

2009 Grand Prize of Minister of Economy, Trade and Industry

Realization of “ Visualization ” of Power Consumption by Municipal Schools and Energy-saving Education Activity

Kyoto Municipal Education Committee
Omron Corporation

1. Background and Needs

In addition to the Global Warming Prevention Kyoto Conference (COP3) held in 1997 and the 3rd World Water Forum held in 2002, to play a leading role as the birth place of Kyoto Protocols, Kyoto City is engaged in the advanced activities toward realization of the city of Kyoto, which coexists with the environment as a base of every policy like enactment of the nation’s first global warming prevention ordinance in December 2004. In January 2009, Kyoto City was certified as the nation’s “ Model Environmental City ” . Then, Kyoto City set the target of reducing global warming gases 40% by 2030 and 60% by 2050 from the level of 1990 based on the “ Kyoto City Environment Model City Action Plan ” . Thus, Kyoto City has just launched the project to accept the challenge of a “ carbon-free ” city in association with the citizens, corporations and the local government.

In kindergartens and schools, in addition to traditional studies of society, science, and morality, etc., milk pack recycling, crafting slogans/compositions/posters, and community sweeping by pupil conventions/student conventions, pupils, and students are taking action themselves and are engaged in “ making schools eco-friendly ” in association with families and local residents to learn the significance of the environment. Their activities include “ creating environment declaration at all municipal schools and kindergartens ” and having the “ school version KES (environment management system standard) ” certified.

Also, the Education Committee is attempting to enhance facilities to advance environmental education like installing green curtain, wind power generator and solar power generator to kindergartens and schools. In particular, since there are limitations for kindergartens and schools alone to engage in reducing energy, the Education Committee as the educational administration agency is now deeply involved and began to install from 2006 in all

kindergartens and schools the power monitoring meter that enables us to grasp daily power consumption and yearly maximum demand power value. For energy conservation, not only installation of equipment but also implementation of energy management for analysis of the obtained data and improvement is necessary. Therefore, we asked Omron, who installed the equipment, for their support and cooperation using the company's know-how to advance our activity.

Omron provides not only "visualization" (numerical data, graph) of energy consumption with devices but also proposes "what to do after visualization" with which they take concrete action like the list of items to turn-off immediately, which indicates which facility should be turned off first when power consumption is about to exceed the target set by each kindergarten or school. Omron is promoting energy-saving activities by individually analyzing the measured energy data, identifying abnormalities, and proposing improvements. Also, Omron is voluntarily supporting improvements by periodically explaining how to use the system and how to examine the measured data. Like this, Omron is offering consultations on how to reduce CO² through energy-saving activities and providing support so that schools can voluntarily and continually reduce carbon use.

To utilize "visualization" at the education site through the use of this as a tool for environmental education, we expect children to experience, discover, and create natural power and energy. Thus, we aim to contribute to human education toward realizing a sustainable society. Also, we expect these activities to spread to homes and society.

Aim of environmental education (Ministry of the Environment)

Human education toward sustainable society development to home/local community

Environmental education as a target of Omron

With a tool of **“Solar panel + visualization”**, let people **experience, discover and create** the natural power (energy).



Raise human resources who cherish environment in daily lives.

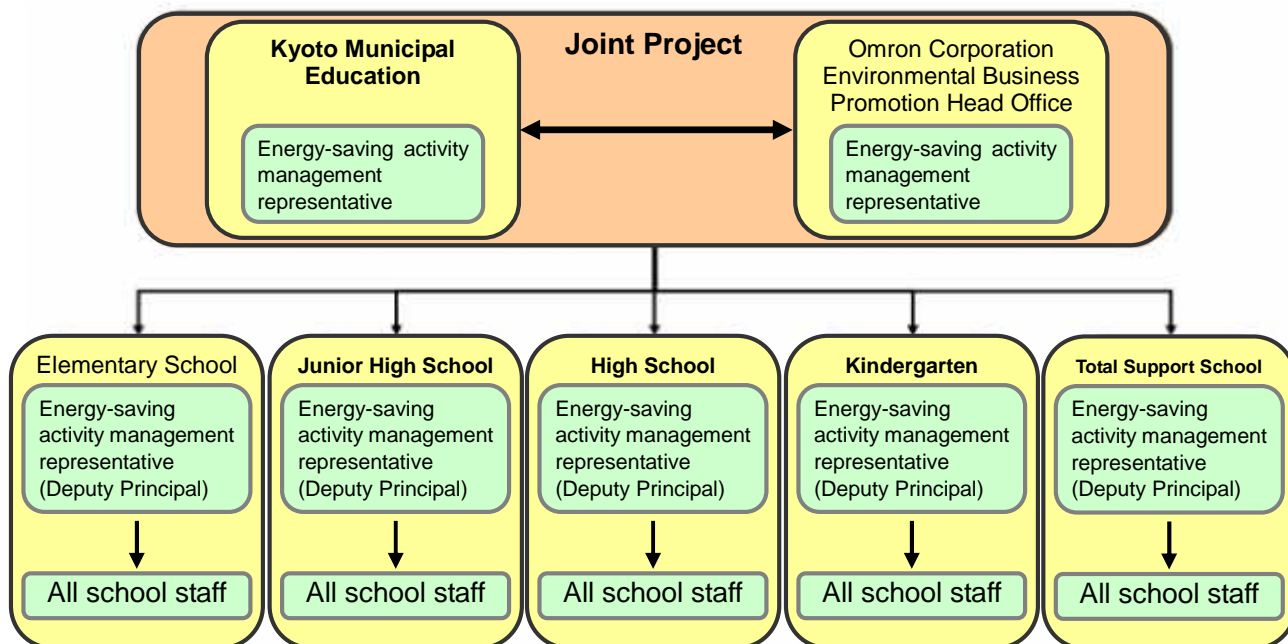
* We can expect those human resources to become “people who create future society (low-carbon society)” in the future.

As we mentioned earlier, we promote energy conservation efforts from the birthplace of the Kyoto Protocols and try to raise and educate human resources who can voluntarily think and act on the environment. Thus, the Kyoto Municipal Education Committee and Omron Corporation joined hands to kick off this project in 2006.

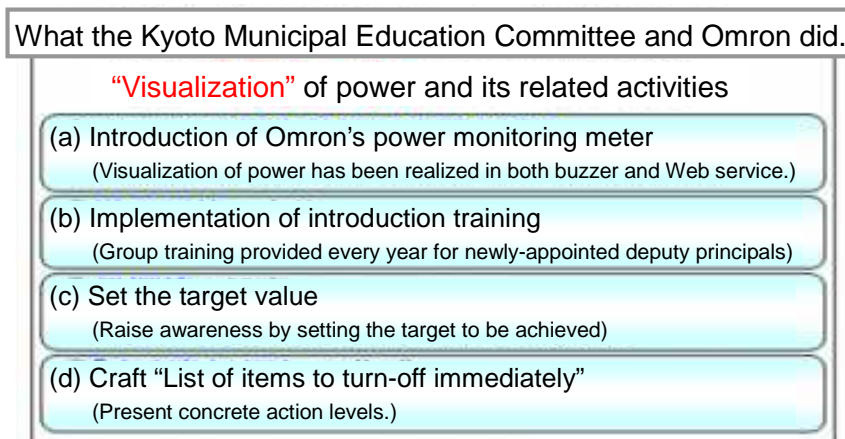
2. Contents of Activity

<Promotion system>

The joint project by the Kyoto Municipal Education Committee and Omron Corporation will promote energy-saving activities.



<Outline of Project>



<Actual poster>



Effects have emerged with new issues.

Issues= Step for further reduction in CO2

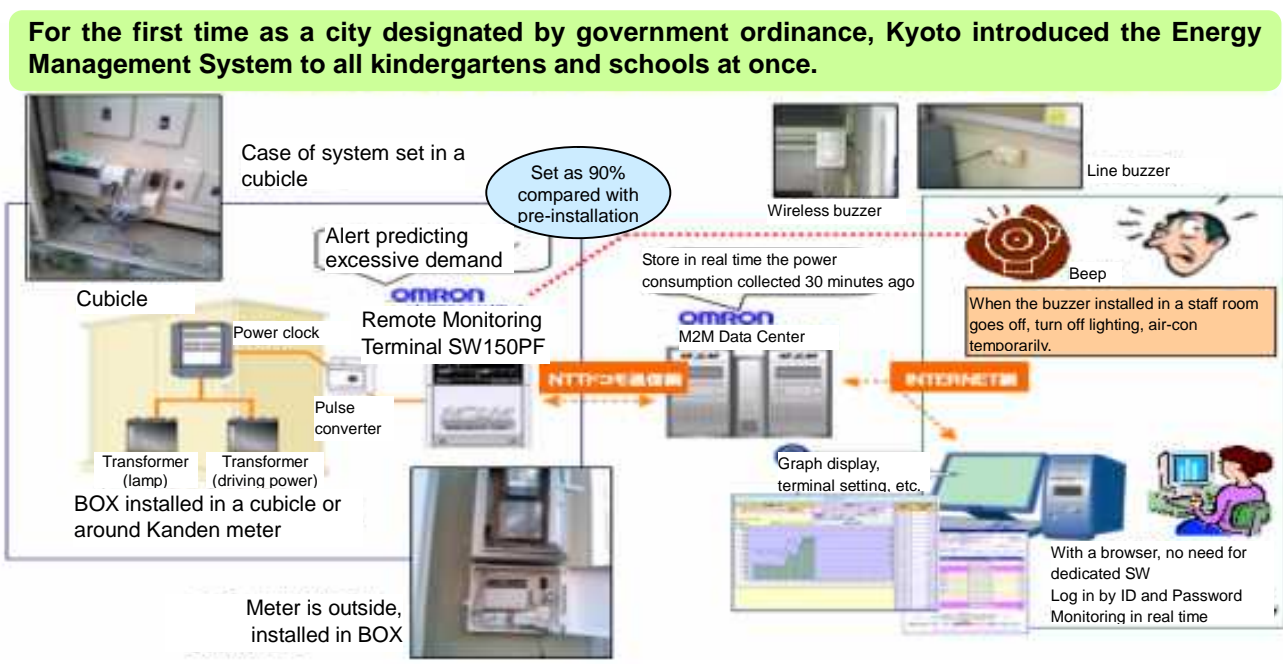
(1) Advancement / Creativity

Under the theme of energy conservation (electricity conservation), the local governmental organization (Kyoto Municipal Education Committee) and the business enterprise (Omron) associated with each other and introduced the Energy Management System to all kindergartens and schools (around 300 institutions, nation’s biggest scale). Also, the

mechanism by which the activity results will be returned to kindergartens and schools is unprecedented.

1) Introduction of the Energy Management System to all kindergartens and schools

- (a) The Energy Management System by which the demand and power consumption by school (or kindergarten) can be visualized in real time has been introduced to all municipal (Kyoto City) **kindergartens and schools**. (The first time as a city designated by government ordinance)
- (b) The demand data and power consumption data collected by each school (or kindergarten) **are centrally managed** by the Data Center of Omron. The data are used not only by each school (or kindergarten) but also by the Education Committee to centrally manage the entire status.
- (c) Once the target value of demand is set, the Energy Management System will not let energy-saving managers know after the value is exceeded but let them know with a buzzer when the value is about to be exceeded to support the activity.
- (d) Based on the data accumulated in the past, an energy-saving manager can see the status of demand and power consumption at any time and easily analyze it with a comparison, which makes it possible for him to find issues about energy consumption.



2) Extension of discretion of school

(a) Introduction of total execution system

To promote the unique school system, Kyoto City has the system (total execution) by which each school can execute the school administration budget heavily for necessary activities. Since 2004, the system has been extended to every school administration budget, including utility and water expenses. Since 2005, Kyoto City has been extending the discretion of schools by letting them adjust the expense items even in the middle of the fiscal year by computerizing financial accounts. This made it possible to allocate the saved administrative budget like utility/water expenses and toilet cleaning expenses to enhance educational activities like library enhancement.

Kyoto City succeeded in settling the voluntary energy-saving activities by extending the discretion of schools.

Total execution system (Kyoto City)

The system by which each school can execute the school administration budget heavily for necessary activities to promote a unique school system.

2004: Extended to every school administration budget including utility and water expenses

2005: Able to adjust the expense items even in the middle of fiscal year by computerizing the financial account

Now, possible to allocate the saved administrative budget like utility/water expense and toilet cleaning expense to enhancement of educational activity like library enhancement.



(b) Implementation of “ Miyako school eco-mileage ”

Kyoto City has established a system called “ Miyako School Eco-mileage ” by which the school budget is to be allocated according to points gained from implementation and results related to the environment, like the environmental education activity or the effective use of school goods system. This system is intended to promote eco-friendly schools.

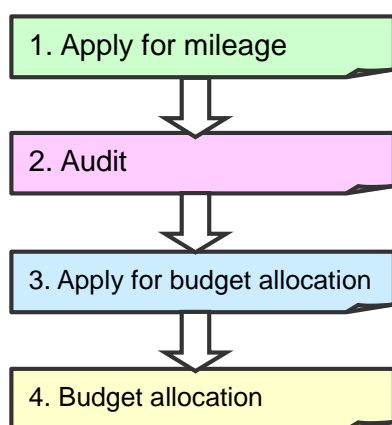
<Point>

- Contribute to the global environment
- Activity spreads to all cities nationwide
- Activity continues in the middle-long term.

<Item>

- : Energy conservation
- : Use of school goods effective use system
- : Promotion of environmental education
- : Environment arrange project
- : Others (press, award, etc.)

<Flow of administration>



(2) Versatility / Applicability

As the Energy Management System allows us to centrally manage and analyze energy, schools and universities in other prefectures can do the same. Also, since wireless technology and the ASP method make it possible to introduce the Energy Management System in a short period of time, not only schools but a company with lots of branches can introduce it.

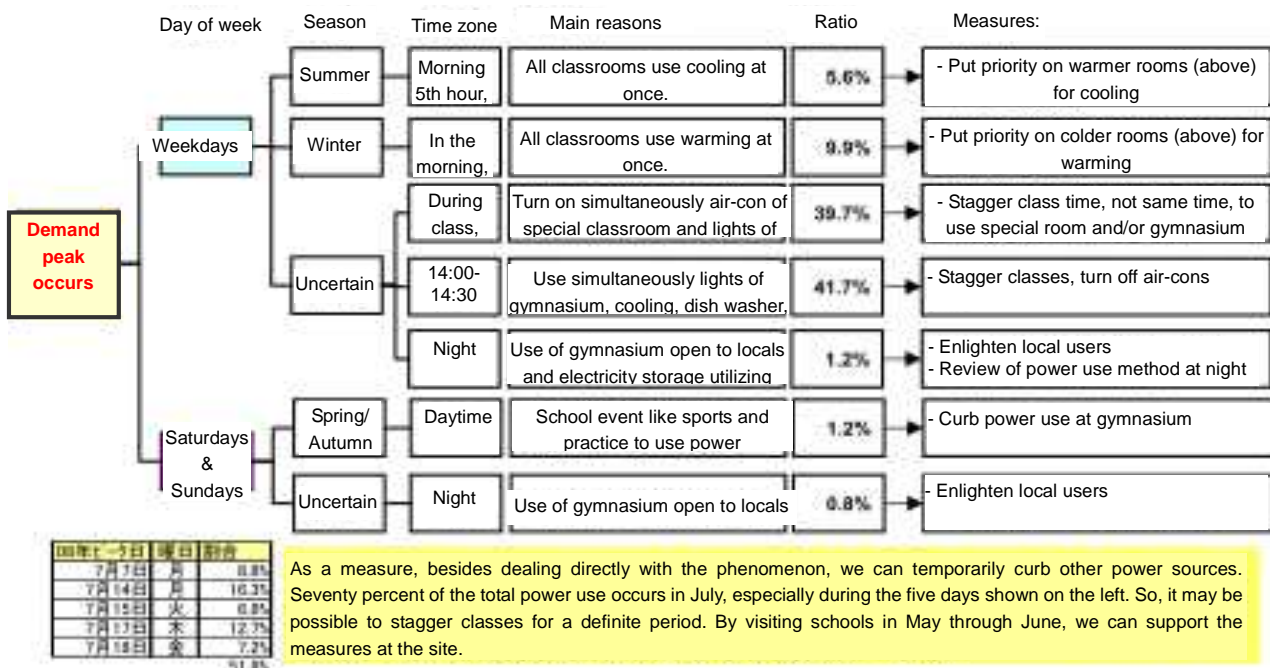
1) Comprehensive analysis of data

As Omron analyzes the data collected from all branches, it is possible to grasp measures from a wide perspective. We utilized the analysis results when we visited each school and/or gave advice by phone. It is possible to apply this type of total support to some 30,000

schools nationwide, 1,800 local governments, and many other corporations.

Structural tree of demand peak

By analyzing the data from all schools and arranging the phenomena, it is possible to present the causes and measures in the structure as below:



Structural tree of power consumption

By systematically measuring “consumed power volume”, it is possible to methodically present a cause analysis and effect validation of preventive measures.



2) Utilization for environmental education

By implementing not the general theme but environmental education that uses the data on the power we actually consumed, the users' (student, staff) awareness can be raised.

3) ASP method

By adopting this method, it is possible to introduce the Energy Management System to local governments or corporations that do not have expert staff who can deal with LANs and servers.

4) Wireless data method

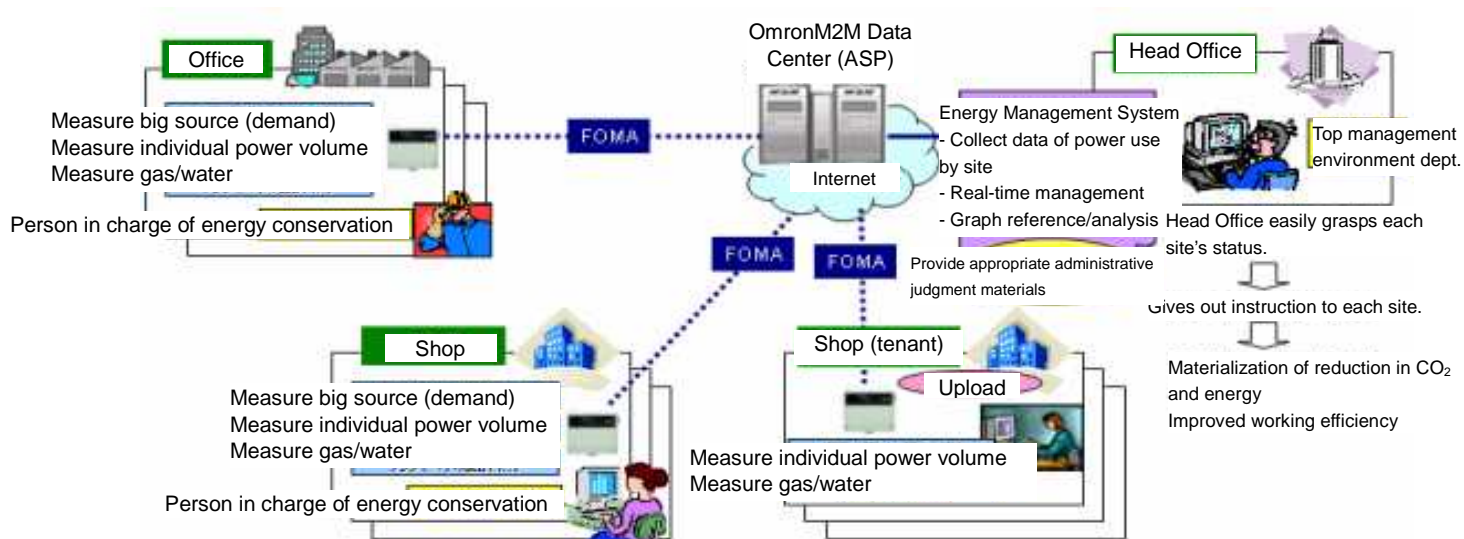
By adopting this method, it is possible to eliminate wiring construction, alleviate the building load, and introduce the Energy Management System inexpensively.

5) Real-time WEB access

Since the activity results can be shown in real time thanks to the system, the motivation of site staff who are engaged in the energy-saving activities can be raised.

6) Deal with the revised Energy Conservation Law

It becomes possible to introduce in a short time the mechanism of energy data management at each branch. Not only schools in other prefectures but corporations with many branches like chain stores can utilize it.



(3) Continuity / Sustainability

Thanks to the incentives after energy reduction and the measures by the local government (Education Committee) and the corporation (Omron) to grasp and improve the energy-saving activity status, the voluntary energy-saving activities by Kyoto municipal schools and kindergartens can continue.

1) Incentives for job sites through total execution system

(The saved utility/water expense is to be used as library expenses, etc.)

- From 2007, Kyoto City started the “ school budget carry-over system ” that allows a school to carry over the budget to next year. (Upper limit: 100,000 yen, current limit: 400,000 yen)

2) Examine the measures to investigate and improve the energy-saving activity status of schools/kindergartens

- Omron regularly reports the activity status of the theme agreed upon at the start of the year and suggests the measures to develop at all schools and kindergartens. The Education Committee and Omron regularly meet to discuss and examine them.

<Concrete activity contents>

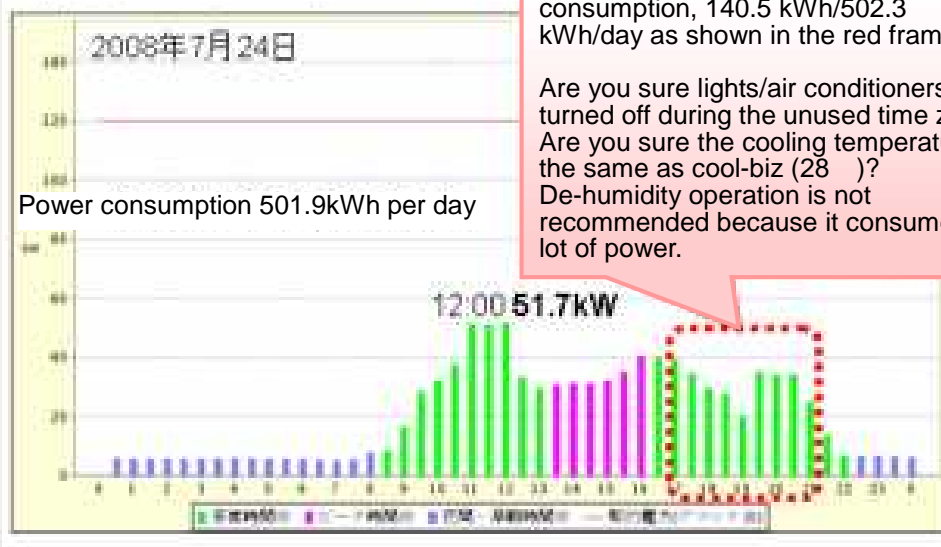
(a) Reduction in power consumption

Real-time visualization of total power consumption by the demand monitoring system

Real-time visualization of power consumption by the Energy Management System and an individual report with comments (Example: “A” school)

The highest temperature in July 2008 was 37.7 °C (day of 25, 26).
July 24 (Thu.) was very hot, recording 36.8 °C (3 p.m.).
At 9 p.m. on July 24 (Thu.), it was 31.2 °C, very muggy.
During a summer school 7/22-7/25, no meals provided by school
No peak of more than 40 kW that usually occurs at 2 p.m. to 3 p.m.

Power consumption was greater at 11 a.m. to 12 a.m. than the time
when the highest temperature occurred.
12:00 51.7kW (Maximum).



Power-saving activity by teaching staff and students throughout school

- Diligently turning off lights in rooms like the printing room and toilet except classroom
- After classes, the teaching staff should work only in the staff room. Individually set the lighting locations in the staff room, set a day when everyone goes home at a fixed time.

Reduction in air-conditioner energy consumption at local free space in summer by utilizing blinds and curtains ("A" school)

Reduction in energy consumption in summer and winter by using fans in classrooms on the highest floor ("A" school)

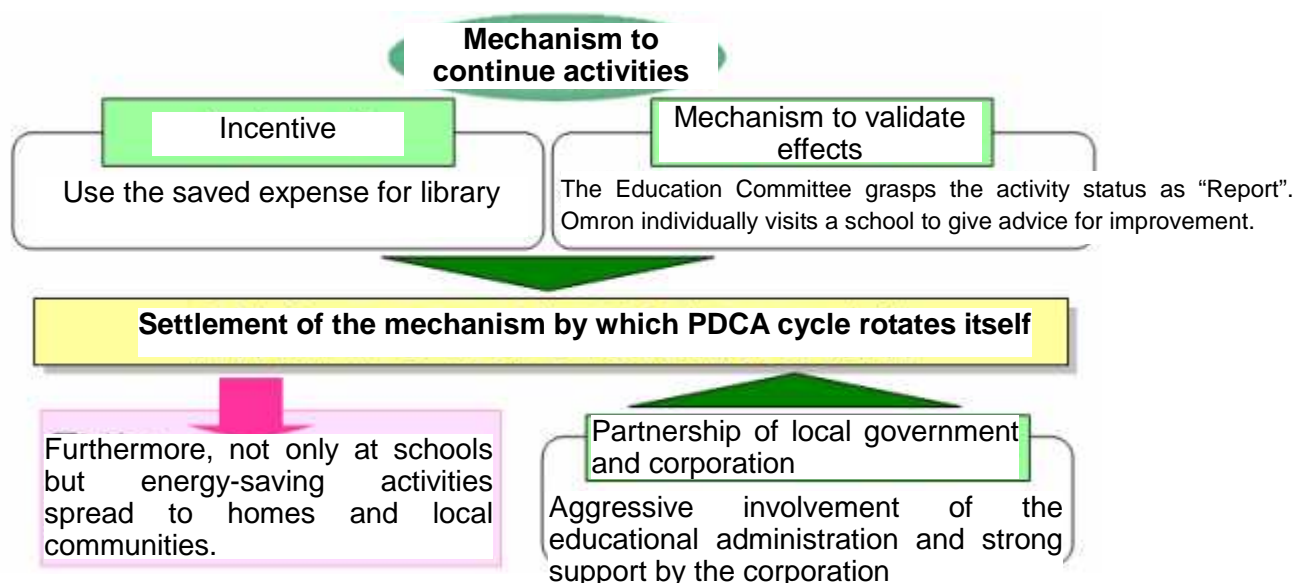
3) Support principals and vice principals in the promotion of energy-saving activities in schools

- Based on each school's data, we extract schools where the demand and consumption rise and give advice to them in person or by phone. We are promoting activities in close association with each school by introducing success stories from schools where the demand and consumption decreased.

3. Effects

(1) Settlement of the mechanism by which PDCA cycle rotates itself

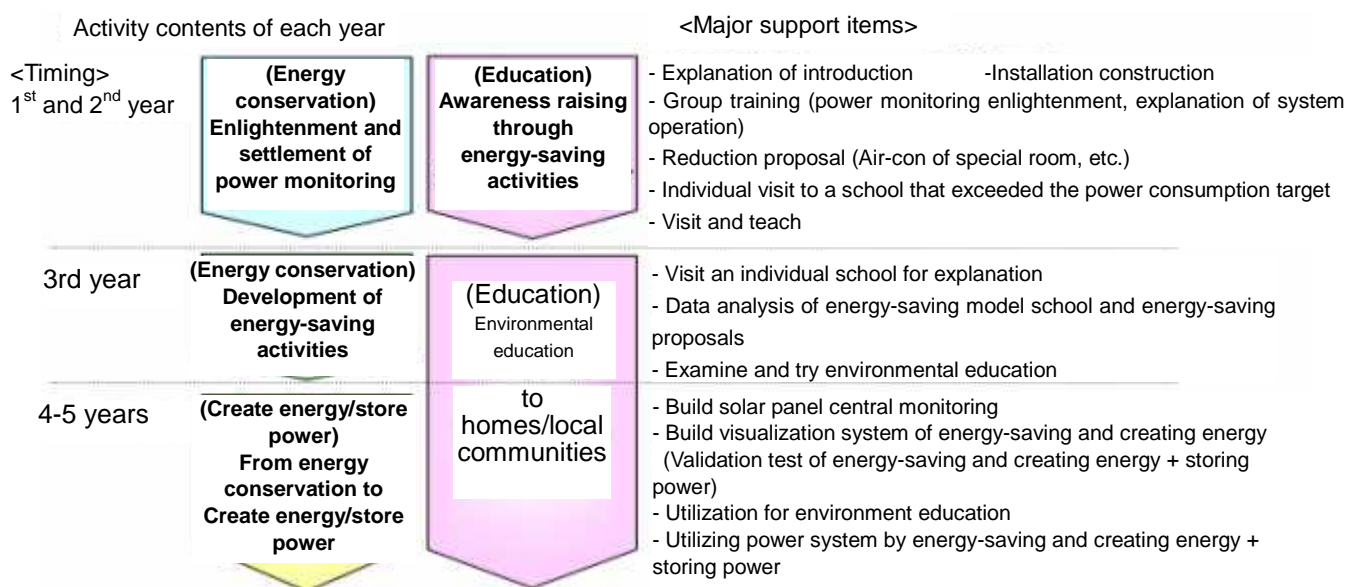
We promoted various energy-saving activities by the education project led by Kyoto Municipal Education Committee and Omron and succeeded in settling the mechanism by which the PDCA cycle of energy-saving activities rotates itself. As successful factors, we raise three points, which are incentive, mechanism of validating effects, and partnership of local governments and corporations.



<Engagement of each year toward settlement of activities>

We set the engagement contents in steps for each year and promoted the settlement of activities.

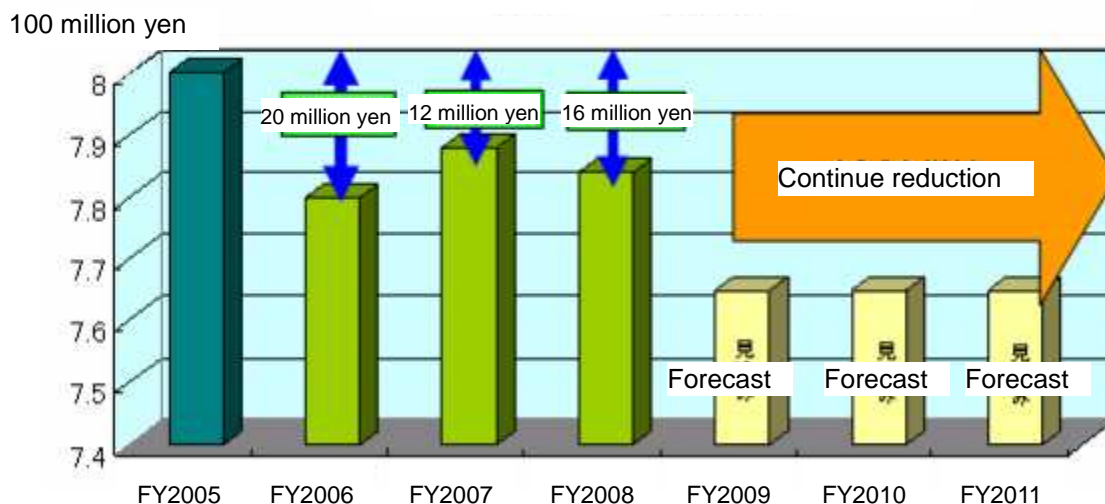
For the first and second years, we focus on visualization of power consumption by power monitoring and a reduction in contracted basic fees, and for the third year and later, we aim to settle the energy-saving activities and **spread them from environmental education to homes.**



(2) Reduction Effects

In all Kyoto Municipal schools and kindergartens as a whole, they managed to reduce consumption by curbing demand 20 million yen for the first year and around 50 million yen in three years. We expect the reduction to continue by continuing and settling the activities.

Power Reduction Effects by Curbing Demand



The total electricity charge is uncalculated since it is difficult for the comparative analysis because of the charge adjustment, climate change (the extreme heat in Year 2007) and utilization of air conditioning, etc

• Change in 3 years at an individual school

(Example: Trend of power consumption at “A” elementary school)

【電力使用量】 (単位: kWh)

年度	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	合計
2006年度(H18)	9,019	8,397	8,090	11,744	9,456	10,753	8,891	9,894	10,994	7,711	11,088	9,874	115,820
2007年度(H19)	8,561	8,468	10,032	10,955	9,314	10,337	9,336	8,240	8,448	8,714	10,517	8,524	113,449
2008年度(H20)	7,570	8,392	8,778	11,156	8,064	9,726	8,718	8,273	8,447	8,167	8,723	8,289	104,304

【電力使用量】 2006年度比 (%)

年度	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	合計
2007年度(H19)	94.9%	112.9%	124.5%	93.3%	98.5%	95.1%	105.0%	83.4%	76.9%	113.0%	95.3%	86.3%	88.0%
2008年度(H20)	83.9%	99.7%	108.9%	95.0%	85.6%	90.4%	98.1%	83.6%	76.8%	105.9%	79.0%	84.0%	90.1%

(Example: Trend of power demand at “A” elementary school)

【デマンド】 (単位: kW)

年度	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	MAX
2006年度(H18)	53	55	55	65	52	54	60	55	43	44	49	45	65
2007年度(H19)	38	44	60	57	53	59	34	35	46	57	57	47	60
2008年度(H20)	34	36	42	54	44	46	35	40	42	50	51	48	54

【デマンド】 2006年度比 (%)

年度	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	MAX
2007年度(H19)	74.2%	80.2%	108.5%	88.0%	101.0%	108.9%	57.3%	64.0%	107.9%	129.8%	115.3%	104.2%	81.8%
2008年度(H20)	64.9%	64.4%	76.9%	82.5%	83.8%	85.0%	58.7%	73.1%	98.1%	112.5%	104.7%	99.8%	82.5%

As you can see, the power consumption decreased some 10% and the demand some 18% compared with the initial year.

Schools that are energy-saving sites and Omron are promoting in close tandem with each other these energy-saving activities.