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

بـلديـــة رأس الخـيـمـة
Ras Al Khaimah Municipality

Energy Management Initiatives in the Government of Ras Al Khaimah

Report

August 2021

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Citation
Reem (Energy Efficiency and Renewables Office), Ras Al Khaimah Municipality, 2021 – Energy Management Initiatives in the Government of Ras Al Khaimah.

1 Summary

Energy and water are central to the policy agenda of the Government of Ras Al Khaimah, and in 2018, the Energy Efficiency & Renewables (EE&R) Strategy 2040 was adopted to support competitiveness of the economy, through efficient use and cost-competitive, available and reliable supply of energy and water. The EE&R Strategy envisages the government as a champion in adopting energy efficiency solutions. In line with this vision, the Government of Ras Al Khaimah set the ambition to be the first ISO 50001:2018 compliant local government by 2023.

Government adoption of energy efficiency was mandated through a directive, Amiri Resolution No.15 of 2018, setting an overall target of 20% energy and water savings by 2022 for the entire Government of Ras Al Khaimah. A government organisation: Energy Efficiency and Renewables Office (Reem) in Ras Al Khaimah Municipality has been assigned the task to coordinate implementation. Following this mandate, a plan was prepared to reach the target. This plan, shown in figure 1, is largely on track as this paper is being written.

All the initiatives of the plan have yielded successful results. Savings of over AED 400,000 (EUR 92,000) were obtained in the first year of operations following the Municipality retrofit project, setting a successful example to be followed by other organisations. An energy management system was deployed at the Municipality and is undergoing an ISO 50001:2018 certification process. A quick-win initiative was also implemented across 23 government entities, leading to about 8% energy savings in the summer of 2020 vs. 2019, after adjusting for differences in weather conditions. These savings are additional to those attributable to reduced office occupancy due to the COVID-19 pandemic. While quick-wins were being implemented, Reem began preparations to extend the energy management system to other government entities. ISO 50001:2018 is the guiding standard for this initiative, as it was for the Municipality.

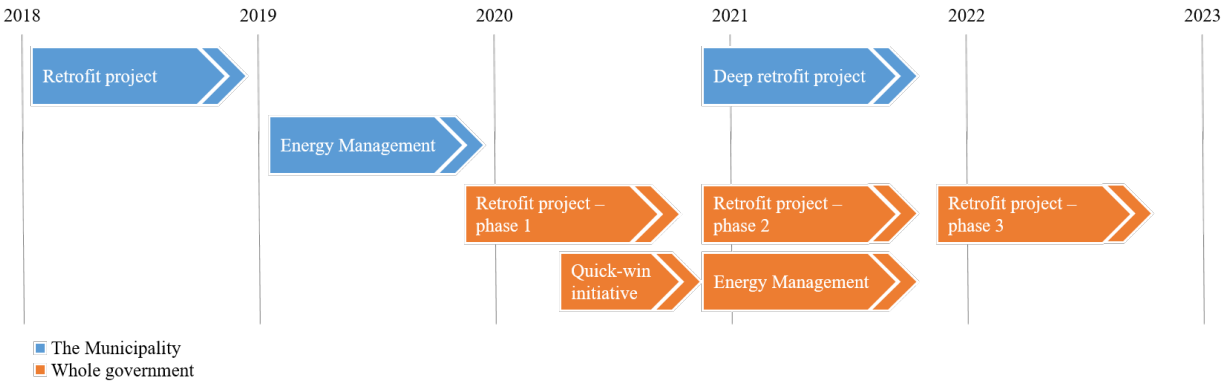


Figure 1: Timeline to reach energy management targets for Ras Al Khaimah government. Source: Reem

The case of retrofits and energy management in the Government of Ras Al Khaimah provides some key learnings or conclusions that may be applicable to other governments in the region and the world. These learnings are listed below:

1) A well-implemented, low investment approach can lead to significant energy savings.
2) Starting with quick-wins can support the case for more comprehensive measures.
3) Regular monitoring and reporting seems to be the most effective quick-win.
4) A centralised approach supports faster and more complete participation, as well as cross-learnings.
5) A small control team, for example, positioned within an energy agency, can easily coordinate activities across a large number of government entities (the whole-government energy management initiative was entirely driven by three employees of Reem working for about 20% of their time; a key input to make this possible is the support of government leadership in obtaining high degrees of participation from government entities).

2 Introduction

2.1 Ras Al Khaimah

Ras Al Khaimah is the fourth-largest emirate in the United Arab Emirates, occupying an area of 2,478 km^2 with a population of about 400,000 residents. The emirate is governed under the leadership of UAE Supreme Council Member and Ruler of Ras Al Khaimah, His Highness Sheikh Saud bin Saqr Al Qasimi, and the Crown Prince, His Highness Sheikh Mohammed bin Saud bin Saqr Al Qasimi.

2.2 Ras Al Khaimah Energy Efficiency & Renewables Strategy 2040

Ras Al Khaimah is undergoing a remarkable transformation and growth in multiple sectors of its economy. Energy and water are central to the policy agenda of the Government of Ras Al Khaimah, and in 2018, the Energy Efficiency & Renewables (EE&R) Strategy was adopted to support competitiveness of the economy in different ways, through efficient energy use and cost-competitive, available and reliable energy supply. The EE&R Strategy targets 30% energy savings, 20% water savings and 20% contribution from renewables by 2040. It comprises nine (9) programs, which are briefly described in figure 2.

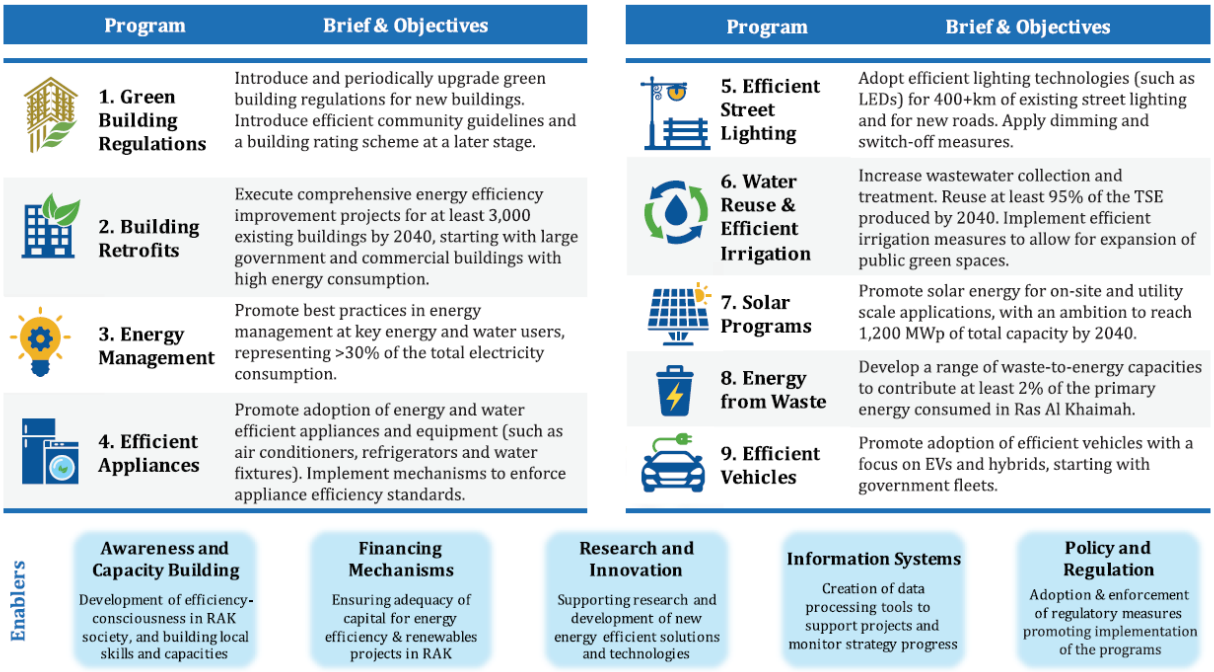


Figure 2: EE&R Strategy Programs. Source: Reem

More information on the EE&R Strategy and its programs is available on the website of Reem, www.reem.rak.ae.

2.2.1 Building Retrofits Program

Existing buildings represent the majority of electricity consumption and a large portion of water consumption of Ras Al Khaimah. A retrofit project can substantially reduce the energy and water consumption of a building by replacing or optimising equipment or systems without interrupting the normal operations of the building. The Building Retrofits Program is therefore an important component of the EE&R Strategy. Its ambition is to ensure that at least 3,000 buildings are retrofitted in Ras Al Khaimah by 2040.

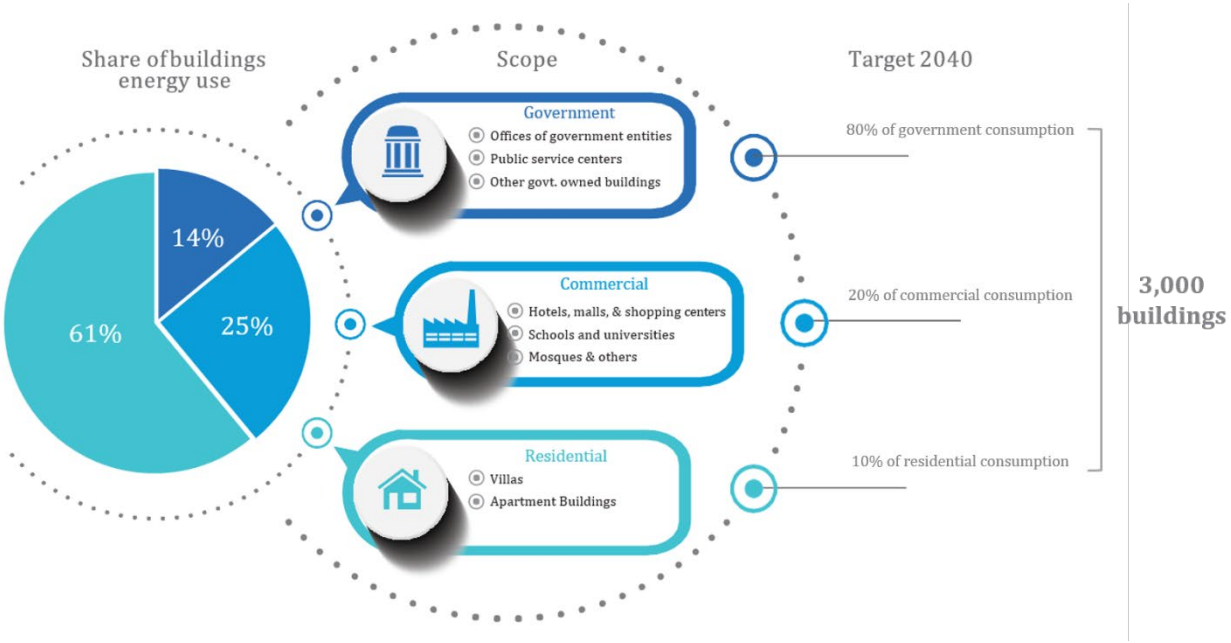


Figure 3: Building Retrofits Program plan & targets. Source: Reem

2.2.2 Energy Management Program

The Energy Management Program, which is the third program of the EE&R Strategy, aims to promote systematic energy management practices such as ISO 50001:2018 across high-energy users among industries as well as commercial and government entities in Ras Al Khaimah. The EE&R Strategy targets implementation of such energy management systems in at least 30 high-energy users by 2040.

2.3 Role of the Government of Ras Al Khaimah in the Programs

The Government of Ras Al Khaimah consists of 23 entities, covering different local government functions such as municipal services, public infrastructure, environmental protection, customs, museums, economic development, etc.

The EE&R Strategy envisages the government as a champion in adopting energy efficiency solutions. In the Building Retrofits and Energy Management Programs, the government is expected to set best-practice examples for the industry and the community to follow. In line with this vision, the Government of Ras Al Khaimah set an ambitious target to be the first ISO 50001:2018 compliant local government by 2023.

3 Methodology

At the launch of the Building Retrofits and Energy Management Programs, a mandate was issued by H.H. Sheikh Saud bin Saqr Al Qasimi, UAE Supreme Council Member and Ruler of Ras Al Khaimah, to set expectations from government and semi-government entities in terms of specific energy efficiency targets. The mandate expressed in Amiri Resolution No.15 of 2018, sets an overall target of 20% energy and water savings by 2022.

Figure 4: Amiri Resolution No.15 of 2018 and implementation guidelines. Source: Reem

Following the issuance of this resolution, a plan was prepared for reaching the target. According to this plan, the Municipality was selected as a test-bed for a retrofit project followed by implementation of an energy management system. Following success at the Municipality, such projects would be replicated at the whole-government scale (see figure 1).

The Municipality was selected as a pilot organisation, as it hosts Reem, which is the center of energy efficiency expertise in the government and is also the body coordinating the EE&R Strategy. This allowed easier project coordination in the initial stages of the plan.

3.1 Municipality Buildings Retrofit Project

The first retrofit project in the government was contracted under an energy-performance contracting (EPC) model with guaranteed savings, in October 2018. The scope includes four (4) buildings of the Municipality, with a total floor area of 11,000 m^2, and 31% savings are expected in utility costs over 5 years. The total project investment was AED 1.7 m (~EUR 390,000) with a payback period of 4.3 years. In this project, the contracted ESCO guaranteed a minimum level of savings, and would reimburse the Municipality for any shortfall in savings during the contract period (2019-2024). The main energy conservation measures (ECMs) include HVAC

Figure 5: Municipality Headquarter building. Source: Reem

replacements and optimisations, lighting replacement, retrofit of water fixtures, sun control films on windows and thermal coating on the roof.

3.2 Municipality Deep Retrofit Project

The Municipality planned expansion of retrofit measures to other smaller Municipality buildings, following the success of the first retrofit project described in section 3.1. The expansion includes among other projects, the deep retrofit of one (1) building. This is reflected in the plan provided above in figure 1. The deep retrofit will test the effectiveness of building envelope improvement technologies, like façade and roof insulation. The chosen building for this project is the Archive Building, a building with special operational conditions, such as minimum sun light and low temperature requirement.

3.3 Whole-Government Retrofit Project

Building on the success of the Municipality retrofit project, Reem started a wider project to extend retrofit measures to other government entities in Ras Al Khaimah. Walkthrough audits of all the government buildings were conducted, revealing that about 60 buildings, covering 20 entities of the government, were suitable for retrofit projects. Some buildings were excluded from the scope of the retrofit project due to their special uses, for example, data centers, tenancy conditions, or extremely low consumption levels.

The suitable buildings were tendered for retrofit under a guaranteed savings contract, similar to the one adopted for the Municipality, and an ESCO was selected to carry out the project. It was decided to phase the project investment over three phases, with the first phase starting in 2020 addressing 12 of the most important buildings and the third phase extending through 2023. This first phase is currently on track with the expected savings being exceeded.

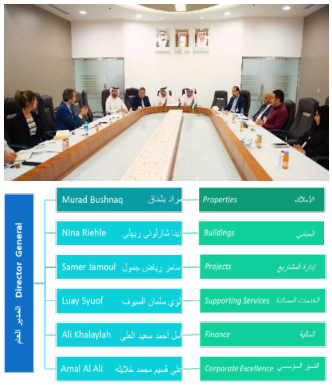
The project marked innovations in contracting and financing through a collaboration with Ras Al Khaimah Department of Finance, allowing a joint procurement approach across multiple entities.

3.4 Municipality Energy Management Project

Following completion of the Municipality building retrofit project, the implementation of an ISO 50001:2018 compliant energy management system was launched, in order to ensure continuous improvement of the achieved savings.

The Municipality first established an energy policy and an energy team to lead all energy management processes. A gap analysis was performed comparing existing processes with the requirements of ISO 50001:2018. Walkthrough energy audits of all 14 Municipality buildings were conducted. Also, processes for consumption reporting, monitoring and review were put in place, including development of a bespoke energy model for the Municipality buildings. Energy ambassadors were selected from each department, and awareness campaigns using emails and visual communication were deployed. Figure 6 illustrates some of the energy management actions of the Municipality. Currently, the Municipality is undergoing an ISO 50001:2018 certification process.

Consumption Monitoring



Energy team & monthly meetings

Awareness

Energy Policy

Figure 6: Energy Management Project implementation in the Municipality. Source: Reem

3.5 Whole-Government Quick-wins

After completion of the energy management system in the Municipality in 2020, Reem kicked off a wider energy management initiative, covering all 23 government entities. Energy management was perceived by government leadership as a tool to fight the economic difficulties caused by the COVID-19 pandemic. Hence, quick-wins in energy equipment, monitoring, and consumption behaviour were prioritised for immediate deployment, with implementation of a more complete energy management system after the quick-wins. Energy managers and teams were nominated to coordinate this initiative in each government entity.

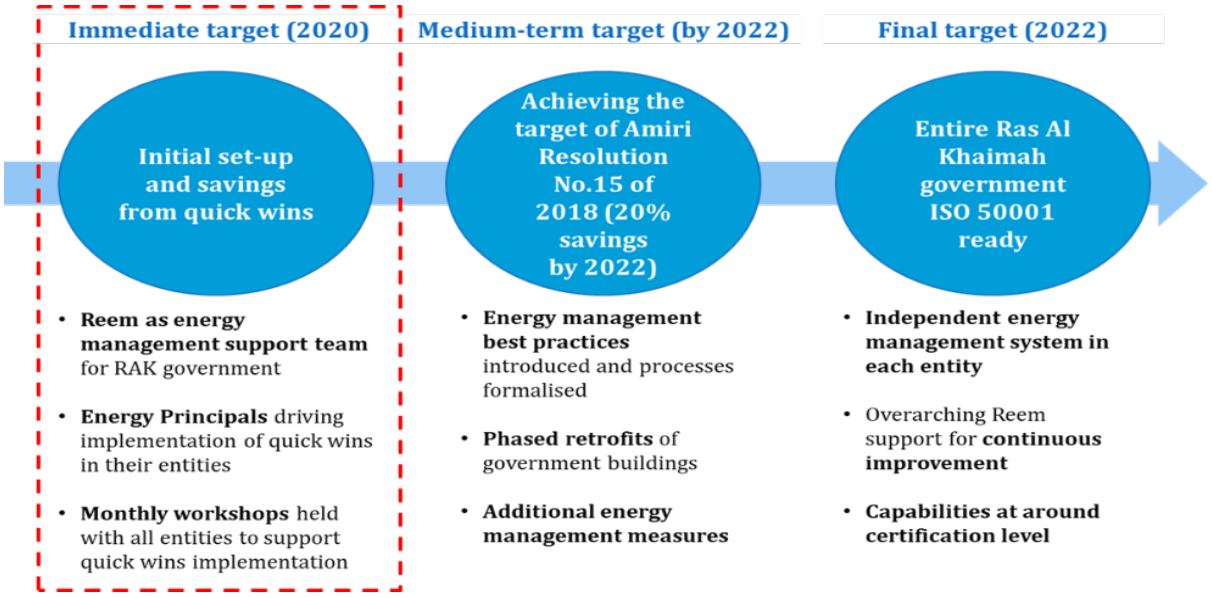


Figure 7: ISO 50001:2018 Energy Management for Ras Al Khaimah government project targets. Source: Reem

To activate this initiative, Reem, in collaboration with Ras Al Khaimah Department of Finance, deployed a central team to support all government entities. Through its energy management experience in the Municipality, Reem developed a set of 60 quick-win actions to be implemented in each government entity (see figure 8). Energy managers and teams were nominated to coordinate this initiative in each government entity.

A reporting system was put in place, including monthly collection and recording of utility bills, progress reporting, periodic workshops, and management meetings. Monthly workshops were conducted along with one-to-one meetings with all nominated energy managers to encourage and support them, and monitor their progress. While this system was put in place to deploy quick-wins on an accelerated basis, it also established the framework of coordination for the more comprehensive energy management initiative described in the next section.

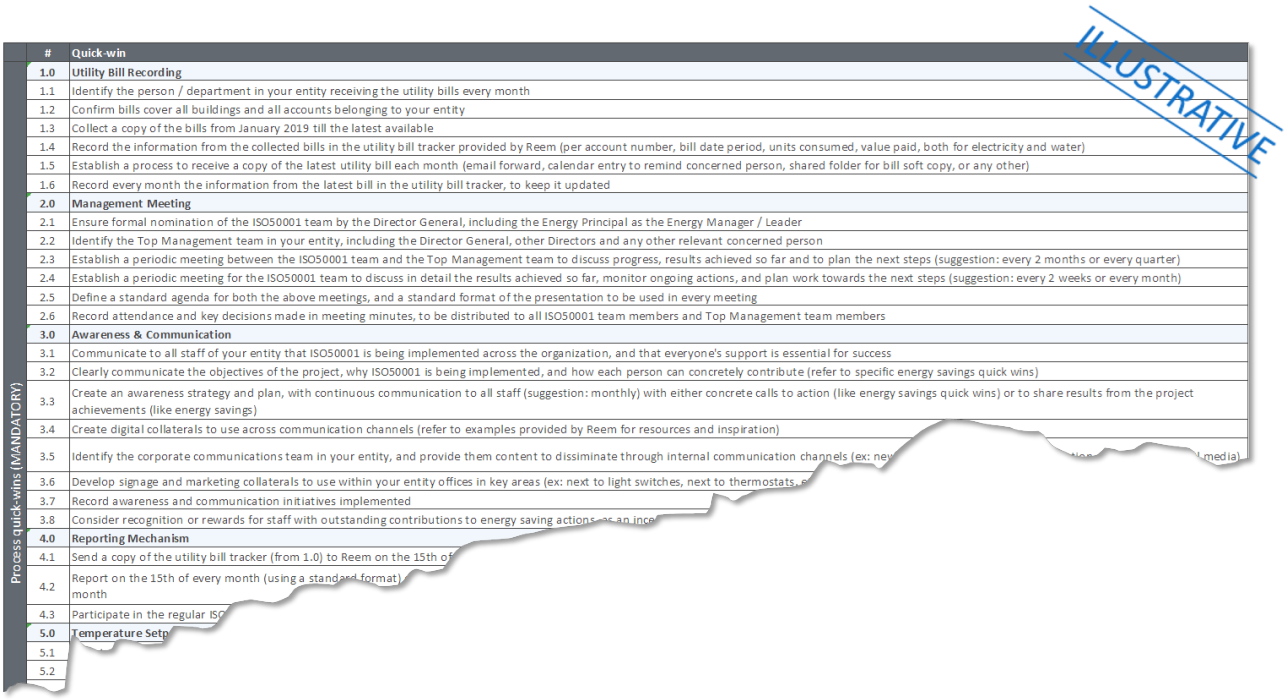


Figure 8: Illustrative extract of the established list of quick-wins. Source: Reem

3.6 Whole-Government Energy Management

During implementation of the quick-wins, Reem began preparations to deploy a full-fledged energy management system for the government. ISO 50001:2018 was the guiding document for this initiative, as it was for the Municipality. The five-step roadmap below was adopted, with the final goal of ISO 50001:2018 certification. The Energy Management initiative in Ras Al Khaimah government is now in the implementation phase as shown in figure 9.

Preparation Completed	Quick wins Ongoing	Gap analysis Completed	Implementation Ongoing	ISO 50001 certification
• Formal commitment from each entity • Nomination of entity-level teams • Confirmation of buildings in the scope (the ones in the retrofit or others) • Compilation of 2019 and 2020 electricity & water bills and fuel consumption	• Immediate planning of quick-wins • Implementation of process quick-wins • Implementation of energy saving quick-wins like thermostat controls, de-lamping, water flow reducers	• Identification of gaps between existing processes and ISO 50001 requirements • Collection and review of information on gaps • Preparation of gap analysis report with gaps identified and roadmap to overcome them	• Actions to close gaps identified in the gap analysis • Continuous support and review of actions from Reem • Sharing of EnMS toolbox by Reem to simplify the work	• Achievement of "certification ready" status through full alignment with ISO 50001 • Internal audit to verify compliance with ISO 50001 • Certification through an independent body

Figure 9: Energy management initiatives in Ras Al Khaimah government. Source: Reem

4 Results

4.1 Municipality Buildings Retrofit Project

The five-year period of operations, maintenance and guaranteed savings started in 2019. The project is expected to deliver guaranteed total savings of more than 4 GWh of electricity over the contract period, and save more than 36,000 m^3 of water. This will lead to avoidance of about 3,300 tons of CO_2 emissions. The results of the first year of operations were aligned with these expectations. The schedule in figure 10 provides a summary of project measurement and verification (M&V) for the first year. Savings of over AED 400,000 (EUR 92,000) were obtained, setting a successful example to be followed by other organisations.

	AED	EUR
Baseline consumption	1,260,464	~290,000
Reporting period consumption	969,052	~223,000
Adjusted baseline consumption	1,371,847	~316,000
Net actual savings	**402,795**	**~92,000**
Target savings	350,564	~81,000

Figure 10: First year savings of the Municipality's retrofit project. Source: Reem

4.2 Municipality Energy Management Project

The results from implemented energy management actions are monitored and tracked in an energy review process, showing the savings achieved versus targets, through a bespoke energy consumption-tracking tool as shown in figure 11.

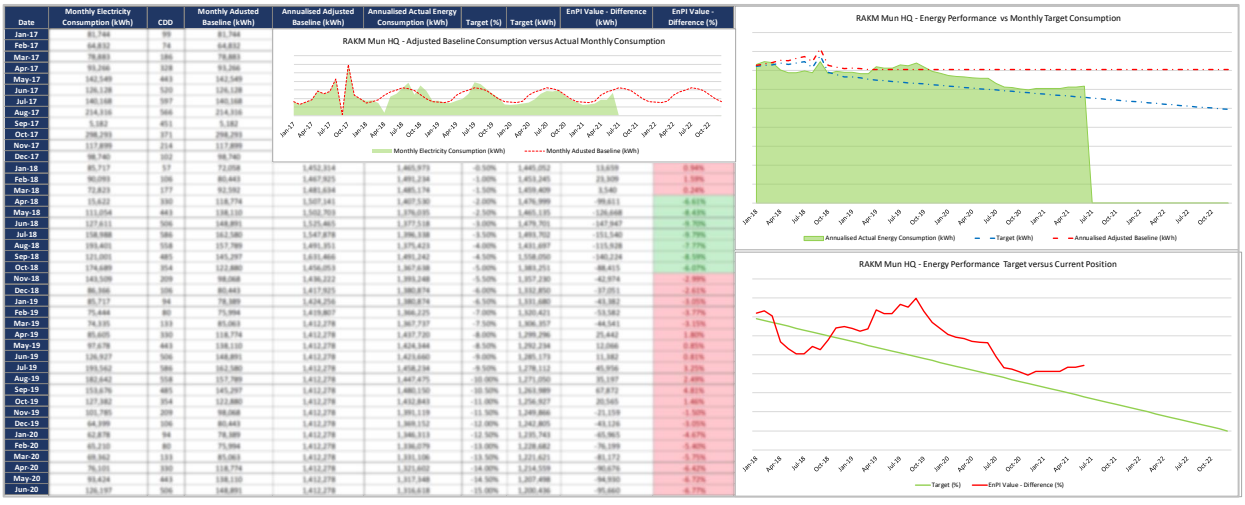


Figure 11: Tool to monitor energy consumption. Illustrative (figures not disclosed for confidentiality) Source: Reem

A more rigorous management of temperature set points for AC was considered one of the main improvement opportunities in energy performance. Therefore, the energy manager and team were dedicating their efforts to enforce a 23ºC set point throughout the office spaces, while allowing a variation of 1ºC. A periodical reporting process on the cases of non-compliance versus target set points was useful to plan action, and reinforce conviction that full compliance is possible, as shown in figure 12.

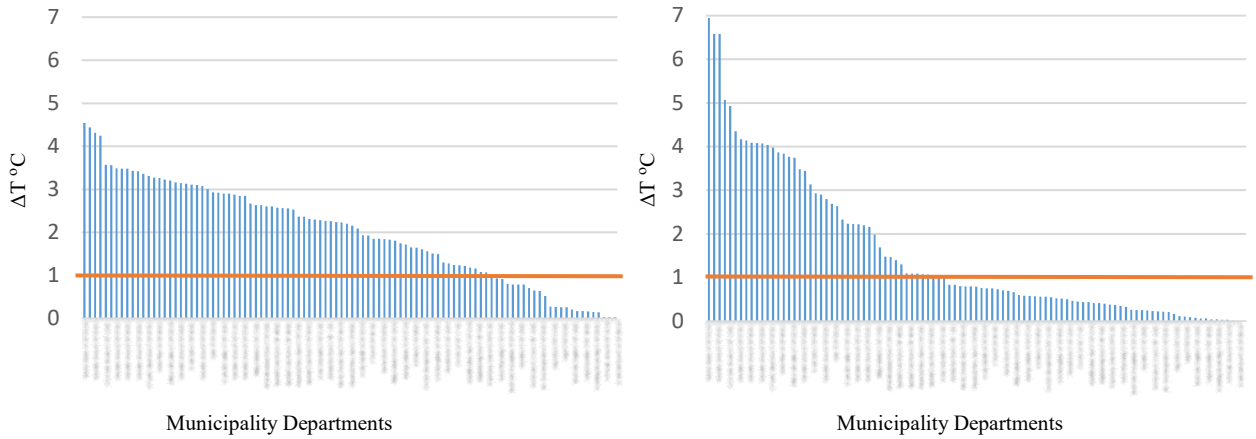


Figure 12: Average deviation from the standard set point (23ºC) for August (left, before intervention) and September (right, after intervention) 2019 by department. Department names not shown for confidentiality. Source: Reem

4.3 Whole-Government Quick-wins

Monthly workshops with energy managers started from May 2020. These workshops have demonstrated the continuous commitment of energy managers to the initiative, over 14 workshops so far. The implementation of quick-wins is tracked using a bespoke tool as shown in figure 13.

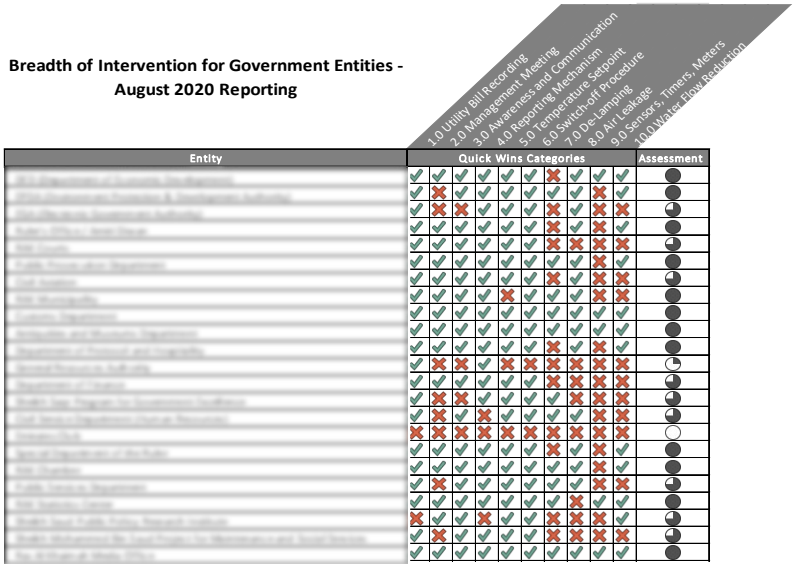


Figure 13: Quick-win action tracking tool. Government entity names not shown for confidentiality. Source: Reem

In the summer of 2020, about 8% savings were observed versus the same period of 2019, after adjusting for differences in weather conditions, with most government entities showing a decrease in energy consumption, as shown in figure 14.

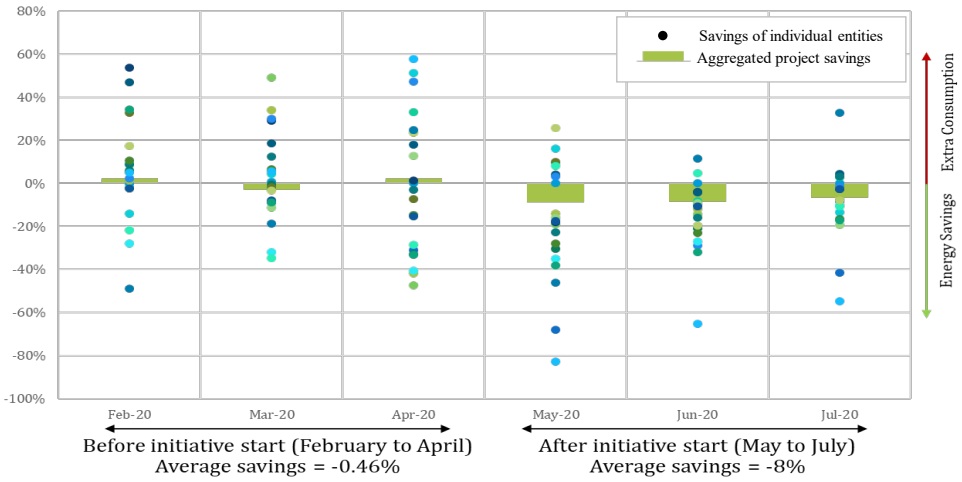


Figure 14: Consumption in 2020 vs 2019 (February – July). Source: Reem

Part of the savings during this period may have been driven by lower occupancy of government offices during the COVID-19 pandemic. However, impact of the pandemic seems relatively small compared to the impact of quick-wins as shown by the comparison of savings in the months of April and May, both characterised by lockdown measures.

4.4 Whole-Government Energy Management

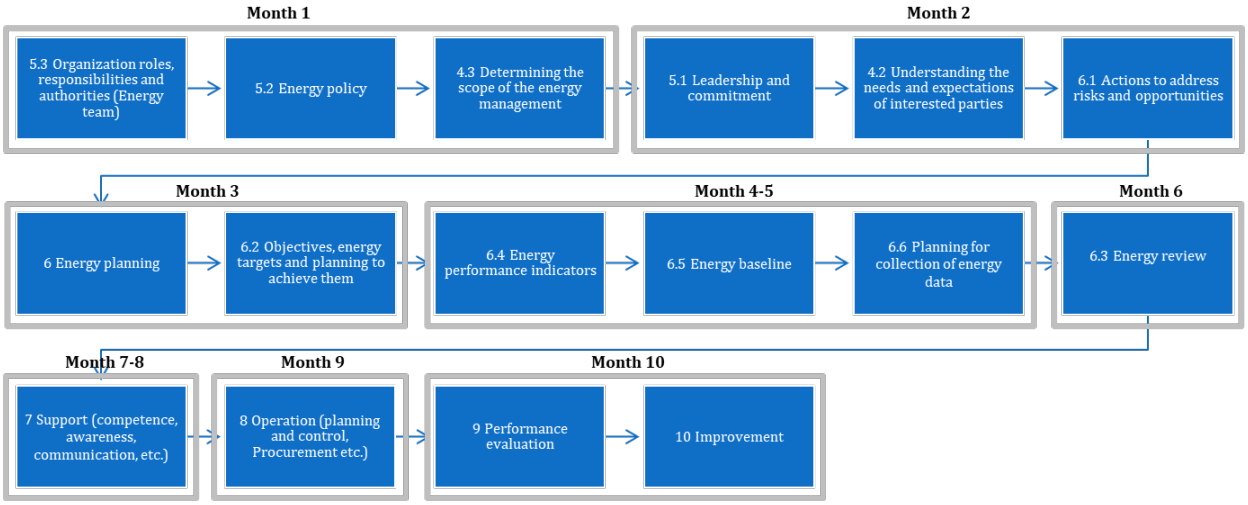


Figure 15: ISO 50001 implementation roadmap. Source: Reem

A gap analysis showed common gaps in ISO 50001 readiness among government entities. Therefore, a common implementation roadmap was developed to bring all government entities to ISO 50001:2018 readiness, targeting completion within one (1) year.

Reem is supporting the implementation in all government entities through monthly workshops, guidance sessions and energy management tools.

Figure 16: Support provided by Reem, Ras Al Khaimah Municipality. Source: Reem

5 Conclusions

The case of retrofits and energy management in the Government of Ras Al Khaimah provides some key learnings that may be applicable to other governments in the region and the world. The main learnings are the following:

1) A well implemented, low investment approach can lead to significant energy savings
2) Starting with quick-wins can support the case for more comprehensive measures
3) Regular monitoring and reporting seems to be the most effective quick-win
4) A centralised approach supports faster and more complete participation, as well as cross-learnings
5) A small control team, e.g. positioned within an energy agency, can easily coordinate activities across a large number of government entities (the whole-government energy management initiative was entirely driven by three employees of Reem working for about 20% of their time; a key input to make this possible is the support of government leadership in obtaining high degrees of participation from government entities)

6 Editorial Team

Mahra Alhoot
Energy Engineer
Reem, Ras Al Khaimah Municipality
Author

Akshay Datar
Strategy and PMO Manager
Reem, Ras Al Khaimah Municipality
Co-Author

For any feedback on the content of this document, contact Reem, the Energy Efficiency and Renewables Office of Ras Al Khaimah Municipality (info.eer@mun.rak.ae)

About Ras Al Khaimah Municipality and Reem

Ras Al Khaimah Municipality was established in 1959 by an Emiri decree issued by His Highness Sheikh Saqr bin Mohammed Al Qasimi and since then works on providing a comfortable environment in which people can live and work. Reem, the Energy Efficiency and Renewables Office at Ras Al Khaimah Municipality coordinates the implementation of the RAK Energy Efficiency and Renewables Strategy 2040, established under the patronage of His Highness Sheikh Saud bin Saqr Al Qasimi, UAE Supreme Council Member and Ruler of Ras Al Khaimah. The Strategy targets 30% energy savings, 20% water savings, and 20% generation from renewable energy sources by 2040.

بلدية رأس الخيمة

Ras Al Khaimah Municipality

reem

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