

Global Energy Management System Implementation: Case Study

United Arab Emirates (UAE)

Abu Dhabi City Municipality



Business Case for Energy Management

Organization Profile/Business:

The Municipality of Abu Dhabi City (ADM), had been established in 1962, under the name "Municipality and Town Planning Department". In 1969, a Royal Decree was issued forming the Municipal Council of Abu Dhabi City, with the aim of offering a complete range of services to residents of Abu Dhabi City. In 2007 a Royal Decree was issued forming the Department of Municipal Affairs which consists of three independent Municipalities which are; Abu Dhabi City Municipality, Ain City Municipality, & Western Region Municipality.

In 2017 a Royal Decree was issued merging Department of Municipal Affairs with Urban Planning Council and forming new Department which is called Department of Urban Planning & Municipalities. The Department of Urban Planning & Municipalities includes also the three municipalities; Abu Dhabi City Municipality, Ain City Municipality, Al Dhafra Region (previously Western Region) Municipality.

ADM is renovating all aspects of infrastructure, including bridges, sewage networks, and road networks,

and transport means which would have the strongest impact in making the city of Abu Dhabi one of the best cities to live in across the globe.

The scope of core business of Abu Dhabi City

Municipality:

The scope covers the Town Planning, Infrastructure, Customers Services, and Community Services.

Motivation:

There are so many drivers/triggers which motivated ADM to adopt & implement the EnMS 50001. Such as Abu Dhabi Emirate Government General Policy Agenda, UAE Strategy for Green Development under slogan of Green Economy for Sustainable Development, Environment, Health & Safety (EHS) Management System, 2030 Environmental Vision of Abu Dhabi Emirate Government, Abu Dhabi City Municipality Vision, UAE Cabinet Document: UAE one of the best Countries for 2021, & International Conventions & Protocols related to Environment & Climate Change which UAE subscribed.

Energy Management Program:

There are several local, national & international programs which encourage the energy management actions, for instance Abu Dhabi Emirate Government General Policy Agenda (*Local Abu Dhabi Emirate Level*), Abu Dhabi Emirate Environmental Strategy (*Local Abu Dhabi Emirate Level*), Abu Dhabi Emirate Greenhouse Gases Inventory Projects (*Local Abu Dhabi Emirate Level*), Abu Dhabi Emirate Strategy for General Lighting in Roads/Streets & Yards, & UAE Green Growth Strategy launched by H.H. Sheikh Mohammed bin Rashid Al Maktoum. (*Federal UAE Level*).

Energy Reduction Approach:

The prior approaches to reduce energy use in ADM are; solar power generation system in ADM buildings project (Roof PV System), implementation of Abu Dhabi Emirate Strategy for General Lighting in Roads/Streets & Yards, utilization of CNG (Compressed Natural Gas) in ADM

vehicles, smart maintenance programs in ADM facilities & equipment, sustainability programs for ADM buildings & their rehabilitation, water consumption reduction program in ADM buildings, waste management program in ADM, green procurement/purchasing for materials, equipment & services, & awareness programs of energy efficiency among ADM employees & interested parties.

Business Benefits Achieved:

The Abu Dhabi City Municipality achieved various benefits from implementing ISO 5001 EnMS. These benefits can be summarized as; financial benefit in term of the cost savings, reduction on the energy consumption bill of ADM, best utilization of the energy assets/equipment, enhancement of the environmental performance related the implemented EMS in ADM, good image & reputation for ADM, setting framework for enhancing energy efficiency throughout the supply chain, priorities evaluation & determination for implementing technologies those save/conserves energy, best practices in energy Management & behavior, opportunities for benchmarking with other organizations, & finally transparency & communication with regard to energy resources management.

Abu Dhabi City Municipality’s Approach for Building its EnMS:

Consultation, gap analysis & assessment, establishing & development of the relevant ISO 5001 EnMS documents; Policy, Procedures, Forms, & Plans, integration with other implemented Systems (EMS ISO 14001, OSHMS OSHAS 18001, & QMS 9001), forming the Energy Management Team from various ADM Divisions with specific roles & responsibilities, training & awareness, developing & implementing of EnMS Action Plan, conduction of the EnMS internal audit, corrective & improvement action plan for the identified NCRs/observations, assessment external audit, & lastly certification external audit.

Energy Review & Planning:

For better understanding of its energy use, ADM follows a phased energy Assessment/Review approach that is conducted on periodic basis. The extent of the assessment depends on the level and quality of the

gathered information, Assessment cost, availability of ADM competent resources and expertise.

ADM comprehensive or partial energy review is carried out at least once annually where needed or when update of the information. ADM relies in its energy review on one or all of the following; desktop reviews, energy inspections & inspection logs, information

Case Study Snapshot	
Industry	Governmental
Product/Service	Municipal Services
Location	UAE – Abu Dhabi City
Energy Management System	ISO 50001
Energy Performance Improvement Period	One year (from 2015 to 2016).
Energy Performance Improvement (%) over improvement period	5.8 %
Total energy cost savings over improvement period	\$USD 86,398
Cost to implement EnMS	\$USD 67,076.1
Payback period (years) on EnMS implementation	0.78 year
Total Energy Savings over improvement period	3,853.9 GJ
Total CO ₂ -e emission reduction over improvement period	354443 metric tons

obtained from ADM energy O&M contractor, personnel, and O&M logs, & energy surveys

Preliminary Energy Assessment/Review:

This type of review can be through desktop analysis of all available & relevant information, & walk through (preliminary audit) by the energy team & ADM subject experts.

Detailed Energy Assessment/Review.

ADM is undertaking a detailed energy assessment by ADM Energy Management Team. To ensure maintenance and improvements of ADM energy performance, ADM will undertake such assessment on periodic basis, preferably once every 3-5 years.

Identification of ADM Energy Sources across Boundaries of ADM; ADM Energy Sources:

ADM energy sources include; electricity, fuels, compressed Natural Gas (CNG), & photovoltaic solar system (PV)

ADM Energy Usage:

ADM consumes energy in the following areas; meat production, staff transportation, Heating, Ventilation & Air Conditioning (HVAC), refrigeration, water heating for sterilization of meat processing equipment, steam generation, combustion for odor control, pumping of water, storm water, & treated sewage, effluent as well as diesel, lifting operations in buildings, warehouses & storage areas, sanitations, bathing, kitchen applications, electricity generation in generators applied temporarily, illuminating of internal & external offices buildings. lighting of streets & public areas, powering of servers, data processers, computers, data storage, data Centers, printers, copy machines & other Offices & kitchens appliances, powering of other miscellaneous loads, parks & landscapes irrigation, pleasure & entertainment activities, decorative & event Lighting, & ADM security guards housing.

Determination/Evaluation of ADM Past and Current Energy Use and Consumption:

Satisfactory measurement, metering and data capture systems are vital to facilitate energy management efforts and for current and future energy reporting. Developing metering and data analysis systems at ADM is an iterative process.

Understanding energy performance & its effective reporting relies on the availability of good data & sound analysis. This requires availability of an effective energy Metering, Monitoring & Targeting (MM&T) procedure/process/system at ADM to enable the easy

production of suitable reports based on reliable information. MM&T is an integral & important part of ADM's EnMS & actions. ADM MM&T may be used to identify opportunities for energy saving through a number of techniques, including; examining energy demand during out-of-hours periods (e.g. overnight and weekends), statistical analysis of data, & implementing automatic exception reporting to flag when energy use falls outside expected norms.

Analysis of Energy Use and Consumption:

Analysis of energy use & consumption is being based on measurement & other data that has been collected and gathered. Monthly, quarterly, & annual consumption and / or generation data information are compared for any increase and or any decrease in consumption trends. Comparisons of consumptions & / or generations are made over a fixed period of time and or the same duration for different years. Evaluation of past & present energy use & consumptions where annual consumption is logged and compared from one year to another to note any increase or decrease in the consumption.

Identification of Relevant Variables Affecting Significant Energy Use and Performance:

Variables that effect the energy consumption of energy such as petrol, diesel, gas, electricity, water, and treated sewage effluent varies based on the activity they are being applied at.

Determination of Energy Baseline and Energy Performance Indicators:

The ADM documented baseline is an outcome of the ADM energy review process & activities. It is determined by utilizing all relevant information obtained from its initial energy review over or considering a suitable data period suitable to ADM energy use & consumption as well as other information relevant to energy audit activities. ADM Energy performance will be measured against the energy baseline. The ADM baseline determination considers Identification of relevant variables affecting significant

energy use & performance & review of ADM compliance with energy relevant legal, regulatory, & and other requirements.

Determination of Energy Objectives and Targets:

Objectives and targets are outputs of the ADM Energy review process.

ADM objectives & targets revolves around achieving ADM business with minimum energy cost, improving its energy performance, saving energy, reducing energy consumption, & minimizing environment impacts & ADM carbon foot print, securing energy supply, improving energy usage through energy efficiency & exploring for application of renewable energy.

Determination of Action Plan (s):

ADM Energy Management Action plan is established & developed at the minimum along with the following guidelines; shall focus on achieving specific improvement in energy efficiency / on achieving improvements in overall energy management, shall demonstrate for each goal the corresponding energy objectives, & shall determine for each action, the Implementation timeframe, & designate the responsible person or division for implementation.

Financing of ADM EnMS:

ADM utilized its own financial resources for the establishment, development & implementation of the EnMS ISO 50001. The finance resources obtained from

the annual budget which allocated by Abu Dhabi Government through the Department of Finance (DOF).

Duration for Establishing ADM EnMS:

The duration for establishing EnMS for ADM almost 18 months.

Cost Benefit Analysis:

Savings in the electrical energy bills in ADM buildings & facilities. Savings in the water consummation bills in ADM Buildings. Reduction in the fuel bills used in ADM vehicles and transportation. Savings in the maintenance cost for the ADM buildings & facilities. Savings in the maintenance cost for the equipment, devices, & appliances.

Approach used to determine whether Energy Performance Improved:

ADM Energy performance is measured against the energy baseline. The ADM baseline determination considers identification of relevant variables affecting significant energy use and performance and review of ADM compliance with energy relevant legal, regulatory, and other requirements. Data and information used in the baseline must be reliable and accurate. ADM energy baseline and energy performance matches and relates where possible and applicable energy inputs with outputs including but not necessarily limited to production levels, and other factors including areas of applications, number distance travelled, supply quantity, season, and occupancy rate, etc.

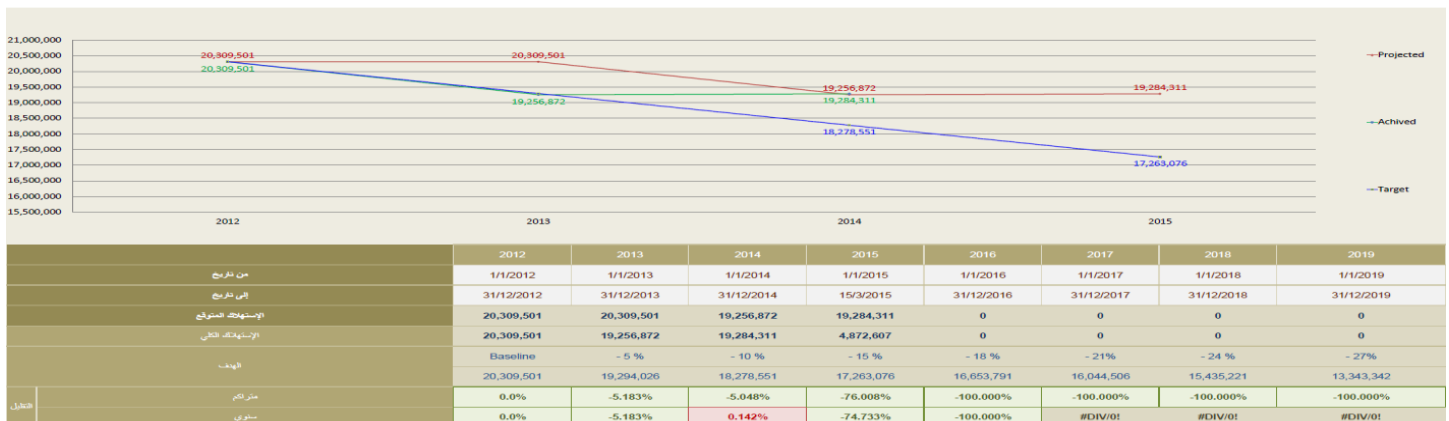


Chart No. (1): Energy Review in ADM Buildings

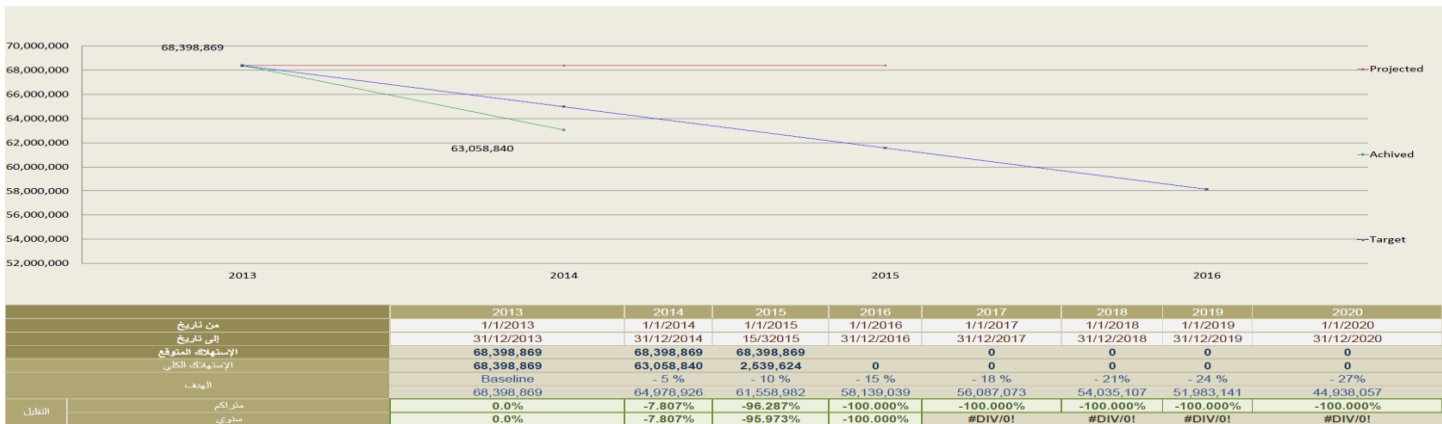


Chart No. (2): Energy Review in ADM Parkas

Approach used to Validate Results:

ADM uses various approaches such as; desktop reviews, energy inspections & inspection logs, information obtained from ADM energy Operations & Maintenance (O&M) contractor, energy surveys, energy audit, & monitoring & measurements using devices & meters.

Steps Taken to Maintain Operational Control & Sustain Energy Performance Improvement:

These steps such as; training for Operational & Maintenance (O&M) ADM team, training for contractors who engaged in operations & maintenance contracts, work instruction, operating manuals & procedures, & energy efficiency criteria for purchasing/tendering for energy equipment, devices, appliances, & services.

Development and Use of Professional Expertise, Training, and Communications:

Examples of EnMS associated trainings conducted to relevant ADM staff are; awareness basic training of EnMS & ISO, internal audit training of EnMS 50001 standard, technical training for implementing of EnMS, lead audit training for EnMS ISO 50001, & energy & carbon print.

The communications channels/means are; regular meetings of the energy management team, management review meetings, awareness materials (posters, leaflets, brochures, booklets, and video footages), induction sessions for new employees, & sites/areas tours & walkthroughs

Tools & Resources:

Tools & resources which are used in implementation, measurement, analysis, & monitoring of the EnMS in ADM can be summarized to; finance resource (annual ADM Budget), internal human resource (trained personnel, technical team, energy manage team), external professional bodies & institutes, devices & instruments & meters, other implemented management systems (EMS ISO 14001, QMS ISO 9001, OSHMS OHSAS 18001), & Software; e.g. Microsoft Office & Project Microsoft.

Lessons Learned / Keyes to Success:

The lessons learned in ADM such as; difficulties of coordination with utilities providers' authorities (ADDC, ADSSC & ADNO FOD), weak knowledge & awareness about the EnMS in particularly among contractors & suppliers, ambiguity concerning energy legislation & legal requirements, changes of processes & procedures related to EnMS, & organizational structure changes encountered in ADM. As the nature of business for ADM is mainly services provider rather than products provider, there are difficulties and challenges for conducting the energy reviews and analysis. The presence & implementation of other management systems in ADM (EMS ISO 14001, OSHMS OHSAS 18001, QMS ISO 90001 enables good opportunity & facilitate the establishing & developing & implementing EnMS. Decentralization of the services offered by ADM to the community of Abu Dhabi City increases the efforts, resources, works, times for establishing and developing and implementing EnMS. Availability of clear & specific

environmental legislations, laws and executive orders in both Emirate level and UAE level paved the road for ADM to establish and specify its targets and objectives concerning the EnMS. Finally the benchmarking with other organization/body with accredited ISO 50001 EnMS in Abu Dhabi Emirate was really an issue. As there was no organization/body had ISO 50001 accreditation in that time when ADM started its project for establishing & developing EnMS.

Quotes:

The business value & usefulness of EnMS ISO 50001 in ADM can be; financial benefit in term of the cost savings

Visuals:

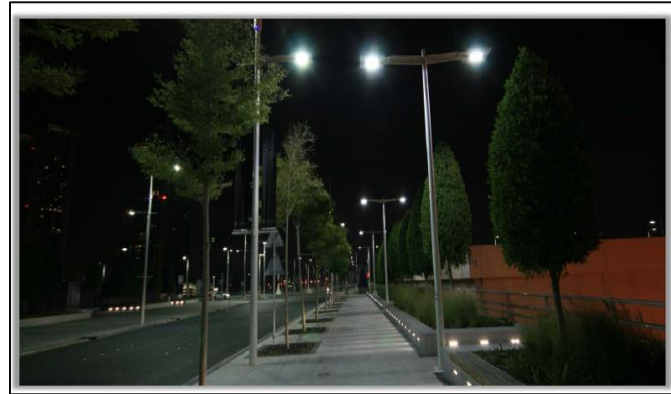


Photo No. (1): LED Lighting in some Street in Dhabi City (Al Mariyah Island)



Photo No. (2): Smart Lighting (LED Lighting) in Parks in Abu Dhabi City (Umm El Emarat Park)



Photo No. (3): Smart Lighting (LED Lighting) in some Pedestrians Bridges in in Abu Dhabi City



Photo No. (4): Solar System (PVT System) in ADM HQ & SCADIA Building