SUB=>

In addition to electricity, a variety of fuel reforms are also under way across the GCC.¹⁶ In late 2015, Saudi Arabia announced increases to the price of natural gas and transport fuel (gasoline and diesel). Oman, Bahrain, the UAE and Kuwait all announced similar reforms in 2015 and 2016 as well.³ The UAE linked transport fuel prices to international markets in August 2015, followed by Qatar in May 2016.¹⁷ And Saudi Arabia further increased gasoline prices by an average of 105% starting in 2018.¹⁸ Further fuel price increases are still expected.^{19,20,21}

As these recent announcements show, each GCC country is moving forward with energy subsidy reform, albeit each at its own pace. While it is difficult to predict the exact speed of reform across the region, it is clear that these energy pricing reforms will continue. It is important that care is taken to ease the inevitable socioeconomic impacts of energy reforms, by developing appropriate programs that help to alleviate the increase in living costs, while ensuring that these programs do not become a permanent burden on the economy. Indeed, the private sector, working hand-in-hand with the public sector, can play an active role in helping to accelerate the reform process and facilitate the transition for GCC residents.

This paper is intended to first serve as a resource for the GCC private sector, providing guidance to help GCC businesses best adapt for these announced reforms and future to-be-determined reforms. Second, this paper is also intended to be an aid to help GCC governments effectively prepare and provide guidance to its citizens and businesses to best cope with the impacts of energy subsidy reform.

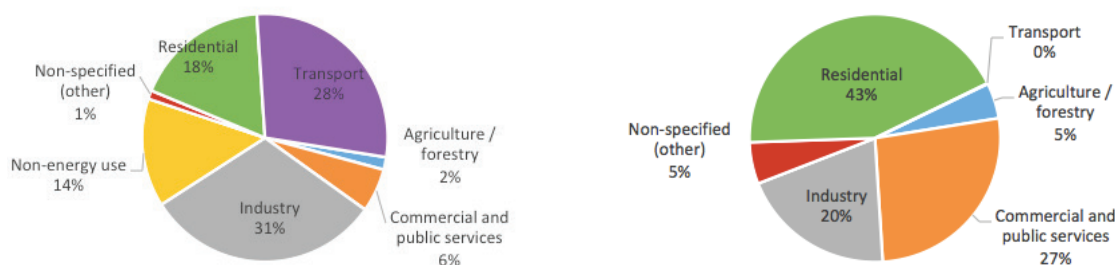
Sectoral View

Buildings, Industry, Transportation

Energy is consumed in a variety of forms (e.g., electricity, natural gas, diesel, etc.) across the major sectors: residential buildings, commercial and government buildings, industry, and transportation, as shown in Figure 3 below. This section focuses on developments and recommendations to improve each sector's energy efficiency, providing some GCC-specific context and recommendations applicable to government and private sector stakeholders.

Figure 3: GCC Total Final Energy Consumption by Sector in 2015 (left) and GCC Total Final Electricity Consumption by Sector (right) in 2015²²

Graphic available online at <http://cebcmena.com/gcc-energy-consumption/>



Prior to detailing sector-specific recommendations, two over-arching recommendations that apply to all sectors are important to mention for policy makers. First, it is important to collect sector-specific data and energy efficiency indicators specific that will help to ensure that appropriate metrics can be devised, progress is be tracked, and programs are appropriately refined. The International Energy Agency has published two resources on the topic of

16 Note: Water pricing reforms are not mentioned here since they are not the focus of this paper. However, water is still inexorably linked to energy, especially in the GCC where so much of the region's water comes from energy-intensive water desalination.

17 Glada Lahn, Fuel, Food and Utilities Price Reforms in the GCC A Wake-up Call for Business. Chatham House. June 2016. <https://www.chathamhouse.org/publication/fuel-food-and-utilities-price-reforms-gcc-business>.

18 Source: <http://saudigazette.com.sa/article/525180/SAUDI-ARABIA/Saudi-Arabia-hikes-fuel-price>

19 Source: <https://www.bloomberg.com/news/articles/2017-09-18/saudis-said-to-weigh-raising-gasoline-prices-by-end-of-november>

20 Source: <https://www.thenational.ae/business/energy/saudi-arabia-extends-deadline-for-energy-price-reform-1.689473>

21 International Monetary Fund, Energy Price Reforms in the GCC—What Can Be Learned From International Experiences?. November 2015. <https://www.imf.org/external/np/pp/eng/2015/111015b.pdf>.

22 Source: IEA World Energy Balances, <http://www.iea.org/statistics/topics/energybalances/>.

energy efficiency indicators, based on years of development and extensive study of 160 country best practices.^{23,24} Second, in order to help to jump-start the energy efficiency market, it will be important to provide incentives for energy efficiency improvement projects. In the buildings sector, for example, competitive funding for green projects through grants or preferred loans can help to fill an important element missing in the market and helping to stimulate the deployment of energy efficiency projects that are stalled just by lack of financing. A positive step in this direction is currently under way in Dubai, which is developing a Green Fund that will partially assist Dubai residents and businesses in securing low-cost loans for residential and commercial energy efficiency improvement projects.²⁵

Commercial and Government Buildings Sectors

Commercial and government buildings consume 6% of the GCC's total final energy consumption and 27% of its electricity. In recent years, commercial and government buildings sectors have seen the most energy efficiency activity due to a variety of programs focused on improving the financial performance (and energy efficiency) in government and private sector buildings. Many institutional building owners and operators, such as large hotel chains, have also made a push in recent years to become more efficient due to internal mandates, or the need to protect against rising energy costs and lower revenues. Some especially motivated companies and government entities are starting to pursue the construction of net-zero and nearly-zero energy buildings.²⁶



Most commercial buildings are great candidates for impactful energy savings and performance improvement. For example, malls, movie theatres, hotels, hospitals, and similar buildings have very high energy consumption due to their long operating hours and the need to maintain cooling demand to keep tenants comfortable and satisfied. For this reason, in addition to the emergence of improved energy-efficient technologies, applying energy efficiency improvements is a very attractive financial proposition for commercial buildings and businesses in the region. Return-on-investment of course is heavily dependent on current and expected future electricity tariffs.

Recommendations for Building Owners

- 1. Define Goals.** The first step for all businesses and government to become more efficient is to understand their organization's sustainability and energy savings goals. Securing internal consensus and buy-in from top leadership to improve energy performance will help set the groundwork for a successful implementation or savings program.
- 2. Learn the various methods of achieving these savings and procuring energy efficiency.** Many sources are available online, and the Emirates Green Building Council's Technical Guidelines for Retrofitting Existing Buildings is also a good starting point.²⁷
- 3. Perform a basic energy audit or benchmarking exercise to understand consumption patterns.** For example, Dubai's RSB shows a list of accredited energy auditors²⁸ and ESCOs²⁹ that are qualified to perform energy audits.
- 4. Hire a quality service provider to support, or deliver energy efficiency services based on the needs of the business (risk, investment, targets).** Again, the Dubai RSB list of accredited ESCOs is a good starting point.²⁹
- 5. Monitor and report on progress and achievements** and focus on continual energy performance improvement.³⁰

23 International Energy Agency. Energy Efficiency Indicators: Fundamentals on Statistics. 2014.

https://www.iea.org/publications/freepublications/publication/IEA_EnergyEfficiencyIndicatorsFundamentalsonStatistics.pdf.

24 International Energy Agency. Energy Efficiency Indicators: Essentials for Policy Making. 2014.

http://www.iea.org/publications/freepublications/publication/IEA_EnergyEfficiencyIndicators_EssentialsforPolicyMaking.pdf.

25 Source: <http://gulfnews.com/business/sectors/investment/dubai-s-dh100b-fund-out-to-make-a-point-investing-in-green-projects-1.2112362>.

26 Source: Emirates Green Building Council, Defining Nearly Zero Energy Buildings in the UAE, 2017.

<http://emiratesgbc.org/wp-content/uploads/2017/03/Defining-nZEBs-in-the-UAE-2017.pdf>.

27 Source: Emirates Green Building Council, Technical Guidelines for Retrofitting Existing Buildings, 2015.

<http://emiratesgbc.org/wp-content/uploads/2017/03/Defining-nZEBs-in-the-UAE-2017.pdf>

28 RSB Dubai accredited auditors: <https://www.rsbdubai.gov.ae/energy-auditors/>

29 RSB Dubai accredited ESCOs: <https://www.rsbdubai.gov.ae/esco/list-of-accredited-escos/>

30 The ISO 50001 standard provides guidelines for continual improvement of energy performance through the establishment of an energy management system.

Recommendations for Policy Makers

In order to incentivize energy efficiency improvements in commercial and government buildings, governments can consider the adoption of the following programs and policies:

Incentive Programs

Give discounts or revise the tariff structure based on high-performance. Under this type of a program, properties that are below a threshold of EUI or similar performance metric would be charged at one slab lower, or a pre-defined discount tariff. In jurisdictions that this is not possible, or too complex, a simple monthly credit could be applied, as an example 10% of total bill, or 10% off of utility rate.

This incentive structure, as opposed to a penalty system for over-consumption, would drive buildings to reduce consumption and improve energy performance. After receiving cost savings incentives through reduced consumption, building owners will be motivated to save even more, and be confident in the ability to continually drive more savings.

Energy Reporting

Public marketing campaigns can showcase and actively promote the highest performers at the neighborhood, city and country level. This would help for people to know the macro-level ability of buildings and their impact to perform. Currently there lacks the basic education that buildings consume too much and can make big energy, cost and carbon savings.

To support this program, a database with localized city benchmarking data would easily show the distribution of consumption and performance. Currently the Emirates Green Building Council (EGBC) is developing a similar type of project with UAE hotels, and the Dubai government is working on a number of initiatives, including the development of an energy intensity mapping project³¹ and a building rating labeling scheme. Linking this with real estate transactions, GIS and the land department would begin to drive owners and operators improve energy efficiency due to natural demand by informed buyers.

Training and Education Programs

Education and training programs give owners, operators and developers insights to help make energy efficiency improvement easier to develop and scale. These programs can be offered during license renewal annually, building permitting, or at a community level by the jurisdictions the building operates in. For example, a city's land department or municipality can hold large seminars based on a specific type or size of building that would be a prerequisite of renewing the building license annually.

This could be coupled with a support system for the procurement and purchasing of energy efficiency services. Helping owners and operators quickly, easily and accurately complete projects in a fair and transparent manner helps not only the customer, but the providers, governments and market as a whole.

The ESCO Market

This section discusses recent and future trends in the GCC's energy service company (ESCO) industry. It also analyzes the market characteristics, progress and size and the history of American and European ESCO markets.

In general, the market for Energy Services Companies (ESCOs) in the GCC is still underdeveloped, however it is accelerating slowly. The reasons for the slow development of the ESCO industry in the GCC are numerous. In order for an ESCO market to flourish there are several key necessities; available financing, expertise and a mature legal system. In the past, each of these areas has been lacking with most of the regions available finance being used to promote rapid growth. The need for energy efficiency was largely overlooked when energy costs were low. This lack of necessity and the acceptance of speed over quality in construction led to a lack of expertise in the market. Combined with the immaturity of the legal system, this led to a very poor environment for ESCO market growth.

In recent years, there has been a strong push by several GCC governments to accelerate the development of the energy efficiency market through the creation of government bodies to assist in regulating the industry, develop projects and market education. In 2013, Etihad Super ESCO was established in Dubai to develop and administer large retrofit building projects in Dubai. More recently, Saudi Arabia has created NESCO (National Energy Services Company) with the mandate to retrofit all Saudi government buildings through ESCOs. Abu Dhabi has launched its

31 Taqati, 2015 Annual Report, 2016. http://taqati.ae/wp-content/uploads/2016/12/Taqati_Annual_Report_2015_English.pdf

Recent ESCO Market Developments in the GCC

*In **Saudi Arabia**, the National Energy Services Company (NESCO) was formed in 2017 under the Saudi Public Investment Fund (PIF) and through a Royal decree with the mandate and exclusivity to retrofit all government buildings in the Kingdom to reduce their energy consumption.³²*

*In **Abu Dhabi**, ADWEA has launched its Tarsheed program in 2016 to promote the efficient use of energy and launched the Kafa'ati program in March 2017 a program dedicated to improving the efficiency of existing buildings.³³*

*In **Dubai**, the Etihad Energy Services Super ESCO program, established in 2013, has reached AED 160 million of new projects in 2017, with a total of AED 392 million in the program's pipeline.³⁴*

Kafa'ati program in March 2017 to improve the energy efficiency of existing buildings. Bahrain has signed the Energy Efficiency Implementation Program with the World Bank for Energy Efficiency Technical Support and Advisory. And there have been numerous updates of codes and labeling standards across the entire GCC. These efforts will help to jump-start the market for energy efficiency across the GCC, helping utility providers to keep up increasing demand for electricity and thus creating a massive market for energy efficiency related services.

The United States market is often referenced as the most comprehensive ESCO market with more than 50 national ESCO companies performing projects across the country. In contrast to the rapid growth in some parts of the GCC, the United States ESCO industry is characterized by consistent slow growth focused on comprehensive upgrades of public and institutional facilities, especially in the so-called MUSH (Municipal and state governments, universities and colleges, K–12 schools, and healthcare) markets.³⁵ Over the last 40 years the ESCO market in the U.S. has matured into a strong and vibrant industry. Today the United States ESCO market is estimated to be worth \$7.6 billion with an estimated annual growth of 13%.²⁹

ESCO markets around Europe have achieved similar growth and complexity to the United States.³⁶ In both these markets, it is important to note that there are still large barriers to growth in the industry, since much of the U.S. and European industries success has been largely due to the acceptance and participation of the government at every level. The most mature markets are still struggling to fully exploit the private market largely due to a lack of access to funds.

The Residential Market

Residential buildings consume 18% of the GCC's total final energy consumption and 43% of electricity, according to the International Energy Agency (IEA). Governments and utility companies often have one goal when it comes to the generation, transmission and distribution of energy (electricity, chilled water, gas, etc.) and that is to recover their costs. The inability for a utility company to recover its costs is not good for business and, in the long run, will result in its demise. In the Gulf, each country typically has one government-owned utility company. While this is not always the case, countries with single utility companies cannot afford to go out of business and, therefore, attempt to recover costs through government subsidies, utility rate increases, or both. Until recently, the effects of climate change were not a major driving factor for policymakers and consumers to reduce energy consumption; however, increases in utility rates are indirectly pushing consumers to want to make a change and lower their energy consumption.



32 Source: <http://www.tarshid.com.sa/>

33 Source: <http://www.tarsheedad.com/en/at-work/initiatives/kafaati>

34 Taqati, 2016 Taqati Annual Report, 2017. <http://taqati.ae/reports/Taqati-Annual-Report-2017-Eng.pdf>.

35 Lawrence Berkeley National Laboratory, U.S. Energy Service Company (ESCO) Industry: Recent Market Trends, 2016. <https://emp.lbl.gov/publications/us-energy-service-company-esco>.

36 Grazer Energieagentur GmbH, Report on the European EPC Market, 2016. http://guarantee-project.eu/wp-content/uploads/2016/12/guarantEE_EU_EPC_Market_Report.pdf

Often, the residential sector feels the major brunt of these increases. While it is true that commercial and industrial sectors are also effected, they have the flexibility of adjusting the prices of goods and services to make up for this additional expense. The increase in prices of goods and services indirectly impacts the residential sector as well, which results in a large net cost increase for an average household relative to previous years when the utility rate was lower.

Recommendations for Individuals

As mentioned, consumers are starting to look for ways to reduce their energy consumption to reduce the amount of money they pay. While this is a positive start, consumers need to realize the actual impact of their footprint that goes beyond their wallets. Reducing consumption through energy efficiency results in a lower need for more generation. This lower need translates into avoided expenditure for the government and, consequently, lower costs. Lower costs mean governments do not need to increase utility rates and can potentially lower them. Actions individuals can take include:

1. Check the performance of your home or building. Ask your real estate agent, owner or manager.
2. Understand your consumption through utility bills, software or metering.
3. Do the simple things first: turn off lights, set the thermostat higher when nobody is home, use shades and curtains.
4. Consider performing a home energy audit. Gain insight and support from quality service providers to help with the larger items.
5. Take advantage of any government or utility programs that may help to subsidize or support increased energy efficiency.

Recommendations for Governments

It is critical for policymakers to understand that energy efficiency is a cheaper investment than new power plant generation, especially at peak hours when generation is rarely utilized. As such, policymakers need to promote energy efficiency through education and awareness programs to reach consumers. While the benefits of clean energy are huge in the long run, it currently results in higher capital expenditures that increase utility rates for consumers. Several companies provide energy efficiency services without the need for capital expenditure through a paid-from-savings scheme. Policymakers should explore the feasibility of implementing region-wide policies that make it mandatory to reduce carbon footprint and energy consumption. In addition, governments can consider the adoption of behavioral approaches to reduce residential energy consumption.³⁷ Over the long-term, research and development activities are important to develop and deploy energy efficient building technologies that are especially well-suited for the GCC climate. One such R&D program is the Solar Decathlon Middle East university competition, being run by Dubai Electricity and Water Authority (DEWA).³⁸

The Industrial Sector

Globally and in the GCC region, the industrial sector consumes more primary energy than any other sector, accounting for more than half of global energy consumption.³⁹ In the GCC, industry consumes 31% of total final energy consumption and 20% of electricity, according to the IEA. Estimates are that currently available technologies and best energy management practices can contribute to reducing industrial energy consumption by 10% to 40%.⁴⁰

Industrial sectors vary in composition in the GCC countries. For example, Saudi Arabia has large cement, iron & steel, and petrochemicals industries. The UAE has large aluminum, cement, and petroleum refining industries. While in Oman, the largest industrial sectors are basic metals (i.e., iron and steel and aluminum), chemicals, and petroleum refining, cement and food manufacturing. All of these industries are energy-intensive and are heavily impacted by increasing energy costs.



37 The American Council for an Energy-Efficient Economy, Behavior Change Programs: Status and Impact, 2016. <http://aceee.org/research-report/b1601>.

38 Source: <https://solardecathlonme.com/>.

39 U.S. Energy Information Administration, International Energy Outlook. <https://www.eia.gov/outlooks/ieo/>.

40 Maja Dahlgren et al., Models for Driving Energy Efficiency Nationally Using Energy Management, 2014. http://www.cleanenergyministerial.org/Portals/2/pdfs/GSEP-EMWG_Models_for_Driving_EE-EnMS_June2014.pdf.

Industrial sector policies pursued by the Saudi Energy Efficiency Center include defining energy efficiency targets for new and existing industrial plants and industrial electric motors policy development. In addition, both the UAE and Saudi Arabia place an emphasis on the development of industrial energy management policies using the ISO 50001

energy management system framework, an effort strengthened by both countries participation in the Clean Energy Ministerial Energy Management Working Group (EMWG).^{41,42} CEM is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Initiatives are based on areas of common interest among participating governments and other stakeholders. Two initiatives of the CEM EMWG are the Energy Management Leadership Awards⁴³, which recognizes organizations demonstrating energy management excellence through the implementation of the ISO 50001 energy management system standard, and the global Energy Management Campaign⁴⁴ which aims for 50,001 global certifications by 2020.

Recommendations for Policy Makers

- 1. Incentivize organizations to adopt the ISO 50001 energy management system.** These policies are well-established internationally, with over 20,000 ISO 50001 certifications globally, and strong adoption in countries like Germany and across the European Union. In the GCC, the UAE has more certifications than any other countries and the UAE-based Abu Dhabi National Oil Company was recently awarded the 2017 CEM Award of Excellence in Energy Management.⁴⁵
- 2. Provide incentives to industrial organizations to perform an energy audit.** While not as comprehensive or robust as an energy management system, an industrial energy audit can help to build momentum for a strong energy management program and also uncover energy cost savings to help industrial companies to better cope with increasing energy costs. As an example of such an approach, between 2006 to 2009, the U.S. DOE provided over 600 free energy audits to U.S. industrial organizations as a way to help them better cope with increased natural gas prices in the aftermath of Hurricane Katrina. The implementation of a similar program can help GCC industries to better cope with increased electricity rates.
- 3. Develop an industrial energy management workforce.** A well-qualified industrial energy management workforce is critical to establishing an energy-efficient industrial sector. One example of a program that has successfully developed strong workforce specialized in industrial energy efficiency is the U.S. Department of Energy (DOE) [Industrial Assessment Center \(IAC\) program](#), which has been in place since 1976. This program funds engineering programs at 24 U.S. universities to provide free assessments to identify significant energy savings, water and waste reduction recommendations, and productivity improvements at small and medium-sized manufacturers.⁴⁶ The program is a “win-win-win” in that it provides students with first-hand experience performing energy audits; it exposes small and medium-sized facilities to the concept of an energy audit and energy efficiency; and it cultivates a pipeline of talented technical engineering staff that go on to have productive careers. With assistance from the U.S. Department of Energy, Saudi Arabia has developed and launched its own university-led industrial assessment program inspired by the IAC model, based in the King Fahd University of Petroleum and Minerals.

Recommendations for Industrial Facilities

- 1. Certify to ISO 50001.** The development of a rigorous energy management system based on the ISO 50001 standard will institutionalize energy management and energy efficiency at your organization, helping to ensure continual improvement in energy performance.
- 2. Perform an energy audit.** If certification is not a viable option, have an energy audit performed at your facility to identify low-hanging-fruit savings that can be used to build confidence and jump start your organization's energy management program.

41 Source: <http://www.cleanenergyministerial.org/Our-Work/Participation>.

42 Clean Energy Ministerial Energy Management Working Group: <http://www.cleanenergyministerial.org/Our-Work/Initiatives/Energy-Management/EMWG-Overview>.

43 Source: <http://www.cleanenergyministerial.org/Energy-Management-Leadership-Awards>

44 Source: <http://www.cleanenergyministerial.org/energy-management-campaign>.

45 Source: <http://cem-backup.carrespace.fr/cem-ok/www.cleanenergyministerial.org/2017-Energy-Management-Leadership-Awards.html>

46 Source: <http://energy.gov/sites/prod/files/2014/06/f17/Industrial%20Assessment%20Centers.pdf>

The Transportation Sector

Introduction

In addition to the industry, residential and commercial/government buildings, the transportation sector is a major consumer of energy in the GCC, consuming approximately 29% of the region's total final energy consumption, according to the IEA. The transportation sector is expected to experience a large structural change over the next decade, with an expected shift away from internal combustion engines and towards increased electric vehicle (EV) adoption. Compared to gasoline-powered cars, EVs are more energy efficient and cost 50-70% less to operate per km. Globally, the EV stock was 3 million at the end of 2017 and IEA expects that EV stock will range between 9 million and 20 million by 2020 and between 40 million and 70 million by 2025.⁴⁷ In addition, connected and autonomous vehicles (CAVs) are expected to gain penetration in the market starting in 2020, especially in the Smart City context, which will further impact transportation energy consumption.⁴⁸



GCC countries are in varying stages of making energy efficiency improvements to national transportation sectors. In Saudi Arabia, the Saudi Energy Efficiency Center (SEEC) issued a fuel economy standard for light duty vehicles in late 2014 based on the U.S. Corporate Average Fuel Economy (CAFE) standards and started implementing this standard in January 2016.⁴⁹ In the UAE, the Emirates Authority for Standardization and Metrology (ESMA) is also developing a new regulation for cars based on the U.S. CAFE standards.⁵⁰ Dubai's Green Mobility Initiative was launched to accelerate the adoption of hybrid and electric vehicles as part of its efforts to support their Climate Abatement Strategy 2021 and provide alternative modes of transportation to save fuel and reduce carbon emissions. As part of this Strategy, the Dubai Supreme Energy Council (DSEC) developed a staged roll-out plan to meet the 10% penetration target for hybrid and electric vehicles in the government fleet by 2021. In the northern emirates, FEWA recently started operating the first of 61 planned EV charging stations, which will include 11 inside FEWA offices in the northern emirates and 50 on highways and at public and private entities across the UAE.⁵¹

Recommendations for vehicle fleet owners (governments and private sector)

- 1. Conduct an energy fleet assessment.** The energy performance of existing vehicles fleets such as buses, emergency vehicles, and medium/heavy duty vehicles can be optimized through the performance of a vehicle fleet assessment. Similar to a building energy audit, a vehicle fleet assessment will identify a variety of energy conservation measures (ECMs) that can cut costs, save energy, and reduce GHG emissions. Vehicle fleet ECMs can range from low-cost/no-cost behavioral changes (e.g., idle reduction through driver training) to capital intensive technology changes. Typical efficiency measures include the development of idle reduction strategies, the use of GPS technology, and vehicle "right typing" or "right sizing". Technology approaches include adopting electric or natural gas vehicles.
- 2. Prepare an implementation strategy to "green your fleet".** A roadmap can help to develop a strategy to identify priorities, costs, timing and KPIs that will help to ensure the fleet's energy performance is continuously optimized. This is especially important given the expected increased market penetration of electric vehicles and later, connected and autonomous vehicles. The relatively small upfront investment for such studies can often pay for itself with less than a year of savings that can result from implementation of a single recommended measure.

Recommendations for policy makers

- 1. Develop Corporate Fuel Economy Standards.** If not in place already, develop national corporate fuel economy (CAFÉ) standards for light duty vehicles.

⁴⁷ Source: IEA, Global EV Outlook 2017, <https://www.iea.org/publications/freepublications/.../GlobalEVO Outlook2017.pdf>.

⁴⁸ Source: U.S. Energy Information Administration, Study of the Potential Energy Consumption Impacts of Connected and Automated Vehicles, https://www.eia.gov/analysis/studies/transportation/automated/pdf/automated_vehicles.pdf.

⁴⁹ Source: Saudi Energy Efficiency Center, presentation at the 1st IEF-EU Energy Day. https://www.ief.org/_resources/files/events/1st-ief-eu-energy-day/ief-meeting-v1.pdf

⁵⁰ Source: http://uae.panda.org/what_we_do/ecological_footprint_initiative/uae_vehicle_fuel_economy_standard/

⁵¹ Source: <http://www.khaleejtimes.com/nation/ajman/now-charge-your-car-for-free-at-few-stations>.

1. **Plan for electric vehicle adoption.** For governments and utilities, assess your EV-readiness. Carefully consider where to install a network of EV charging stations to align with regular routes for government or private fleets of EVs. Consider strategies and programs to incentivize adoption of EVs.
2. **Plan for support and adoption of Connected and Autonomous Vehicles.** Adopting regulations now that allow for connected and autonomous vehicle (CAV) testing and including CAVs in regional transportation master plans are very important for successful adoption. Considering supporting communication infrastructure as part of capital transportation system improvement projects will also play an important role.
3. **Educate the public.** Large scale awareness campaigns will be needed to educate residents and policy makers on the benefits of EVs. These campaigns should be coordinated with EV manufacturers and local car dealerships.

Conclusions

Improving energy efficiency can provide great benefits to the GCC, especially considering there is a large opportunity for energy efficiency improvements, and given that GCC energy reforms have only recently gained steam. Well-designed energy efficiency programs can be deployed in coordination with continued energy tariff reform in order to ease the burden on GCC residents. There is also a major opportunity for smart businesses and individuals implement low-cost energy efficiency opportunities that will save money with an excellent return on investment. There are a variety of cost-effective energy efficiency opportunities available to industrial facilities, commercial and government buildings, vehicle fleet owners, and residential homes and apartments.

Authors



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Mr. Ridah Sabouni is the Managing Director in the MENA region for the clean energy consultancy, Energetics. He led the establishment of Energetics' Dubai office in late 2015. Prior to relocating to Dubai, he spent seven years at the company headquarters in Washington DC. His professional areas of expertise include strategic energy management (ISO 50001) for industry and buildings, R&D program support and global manufacturing innovation and energy efficiency policies. He has nearly 10 years' experience consulting for the U.S. Department of Energy and recently led a project to establish a national energy efficiency data framework of key energy efficiency indicators in the industrial, commercial and government buildings and residential buildings sectors.



Charles F. Blaschke - Founder and Managing Director, taka solutions

Mr. Charles F. Blaschke is the Founder and Managing Director of taka solutions. taka solutions specialises in fully-financed, paid-from-savings Energy Performance Contracting. taka solutions' regional goal is to work with government bodies to adopt the widespread use of technology and business models to curb the world's energy supply needs. Mr. Blaschke works in all aspects of building analysis, design, construction and operation, as well as project financing and management. His work assists building owners and individuals to reduce their energy consumption and energy related costs. taka solutions' ultimate mission is to drive policy change to make a significant impact on energy usage worldwide.



Dr. Raed Bkayrat - Managing Director, Clean Energy Business Council

As Vice President for Business Development for the ME region at First Solar, Dr. B'kayrat Bkayrat was responsible for establishing and overseeing First Solar's commercial footprint in the region, market setup, origination and strategy development. Upon moving back to the ME in 2009, Raed joined the core team that built the Economic Development Division at KAUST, where he was responsible for creating the institution's successful Industry Collaboration Program. During his four year stint at KAUST, he also created a demonstration and testing program for solar and other clean energy technologies, advised several Saudi governmental and industrial entities and mentored startup companies.



Stephane le Gentil - Founder and Chief Executive Officer, Wattaqa

Mr. Stephane Le Gentil is the Founder and CEO of Wattaqa. Through Wattaqa he has provided strategic consultancy, advisory and project management services in end-use energy efficiency, energy Demand Side Management (DSM), renewable energy generation and Energy Services (ESCO) activities, with a focus in the Middle East region. In 2013 Mr. Le Gentil came to Dubai, United Arab Emirates, to found and manage the Dubai's Super ESCO named Etihad Energy Services Company or Etihad ESCO. Etihad ESCO was created as the official government organization to reduce significantly the consumption of electricity and water in 30,000 existing buildings in Dubai.

Endnotes

i. GCC Residential Sector Electricity Tariffs Data Notes and Sources:

Bahrain (MEW): Residential tariff rates based on monthly electricity consumption for the primary home of Bahraini citizens are \$0.008/kWh (0 - 3,000 kWh), \$0.024/kWh (3,001 - 5,000 kWh), \$0.042 (> 5,000 kWh). Source: http://www.mew.gov.bh/media/pdf/tariff_a4_brochure_eng.pdf. Currency conversion: 1 Bahraini Dinar = USD \$2.64901.

Kuwait (MEW): Residential tariff slab rates are \$0.017/kWh (1 - 3,000 kWh), \$0.027 (3,001 - 6,000 kWh), \$0.033/kWh (6,001 - 9,000 kWh), \$0.05/kWh (>9,000 kWh). Source: <http://www.mew.gov.kw/>. Currency conversion: 1 Kuwaiti Dinar = USD \$3.3333.

Oman (AER): \$0.026/kWh (1 - 3,000 kWh), \$0.039/kWh (3,001 - 5,000 kWh), \$0.052/kWh (5,001 - 7,000 kWh), \$0.065/kWh (7,001 - 10,000 kWh), \$0.078/kWh (> 10,001 kWh). Source: <http://aer-oman.org/aer/ConsumerTariffs.jsp>. Currency conversion: 1 Omani Riyal = USD \$2.60417.

Qatar: Residential tariff slab rates are \$0.021/kWh (1 - 2,000 kWh), \$0.024/kWh (2,001 - 4,000 kWh), \$0.026/kWh (4,001 - 6,000 kWh), \$0.032/kWh (6,001 - 8,000 kWh), \$0.048/kWh (8,001 - 15,000 kWh), \$0.058/kWh (> 15,000 kWh). Source: <https://www.km.com.qa/CustomService/Pages/Tariff.aspx>. Currency conversion: 3.78 Qatari Riyals = USD \$1.

Saudi Arabia: Residential tariff slab rates are \$0.048/kWh (1 - 6,000 kWh), \$0.08/kWh (>6,000 kWh). An additional 5% VAT is not included here. Source: <https://www.se.com.sa/en-us/customers/Pages/TariffRates.aspx>. Currency conversion: 3.75 Saudi Riyal = USD \$1.

UAE (Abu Dhabi, ADDC): Residential tariff slab rates for UAE national villas are \$0.018/kWh (0 - 12,000 kWh) and \$0.02/kWh (>12,000 kWh). Residential tariff slab rates for UAE national apartments are \$0.018/kWh (0 - 900 kWh) and \$0.02/kWh (>900 kWh). Residential tariff slab rates for expat villas are \$0.073/kWh (0 - 6,000 kWh) and \$0.083/kWh (>6,000 kWh). Residential tariff slab rates for expat apartments are \$0.073/kWh (0 - 600 kWh) and \$0.083/kWh (>600 kWh). An additional 5% VAT is not included here. Source: <https://www.addc.ae/en-US/residential/Documents/02-English.pdf>. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Dubai, DEWA): Residential tariff slab rates for UAE nationals are \$0.02/kWh (0 - 2,000 kWh), \$0.025/kWh (2,001 - 4,000 kWh), \$0.029/kWh (4,001 - 6,000 kWh), and \$0.034/kWh (> 6,000 kWh). Residential tariff slab rates for expats are \$0.08/kWh (0 - 2,000 kWh), \$0.094/kWh (2,001 - 4,000 kWh), \$0.105/kWh (4,001 - 6,000 kWh), and \$0.121/kWh (> 6,000 kWh). Expat rates include a \$0.018/kWh fuel surcharge. An additional 5% VAT is not included here. Source: <https://www.dewa.gov.ae/en/customer/services/consumption-services/tariff> and <http://fcsa.gov.ae/en-us/Pages/Statistics/Statistics-by-Subject.aspx#report-tvDetails>. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Sharjah, SEWA): Residential tariff slab rates for UAE nationals is \$0.02/kWh. Residential tariff slab rates for freehold expats is \$0.123/kWh. Residential tariff slab rates for expats living in UAE national owned homes are \$0.082/kWh (0 - 2,000 kWh), \$0.09/kWh (2,001 - 4,000 kWh), \$0.101/kWh (4,001 - 6,000 kWh), and \$0.117/kWh (>6,000 kWh). An additional 5% VAT is not included here. Source: Communication with SEWA. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Other UAE, FEWA): Residential tariff slab rates for UAE nationals is \$0.02/kWh. Residential tariff slab rates for expats are \$0.076/kWh (0 - 2,000 kWh), \$0.09/kWh (2,001 - 4,000 kWh), \$0.101/kWh (4,001 - 6,000 kWh), and \$0.117/kWh (>6,000 kWh). An additional 5% VAT is not included here. Source: <http://fcsa.gov.ae/en-us/Pages/Statistics/Statistics-by-Subject.aspx#report-tvDetails>. Currency conversion: 3.67 UAE Dirhams = USD \$1.

ii. GCC Industrial, Commercial, and Government Sector Electricity Tariffs Data Notes and Sources:

Bahrain (MEW): Non-residential tariff slab rates are \$0.042/kWh (0 - 5,000 kWh), \$0.058/kWh (5,001 - 250,000 kWh), \$0.061/kWh (250,001 - 500,000 kWh), \$0.077 (> 500,000 kWh). Source: http://www.mew.gov.bh/media/pdf/tariff_a4_brochure_eng.pdf. Currency conversion: 1 Bahraini Dinar = USD \$2.64901.

Kuwait (MEW): Commercial tariff slab rate is \$0.017/kWh. Government tariff slab rate is \$0.083/kWh. Industrial tariff slab rate is \$0.033/kWh. Source: <http://www.mew.gov.kw/NewTariff.aspx>. Currency conversion: 1 Kuwaiti Dinar

= USD \$3.3333.

Oman (AER): Commercial tariff slab rate for accounts <150 MWh is \$0.052/kWh. Government tariff slab rates for accounts <150 MWh are \$0.026/kWh (1 - 3,000 kWh), \$0.039/kWh (3,001 - 5,000 kWh), \$0.052/kWh (5,001 - 7,000 kWh), \$0.065/kWh (7,001 - 10,000 kWh), \$0.078/kWh (> 10,001 kWh). Industry tariff slab rates for accounts <150 MWh are \$0.031/kWh (Sept - Apr: all regions except Dhofar and Aug - Mar: Dhofar) and \$0.063/kWh (May - Aug: all regions except Dhofar and Apr - July: Dhofar). Tariffs for accounts >150 MWhr/year include a bulk supply energy charge, a demand charge, and an energy distribution charge. Bulk supply and distribution charges are: \$0.049/kWh (Jan - Mar & Nov - Dec), \$0.052/kWh (Apr & Oct), \$0.060/kWh (May - July (Off-Peak: 02:00 to 13:00 and 17:00 to 22:00)), \$0.081/kWh (May - July (Night-Peak: 22:00 to 02:00)), \$0.193/kWh (May - July (Weekday-Peak: Sun to Thurs 13:00-17:00)), \$0.117/kWh (May - July (Weekend-Peak: Fri to Sat 13:00 to 17:00)), \$0.057/kWh (Aug - Sept (Off-Peak: 02:00 to 13:00 and 17:00 to 22:00)), \$0.073/kWh (Aug - Sept (Night-Peak: 22:00 to 02:00)), \$0.086/kWh (Aug - Sept (Weekday-Peak: Sun to Thurs 13:00-17:00)), \$0.068/kWh (Aug - Sept (Weekend-Peak: Fri to Sat 13:00 to 17:00)). Source: <http://aer-oman.org/aer/ConsumerTariffs.jsp> and www.aer-oman.org/pdfs/Statement_of_Charges_2018_CRT.pdf. Currency conversion: 1 Omani Riyal = USD \$2.60417.

Qatar: Commercial tariff slab rates are \$0.024/kWh (1 - 4,000 kWh), \$0.034/kWh (4,001 - 10,000 kWh), \$0.04/kWh (10,001 - 15,000 kWh), \$0.048/kWh (>15,000 kWh). Government tariff slab rate is \$0.085/kWh. Industrial tariff slab rate is \$0.034/kWh. Source: <https://www.km.com.qa/CustomerService/Pages/Tariff.aspx>. Currency conversion: 3.78 Qatari Riyals = USD \$1.

Saudi Arabia: Commercial tariff slab rates are \$0.053/kWh (1 - 6,000 kWh) and \$0.080/kWh (>6,000 kWh). Government tariff slab rate is \$0.085/kWh. Industrial tariff slab rate is \$0.048/kWh. An additional 5% VAT is not included here. Source: <https://www.se.com.sa/en-us/customers/Pages/TariffRates.aspx>. Currency conversion: 3.75 Saudi Riyal = USD \$1.

UAE (Abu Dhabi, ADDC): Commercial tariff slab rate is \$0.053/kWh. Government tariff slab rate is \$0.078/kWh. Industrial tariff slab rates are \$0.078/kWh (customers with demand <1 MW), \$0.074/kWh (customers with demand >1 MW, non-peak), \$0.10/kWh (customers with demand >1 MW, peak 10:00 to 22:00). An additional 5% VAT is not included here. Source: <https://www.addc.ae/en-US/residential/Documents/02-English.pdf>. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Dubai, DEWA): Commercial tariff slab rates are \$0.08/kWh (1 - 2,000 kWh), \$0.094/kWh (2,001 - 4,000 kWh), \$0.105/kWh (4,001 - 6,000 kWh), \$0.121/kWh (>6,000 kWh). Industrial tariff slab rate is \$0.08/kWh (1 - 10,000 kWh) and \$0.121/kWh (>10,001 kWh). An additional 5% VAT is not included here. Source: <https://www.dewa.gov.ae/en/customer/services/consumption-services/tariff>. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Sharjah, SEWA): Commercial tariff slab rates (UAE national owned) are \$0.095/kWh (1 - 4,000 kWh), \$0.101/kWh (4,001 - 6,000 kWh), \$0.117/kWh (>6,000 kWh). Commercial tariff slab rate (expat owned) is \$0.123/kWh. Government tariff slab rate is \$0.12/kWh. Industrial tariff slab rate (UAE national owned) is \$0.12/kWh. Industrial tariff slab rate (freehold) is \$0.123/kWh. An additional 5% VAT is not included here. Source: Communication with SEWA. Currency conversion: 3.67 UAE Dirhams = USD \$1.

UAE (Other, FEWA): Commercial tariff slab rates are \$0.076/kWh (1 - 2,000 kWh), \$0.09/kWh (2,001 - 4,000 kWh), \$0.101/kWh (4,001 - 6,000 kWh), \$0.117/kWh (>6,000 kWh). Government tariff slab rates are \$0.076/kWh (1 - 10,000 kWh) and \$0.117/kWh (>10,001 kWh). An additional 5% VAT is not included here. Source: Communication with FEWA. Currency conversion: 3.67 UAE Dirhams = USD \$1.

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