حكومة رأس الخيمة
Government of Ras Al Khaimah

reem
فريق رأس الخيمة لكفاءة الطاقة والطاقة المتجددة
RAK ENERGY EFFICIENCY AND RENEWABLES TEAM

بلدية رأس الخيمة
Ras Al Khaimah Municipality

RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

ANNUAL REPORT 2019

His Highness Sheikh Saud bin Saqr Al Qasimi
UAE Supreme Council Member and Ruler of Ras Al Khaimah

"Energy and water are essentials of our lives and prosperity. They are an integral part of the social and economic development that we aspire to, so we must preserve and invest in them. The application of modern technology and the use of modern building materials in addition to the use of renewables will provide opportunities for all sectors to benefit from energy and water at a lower cost."

His Highness Sheikh Mohammed bin Saud bin Saqr Al Qasimi
Crown Prince of Ras Al Khaimah and Chairman of the Executive Council

"Competitiveness in energy and water costs is key to our development. Efficiency and care in the use of energy and water as well as the adoption of renewable sources of energy support competitiveness of our economy and conservation of the natural resources of our Emirate."

بلدية رأس الخيمة
Ras Al Khaimah Municipality

His Excellency Munther Mohammed bin Shekar Al Zaabi
Director General, Ras Al Khaimah Municipality and
Chairman, Energy Efficiency and Renewables Committee

"The Energy Efficiency & Renewables Strategy 2040 stems from the vision of His Highness Sheikh Saud bin Saqr Al Qasimi to have sustainability as a source of competitiveness for Ras Al Khaimah. Considering the climate change challenges faced globally, this strategy is part of Ras Al Khaimah's contribution to the climate change mitigation efforts of the UAE and the world. It addresses all energy and water consumers across Ras Al Khaimah.

The strategy was set up in collaboration with government entities at the local and federal level, and also aims to encourage participation of the private sector in Ras Al Khaimah."

FOREWORD

The Ras Al Khaimah Energy Efficiency & Renewables Strategy 2040 (EE&R Strategy) was launched in 2018 under the patronage of His Highness Sheikh Saud bin Saqr Al Qasimi, to support competitiveness of Ras Al Khaimah's economy over the long run, by reducing energy and water consumption, and by increasing the use of renewables. It targets 30% energy savings, 20% water savings, and 20% contribution from renewables by 2040.

The strategy was developed in a collaborative effort with many government entities. The nine programs of the strategy address all forms of energy and water consumption in the Emirate. Each program is led by one or more government entities, who manage the implementation of the program, and are responsible for annual targets contributing to the overall targets of the strategy. The strong institutional set-up of the strategy has allowed Ras Al Khaimah to achieve important early successes across programs.

Andrea Di Gregorio
Executive Director, Reem,
Ras Al Khaimah Municipality

The year 2019 marked significant progress in terms of existing initiatives scaled up, new initiatives launched, and future activities planned. Barjeel, the Green Building Regulations of Ras Al Khaimah, completed its phase of voluntary application with a positive market response. Building retrofits accelerated, with several tenders launched and important projects contracted. The first projects in energy management, energy from waste, and rooftop solar are fully or nearly complete, with extension projects and new initiatives being launched. Strong progress was also made on the regulatory front, with studies on guidelines for sustainable communities, standards for public landscaping, guidelines for green procurement, and standards for electric vehicle charging stations all reaching advanced stages of completion at the end of 2019.

In 2020, we expect to further ramp up strategy implementation, along with the introduction of new regulatory enablers. We also eagerly anticipate the launch of several awareness and capacity building initiatives, including a dedicated website, consumer campaigns, and preparations for the first RAK Energy Summit. The capabilities of Reem will also continue to grow steadily to provide the expertise and support required to implement all the programs.

I am proud to present to you this second edition of our annual report, summarising the EE&R Strategy and achievements in 2019. I hope that you find the information contained in it useful, and I look forward to even greater achievements in the coming year.

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EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

This is the second annual report of the Energy Efficiency and Renewables Strategy of Ras Al Khaimah, for the year 2019. The strategy comprises nine programs supported by five enablers, is fully integrated into the wider Ras Al Khaimah Vision 2030, and is aligned with the federal agenda on energy, water and the environment. It supports competitiveness of the Ras Al Khaimah economy by reducing costs and increasing availability of energy and water, while also building local capabilities in related sectors.

The strategy is expected to bring more than AED 9 billion of direct net benefits to the economy of Ras Al Khaimah on a present value basis. Additional social, economic, environmental, health, and safety benefits are also expected.

A dedicated organisational set-up, including Reem (within Ras Al Khaimah Municipality), Program Owners (responsible government entities for each program), supporting entities, and the EE&R Committee, continued to ensure effective strategy implementation in 2019.

Important achievements were made in 2019, the most notable of which are:

- Launch and completion (by January 2020) of the voluntary phase of Barjeel, the Green Building Regulations of Ras Al Khaimah, and completion of preparations for mandatory implementation
- Completion of the first retrofit project in government buildings, for four buildings of Ras Al Khaimah Municipality, with 31% guaranteed energy and water savings
- Contracting of two retrofit projects, for 24 buildings of RAKEZ and RAK Academy, and development of a pipeline of retrofit opportunities for the next two years of targets
- Set up of an ISO 50001-compliant energy management system at the Municipality, to work as a pilot for extension to other government and private organisations
- Completion of the energy efficiency retrofit of 1,500 street lights in the Jazeera Al Hamra Free Zone by RAKEZ
- Expansion of the uses of recycled water (TSE) through contracting for commercial sale of bulk TSE by PSD - Wastewater Agency
- Contracting and commencing works for initial solar PV rooftop projects, including the first government solar PV project for a 230kWp carport at Ras Al Khaimah Municipality
- Installation of 12 public electric vehicle charging stations in Ras Al Khaimah by FEWA and various entities of the Government of Ras Al Khaimah
- Activation of the overall measurement & verification process of the strategy, with the first annual report issued

These initial accomplishments represent a growing pipeline of projects, expected to result in significant energy and water savings in the coming years.

Apart from these achievements, several preparatory activities were initiated to support further development of the programs. These activities are important for the long-term success of the strategy, as they aim to activate key strategy enablers. The most notable of these activities are the following:

Arab Ministerial Forum on Housing and Sustainable Urban Development, Dubai


Arabian Hotel Investment Conference, Ras Al Khaimah

- **Enhancing policy & regulation**, including the ongoing development of sustainable community guidelines, new public landscaping standards, green procurement guidelines and electric vehicle charging station standards.
- **Raising awareness** around energy and water conservation, including preparation for an energy efficiency competition for schoolchildren across Ras Al Khaimah, a social media campaign targeting residents, and the organisation of multiple industry events.
- **Building capacity** in the energy efficiency and renewables sectors, including the launch of a supply market development strategy to attract leading businesses and entrepreneurs to Ras Al Khaimah, and the activation of training programs including the launch of the Barjeel online training platform for engineers and consultants.

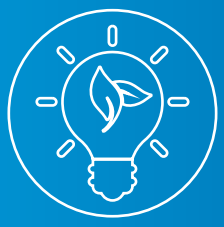
Climate Control Awards, Dubai

EmiratesGBC Congress, Dubai


Danish Trade Council Energy Efficiency Seminar, Ras Al Khaimah

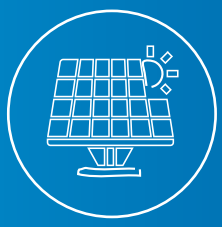

Sustainable Hospitality Conference, Ras Al Khaimah


Earth Hour Celebration, Ras Al Khaimah Heritage Village



30% Energy Savings

20% Water Savings



20% Renewables

RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

2 RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

2.1 Policy & Economic Context

Ras Al Khaimah is undergoing a remarkable transformation and growth in multiple sectors of its economy, primarily real estate, manufacturing and tourism, among others. Energy and water are central to the policy agenda of the Government of Ras Al Khaimah, and the EE&R Strategy is meant to support competitiveness of the economy in different ways:

1) **Cost-competitiveness:** energy efficiency and renewables measures will reduce the cost of energy and water for consumers in Ras Al Khaimah, thus promoting savings for residents and competitiveness for industrial and commercial enterprises.

2) **Availability:** the development of renewables production capacity in Ras Al Khaimah will improve the availability of energy in Ras Al Khaimah by supporting the provision of utility services in previously unserved areas, and reducing the existing dependence on electricity and fuel imports.

3) **Capacity building:** a diverse market for products and services related to energy efficiency and renewables will be developed in Ras Al Khaimah, thus contributing to additional economic growth and the development of local skills and capabilities in these specialised fields.

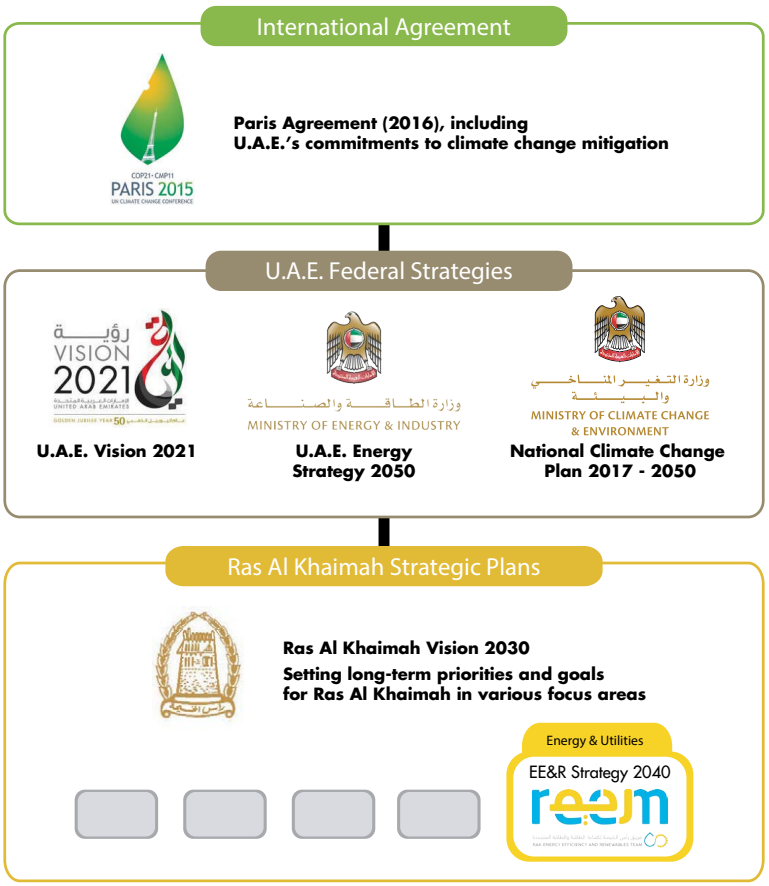


Figure 1: Universe of relevant strategic plans in which the EE&R Strategy fits

The EE&R Strategy is fully integrated into the wider Ras Al Khaimah Vision 2030, and also contributes to the goals of various federal agendas and plans. The framework of strategic plans guiding energy efficiency and renewables in Ras Al Khaimah, as shown in Figure 1, comprises the UAE National Agenda Vision 2021, the UAE Energy Strategy 2050, and the National Climate Change Plan 2017 - 2050 at the federal level; and the Ras Al Khaimah Vision 2030 and the EE&R Strategy at the local level. Each of these strategies is governed and driven by different government entities acting in collaboration.

Specifically, the EE&R Strategy supports the ambition of Vision 2030 for Ras Al Khaimah as a competitive and sustainable investment destination, with distinguished public service standards. In this context, efficiency in energy use and adoption of renewables technologies are critical for achieving two important pillars of the Vision 2030 for the energy, renewables and utilities focus area: energy competitiveness, and sustainability of energy and public services.

The targets of the EE&R Strategy for Ras Al Khaimah are also fully in line with federal targets, as shown in Figure 2.

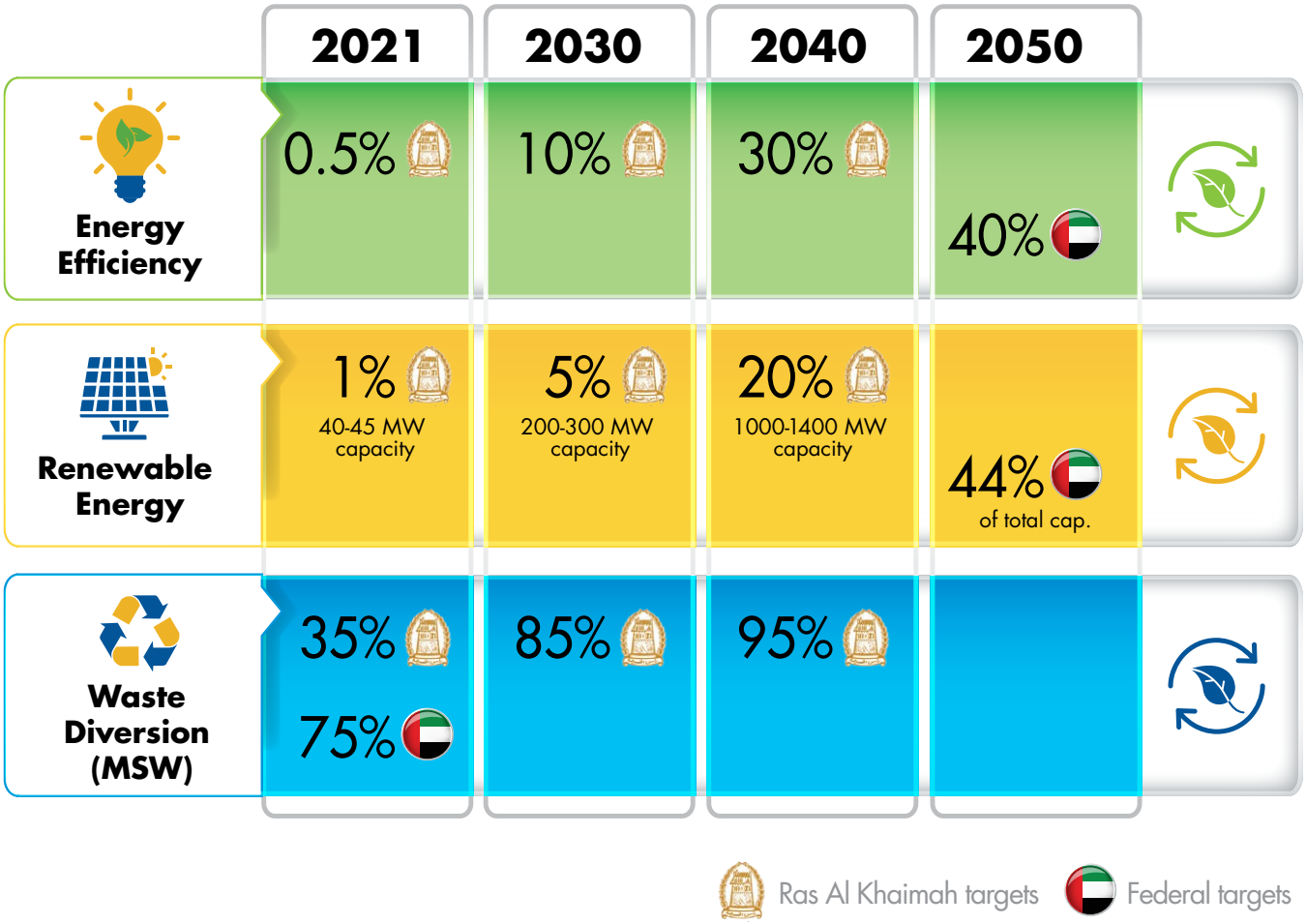


Figure 2: EE&R strategy targets compared to federal targets

From an international perspective, the EE&R Strategy 2040 represents an important aspect of Ras Al Khaimah's contribution to the UAE's commitments towards mitigation of climate change, following the Paris Agreement, and as part of the United Nations Framework Convention on Climate Change (UNFCCC). The EE&R Strategy 2040 supports 11 of the 17 Sustainable Development Goals of the UN, as described in Figure 3.

Figure 3: Assessment of EE&R Strategy 2040 contribution to the UN Sustainable Development Goals

2.2 EE&R Strategy

The main objective of the EE&R Strategy is to ensure reliable and cost-competitive access to energy and water resources for consumers in Ras Al Khaimah, by reducing the energy intensity of the economy and increasing the use of renewable resources.

2.2.1 Benefits of the EE&R Strategy

The EE&R Strategy is expected to bring more than AED 9 billion of net benefits to the economy of Ras Al Khaimah on a present value basis.

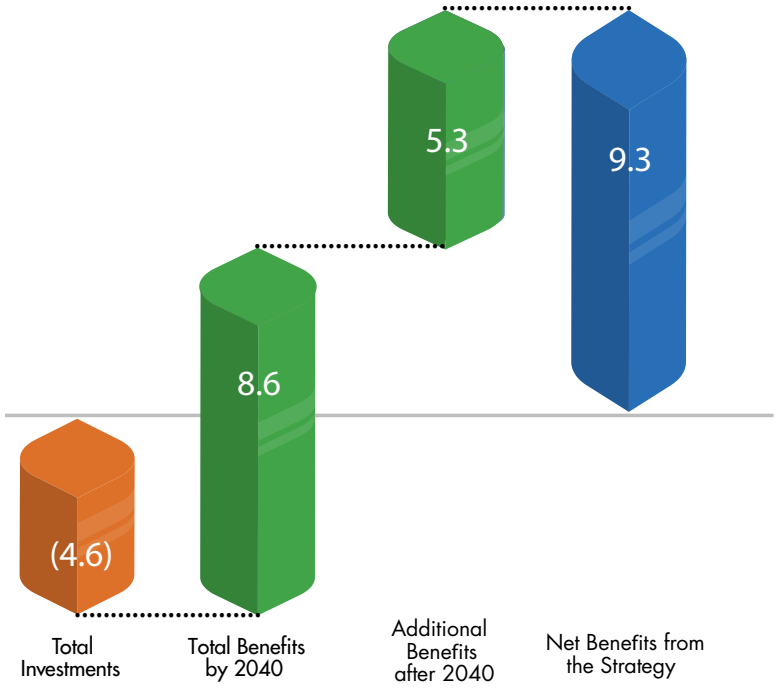


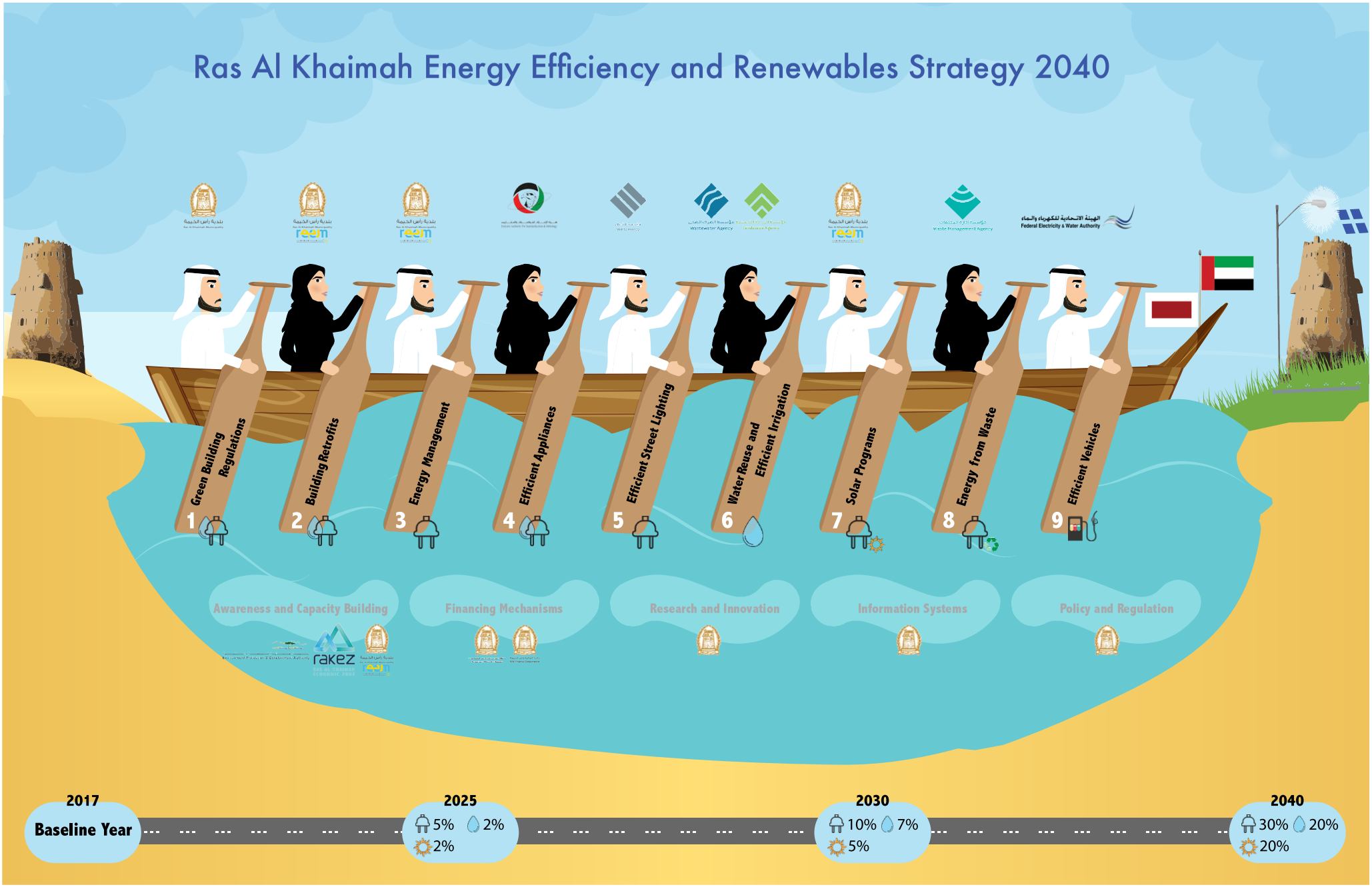
Figure 4: Benefits & costs of the EE&R Strategy (AED billion, present value in 2018)

Other significant benefits of the EE&R Strategy include the following:

1) **Social Benefits:** the EE&R Strategy will improve the positioning of Ras Al Khaimah as an attractive place to live and work. Additional skilled jobs will be created for national and expat communities in the manufacturing and service sectors connected to energy and water industries.

2) **Economic & Market Benefits:** the economic savings brought by the strategy will free up funds that may be reinvested for the benefit of Ras Al Khaimah and its local economy. The strategy will build additional economic resilience against price fluctuations of various conventional fuels. Increased competitiveness will attract more businesses and industries, while further entrenching existing businesses in Ras Al Khaimah. Local markets will be created for energy efficiency and renewables products and services, which will contribute to GDP growth and create opportunities for private sector development. Enhanced work environments, efficient equipment, and proper maintenance practices will improve the overall productivity of the economy. The strategy will benefit the real estate sector, as the added value of efficient buildings is expected to gradually translate into price and rental premiums. The tourism sector will benefit from an image of leadership in environmental and economic sustainability.

3) **Environmental, Health, and Safety Benefits:** implementation of the EE&R Strategy will create better living and working conditions through healthier indoor and outdoor environments in Ras Al Khaimah. It will also promote safety by replacing old equipment while reducing the use of hazardous substances. Environmental benefits will come from better waste management practices, treatment and reuse of wastewater, use of electric and fuel-efficient vehicles, and use of local plant species.


Ras Al Khaimah Energy Efficiency and Renewables Strategy 2040
Federal Electricity & Water Authority
1 Green Building Regulations
2 Building Retrofits
3 Energy Management
4 Efficient Appliances
5 Efficient Street Lighting
6 Water Reuse and Efficient Irrigation
7 Solar Programs
8 Energy from Waste
9 Efficient Vehicles
Awareness and Capacity Building
Financing Mechanisms
Research and Innovation
Information Systems
Policy and Regulation
rakez
2017
Baseline Year
2025
5% 2%
2%
2030
10% 7%
5%
2040
30% 20%
20%

2.2.2 Programs and Enablers

The strategy comprises nine main programs, designed to address most forms of energy and water consumption in Ras Al Khaimah. Implementation of the strategy and its programs is supported by five main enablers. The programs and the enablers are briefly described in Figure 5, below.

Program	Brief & Objectives
1. Green Building Regulations	Introduce and periodically upgrade green building regulations for new buildings. Introduce efficient community guidelines and a building rating scheme.
2. Building Retrofits	Execute comprehensive energy efficiency improvement projects for at least 3,000 existing buildings by 2040, starting with large government and commercial buildings with high energy consumption.
3. Energy Management	Promote best practices in energy management at key energy and water users, representing >30% of the total electricity consumption.
4. Efficient Appliances	Promote adoption of energy and water efficient appliances and equipment (such as air conditioners, refrigerators and water fixtures). Implement mechanisms to enforce appliance efficiency standards.
5. Efficient Street Lighting	Adopt efficient lighting technologies (such as LEDs) for 400+km of existing street lighting and for new roads. Apply dimming and switch-off measures.
6. Water Reuse & Efficient Irrigation	Increase wastewater collection and treatment. Reuse at least 95% of the TSE produced by 2040. Implement efficient irrigation measures to allow for expansion of public green spaces.
7. Solar Programs	Promote solar energy for on-site and utility-scale applications, with an ambition to reach 1,200 MWp of total capacity by 2040.
8. Energy from Waste	Develop a range of waste to energy capacities to contribute at least 2% of the primary energy consumed in Ras Al Khaimah.
9. Efficient Vehicles	Promote adoption of efficient vehicles with a focus on EVs and hybrids, starting with government fleets.

Enablers

Awareness and Capacity Building	Financing Mechanisms	Research and Innovation	Information Systems	Policy and Regulation
Developing efficiency-consciousness in society, and building local skills and capacities	Facilitating investments in energy efficiency & renewables projects	Supporting research and development of new energy efficient solutions and technologies	Creating tools to support projects and monitor strategy progress	Adopting regulatory measures to promote implementation of the programs

Figure 5: EE&R Strategy programs & enablers

2.2.3 Roadmap & Targets

The implementation of the EE&R Strategy will extend from the years 2018 until 2040.

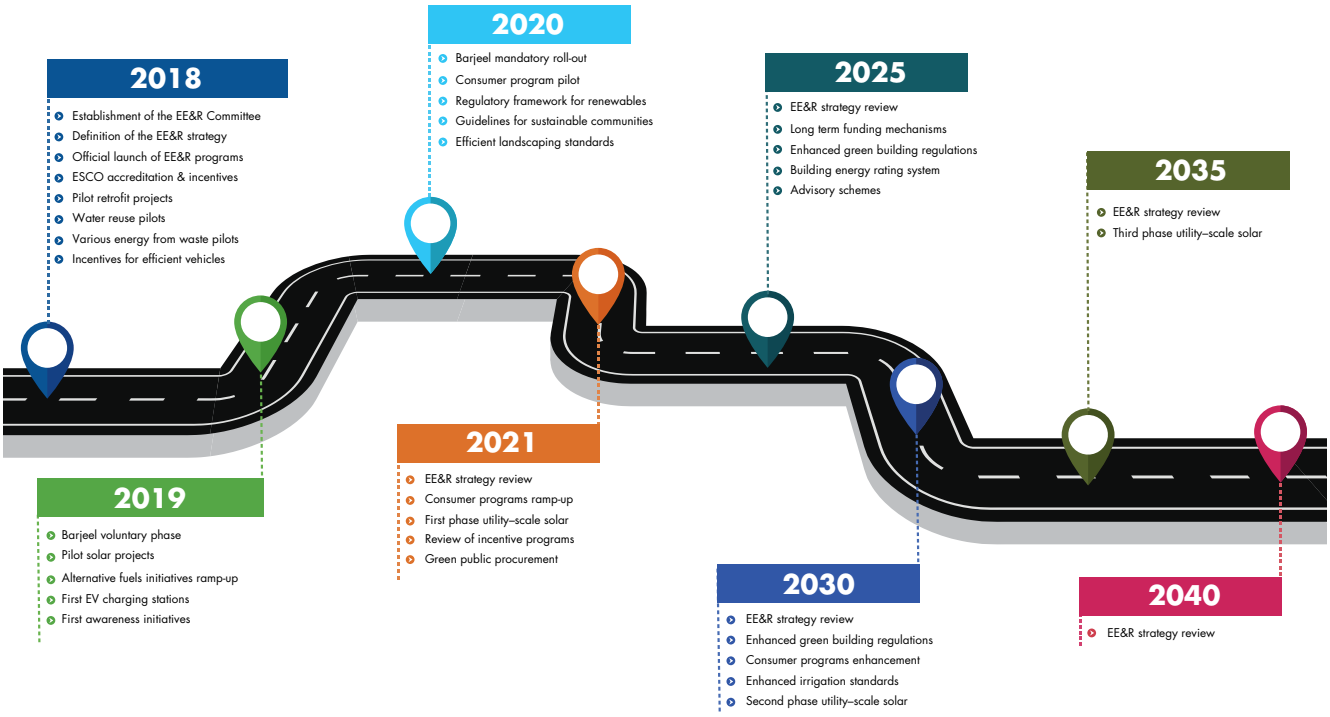


Figure 6: EE&R Strategy roadmap

The year 2018 marked the activation phase, when the EE&R Strategy itself and the institutional set-up were established and early initiatives were started. The period from 2019 until 2021 is the ramp-up phase, when all the programs and most of their constituent initiatives are gradually developed. The EE&R Strategy implementation shall reach the full scope of its activities during this period, barring some exceptional initiatives to be activated in the future. The remaining period from 2022 until 2040 is the phase of continuous implementation of the EE&R Strategy. This period will be marked by periodic reviews and upgrades of the programs, to ensure that the strategy incorporates the latest technical advancements and also remains relevant to the overall context of the Emirate.

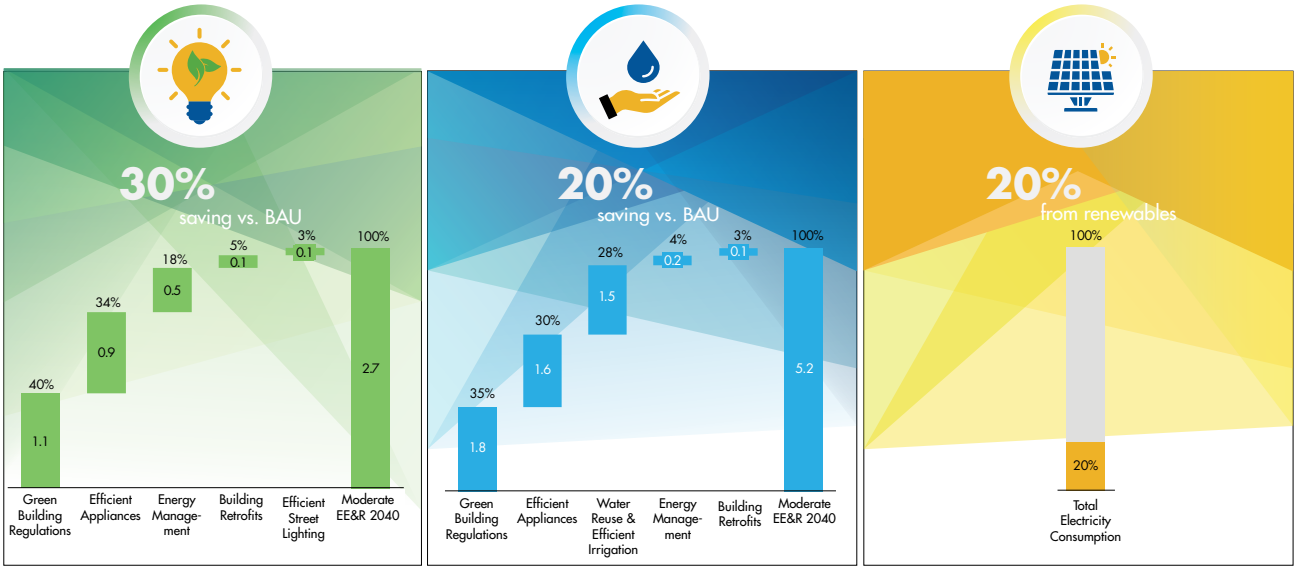


Figure 7: EE&R Strategy targets for 2040 by program (TWh/year for electricity, BIG/year for water)

Strategy implementation will be guided by agreed yearly targets for the programs and the strategy overall. Commitment of the Program Owners and supporting entities to the targets is formalised in a dedicated strategy document, signed by all members of the EE&R Committee.

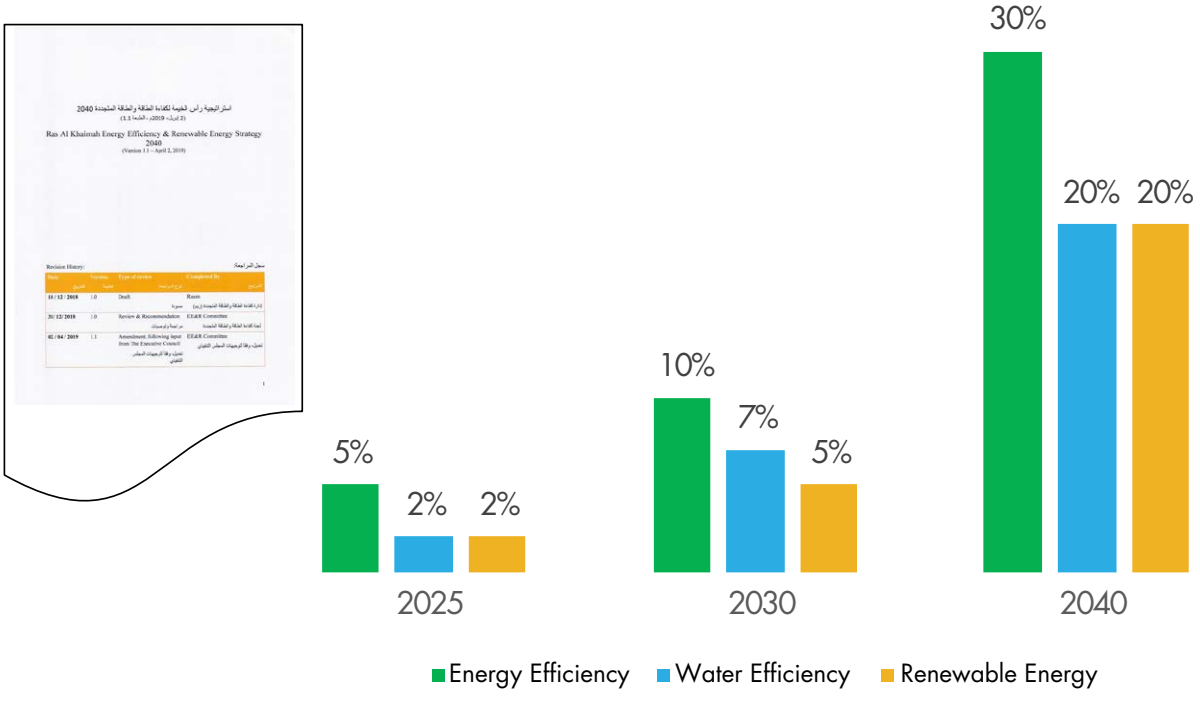


Figure 8: The EE&R Strategy document, and the agreed intermediate targets

2.2.4 Institutional Set-up

A dedicated organisational set-up has been put in place to ensure effective strategy implementation. This includes Reem (part of Ras Al Khaimah Municipality), the Energy Efficiency & Renewables Committee, and the government entities responsible for implementation of each of the programs and initiatives of the EE&R Strategy.

The institutional set-up created for the EE&R Strategy implementation and its place in the overall institution of the Government of Ras Al Khaimah is depicted in the figure below.

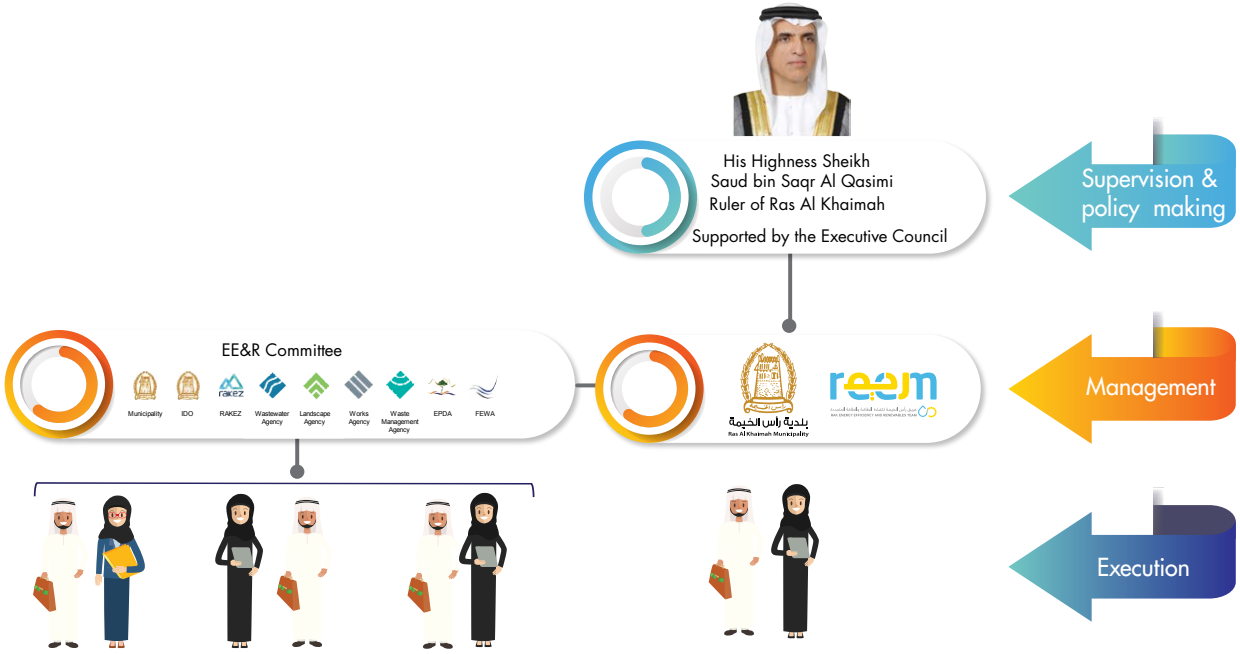


Figure 9: Institutional set-up of the EE&R Strategy, within the Government of Ras Al Khaimah

2.2.4.1 Reem

Reem, the Energy Efficiency & Renewables Office of Ras Al Khaimah Municipality, is the government office dedicated to driving and reporting on the implementation and continuous update of the EE&R Strategy. Its main organisational functions are the following:

Figure 10: Main functions of Reem

Meet some members of reem

Noora Albeqaishi, Office Coordination Specialist

Noora has been with Reem from the start, and her administrative support is the reason for the smooth running of Reem. She is free-spirited with an endless supply of positive energy. When it comes to hobbies, she has the longest list. She likes reading manga, sketching, watching movies, acting as well as playing a variety of sports. She has an exceptional ability to stay calm during any storm.

Henrique Pereira, Senior Manager – Energy Services

For anything to do with energy in buildings or industry, Henrique is the go-to guy! He has led the first successful building retrofits of Reem, and continues to do so every day. He has worked in many different places in Europe, Africa and the Middle East over his long career and, consequently, has an endless supply of funny and interesting stories to tell. He loves reading and enjoys spending time with his family.

Mahra Alhoot, Energy Analyst

Mahra is monitoring the progress of the EE&R Strategy and helps verify energy and water savings from all the programs. Having recently graduated, in January 2019, Mahra is developing her technical and analytical skills at Reem. She has a passion for public speaking, and enjoys drawing and painting. She sometimes also applies her artistic touch to her presentations.

Ruqiya Shariff, Manager – Awareness and Capacity Building

Ruqiya manages all awareness campaigns, events, and training initiatives of Reem, which are important enablers of the strategy. She enjoys reading poetry, fantasy and fiction, and she also writes occasionally. Her energy and drive make her a role model for her more junior team members. Ruqiya is learning Arabic, and appreciates anyone who teaches her a new word or phrase.

Akshay Datar, Senior Strategic Planning Specialist

Akshay is the strategist in the team. He supports in developing and implementing the programs, and his strength lies in multi-tasking. Some say he resembles a Bollywood celebrity, but Akshay is really a thinker at heart, who is very curious and enjoys learning. His current interests are economics and history, and he enjoys reading or listening to podcasts on these and many other topics.

2.2.4.2 Energy Efficiency & Renewables Committee

The Energy Efficiency & Renewables Committee guides and supports Reem in the implementation of the EE&R Strategy. The committee met six times in 2019, and discussed the status of strategy implementation and the development of new initiatives.

Figure 11: EE&R Committee meeting

Members of the Energy Efficiency & Renewables Committee

H.E. Munther Mohammed bin Shekar
Director General,
Ras Al Khaimah Municipality
Chairman

Alan Turner
Executive Director,
PSD Wastewater Agency
Member

H.E. Ahmed Al Hammadi
Director General,
Public Services Department
Member

Savvas Othon
Executive Director,
PSD Landscape Agency
Member

H.E. Dr. Saif Al Ghais
Director General,
Environment Protection and Development Authority
Member

Eyad Ismail
Group Director of Engineering,
Ras Al Khaimah Economic Zone
Member

Salim Bin Rabee'a
Executive Director,
Electricity Directorate,
Federal Electricity & Water Authority
Member

Nitin Johar
Head of Treasury,
Investment and Development Office
Member

Oussama Al Natour
Executive Director,
PSD Waste Management Agency
Member

Andrea Di Gregorio
Executive Director,
Reem, Ras Al Khaimah Municipality
Member and Secretary

Ahmed AlSayed Ban
Executive Director,
PSD Works Agency
Member

2.2.4.3 Implementation Responsibilities

Each program of the EE&R Strategy is assigned to a Program Owner, selected based on its mandate and expertise. The Program Owner is the entity responsible for the overall execution of the initiatives of that program, and is accountable for the achievement of program targets and operational objectives. In most cases, supporting entities are also identified to assist the Program Owner through the activation of program enablers or the execution of some initiatives within the program. The Program Owners and supporting entities are shown in Figure 12.

Program	Program Owner	Support
1. Green Building Regulations	بلدية راس الخيمة	rakez
2. Building Retrofits	بلدية راس الخيمة, reem	مكتب الاستثمار والتطوير Investment & Development Office
3. Energy Management	بلدية راس الخيمة, reem	rakez
4. Efficient Appliances	Emirates Authority for Standardization & Metrology	بلدية راس الخيمة, reem
5. Efficient Street Lighting	مؤسسة الاشغال Works Agency	الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority
6. Water Reuse & Efficient Irrigation	مؤسسة الصرف الصحي Wastewater Agency, مؤسسة الزراعة التجميلية Landscape Agency	بلدية راس الخيمة, reem
7. Solar Programs	بلدية راس الخيمة, reem	مكتب الاستثمار والتطوير Investment & Development Office, مؤسسة إدارة المخلفات Waste Management Agency
8. Energy from Waste	مؤسسة إدارة المخلفات Waste Management Agency	مؤسسة الصرف الصحي Wastewater Agency
9. Efficient Vehicles	الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority	بلدية راس الخيمة, reem

Figure 12: Program owners & supporting entities for all programs

H.E. Dr. Saif Al Ghais
Director General, Environment Protection and Development Authority
Member

"Energy efficiency and renewable energy are essential for our fight against climate change and environmental degradation.

The Environment Protection and Development Authority supports the EE&R Strategy through its contributions in raising awareness about the benefits of efficiency and through capacity-building programs such as the development of a green procurement policy."

2.3 Initial Achievements

2.3.1 Progress of Strategy Implementation

Over the year 2019, strategy implementation efforts across all programs have marked a series of important accomplishments:

- Launch and completion of the voluntary phase of Barjeel, the Green Building Regulations of Ras Al Khaimah, and completion of preparations for mandatory implementation, including IT enhancements, awareness, training and certification
- Completion of the first retrofit project in government buildings, for four buildings of Ras Al Khaimah Municipality with 31% guaranteed energy and water savings
- Contracting of two retrofit projects, for 24 buildings of RAKEZ and RAK Academy, and development of a pipeline of retrofit opportunities for the next two years of targets
- Set up of an ISO 50001-compliant energy management system at the Municipality, to work as a pilot for extension to other government and private organisations
- Completion of the energy efficiency retrofit of 1,500 street lights in the Jazeera Al Hamra Free Zone by RAKEZ
- Expansion of the uses of recycled water (TSE) through the contracting for commercial sale of bulk TSE by PSD - Wastewater Agency
- Contracting and commencing works for initial solar PV rooftop projects, including the first government solar PV project for a 230kWp carport at Ras Al Khaimah Municipality
- Installation of 12 public electric vehicle charging stations in Ras Al Khaimah by FEWA and various entities of the Government of Ras Al Khaimah
- Activation of the overall measurement & verification process of the strategy, with the first annual report issued

These initial accomplishments represent and support a growing pipeline of projects, expected to result in significant energy and water savings in the coming years.

Apart from the above achievements, several preparatory activities were initiated to support further development of the programs. These activities are important for the long-term success of the strategy, as they are aimed to activate key strategy enablers. The most notable of these activities are the following:

- **Enhancing policy & regulation**, including the ongoing development of new public landscaping standards, green procurement guidelines, electric vehicle charging station standards, and sustainable community guidelines. An extensive stakeholder consultation process has been set up to ensure each of these regulations remains in line with international benchmarks and is relevant to market conditions in Ras Al Khaimah. The development of each of these regulatory documents is described in their respective chapters in this report.
- **Raising awareness** around energy and water conservation, including launch of an energy efficiency competition for schoolchildren across Ras Al Khaimah, preparation of a social media campaign targeting residents, and organisation of multiple industry events, including initial plans for the first RAK Energy Summit, which will bring regional and international experts and businesses in the fields of energy efficiency and renewables to Ras Al Khaimah.

- **Building capacity** in the energy efficiency and renewables sector, including the launch of a supply market development strategy to attract leading businesses and entrepreneurs to Ras Al Khaimah (through planned outreach initiatives, start-up and SME competitions) and the activation of training programs, including a Barjeel online training platform for engineers and consultants.

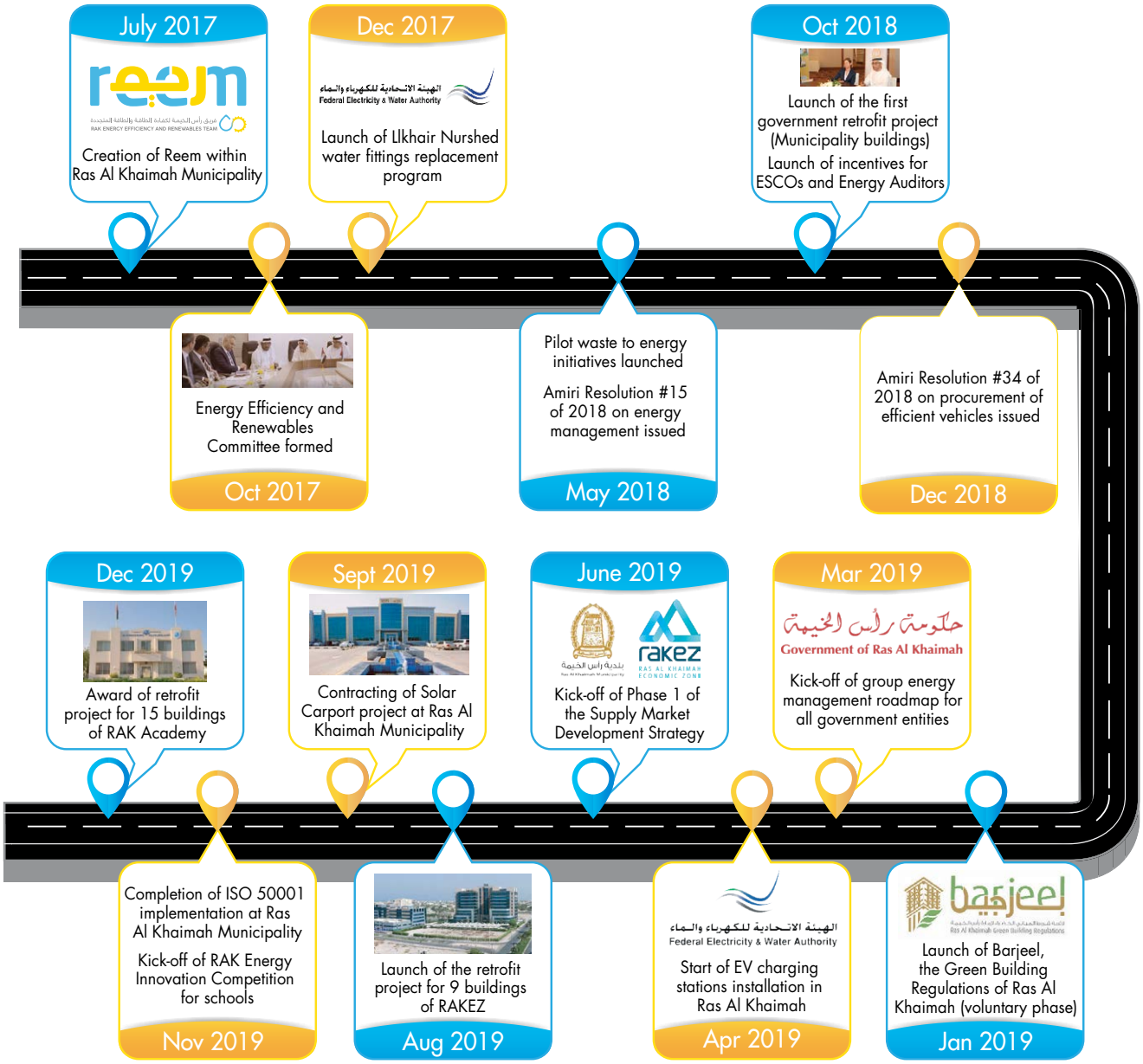


Figure 13: Initial achievements of the EE&R Strategy by 2019 year end

2.3.2 Energy & Water Savings

Initial results, in the form of electricity and water savings from some of the programs, were observed in 2019. In total, 7 GWh of electricity and 109 MIG of water were saved in Ras Al Khaimah in 2019. These initial savings were achieved by the Building Retrofits, Efficient Appliances, Efficient Street Lighting and Water Reuse & Efficient Irrigation programs. Additional savings were observed in 2019 through other activities, mainly the Ilkhair Nurshed and Your Home Our Care initiatives of FEWA. Electricity and water savings information related to such initiatives is being processed, and will be included in the next annual report.

Apart from savings in electricity and water, direct savings of 423 GWh thermal of fossil fuel energy were achieved by the Energy from Waste and Efficient Vehicles programs.

A detailed breakdown of the measured and verified savings by program is provided below:

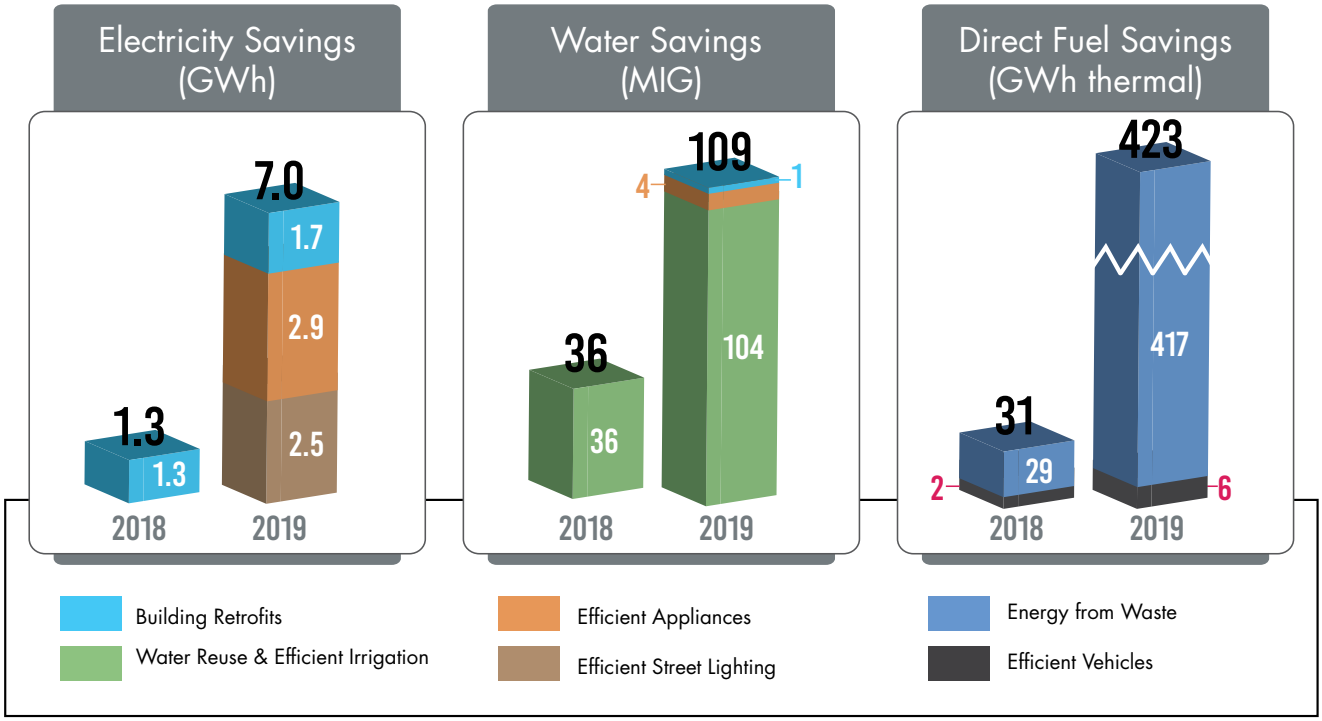


Figure 14: Annual energy and water savings achievements by program

THE NINE PROGRAMS

3 THE NINE PROGRAMS

3.1 Green Building Regulations

Program Owner: بلدية رأس الخيمة Ras Al Khaimah Municipality

Supporting Entity: rakez RAS AL KHAIMAH ECONOMIC ZONE

Abdulla Samhan
CEO, Technical Affairs Sector, Ras Al Khaimah Municipality

3.1.1 Barjeel

Barjeel, the Green Building Regulations of Ras Al Khaimah, sets minimum sustainability standards for new buildings. Buildings permitted under Barjeel are expected to consume 30% less energy and water compared to a typical building in Ras Al Khaimah, resulting in lower utility bills. Thus, Barjeel provides significant added value for both owners and tenants over the life-time of the buildings.

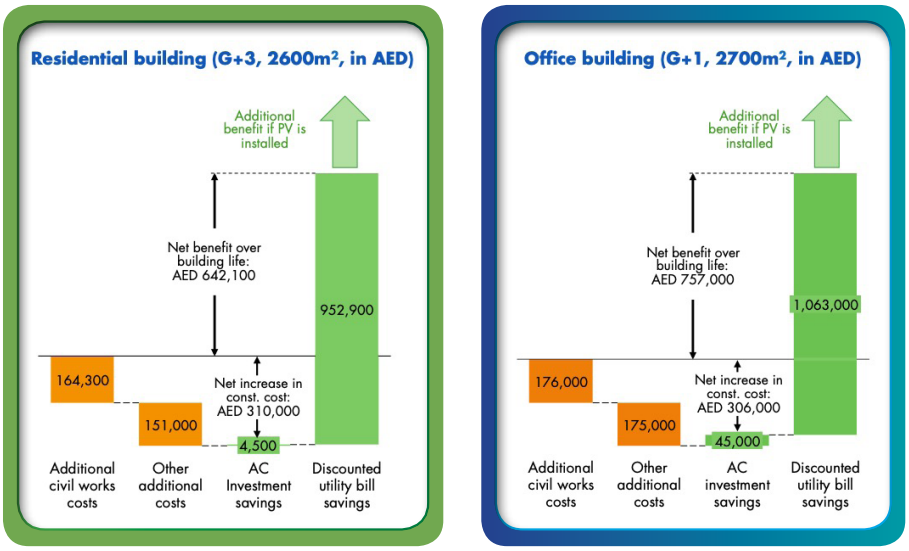


Figure 15: Estimation of costs and benefits of Barjeel for selected building types

We decided to have a gradual implementation of Barjeel, to allow the market to adjust smoothly to the new requirements. For this reason, we launched a one-year voluntary phase of Barjeel on January 29, 2019. During the voluntary period, Ras Al Khaimah Municipality offered incentives for early adopters of Barjeel of up to 100% discount on building permit fees. The market responded very positively, and in the voluntary period Barjeel has been successfully applied to 279 pilot projects, covering a broad range of building types including private villas, schools, hotels, warehouses and staff accommodations.

Figure 16: Barjeel launch event

Figure 17: Adoption of Barjeel during the one-year voluntary phase

We also rolled out a comprehensive training campaign for building consultants to prepare the market for the mandatory period of Barjeel. This included face-to-face training sessions, online training, examination and certification. In addition to this, a supplier workshop was organised with the main local suppliers to ensure the availability of suitable construction materials. Multiple awareness initiatives for the general population were also conducted, including mall campaigns and media coverage through interviews and external event participation.

Figure 18: Training and awareness initiatives for Barjeel

Mohamed Nazmy
Building Permit Section Head,
Ras Al Khaimah Municipality

> We are proud to say today that Barjeel is appreciated and recognised for its innovative approach among building regulations in the GCC region. We believe that Ras Al Khaimah is now ready for the mandatory application of Barjeel, starting in 2020.

Figure 19: Barjeel awareness campaigns in malls

Within the Municipality, we have extensively trained our staff and updated our systems for complete integration of Barjeel requirements with the existing electronic permitting process. This facilitated a smooth transition for consultants and contractors, without affecting customer service levels and the processing time for building permit issuance.

In preparation for mandatory application of Barjeel, we also conducted a study of the projects permitted during the voluntary phase of Barjeel, to verify smooth application of the regulations. The lessons learnt from this study were incorporated in an updated version of Barjeel, and some requirements were relaxed to further reduce the impact of Barjeel on construction costs. The updated version of Barjeel was released in December 2019.

3.1.2 Sustainable Community Guidelines

Barjeel addresses sustainability aspects of building construction, commissioning and operations. However, there are aspects of energy and water efficiency, and others such as liveability and mobility, which cannot be addressed at the level of the individual building, and require a broader look at the public realm, i.e. public infrastructure and facilities outside buildings. For this reason, in 2019, Ras Al Khaimah Municipality started to develop guidelines for sustainable communities, which would complement Barjeel.

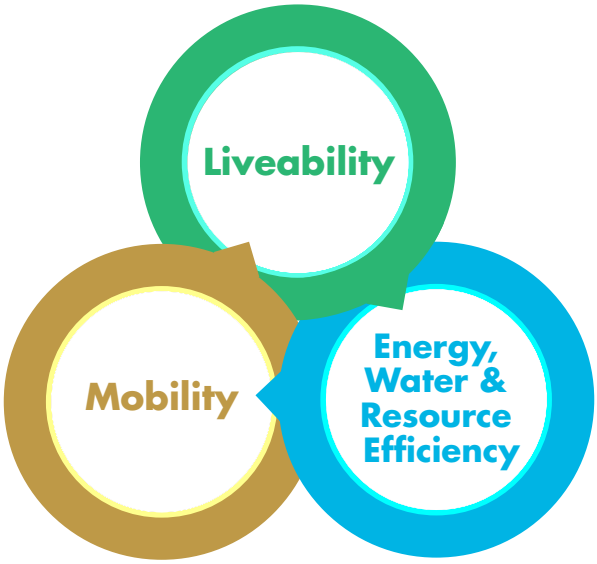


Figure 20: Objectives of the Sustainable Community Guidelines

Nina Riehle-Hussain
Senior Sustainability Specialist,
Ras Al Khaimah Municipality

"The guidelines are expected to bring a broad range of benefits across all dimensions of sustainability: social, economic and environmental. Among all those aspects, we are stress-testing each requirement with deep cost-benefit analysis, to ensure the guidelines have a strong economic rationale for stakeholders."

Mohamed Saif Al Ghais
Urban Planner,
Ras Al Khaimah Municipality

"Our team held two workshops with experts from over 50 participating government entities and private stakeholders to understand their priorities and recommendations. Their feedback has helped us tremendously to set the framework for Ras Al Khaimah's first sustainable community guidelines."

Figure 21: Stakeholder engagement workshop on the sustainable community guidelines

3.2 Building Retrofits

Program Owner: بلدية رأس الخيمة Ras Al Khaimah Municipality; reem

Supporting Entity: مكتب الاستثمار والتطوير حكومة رأس الخيمة Investment & Development Office Government of Ras Al Khaimah

The existing building stock of Ras Al Khaimah comprises buildings of very different levels of energy performance. This creates a major opportunity for energy and water retrofits of these buildings. A retrofit project addresses this area of opportunity by examining and then replacing, adding or optimising equipment or systems without interrupting the normal operations of the building. For this reason, Building Retrofits, driven by Reem, was included in the EE&R Strategy as one of the main programs. In 2019, the program has quickly ramped up in terms of retrofit project development, and we have also enriched the ecosystem for building retrofits in Ras Al Khaimah in other ways.

Henrique Pereira
Senior Manager
Energy Services, Reem,
Ras Al Khaimah Municipality

reem

بلدية رأس الخيمة Ras Al Khaimah Municipality

In 2019, retrofit works were completed for four buildings of Ras Al Khaimah Municipality, representing the first retrofit project for government buildings in Ras Al Khaimah, under an energy performance-contracting scheme. The five year period of operations, maintenance, and guaranteed savings started from March 2019, and preliminary results for 2019 are aligned with our expectations.

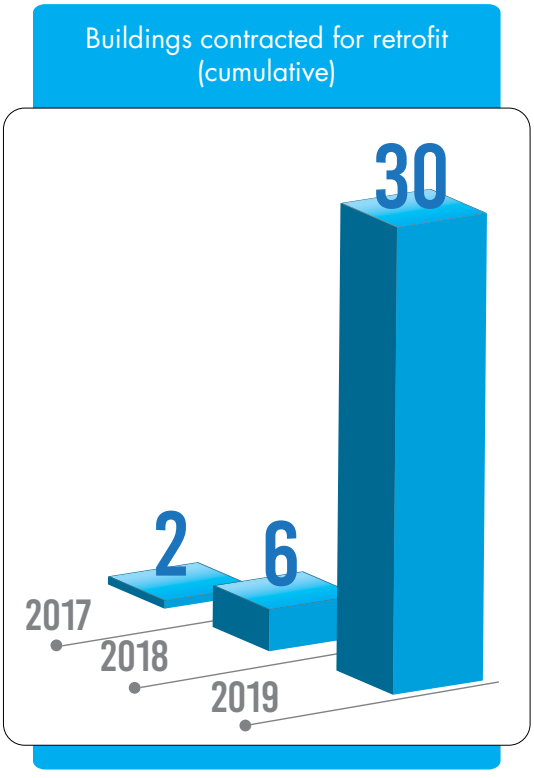


Figure 22: Operational KPI progress

Contracting for new retrofit projects is ramping up. RAKEZ started the retrofit of nine buildings, including a district cooling plant, with guaranteed savings exceeding 38%. Another retrofit project for commercial buildings was also awarded in 2019, for 15 buildings of RAK Academy spread across three campuses and five schools. About 34% savings in RAK Academy's utility costs are expected, once this project is completed.

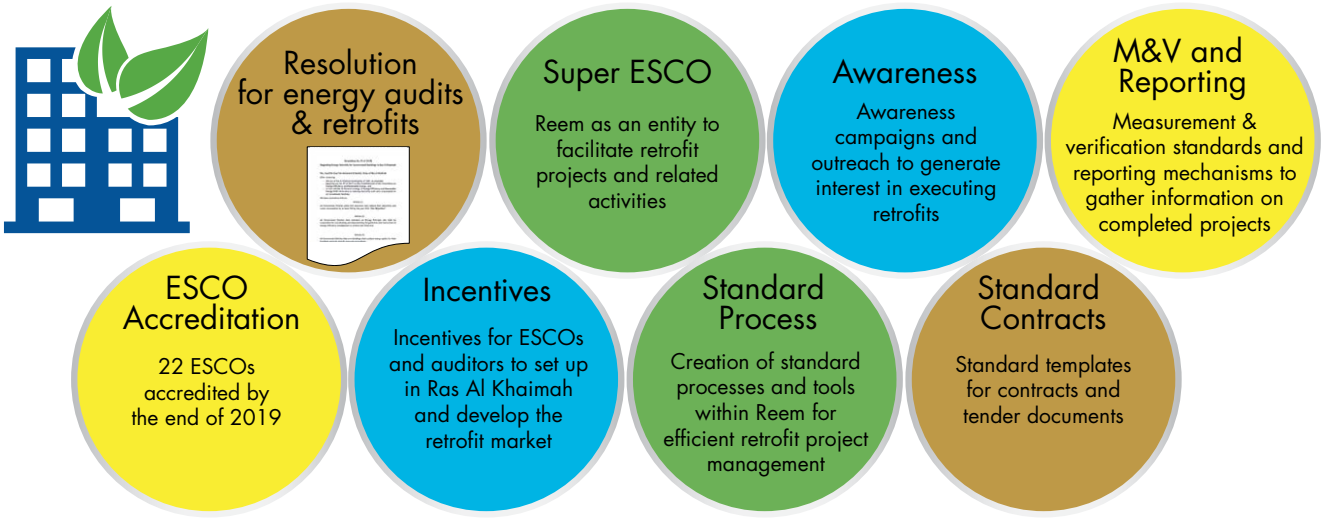


Figure 23: Components of the Building Retrofits Program

A strong pipeline of retrofit projects is being built. Reem conducted mini-walkthrough audits for over 150 buildings in 2019, and the project pipeline contains over 200 buildings in various stages of project development. The tender process has already been activated for a majority of these buildings, while the remaining are expected to be tendered over the next few years.

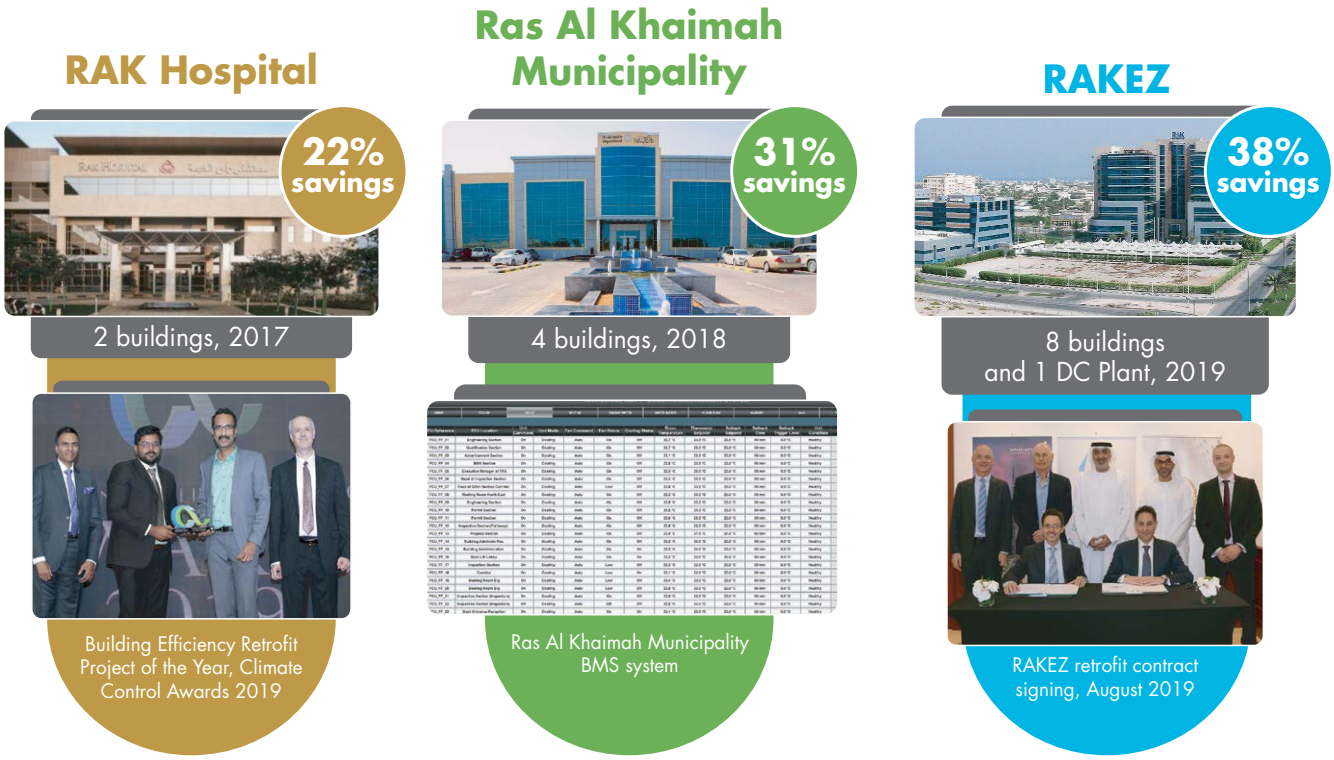


Figure 24: Examples of retrofit projects implemented in Ras Al Khaimah

Eyad Ismail
Group Director of Engineering, RAKEZ

> Nine buildings of RAKEZ were contracted for retrofit in August 2019, with exceptional guaranteed savings of 38.5% of our baseline utilities consumption. This project is remarkable, as it includes the optimisation of a district cooling plant, which serves several RAKEZ buildings. This inclusion contributes substantially to the high savings expected. At the end of 2019, retrofit works are already on track for completion in early 2020.

In the meanwhile, Ras Al Khaimah is increasingly being recognised for its achievements in this type of projects. A retrofit project by RAK Hospital was awarded as the Building Efficiency Retrofit Project of the Year by Climate Control Awards. This was the first retrofit project for commercial buildings in Ras Al Khaimah, and was contracted using an innovative shared savings model.

While keeping our focus on government and commercial buildings, we made progress on initiatives meant to promote adoption of retrofit measures in the residential sector. The Model Villa Initiative, launched in collaboration with Masdar, aims to showcase the benefits of these types of projects. A first villa, selected by public draw in 2018, was retrofitted in 2019. Ras Al Khaimah Municipality and Masdar are now monitoring the energy and water savings in this villa. In partnership with the Sheikh Zayed Housing Program, a second villa was selected for this initiative in 2019. The villa has been audited, and the retrofit is expected to start in 2020.

Yousef Baselaib
Executive Director, Sustainable Real Estate, Masdar

> Masdar is proud to have launched the Model Villa initiative together with Ras Al Khaimah Municipality. We consider this a first step in educating residents about the benefits of retrofitting their homes.

Developments are taking place also on the supply side, with the development of the bases of an energy service industry in Ras Al Khaimah. A total of 22 ESCOs were accredited by Ras Al Khaimah Municipality at the end of 2019. Three of them have established new permanent offices in Ras Al Khaimah, along with three new energy-auditing companies.

3.3 Energy Management

Program Owner: Ras Al Khaimah Municipality, Reem

Supporting Entity: RAKEZ

The Energy Management Program, led by Reem, aims to promote systematic energy management practices, such as ISO 50001, across high-energy users among industries as well as commercial and government entities in Ras Al Khaimah.

The government is leading implementation of this program by example. Ras Al Khaimah Municipality completed the implementation of an ISO 50001-compliant energy management system in its organisation. The most important part of this project is the development of a continuous improvement process for energy performance. This is expected to enhance and extend the energy and water savings in the Municipality buildings that were retrofitted, and to extend energy efficiency best practices to other buildings that are otherwise unsuitable for comprehensive retrofits. The project is driven by an energy management core team, and is also supported by volunteers from different departments.

Henrique Pereira
Senior Manager,
Energy Services, Reem,
Ras Al Khaimah Municipality

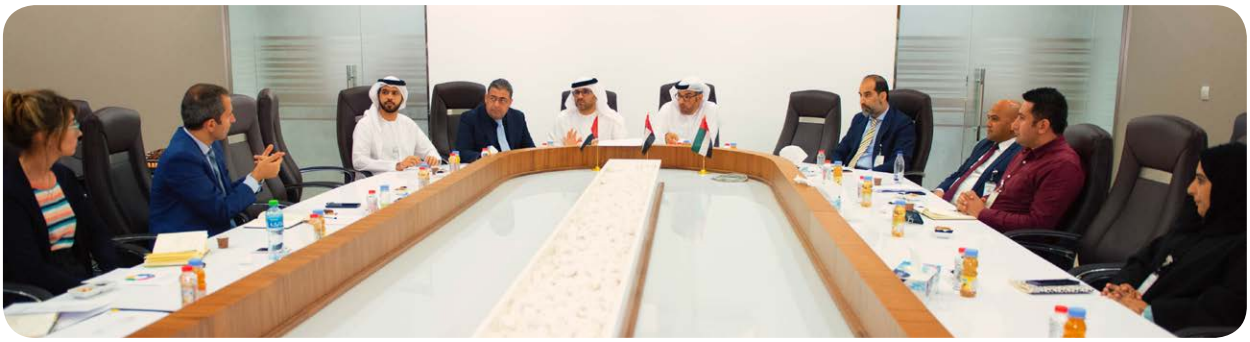
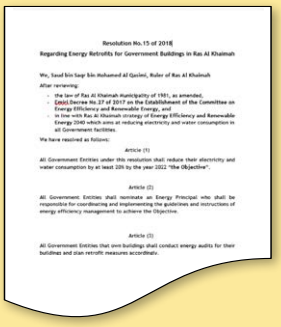


Figure 25: Municipality energy management system implementation kick-off meeting

Murad Bushnaq
Energy Manager and Properties Section Director (Acting),
Ras Al Khaimah Municipality

> "Besides integrating energy management into existing processes, we nominated voluntary "Energy Ambassadors" to help create a culture of energy and water efficiency. This would not have been possible without the support of our senior management, and their conviction in the benefits of systematic energy management."

Figure 26: Municipality energy management policy and internal awareness material



- Issued by His Highness Sheikh Saud bin Saqr Al Qasimi, UAE Supreme Council Member and Ruler of Ras Al Khaimah
- Defines an overall target of 20% energy and water savings by 2022 for government and semi-government entities

Figure 27: Amiri Resolution No. 15 of 2018 and its objectives

Building on the learnings and experiences from this project, Reem has initiated a wider energy management initiative for all government entities sponsored by the Department of Finance. In 2020, Reem will provide specialised support to all participating government entities who decide to adopt ISO 50001 energy management standards.

H.E. Yousef Al Belooshi
Director General,
Ras Al Khaimah
Department of Finance

"We consider energy efficiency as a key driver of government excellence. We are working with Reem on two projects across all government entities that we support: a building retrofit project launched in 2018 and an energy management project launched in 2019. Following extensive energy audits, 60 buildings of 20 government entities were selected for the retrofit project, expected to be contracted in 2020. Through the energy management project, the entities willing to go further will be supported with additional tools and advice, which will help them sustain and increase the savings over the long run.
Our ambition is to make the entire Government of Ras Al Khaimah an example of world-class energy management in the public sector."

Ras Al Khaimah Municipality has also initiated a collaboration with Grundfos to explore and quantify opportunities for energy savings in pumping systems. Often neglected in overall building retrofit or energy management projects, pumping systems are responsible for a sizeable share of the energy consumption in cooling and water supply. An MoU signed with Grundfos allows Ras Al Khaimah Municipality to benefit from specialised audits conducted by Grundfos to identify energy savings opportunities in such pumping systems. Initial audits have already been conducted for some Municipality buildings and other hospitality and residential buildings, as well as for pumping stations in large communities, with significant savings identified. Similar audits will continue to be conducted in other buildings to support the wider Building Retrofits and Energy Management Programs.

Figure 28: MoU signing with Grundfos for pumping systems auditing services

Furthermore, two pilot projects will be initiated in 2020 for energy management in the industrial sector. These will start with an energy auditing stage, to highlight potential opportunities for efficiency improvement in industrial facilities. Following success of the pilot projects, the initiative will then be extended to other industrial players in the market interested in improving energy performance of their facilities.

3.4 Efficient Appliances

Program Owner: Emirates Authority For Standardization & Metrology

Supporting Entity: بلدية رأس الخيمة Ras Al Khaimah Municipality, reem

Over 20% of all electricity consumed in Ras Al Khaimah is used to run domestic appliances, such as window and split ACs, refrigerators, washing machines, dishwashers, and water heaters. The Emirates Authority for Standardization and Metrology (ESMA) is responsible for setting standards for such appliances and equipment, keeping in mind efficiency and environment conservation, among other factors. However, we recognise that setting minimum standards is not enough to promote efficient appliances. The Efficient Appliances Program aims to promote the purchase and use of efficient appliances in Ras Al Khaimah by addressing all aspects of the market for appliances in Ras Al Khaimah.

The primary driver of this improvement has been the enforcement and continuous update of appliance performance standards by ESMA.

H.E. Abdulla Al Maeeni
Director General, ESMA

Emirates Authority For Standardization & Metrology

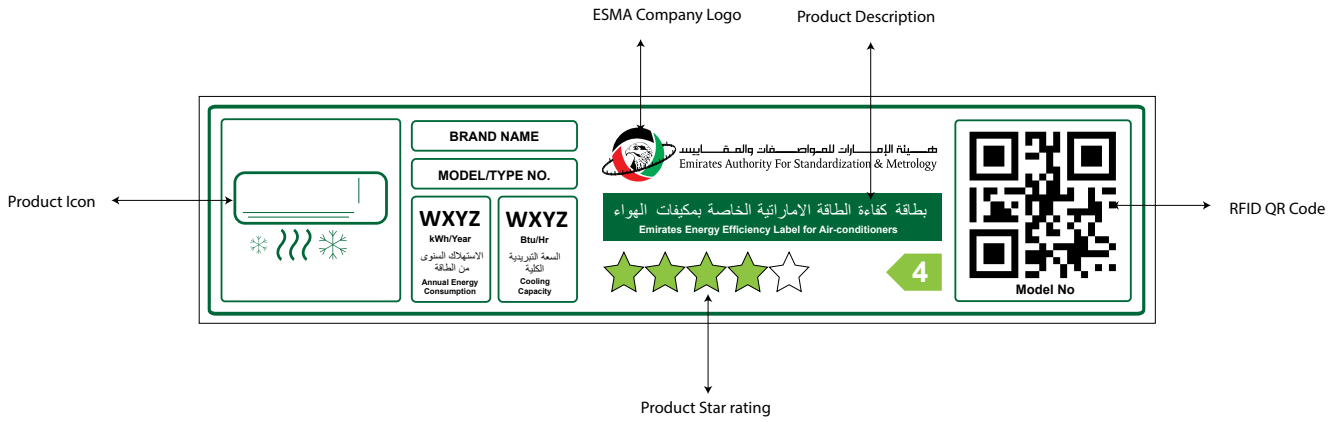


Figure 29: ESMA energy efficiency rating label design for air conditioners

Most large appliances used in UAE households are today subject to minimum energy performance standards and are required to display standardised comparative labels indicating their efficiency level. Appliances that do not meet the minimum efficiency standards (corresponding to 1-star on ESMA's labels) are not allowed to enter the UAE market. ESMA plans to gradually update these standards and labelling requirements to improve the efficiency of appliances sold in Ras Al Khaimah and the UAE.

In 2019, we implemented new energy efficiency standards and labels (EESL) for televisions (TVs). Updated standards for washing machines, dryers, and dishwashers were also published in 2019. Mandatory implementation of these updated standards will start from 2020, as we allow manufacturers and distributors some time to adapt to the new standards. Further, we are currently developing updated standards for air conditioners, refrigerators, freezers, and vacuum cleaners for future release. The timeline of EESL issuance by ESMA can be found below.

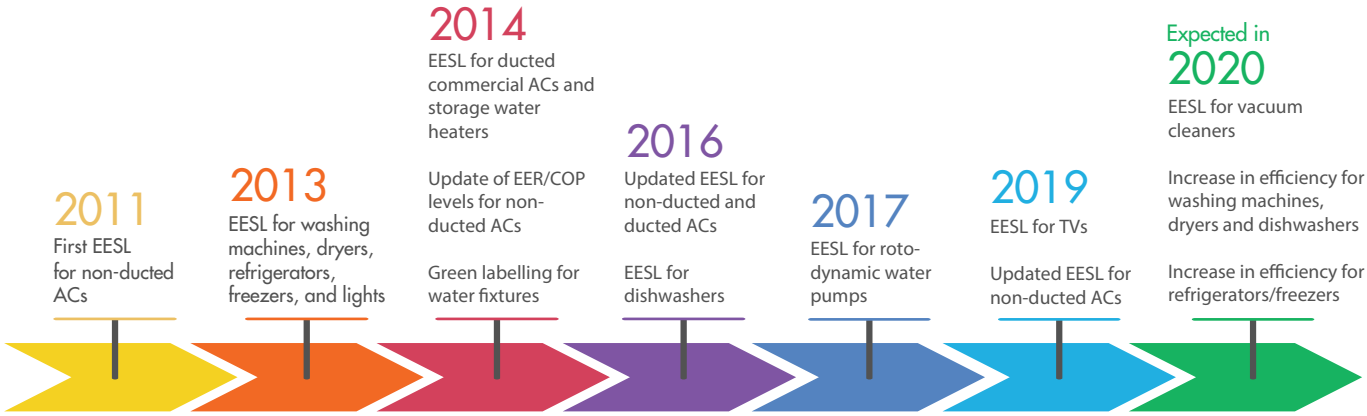


Figure 30: Timeline of EESL issuance and update

Consumer programs are another route being pursued to improve the usage of efficient appliances and equipment, by directly addressing household consumers of energy and water. We see two broad kinds of such consumer programs:

1) **Replacement programs**, where the direct replacement or upgrade of inefficient appliances in consumers' homes is facilitated or incentivised.

الهيئة الاتحادية للكهرباء والماء
Federal Electricity & Water Authority

Hind Rashid Al Ali
Director of Electricity and Water Conservation, FEWA

> An example of replacement programs is the Llkhair Nurshed Program for water fixtures and fittings, organised by FEWA. Under this program, water fittings and fixtures were replaced or upgraded in more than 15,000 villas and other buildings in Ras Al Khaimah.

2) **Promotional programs**, where new efficient appliances are promoted to consumers buying appliances through discounts or other incentive mechanisms. Ras Al Khaimah Municipality, in partnership with FEWA, is developing a pilot initiative of this type to be launched in 2020 - 2021.

> Reem is developing new promotional mechanisms to encourage the use of highly efficient 5-star rated domestic appliances, such as ACs, refrigerators and washing machines, in place of less efficient 1-star or 2-star rated appliances currently in popular use in Ras Al Khaimah.

Asma Abdulsalam Alshehhi
Energy Analyst, Reem, Ras Al Khaimah Municipality

3.5 Efficient Street Lighting

Program Owner: مؤسسة الأشغال Works Agency

Supporting Entity: الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority

Provision of street lighting is a necessity in modern urban environments. It is widely accepted across the world that street lighting adds considerably to the safety and to feelings of comfort and security in outdoor street environments. With this in mind, Ras Al Khaimah Vision 2030 targets achieving 65% coverage of street lighting by 2030.

Ahmed AlSayed Ban
Executive Director,
Works Agency,
Public Services Department

مؤسسة الأشغال Works Agency

The Works Agency of the Public Services Department is the government entity responsible for the construction, operation, and maintenance of street lights, among other infrastructure in Ras Al Khaimah. It manages over 2,000 kilometres of roads, of which about 400 kilometres are lit.

With the planned expansion of street lighting over the next decade, it becomes important to consider energy efficiency improvements in street lighting. The Works Agency is already committed to using LED technology for any new street lighting expansion works in Ras Al Khaimah. Apart from new street lights, we are gradually replacing existing high-pressure sodium vapour lights with LEDs, within our routine maintenance cycles. In 2019, we upgraded 18 kilometres of street lights to LEDs in this way and we replaced more than 800 individual luminaires. The pace of such lighting replacements is expected to remain steady over the coming years.

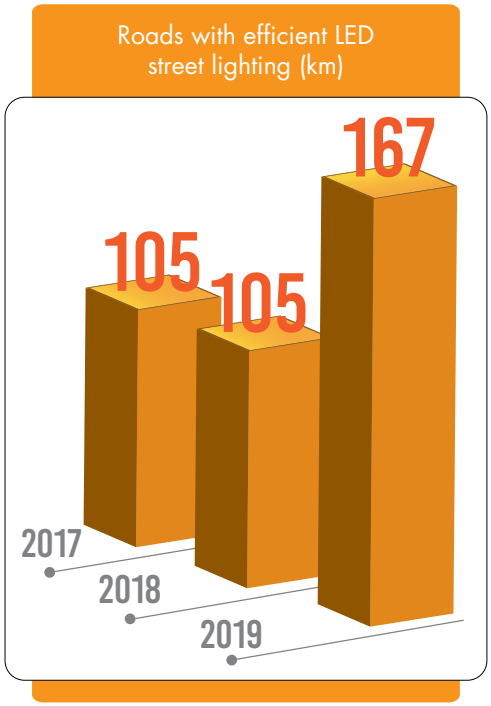


Figure 31: Operational KPI progress

In addition, we have initiated a study on reducing light pollution, with the objective of establishing a night sky protection regulation. This is expected to support sustainability in Ras Al Khaimah and further enhance energy efficiency in outdoor lighting.

Eyad Ismail
Group Director of Engineering, RAKEZ

"Apart from the public roads managed by the Works Agency, roads in the industrial zones are managed by RAKEZ. In 2019, RAKEZ initiated and completed its "Improvement of Street Lighting in Al Hamra Industrial Zone" project, to replace the conventional street lights on about 50 km of roads with energy efficient LEDs. We also installed cloud-based smart controls and a real-time monitoring system as part of this project. This not only improved the luminance level on the industrial zone roads but also resulted in direct energy savings of 70% and about 10% additional indirect savings from the improved lighting management, scheduling and controls."

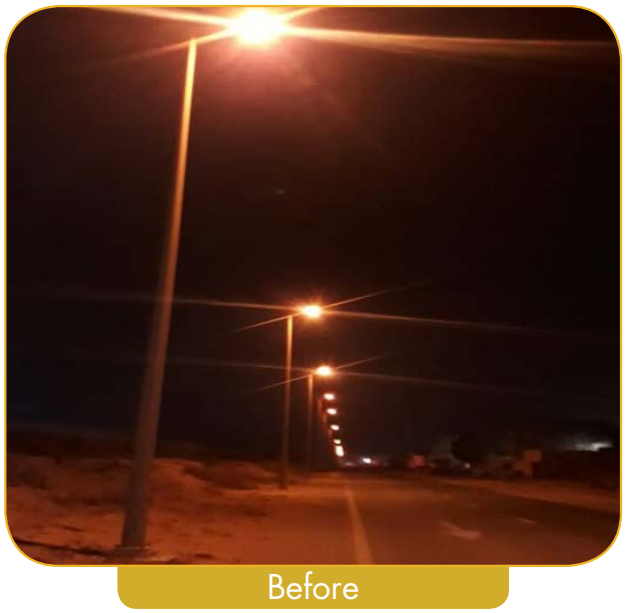


Figure 32: RAKEZ street lighting retrofit project

3.6 Water Reuse & Efficient Irrigation

Program Owner: مؤسسة الصرف الصحي Wastewater Agency; مؤسسة الزراعة التجميلية Landscape Agency

Supporting Entity: بلدية رأس الخيمة Ras Al Khaimah Municipality; reem

Alan Turner
Executive Director,
Wastewater Agency,
Public Services Department

مؤسسة الصرف الصحي Wastewater Agency

Savvas Othon
Executive Director,
Landscape Agency,
Public Services Department

مؤسسة الزراعة التجميلية Landscape Agency

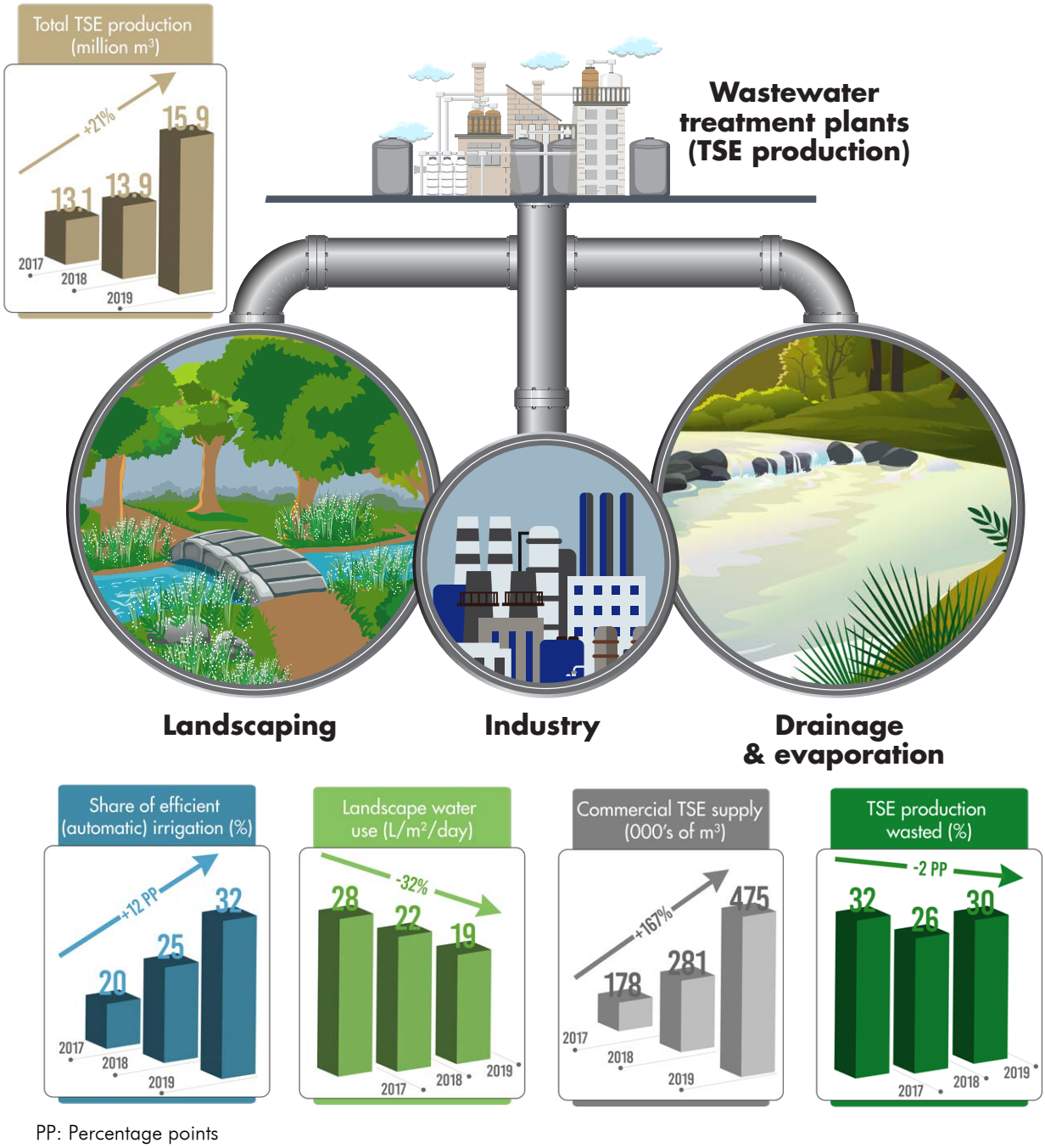
The Wastewater Agency and the Landscape Agency are sister government entities belonging to the Public Services Department of Ras Al Khaimah. They manage the wastewater collection and treatment system and develop public landscapes and parks, respectively. The two agencies are entering a new period of growth, as we have set ambitious targets of 95% reuse of treated wastewater (TSE) and 20m^2 per capita of total landscapes by 2030, in support of Ras Al Khaimah Vision 2030.

In 2019, the Wastewater Agency continued to develop and modernise its wastewater collection network. A significant achievement in 2019 was the development of our TSE sales business. We explored long-term bulk TSE sales with various private offtakers, and we expect to sign a first commercial bulk TSE sale agreement in 2020. We also completed a comprehensive master planning exercise for the wastewater network and treatment capacity of Ras Al Khaimah. The masterplan produced out of this exercise sets the roadmap for wastewater network development and treatment capacity expansion until 2043, and outlines the required projects and investments to achieve our targets for this program and for Vision 2030. We will begin implementing this master plan from 2020.

The Landscape Agency has built additional efficient landscapes in 2019, continuing from pilot projects in 2018. We are also working to develop new public landscaping standards. These standards incorporate all our learnings from pilot projects and from best practices across the world. We have already started adopting many aspects of these standards in our new projects, including a higher use of hardscaping, planting native or adaptive plant species, using drip irrigation and installing automated irrigation controls. We plan to finalise and adopt these standards in 2020.

Figure 33: New efficient landscapes in Ras Al Khaimah

Figure 34: Signing of an MoU for energy efficient wastewater treatment plants with the Water Efficiency Alliance MENA, facilitated by the Royal Danish Consulate in Dubai, on the occasion of WETEX



PP: Percentage points

Figure 35: Wastewater flows in Ras Al Khaimah

3.7 Solar Programs

Program Owner: بلدية رأس الخيمة Ras Al Khaimah Municipality; reem

Supporting Entities: مكتب الاستثمار والتطوير حكومة رأس الخيمة Investment & Development Office Government of Ras Al Khaimah; مؤسسة إدارة المخلفات Waste Management Agency

Ras Al Khaimah offers consistent solar irradiation, with over 300 days of sunshine a year, suitable land areas, and an abundance of buildings with roofs suitable for solar installations. We are putting in place Solar Programs to address this opportunity to improve energy sustainability and competitiveness in Ras Al Khaimah, through regulatory enablers, pilot projects and capacity building initiatives. We have an ambitious target of 1,200 MWp of solar capacity in Ras Al Khaimah by 2040, of which 600 MWp is expected to come from distributed installations, while another 600 MWp is expected from utility-scale developments.

Anoop Babu,
Renewable Energy Manager,
Reem,
Ras Al Khaimah Municipality

reem بلدية رأس الخيمة Ras Al Khaimah Municipality

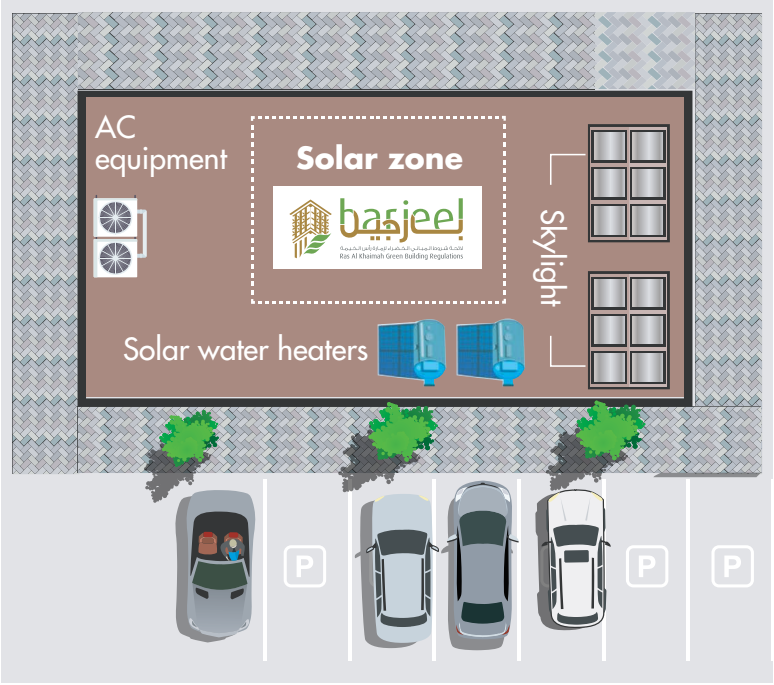


Figure 36: Solar-ready regulations in Barjeel

Policies and regulations that set the conditions for renewable energy generation projects to be connected to the grid are the most important enablers of this program. We believe that an ideal regulatory framework for Ras Al Khaimah would include a net-metering regulation for distributed solar installations, and a set of IPP policies for utility-scale installations. We rely on federal authorities, including the UAE Ministry of Energy and Industry, and FEWA, for the development of these regulations, and we hope for their speedy issuance and implementation. In parallel to these regulatory enablers, Ras Al Khaimah Municipality has implemented solar readiness requirements for new buildings, as part of Barjeel. These requirements ensure that new buildings be largely ready to benefit from future solar rooftop installations.

Figure 37: Construction of solar carports at Ras Al Khaimah Municipality

In the meantime, some pilot projects have begun implementation in Ras Al Khaimah. The Municipality is building a solar carport of 230 kWp capacity at its head office, which is on track to be commissioned in early 2020. A larger carport project of 1 MWp capacity is under construction at the Mina Al Arab community.

Apart from the pilot projects, Reem is preparing for a first phase of distributed solar projects for implementation before a net-metering scheme is adopted. About 45 MWp of solar project opportunities are being considered for this phase, with support from the Investment and Development Office of Ras Al Khaimah. Reem and FEWA are studying these project opportunities from a regulation and grid management point of view. This first phase is expected to be tendered in 2020 with a zero-energy-export system. When more favourable federal regulation is introduced, these projects may be further extended, depending on the consumption and needs of the end-customers.

As we enter 2020, Reem is expected to study the potential of other applications of renewable energy in Ras Al Khaimah; this includes floating solar PV, solar absorption cooling, concentrated solar thermal energy, and wind energy. Initial evaluations of utility-scale solar have also begun, and land areas are being studied in preparation for future projects.

3.8 Energy from Waste

Program Owner: مؤسسة إدارة المخلفات Waste Management Agency

Supporting Entity: مؤسسة الصرف الصحي Wastewater Agency

The Waste Management Agency is responsible for the safe and timely collection, recycling, treatment and disposal of all the solid waste generated in Ras Al Khaimah. The Energy from Waste Program of the EE&R Strategy was developed as an integral part of the waste management strategy of Ras Al Khaimah.

The Energy from Waste Program is planned in two phases:

1) an initial phase of studies and pilots (2018 – 2020), when various diversion options and energy outcomes are explored for different waste streams and the best options are selected; and

2) a subsequent phase of implementation (2021 onwards), when the waste treatment options selected in the first phase are implemented.

Oussama Al Natour
Executive Director,
Waste Management Agency,
Public Services Department

مؤسسة إدارة المخلفات
Waste Management Agency

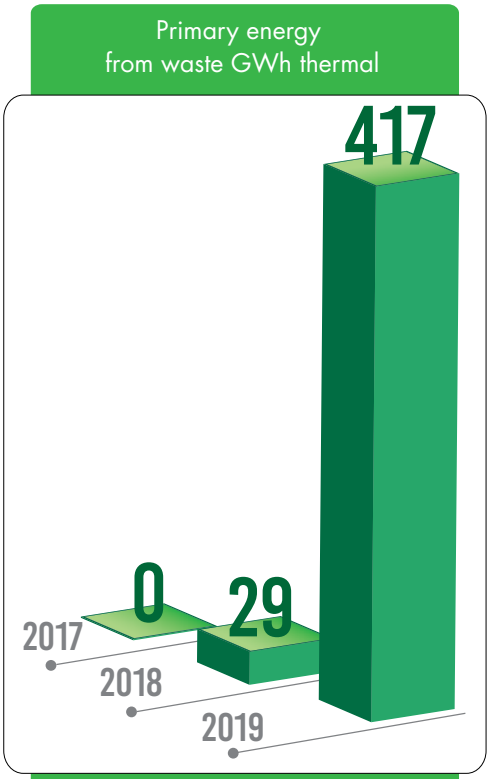


Figure 38: Operational KPI progress

We are currently in the first phase of implementation, and accordingly we have completed several studies and pilots over the last two years, for energy production from various waste types, including camel waste, wood waste, waste tires, textile waste, mixed solid waste (MSW), used cooking oil, and brown grease.

Several of these pilots have already resulted in large-scale waste diversion towards energy outcomes. In particular, we have achieved great success in diverting camel waste, wood waste, waste tires and used cooking oil towards energy outcomes. Camel waste, wood waste and waste tires are used as alternative fuels to substitute coal in cement plants in Ras Al Khaimah, while the used cooking oil is recycled into biodiesel for use in trucks. The use of alternative fuels at cement plants is expected to continue to increase as the UAE Ministry of Climate Change and Environment issued Decree No. 98 of 2019, mandating the use of refuse-derived fuel (RDF) for at least 10% of the energy needs of cement plants in the UAE.

In 2018, we began pilot projects for diversion of green waste, brown grease, textile waste, dry sludge, and other waste types. Many of these pilots explore energy outcomes, mainly through incineration or conversion into alternative fuels. We reached a preliminary agreement with UTICO on a first landfill gas to electricity project. Other treatment options for MSW such as waste to energy incineration or RDF production are being explored in coordination with the UAE Ministry of Climate Change and Environment. These studies and project explorations are expected to bear fruit in the coming years.

An important enabler for the Energy from Waste Program is segregation of waste at source generation. Segregation of MSW enables composting or digestion of its organic components such as food waste and green waste. Segregation of construction and demolition (C&D) waste enables recycling of sand and aggregates, and also the diversion of wood waste to energy outcomes. In 2019, the Waste Management Agency took the first steps towards implementing C&D waste segregation on-site. Workshops with construction companies were held to explain the right methods of C&D waste segregation aligned with onsite training and proper disposal. C&D waste segregation will be made mandatory at all large construction sites as part of Barjeel, from early 2020.

Figure 39: Workshops on segregation and disposal of construction and demolition waste

3.9 Efficient Vehicles

Program Owner: الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority

Supporting Entity: بلدية رأس الخيمة Ras Al Khaimah Municipality, reem

The Efficient Vehicles Program addresses energy efficiency in the transportation sector of Ras Al Khaimah. It promotes the adoption of electric, hybrid and fuel-efficient conventional vehicles in the fleet of the Emirate. Through this program, we target electric and hybrid vehicle sales to reach 50% of the total new vehicle sales in Ras Al Khaimah by 2040.

Several initiatives for promoting electric vehicles are underway. In terms of infrastructure, by the end of 2019, FEWA has installed nine EV charging stations in key areas of Ras Al Khaimah, and these are being fitted with an authentication and payment system. In addition to this, the Ras Al Khaimah Government has installed three EV charging stations at their offices. Free charging is available at all FEWA EV charging stations until the end of 2020. By the end of 2019, 17 electric and 738 hybrid vehicles were registered in Ras Al Khaimah. These EVs can avail of the registration fee waiver offered by Ras Al Khaimah Police and discounted insurance rates offered by RAK Insurance.

Salim Bin Rabee'a
Executive Director, Electricity Directorate, Federal Electricity & Water Authority

الهيئة الاتحادية للكهرباء والماء
Federal Electricity & Water Authority

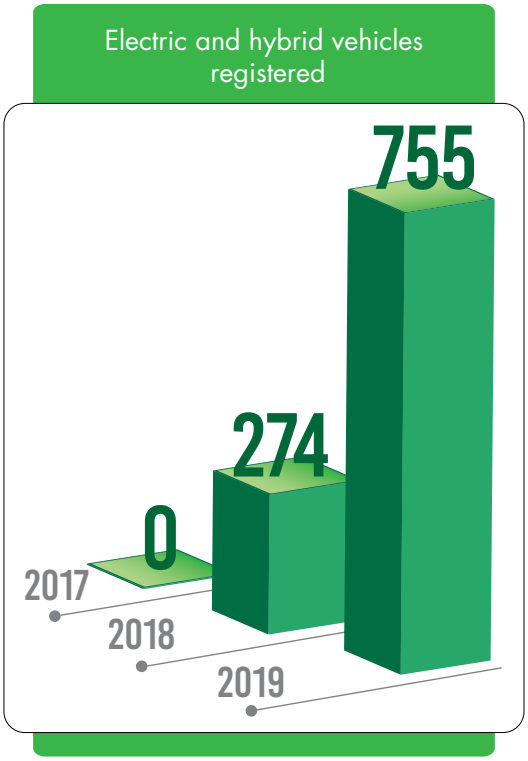


Figure 40: Operational KPI progress

First Lieutenant Jarrah Al Tair
Ras Al Khaimah Police

> "Ras Al Khaimah Police is proud to support the Efficient Vehicles Program by waiving all registration fees for EVs until 2021. We also plan to install EV charging stations at our new police station in Al Dhait, in line with Barjeel requirements for government buildings."

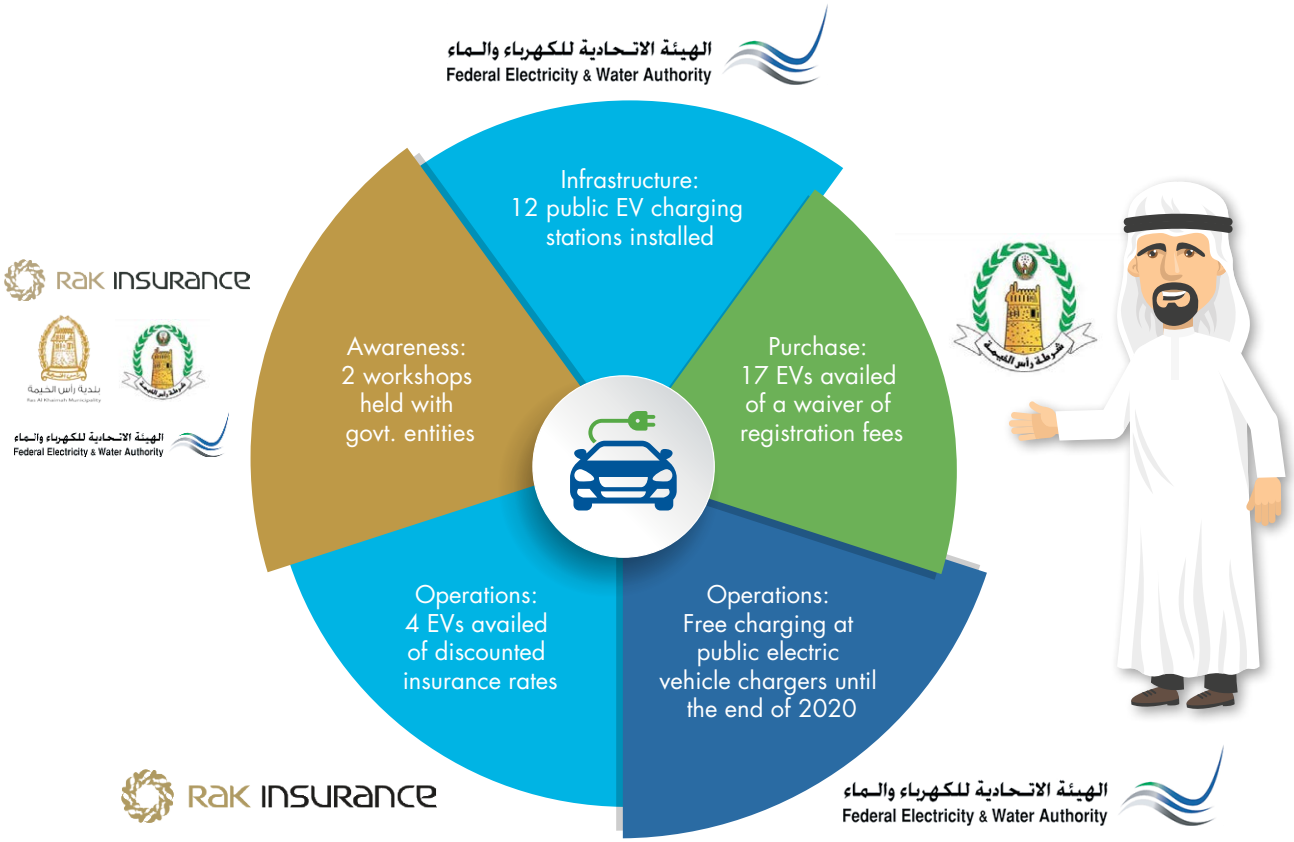


Figure 41: Initiatives to promote electric vehicles

Natalie Joseph
Energy Analyst, Reem,
Ras Al Khaimah Municipality

> The Government of Ras Al Khaimah has exceeded its target of 30% procurement of efficient vehicles, set in Amiri Resolution No. 34 of 2018, in the first year of implementation. About 82% of the new vehicle purchases of the Government of Ras Al Khaimah in 2019 were efficient vehicles, and 72% were either electric or hybrid vehicles. Periodic training workshops were conducted by Reem to support purchase decisions. Ras Al Khaimah Transport Authority also procured a large number of new hybrid taxis in 2019.

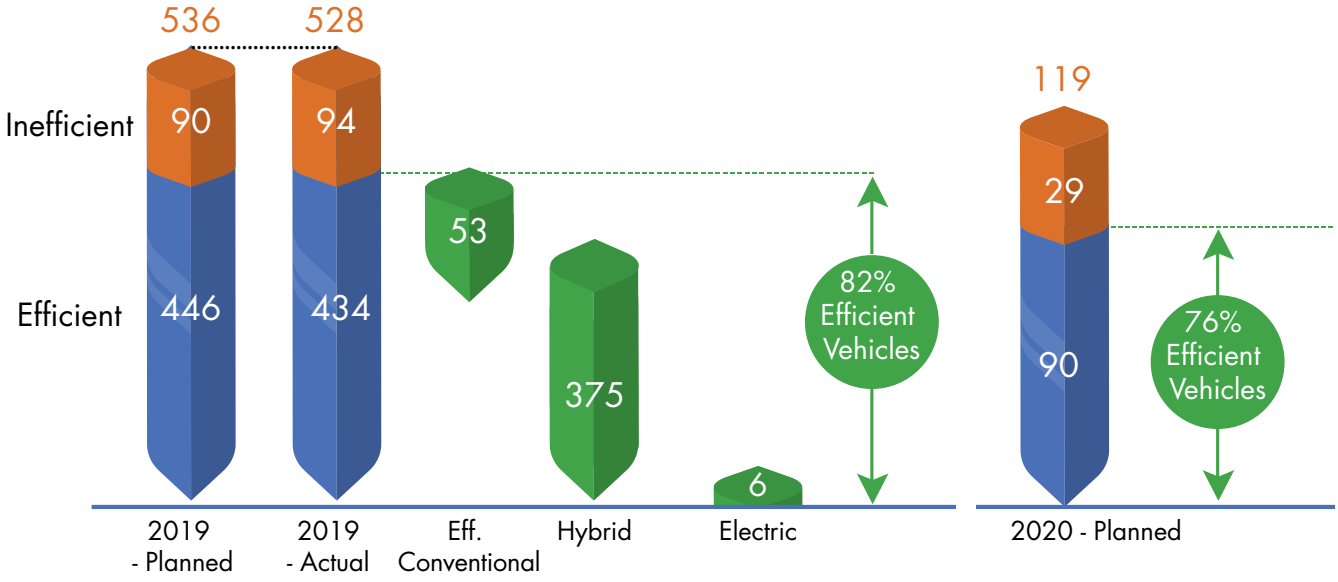
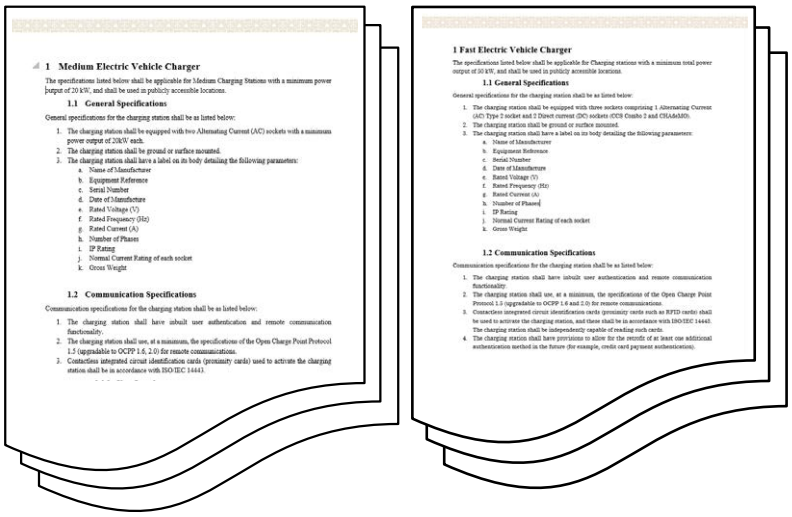


Figure 42: Government vehicle purchases in 2019 and planned purchases in 2020

Figure 43: Workshops on efficient vehicles and electric vehicles organised by the Municipality in collaboration with the Department of Finance



1 Medium Electric Vehicle Charger

The specifications listed below shall be applicable for Medium Charging Stations with a minimum power [output of 20 kW, and shall be used in publicly accessible locations.

1.1 General Specifications

General specifications for the charging station shall be as listed below:

1. The charging station shall be equipped with two Alternating Current (AC) sockets with a minimum power output of 20KW each.
2. The charging station shall be ground or surface mounted.
3. The charging station shall have a label on its body detailing the following parameters:
   a. Name of Manufacturer
   b. Equipment Reference
   c. Serial Number
   d. Date of Manufacture
   e. Rated Voltage (V)
   f. Rated Frequency (Hz)
   g. Rated Current (A)
   h. Number of Phases
   i. IP Rating
   j. Normal Current Rating of each socket
   k. Gross Weight

1.2 Communication Specifications

Communication specifications for the charging station shall be as listed below:

1. The charging station shall have inbuilt user authentication and remote communication functionality.
2. The charging station shall use, at a minimum, the specifications of the Open Charge Point Protocol 1.5 (upgradable to OCPP 1.6, 2.0) for remote communications.
3. Contactless integrated circuit identification cards (proximity cards) used to activate the charging station shall be in accordance with ISO/IEC 14443.

1 Fast Electric Vehicle Charger

The specifications listed below shall be applicable for Charging stations with a minimum total power output of 50 kW, and shall be used in publicly accessible locations.

1.1 General Specifications

General specifications for the charging station shall be as listed below:

1. The charging station shall be equipped with three sockets comprising 1 Alternating Current (AC) Type 2 socket and 2 Direct current (DC) sockets (CCS Combo 2 and CHAdeMO).
2. The charging station shall be ground or surface mounted.
3. The charging station shall have a label on its body detailing the following parameters:
   a. Name of Manufacturer
   b. Equipment Reference
   c. Serial Number
   d. Date of Manufacture
   e. Rated Voltage (V)
   f. Rated Frequency (Hz)
   g. Rated Current (A)
   h. Number of Phases
   i. IP Rating
   j. Normal Current Rating of each socket
   k. Gross Weight

1.2 Communication Specifications

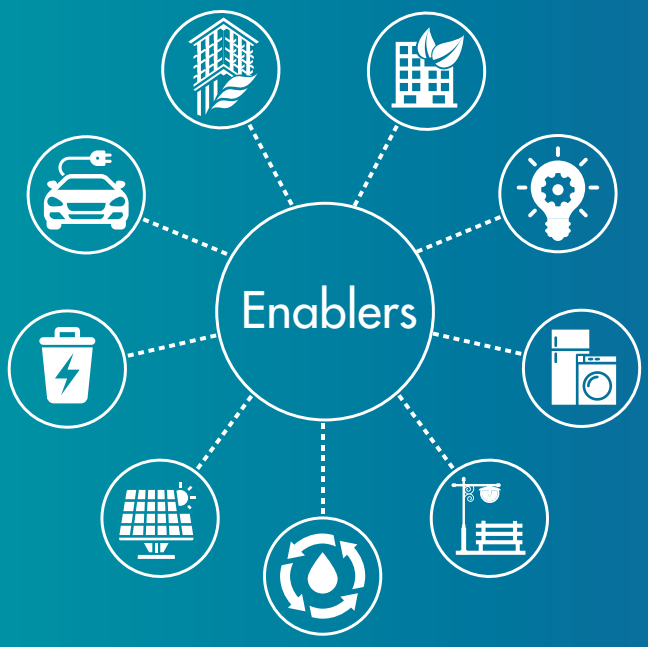
Communication specifications for the charging station shall be as listed below:

1. The charging station shall have inbuilt user authentication and remote communication functionality.
2. The charging station shall use, at a minimum, the specifications of the Open Charge Point Protocol 1.5 (upgradable to OCPP 1.6 and 2.0) for remote communications.
3. Contactless integrated circuit identification cards (proximity cards such as RFID cards) shall be used to activate the charging station, and these shall be in accordance with ISO/IEC 14443. The charging station shall be independently capable of reading such cards.
4. The charging station shall have provisions to allow for the retrofit of at least one additional authentication method in the future (for example, credit card payment authentication).

Figure 44: Standards for electric vehicle charging stations

In addition to this, Ras Al Khaimah Municipality has developed standards for electric vehicle charging stations (EVCS) to homogenise their technical specifications across Ras Al Khaimah. These standards are made available to government and semi-government entities in the procurement of EV charging stations.

Going forward, we will continue to deploy EVCS and monitor their usage. Ras Al Khaimah Municipality has also recently initiated a project to map all public and private EV charging stations in Ras Al Khaimah, to make sure they are visible to EV users online. Initial steps are also being made to standardise EVCS signage across the Emirate. These initiatives will support successful implementation of the program in the coming years.



ENABLERS: FOCUS ON AWARENESS AND CAPACITY BUILDING

4 ENABLERS: FOCUS ON AWARENESS AND CAPACITY BUILDING

Implementation of the EE&R Strategy is supported by several enablers, which are meant to set favourable conditions for government, businesses and residents to participate in the programs by removing barriers and by providing incentives, where necessary.

The main enablers include:

1) **Policy & regulations:** adopting regulatory measures to promote implementation of the programs

2) **Financing mechanisms:** facilitating investments in energy efficiency & renewable energy projects in Ras Al Khaimah

3) **Research & innovation:** supporting research and development of new energy-efficient solutions and technologies

4) **Information systems:** creating tools to support projects and monitor the progress of the EE&R Strategy

5) **Awareness & capacity-building:** developing efficiency-consciousness in Ras Al Khaimah society, and building local skills and capacities.

We will focus this section of the annual report on awareness and capacity building, since progress on other enablers has been largely covered in other chapters, and given the relevant developments that took place in the field in 2019.

Awareness refers to recognition of the need for energy sustainability, knowledge and skills in technologies and methods that may be used to achieve it, and consumption behaviours that favour a more sustainable energy and water system in Ras Al Khaimah. Awareness can be spread in many ways, such as through traditional mass media communication (television or newspapers), social media networks, events, competitions and other forms of direct communication. Leadership by example is a key mechanism supporting awareness, and this has driven the efforts made by the Government of Ras Al Khaimah in showcasing examples of sustainability across multiple initiatives.

Capacity building refers to the development of specialised technical and managerial skills required to execute energy efficiency and renewables projects in Ras Al Khaimah. This is expected to take place by establishing mechanisms that support the development of specialised private sector business activities, attracting relevant talent, and training of existing organisations and residents.

Figure 45: Green procurement stakeholder engagement workshop

4.1 Green Procurement

H.E. Dr. Saif Al Ghais
Director General,
Environment Protection and Development Authority

هيئة حماية البيئة والتنمية
Environment Protection & Development Authority

EPDA began pilot projects for green procurement in 2018, with the launch of green fishing ports across Ras Al Khaimah.

In 2019, together with the Municipality, we have begun the development of green procurement guidelines for the Government of Ras Al Khaimah. A core team comprising of EPDA and Municipality experts is preparing these guidelines in consultation with an extended team of procurement managers from the largest government entities in Ras Al Khaimah. These guidelines are expected to set minimum standards and purchase criteria for commonly procured items such as office consumables, vehicles, large appliances, lights and electronic equipment; as well as for frequently procured services like janitorial services and printing.

Green procurement guidelines will spread awareness of the role of purchases in energy and water conservation, and will also give procurement staff the tools necessary to purchase in a more sustainable manner. Benefits will extend beyond energy and water savings, to include environmental protection and well-being of employees and residents. The project team is expected to develop a draft of these guidelines in 2020, with training of procurement staff and roll-out on track for 2021.

4.2 Supply Market Development

Akshay Datar
Senior Strategic Planning Specialist, Reem,
Ras Al Khaimah Municipality

reem

بلدية رأس الخيمة
Ras Al Khaimah Municipality

As part of Reem's mandate, we are working on a roadmap to expand and improve the supply market for goods and services in the energy efficiency and renewables sector in Ras Al Khaimah. Supply market development has multiple benefits for Ras Al Khaimah, apart from supporting the EE&R Strategy, including:

1) Creation of additional skilled and unskilled employment opportunities,
2) Diversification of the economy,
3) Attraction of high-tech investments to Ras Al Khaimah, and
4) Intensification of bonds with international markets.

Our supply market development roadmap aims to do so using two levers:

1) Attracting specialised companies from other geographies, and
2) Supporting the development of local start-ups and SMEs.

We have activated the first phase of this roadmap in 2019, including direct outreach to leading international businesses and introduction of segment-wide incentives for specific types of activities. RAKEZ has provided considerable support to this initiative, by reaching out to over 100 large companies across the world to discuss opportunities for set up in Ras Al Khaimah. Initial successes have been achieved, and we expect more invited companies in the energy efficiency and renewables sector to set up in Ras Al Khaimah soon.

Ras Al Khaimah has put in place the first segment-wide incentive scheme in 2018, targeting ESCOs and Energy Auditors. The incentives are provided through RAKEZ and the Department of Economic Development and are in the form of highly discounted business set-up fees. Positive results are visible already, with three ESCOs and three Energy Auditors already established in Ras Al Khaimah in 2019, benefitting from favourable cost conditions.

Figure 46: Segment-wide incentives for ESCOs and Energy Auditors

John Cunliffe
Strategic Business Development Director, RAKEZ

> Ras Al Khaimah has everything it takes to be a leading destination for investments in the sustainable energy space, and we are actively supporting sustainable energy projects together with Reem. We believe that energy sustainability projects will further cement Ras Al Khaimah's position as a global investment hub, and all of us at RAKEZ are excited about this new strategic direction. We encourage all investors in the energy sustainability field, who are looking at expanding to the Middle East market, to come and see first-hand what Ras Al Khaimah can offer; and we are all confident that they will find what they are looking for.

Figure 47: Internal supply market development strategy workshop

Figure 48: Selected events and discussions with businesses and industry bodies towards supply market development

4.3 Events and Outreach

The year 2019 marked the activation of multiple awareness initiatives.

Stakeholder awareness was pursued through multiple thematic workshops and events involving the main participants in the EE&R Strategy programs: government entities, real estate developers, contractors, consultants, suppliers, and research institutions. The EE&R Strategy also saw a more regular and extended representation in traditional media, particularly in specialised industry publications. In addition, social media channels were used to reach out to the local business community and the general public.

Ruqiya Shariff
Awareness & Capacity Building Manager,
Reem,
Ras Al Khaimah Municipality

In 2019, apart from our participation in various internal and external events, Reem has begun preparations for a first RAK Energy Summit. The summit will bring together international thought-leaders and decision makers from the government and the private sector, on the themes of energy efficiency and renewable energy. The summit aims to put Ras Al Khaimah on the map for global energy leaders and companies, while simultaneously increasing the awareness of local stakeholders towards energy sustainability. To learn more about the summit, visit www.rakenergysummit.com

RAK ENERGY SUMMIT
قمة رأس الخيمة للطاقة

Important awareness activities in 2020 will include a social media campaign addressing the general public (#EnergyinYourHands) and a school competition (#RAKinnovates). Preparations for both were nearly complete at the end of 2019, with an assigned team, a detailed plan and the required partnerships.

Figure 49: Energy efficiency workshop for school principals and coordinators organised by Reem

Arab Ministerial Forum on Housing and Sustainable Urban Development, Dubai

Green Buildings, District Cooling and Retrofits Seminar, Dubai

Global Conference on Energy Efficiency, Dublin

Arabian Hotel Investment Conference, Ras Al Khaimah

International Conference on Global Warming, Ras Al Khaimah

EmiratesGBC Congress, Dubai

Earth Hour Celebration, Ras Al Khaimah Heritage Village

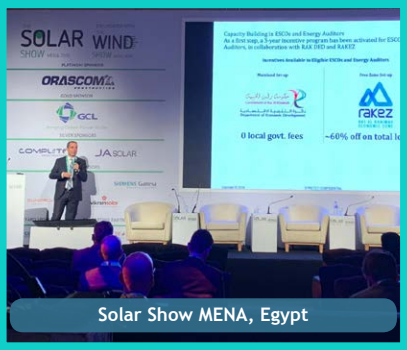
Sustainable Hospitality Conference, Ras Al Khaimah

Danish Trade Council Energy Efficiency Seminar, Ras Al Khaimah

Climate Control Awards, Dubai

RetrofitTech MENA, Dubai

CEBC MENA Knowledge Summit, Dubai



Solar Show MENA, Egypt


VRF Conference, Ras Al Khaimah


Workshop with Dubai Chamber


German Energy Efficiency Symposium, Dubai


Workshop with Al Ain Zoo

EmiratesGBC and Ras Al Khaimah Municipality Workshop, Ras Al Khaimah


WETEX, Dubai


WETEX, Dubai


WETEX, Dubai

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4.4 Partnerships & Collaboration

Reem and other program owners joined forces with many other government entities, industry associations, and private entities in 2019, to carry out studies, share know-how, and begin partnerships in support of the EE&R Strategy. Some of these partnerships were formalised in MoUs, while others were carried out on the basis of mutual interest and trust. Some of the most prominent of the new partnerships and collaborations are featured below.

Emirates Green Building Council


Danish Trade Council

Grundfos


Eurovent Middle East

OUTLOOK FOR THE FUTURE

5 OUTLOOK FOR THE FUTURE

Implementation of all programs of the EE&R Strategy is being accelerated and scaled up in the ongoing ramp-up phase of the strategy. The year 2020 is expected to be the first with full-scale implementation of some key programs.

Barjeel, the Green Building Regulations of Ras Al Khaimah, will apply to all new buildings on a mandatory basis from the end of January 2020. More buildings will be addressed by the Retrofit Program. The Energy Management Program and Efficient Vehicles Program will expand through government and semi-government entities. New awareness initiatives, such as a competition for schools (#RAKinnovates) and a social media campaign (#EnergyInYourHands), prepared in 2019, will be executed in 2020. A promotional program for efficient appliances will be prepared. Capacity building initiatives, such as green procurement, will also be formalised and implemented.

As this report is being written, we are entering a challenging period due to the health and economic effects of the COVID-19 pandemic. Established plans for many activities are being re-examined and re-prioritised to ensure resource efficiency in the short term. However, fortunately, the most important objectives and initiatives in the EE&R Strategy implementation plan for 2020 remain relevant, and program owners will continue to work towards them. The most important of those are summarised here:

1) Implement Barjeel on a mandatory basis for all new buildings in Ras Al Khaimah

2) Complete the development of guidelines and regulations for sustainable communities and prepare for their implementation

3) Expand the retrofit program to address a larger number of existing government buildings and implement initial steps in energy management in all government entities, towards the targets set by Amiri Resolution No. 15 of 2018

4) Prepare a first promotional program to encourage adoption of efficient appliances, for launch in late 2020 or in 2021, depending on the situation imposed by the COVID-19 pandemic

5) Finalise and implement new standards for public landscaping, in line with the upcoming guidelines for sustainable communities

6) Continue to retrofit existing street lighting, while supporting federal projects to extend efficient lighting to additional streets

As implementation of the programs expands, Reem will continue to monitor and support the EE&R Strategy. The main priorities of Reem in this regard are as follows:

1) Continue to optimise the M&V methodology and risk management process for the EE&R Strategy

2) Continue to enhance the regulatory framework in support to the programs

3) Provide coordination and support to existing and new projects in the Retrofit, Energy Management and Solar Programs

4) Reinforce market awareness through new initiatives and events, and keep building capacity by promoting participation of the private sector

5) Explore new business models and financing mechanisms for retrofit and solar PV projects as well as for the development of additional waste to energy capacity.

ACKNOWLEDGEMENTS

6 ACKNOWLEDGEMENTS

We are grateful to all the distinguished leaders, colleagues and advisors, who have made the achievements of the EE&R Strategy of 2019 possible. In particular, we would like to express our deep gratitude to H.H. Sheikh Saud bin Saqr Al Qasimi, Supreme Council Member and Ruler of Ras Al Khaimah, H.H. Sheikh Mohammed bin Saud bin Saqr Al Qasimi, Crown Prince of Ras Al Khaimah and Chairman of the Executive Council, H.E. Munther Mohammed bin Shekar, the Director General of Ras Al Khaimah Municipality, and executives and peers from the following entities (in alphabetical order):

Department of Economic Development

Department of Finance

Dubai Supreme Council of Energy

Regulatory & Supervisory Bureau (Dubai)

Emirates Authority for Standardization and Metrology

Emirates Green Building Council

Environment Protection and Development Authority

Executive Council of Ras Al Khaimah

Federal Electricity and Water Authority

Investment and Development Office

Masdar (Abu Dhabi Future Energy Company)

UAE Ministry of Energy and Industry

Public Services Department

Ras Al Khaimah Economic Zone

Ras Al Khaimah Municipality

Ras Al Khaimah Police

Ras Al Khaimah Ruler's Office

Ras Al Khaimah Statistics Center

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7 GLOSSARY OF TERMS

AC: Air Conditioner

AED: UAE Dirhams

Barjeel: The Green Building Regulations of Ras Al Khaimah

BIG: Billion Imperial Gallons

btu: british thermal units

COVID-19: Coronavirus Disease – 2019

C&D: Construction and Demolition

EESL: Energy Efficiency Standards and Labels

EE&R Strategy: Energy Efficiency & Renewables Strategy 2040

EmiratesGBC: Emirates Green Building Council

EPDA: Environment Protection and Development Authority

ESCO: Energy Service Company

ESMA: Emirates Authority for Standardization & Metrology

EV: Electric Vehicle

EVCS: Electric Vehicle Charging Station

FEWA: Federal Electricity and Water Authority

GDP: Gross Domestic Product

GWh: Gigawatt-hours

hr: hours

H.E.: His Excellency

IDO: Investment and Development Office

ISO: International Organization for Standardization

IT: Information Technology

kWh: kilowatt-hours

kWp: kilowatts-peak

LED: Light Emitting Diode

m: metres

m^2: square metres

m^3: cubic metres

MIG: Million Imperial Gallons

MoU: Memorandum of Understanding

MSW: Mixed Solid Waste

MW: Megawatts

MWp: Megawatts-peak

M&V: Measurement and Verification

PP: Percentage Points

PSD: Public Services Department

PV: Photovoltaic

P.O.: Post Office

RAK Academy: Ras Al Khaimah Academy

RAK Insurance: Ras Al Khaimah National Insurance Company

RAKEZ: Ras Al Khaimah Economic Zone

Reem: The Energy Efficiency & Renewables Office of Ras Al Khaimah

RDF: Refuse-Derived Fuel

SME: Small and Medium Enterprise

TSE: Treated Sewage Effluent

TWh: Terawatt-hours

UAE: United Arab Emirates

UTICO: Utico FZC

WETEX: Water, Energy, Technology and Environment Exhibition

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reem

فريق رأس الخيمة لكفاءة الطاقة والطاقة المتجددة

RAK ENERGY EFFICIENCY AND RENEWABLES TEAM