

# Global Energy Management System Implementation: Case Study

Republic of Korea

## Kangwon Land

*Since the introduction of the energy management system, Achieving of a 3.6% energy performance in 2016 (1 year) compared to 2015 as a result of quantitative evaluation*



Kangwon Land operates hotels, condominiums, golf courses and ski resorts based on the casino. By 2016, the total number of visitors is 512 million.

### Business Case for Energy Management

Kangwon Land Co., Ltd. was established on June 29, 1998 to revitalize the economy of abandoned mine area and to enhance the national competitiveness of tourism industry in the main business of casino and resort.

Kangwon Land Co., Ltd. has a 51% stake in the public sector, such as Mine Reclamation Corp. under Ministry of Trade, Industry and Energy, Gangwon-do and local governments of abandoned mine area (Jeongseon, Taebaek Yeonwol, Samcheok), and contributes to the revitalization of the local economy as other public organizations.

Kangwon Land, as other public organizations, is continuously carrying out activities to save energy such implementing the emission trading system in accordance with the “Low Carbon Green Growth Basic Law” and the “Act on the Allocation and Transactions of GHG Emissions”, enforcing energy saving activities in accordance with the “Regulations for Promoting of Energy Use Rationalization of Public Institutions” and implementing environmental information disclosure system.

*“The Best Eco-friendly Resort Construction through Energy Management System Certification.”*

### Case Study Snapshot

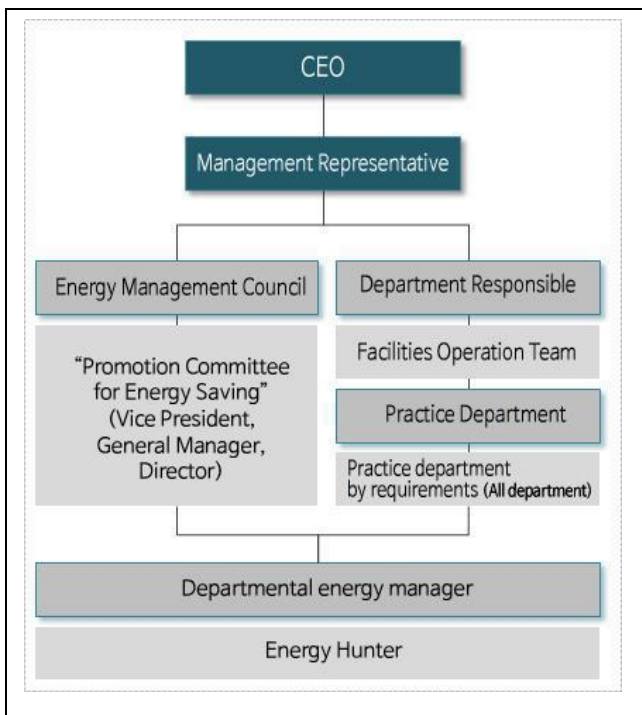
<b>Industry</b>	Kangwon Land
<b>Product/Service</b>	Hotel, Casino
<b>Location</b>	Jeongseon
<b>Energy Management System</b>	ISO 50001
<b>Energy Performance Improvement Period</b>	1year
<b>Energy Performance Improvement (%) over improvement period</b>	3.6%
<b>Total energy cost savings over improvement period</b>	400,000 USD
<b>Cost to implement EnMS</b>	923,621 USD
<b>Payback period (years) on EnMS implementation</b>	2.2year
<b>Total Energy Savings over improvement period</b>	33,137 (GJ)
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	2,002

Kangwon Land Co., Ltd. has set environmental policy for the best eco-friendly resorts and has established and promoted 3 strategies: Green resort construction, Green management, Response to climate change and Ecosystem and biodiversity report.



Energy saving activities of Kangwon Land have been carried out regularly and continuously. However, the energy management system has been set up for more systematic and enterprise-wide improvement of energy performance, and the energy hunter was selected for each organization to improve the energy-saving activities centered on the energy department to energy-saving activities of all departments. Also, an Energy Management Council is organized and operated in accordance with relevant regulations.

Table. Energy Management Council



### Business Benefits Achieved

Kangwon Land sets overall energy targets at the beginning of the year based on energy use in the previous year, and allocates targets for each of the buildings included in Kangwon Land.

Kangwon Land forecasts the energy usage in establishing the business plan to determine the possibility of achieving the energy target and judges whether it will be implemented considering the purpose of the project, the amount of energy savings, and the payback period from the internal investment audit.

In the case of performance analysis conducted while operating the initial energy management system, the energy performance was confirmed by comparing the energy consumption of the evaluation year with the expected usage amount. But there were many difficulties in obtaining actual results because the estimates were not accurate. To solve these problems, regression analysis was used to predict the energy use and the accuracy of the prediction is also very high.

Using the same method, we can confirm the following year's achievements in participating in the Energy Management System Performance Evaluation project promoted by Korea Energy Agency.

- Baseline period : 2015
- Project period : 2016
- Energy result (Electricity) : 1.4 % (8,429 GJ)
- Energy result (Thermal Energy) : 7.8 % (24,708 GJ)
- Energy result (total) : 3.6 % (33,137 GJ)
- Energy reducing cost : 400,000 USD /year

Besides the influence factors that are managed internally, additional influencing factors such as the amount of laundry could be derived from participating in the energy performance evaluation of Korea Energy Agency and the performance evaluation model of the energy management system was improved using the derived models internally.

EnMS Development and Implementation

Kangwon Land is a public organization that established an energy management system. It is promoted in early 2013 with the goal of achieving national greenhouse gas energy reduction targets and building eco-friendly resorts, and received ISO50001 certification in December.



Fig. ISO 50001 Certificates

Organization

The organization of Kangwon Land consists of 4 headquarters, 17 rooms, 54 teams, 2 centers and 1 stage and the main operational departments of the EnMS are the Facility Operation Team, the Facilities, the Construction Management Team, the General Affairs Team, the Purchase & Contract Team, and the Leisure Sales Team which have a significant influence on energy use for building and vehicle operation of Kangwon Land.

The facility operation team establishes energy targets, collects and reports the detailed goals of each team, and improves the efficiency of energy use facilities and manages measurement equipment. The construction management team defines and manages the task procedures considering energy aspects when new building is designed. The Purchase & Contract Team is

responsible for purchasing eco-friendly materials and high-efficiency equipment considering energy aspects.

Responsibility	Department	Role
Top management	CEO	<ul style="list-style-type: none"> <li>General management</li> <li>Decision making</li> </ul>
Management agency	head	<ul style="list-style-type: none"> <li>Confirmation and supervision of work</li> </ul>
Energy management team	Team leader	<ul style="list-style-type: none"> <li>EnMS review and implement</li> </ul>
Energy manager	Energy Hunter	<ul style="list-style-type: none"> <li>Following instructions</li> </ul>
Main department	Facilities Operation Team	<ul style="list-style-type: none"> <li>Energy saving practice</li> </ul>
Practice department	Each department	<ul style="list-style-type: none"> <li>Find saving practice</li> </ul>

Fig. Energy Management Organization

Energy review and planning

Understanding of the current situation

Using the Fence Diagram, the energy flow of Kangwon Land can be grasped at a glance.

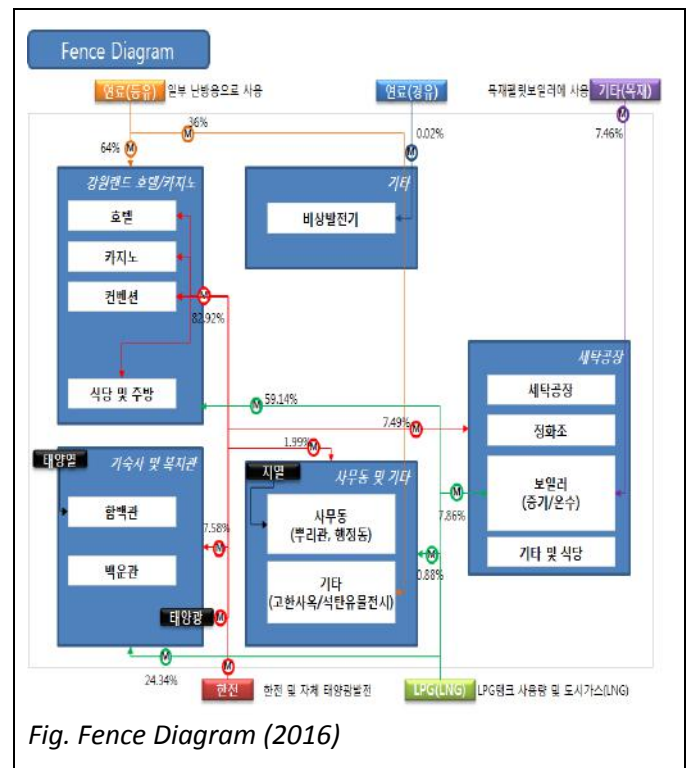


Fig. Fence Diagram (2016)

Kangwon Land's energy is mostly used in hotels and casinos and the energy consumption of laundry factories washing hotel bedding and employee clothing is also significant.

**Significant Energy Use (SEU) Drawing**

Kangwon Land uses the most energy for heating and cooling the building, so the management of the boiler and the air conditioning equipment is important.

Therefore, these facilities are designated as important energy use, and opportunities for efficiency improvement are discovered through operation management and facility maintenance activities.

*“Energy Saving by Active Introduction of High-Efficiency Facilities and Renewable Energy”*

**Finding opportunities for improvement**

Kangwon Land manages the facilities operation guidelines for important energy use and operates according to it and each operation management guidelines include the person in charge of the facility, the driving method, the operation plan, and the maintenance and record of the facility.

Each person in charge of the operation management guide continuously improves, takes efficiency and measures for it, and reflects it in the action plan for a achieving the goal.

Kangwon Land is strengthening its security system to prevent leaking energy through its power system and has also replaced boilers with four 10-ton boilers, one of which is a 10-tonne boiler, with a capacity of 375,000 USD, which is reduced to 5 tons of 2-ton boilers to enable energy saving through algebraic control.

In addition, the company is actively promoting the introduction of wind power, solar energy, solar heat, small hydro power, fuel cells, geothermal heat, wood pellets, etc.

Kangwon Land is fully committed to efficient use of energy because its building energy management system is equipped with its own, and it is striving to keep the optimal system by investing the budget appropriately for the replacement of old facilities



Fig. Solar Power Generation of Kangwon Land



Fig. Solar Heat of Kangwon Land



Fig. Wood pellet boiler of Laundry Factory



**Energy Performance Check**

**Identifying of Influential factors**

Factors influencing the energy use of Kangwon Land were estimated and analyzed.

Table. Deriving of influence factors

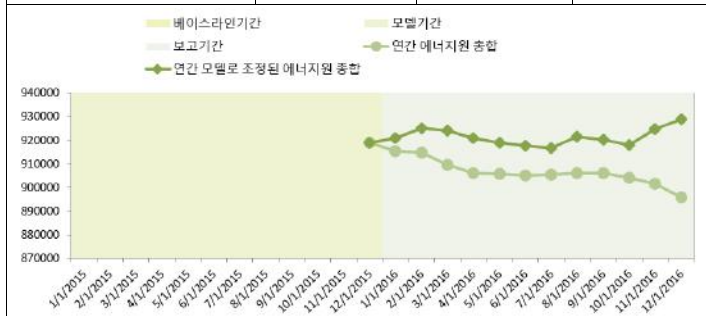
Energy source	Independent Variable (P-Value)				F-Test	Adj. R <sup>2</sup>
	Total production(person)	Laundry weight (kg)	CDD (22°C)	HDD (22°C)		
Electricity (GJ)	0.007	0.0003	0.0002		0.000	93.96 %
Thermal Energy (GJ)		0.05		0.0000	0.00	96.08 %

**Energy performance drawing**

Using the derived influence factors, energy performance of 2016 compared to 2015 was confirmed, and energy performance of 3.6% was confirmed.

Table. Energy Performance drawing

Division	Year	Electricity (GJ)	Thermal Energy (GJ)	Total (GJ)
Baseline Period	2015	612,744	316,099	928,843
Reporting Period	2016	604,315	291,391	895,706
Performance (GJ)		8,429	24,708	33,137
Performance (%)		1.4%	7.8%	3.6



**Cost Benefit**

Various energy saving activities such as boiler improvement activities, air conditioning optimization, and LED replacement were discovered and performed during the achievement period (one year).

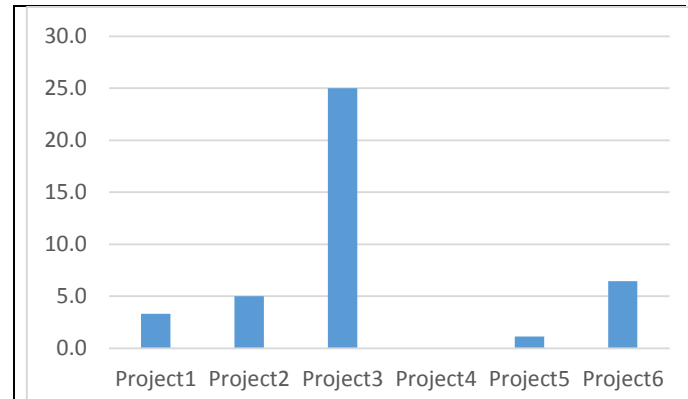


Fig. Payback Period for Major Savings Activities.

We confirmed the energy cost savings of about 400,000 USD during the performance period (2016) by implementing energy efficiency improvement activities.

The investment recovery period for saving activities, excluding internal labor costs, EnMS certification and related investment costs, is about 2.2 years, and the energy management system was able to confirm significant energy saving performance.

**Communication, Education and Tool**

Information related to energy management system, information related to energy performance such as organizational energy policy, energy planning, and energy management review results, etc., is provided through business meeting, newsletter, bulletin board, performance announcement, e-mail, seminar and in-company portal (Hinuri) to inform and collect opinions.

Kangwon Land executives and employees can express opinions, complaints or suggestions related to energy performance through in-company portal (Hinuri).

Information on energy management systems, such as energy management projects and energy performance, is made public on the website or through media reports.

Information about management system is informed to business partners who perform tasks that have a significant impact on energy performance on behalf of Kangwon Land through business meetings, bulletin boards, performance announcements, in-house training, e-mail, seminars and workshops.

## Lessons Learned

In order to establish and maintain standardized operating guidelines for building operation and management, it is necessary to acquire internally specialized personnel and make continuous improvement efforts and research.

We are strengthening individual competence through participation in internal / external education, and are actively utilizing counsel and advice of professional organization.

It has been helpful to improve the energy management system by selecting and organizing the internal audit personnel with specialized personnel for the operation of the energy management system and finding out the problems and improvement points of the existing activities of the energy related persons.

The internal audits, surveillance audit and recertification audit, certification audit as well as internal audit are not just for simple audit for mistakes but are an opportunity for Kangwon Land to improve its energy management system and we also consider it as

an opportunity to improve the energy management system optimized for Kangwon Land by actively coping with and reflecting opinions of judges.

## Keys to Success

- Active improvement will of the hands-on workers
- Active review of energy saving activities in various fields
- Strict internal audits

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](http://www.cleanenergyministerial.org/energymanagement).

