

Global Energy Management System Implementation: Case Study

UNITED ARAB EMIRATES

Sharjah Electricity & Water Authority

Sharjah Electricity and Water Authority (SEWA) stands as the one of the three government utilities in UAE to Implement ISO 50001:2011 having an energy saving of 7.1% achieved within one year of implementation



SEWA Energy Award Team

Business Case for Energy Management

Sharjah Electricity and Water Authority (SEWA) is an independent utility catering half a millions of customers residing in Sharjah covering an area of 235 km². The Company has an electricity load growth of 5% per annum. The core businesses of the organization are a) Generation, Transmission and distribution of electricity b) Water Desalination and Supply c) Piped Natural Gas supply.

Case Study Snapshot

Industry	Energy utility
Product/Service	Generation, Transmission and Distribution of Electricity, water and natural gas
Location	United Arab Emirates, Sharjah Emirate
Energy Management System	ISO 50001:2011
Energy Performance Improvement Period	1 year (2016)
Energy Performance Improvement (%) over improvement period	7.1%
Total energy cost savings over improvement period	\$26,079
Cost to implement EnMS	\$55,571
Payback period on EnMS implementation (years)	2.1 years
Total Energy Savings over improvement period	1248 GJ
Total CO₂-e emission reduction over improvement period	133.8 Metric tons

SEWA has witnessed consecutive huge developments since its inception as a private company. Later its ownership was transferred to Sharjah Government as Sharjah Electricity & Water Authority (SEWA). His Highness Dr. Sheikh Sultan Al-Qasimi, the Supreme Council Member and Ruler of Sharjah appointed Dr. Rashid Alleem as the Chairman of SEWA in 2014. Dr. Rashid Alleem is widely considered as one of the most prominent thinkers for economic development and corporate leadership at both local and international levels.

“I swell with pride to say that SEWA has accomplished ISO 50001(Energy Management System) certification. This is a big step towards prosperity and sustainable growth”

Dr. Rashid Alleem, Chairman

Drivers: Dr. Rashid, under his guidance, fostered SEWA’s Mission and Vision to be well blended with elements necessary to meet imminent global challenges for energy and climate. SEWA’s Vision defines why it exists as an organization and its commitment towards achieving its goals defined during different eras of economic development of the country. SEWA Vision 2020 “To be among the best authentic organizations in the world” has been derived from Ministry of Energy’s (UAE) vision 2021 for sustainable development. Implementing ISO 50001:2011 (Energy Management System) was one of SEWA’s strategic initiatives for the fulfillment of its vision towards a) environment and energy conservation, b) maintaining load growth, c) sustainability and climate change. The company implemented ISO 50001 in 2015 in its Head Office (HO) consisting of ten functional departments with an employee headcount of approximately 300.

Dr. Rashid Alleem, a visionary leader, has written several books for economic excellence. In one of his books “Sustainability- Fourth Wave of Economy” he has talked about an overarching concept of sustainable

development stemmed from inefficient use of natural resources and expected increase in energy demand occurred due to population growth and climatic changes. Feedback from the Chairman’s publications and the company’s vision helped the Energy Management team (ENMs) not only in setting baseline for improvement but also to identify opportunities based on findings. The organization has gained a positive reputation among external and internal stakeholders by successful implementation of the identified prospects.

Energy management program: On a national level SEWA has been part of Ministry of Energy, UAE as well as Clean Energy Business Council (CEBC) Abu Dhabi. On the Emirate level, SEWA has initiated certain energy efficiency programs such as Conservation Award and Peak Hour as a Corporate Social responsibility (CSR) initiative towards the community and an effort that would ultimately position SEWA as an exemplary Green Giant.

Energy reduction approach: SEWA’s energy reduction approach emerges from its Strategic plan is to promote conservation of natural resources. The company has taken several environmental-friendly initiatives to encourage for optimal energy use such as conservation techniques tutorials, use of energy efficient products, peak hour shaving, educational activities in schools and organizations, training scouts and guides etc.

Business Benefits Achieved

The Integrated Management System (IMS) was implemented 2015. The IMS consists of three main standards 9001 for Quality, 14001 for Environment and 18001 for Occupational Health and safety .in parallel ISO 50001 was also made a part of IMS to maximize its effectiveness in implementation.

SEWA ENMS team maintain monthly reports to analyses energy usage and production of carbon emissions for continuous monitoring and improvement.

Reduction in greenhouse-gases (GHG) emissions and carbon footprint showed significant improvement to meet set energy efficiency target and regulations for reducing GHG emissions. EnMS integration with IMS led to increased knowledge of equipment, structured decision making processes and methodologies, energy awareness, corporate reputation, secured energy supply, improved operation and maintenance processes, and redesigning Pre-qualification process for suppliers.

“SEWA as a multi-dimensional and multi-service provider having corporate type organization structure under Government entity is very optimistic about their future energy road map, especially in line with the ISO 50001 achievement, objectives and requirements. The management support and efforts from the Energy Team leads the organization towards the success and required benchmark.”

Eng. Doreb Ebrahim
Technical Advisor-Chairman Office

EnMS Development and Implementation

The EnMS team started to develop the understanding and training of ISO 50001 in Year 2015 and aligned themselves towards the objectives and goals set for EnMS to meet the KPIs and Targets. In 2015 the external audit was successfully completed, resulting in the certification award for ISO 50001. The system was then integrated as a part of IMS to have in depth analysis for EnMS Procedures, Energy use and identified EnPI's, to achieve the optimum percentage in reduction of energy and ultimately Carbon.

SEWA's vision comes from the philosophy of its top management of working towards excellence through tough decisions and established energy goals for performance improvement. The EnMS team works parallel with SEWA's Excellence department which is responsible for the overall development activities

related to Organizational Excellence. SEWA has a dedicated energy management team having skilled technical and supportive staff responsible to implement and monitor EnMS related opportunities. The team consists of one team leader being the technical advisor, and members representing different departments. Members from different departments help identify energy opportunities associated with different functions of the organization for e.g. IT-EnMS members who have initiated and implemented E-Billing initiative. The team members are associated with departments such as quality, technical advisory, Excellence, Energy efficiency, IT and Electrical Services departments.

Review, analysis, and planning: Prior to smart meters, the SEWA HO was equipped with electromechanical meters which usually failed to provide accurate data for energy measurement. The smart meters, on the other hand, was equipped with high accuracy measurement tools, live monitoring and data saving up to six months. To have an in depth analysis on the trend of energy consumption and employee behavior, seven smart meters were installed in SEWA HO. The HO has three floors, each floor comprises of right and left wing occupied by specific departments. Six smart meters were installed in each wing as sub-meters, and the seventh meter is installed to measure the total consumption of the six sub-meters along with separate reading from the HVAC. In Parallel, a specialized team was designated to work on data gathering for all power-consuming equipment and appliances to highlight the significant ones.

Figure 1 represents a graphical picture of energy consumption units where Chillers, lighting and printing show the highest percentage i.e. 65%, 20% and 9% respectively.

In addition the EnMS team has also included fuel consumption and maintenance costs for car fleet that serves the HO operations, within energy review. Factors like Gross Floor Area (GFA) and cooling degree day (CDD) for HVAC are considered for analysis while for other appliances and total consumption GFA and people occupancy, had been taken as main characteristics.

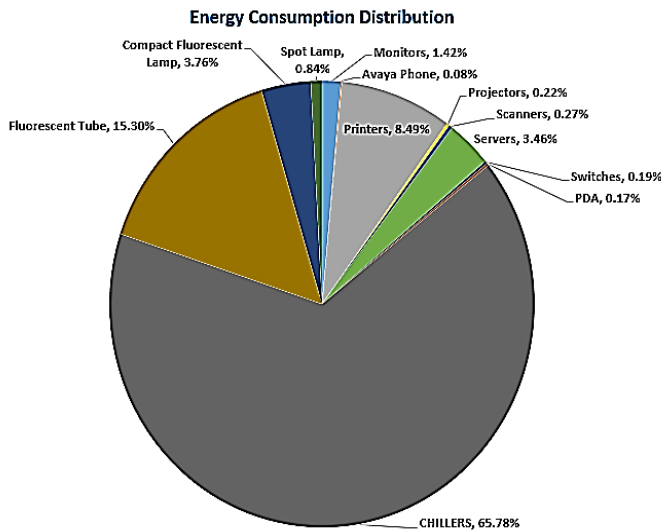


Figure 1: Identified energy use

The Energy Performance Indicators had been developed based on the highest energy consumption factors divided by their characteristics, in order to unify the energy indication, as shown in Figure 2.

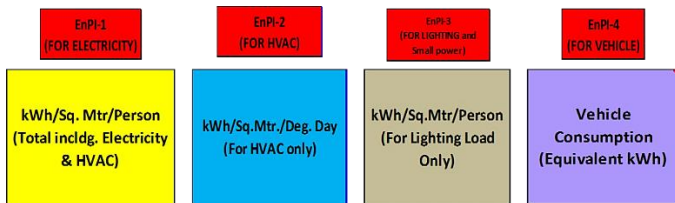


Figure 2: Energy Performance Indicator

In order to meet the Energy performance indicators (EnPIs) presented in Figure 2. The EnMS team has investigated the most feasible opportunities with the highest impact, and came up with four opportunities that were implemented in 2016. Fresh Air Handling Unit (FAHU) was replaced, LED lighting was placed instead of conventional lighting, bill printing was minimized by E-Billing (Green Bill) initiative and vehicles fleet was optimized by reducing number of cars. Other opportunities such as monitoring printing process, condenser evaporative cooling, solar PV rooftop and solar powered EV charging station will be implemented in 2017.

Opportunities had been prioritized based on selected criteria and decision matrix. The priority criteria are usually determined thru project feasibility which includes ease of implementation, implementation period, capital cost, return on investment, and percentage contribution in energy saving and carbon reduction.

Financing: SEWA Budget Process are based on the approval of the Project Charter from the management after being screened from Budget, Finance, Internal Audit and Purchase Section. The project charter describes the Project details and specification, scope, BOQ, duration and cost allocation SEWA has also started product/ process/ solution evaluation in consideration of EnMS norms, mainly Energy Efficiency and low power consumption.

Duration: Project duration are determined by the size of the project, equipment availability at site, man days involved and priority of each project.

Cost - benefit Analysis

The implementation of opportunities expended a total direct cost of \$36,405 and indirect cost of \$19,166 with total saving of \$26,079 having a payback period of 26 months. Below is a table representing analysis of Capital direct cost, annual savings, Carbon savings and annual saving for opportunities implemented.

Cost Benefit Analysis for ISO 50001 Implementation					
DESCRIPTION	ENERGY USE	CAPITAL COST (\$)	Annual Savings (\$)	Carbon Saving (Metric tons)	ANNUAL SAVINGS (\$)
E-Billing	Printing	19,073.60	0.22	0.97	3,183.20
Reduce Vehicles fleet from 19 to 12 cars	Transportation	0	586.5	3.8	7,859.50
Total Electricity Consumption on saving	Fresh Air Handling Unit	HVAC	14,734.90	662.2	129
	CFL replacement	Lighting	2,596.70		
Total		36,405.20	1,248.90	133.8	26,079.20

Table 2: Cost-benefit Analysis

Approach used to determine whether energy performance improved

The Energy Management team conducts periodic session to review the improvements achieved through implementation of EnMS. Some methods include monitoring and investigating energy consumption via monthly reading to validate the pre assessed assumption made to develop energy saving opportunities. In addition employees have been given awareness on paper usage which has actually resulted in reducing the amount of paper consumed previously. The Car fleet expense has been rationalized in terms of the fuel consumption and maintenance costs due to reduction in no of cars (19 to 12).

Approach used to validate results

EnPI has been one of the tool to measure energy performance as it helps setting a baseline for measuring past and present energy performance .It also provides guidelines for future energy benchmarks.

Internal audit is another tool which is conducted twice a year to ensure compliance of the energy management system before the external certification. The internal audit helps the energy team identify discrepancies and corrective actions for their rectification.

Steps taken to maintain operational control and sustain energy performance improvement

To avoid any deviation from ENPIs, EnMS team conducts a follow up by having relevant periodic meetings. Reward and recognition of the efforts is intended to be an essential part to ensure the team remains motivated and effective in implementing the system and raising awareness. The internal audits have been a great help for educating employees and infusing in them a sense of responsibility to comply with Energy Management Initiatives and tutorials such has switching of lights after working hours , keeping AC temperature at 24C , use of LED lighting, and etc.

Development and use of professional expertise, training, and communications

EnMS team has been expanded into energy authenticated talent who specializes in enhancing energy efficiency and performance. The Team has been trained ISO 50001:2011 Energy Management Systems: Internal Auditor by British Standard Institute (BSI) to develop their ability to perform internal audits and checks in order to comply with the standard guidelines during implementation. To match up to the world class standards the team has gone through several workshops and trainings along with participating in various energy exhibitions, conferences and awards such as World Future Energy Summit , Clean Energy Business Council Summit and trainings by Energy Regulatory Authority in Singapore .

Employee engagement: Implementing ISO 50001 was not an easy task to achieve as it involved transforming the mindset of the overall workforce of the organization. However, the implementation proved fruitful in enhancing employee engagement and create a performance-oriented and purpose-driven culture.

Awareness sessions: EnMS along with Excellence team of SEWA arranged several awareness sessions especially related to energy policy which talked about establishing the importance of energy saving towards sustainable growth.

Workshops and training: Several Workshops and training sessions related to KNX automation system have been provided to employees, public and students to enlighten them with benefits of smart energy usage. Update on the same sessions and workshops are held periodically.

Share points for employees: “I am creative” is one such initiative taken by the employees to share ideas related to company including energy saving options and its financial impacts for organization’s benefit.

Professional expertise: Engaging professionals worked as support partner for implementing ISO 50001 in SEWA. The assistance involved experienced learning and practical approaches which were useful in achieving successful outcomes and saving costs. It not only helped

segregating high energy consumption appliances but also provided support in analyzing factors effecting the energy consumption.

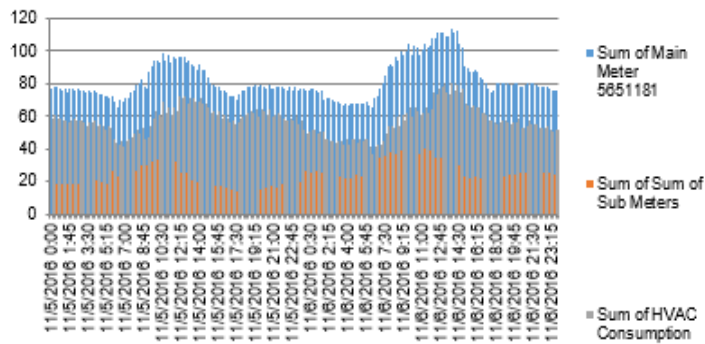


Figure 3: Smart Meter Data Analysis

EnMs team deployed smart meters and other smart devices to assist in monthly management and monitoring of energy data as shown in Figure . The data is then converted into visual displays for e.g. charts and tables illustrating monthly/yearly energy use, capital costs of opportunities and savings in terms of kWh, costs and carbon emissions. The formulation of data helps in re-evaluating the EnMS procedures and opportunities to look for improvements. ISO 50001 being integrated with IMS, SEWA web application had also been developed for SEWA e-billing customer registration to foster the Green Bill initiative.

most of all, love of what you are doing or learning to do.”

Eng. Doreb Ebrahim
Technical Advisor-Chairman Office

With the development of ISO 50001 requirement, a new concept of Energy management emerged, which brought a cultural change not only within the EnMs team but also the general employees changing routine habits to more sensible, smart and responsible towards Energy saving, cost saving and carbon footprints.

SEWA’s Vision, Mission and Corporate strategy revolves around sustainability which gives a good attribute, motive and support from all SEWA community.

Technology advancement is unstoppable, thus delegation, external communications and harnessing technical expertise is a key to bring the best practices solutions.

Keys to Success

- Top management support.
- Raising Employee awareness.
- Technology Harness.
- Integration of ISO 50001 with IMS (9001-Quality, 14001-Environment and 18001-Health and safety) to generate feasible and comprehensive initiatives.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

