



ASEAN BEST PRACTICES AWARD ON
ENERGY MANAGEMENT FOR BUILDINGS

2018



Queen Savang Vadhana Memorial Hospital

Energy Conservation Center of The Thai Redcross Society

LARGE BUILDING Category





Category: Buildings Large Small and Medium
 Industries

Title of Activity / Project / Theme:

Energy Conservation Campaign at Queen Savang Vadhana Memorial Hospital, Thailand.

Applicant General Information

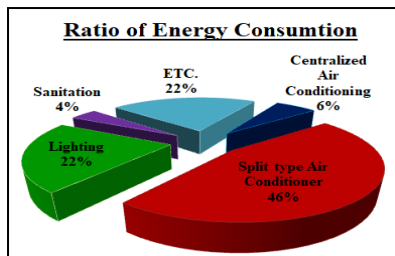
Name of Company	: Queen Savang Vadhana Memorial Hospital
Business Address	: 290 Jemjomphol Road, Sriracha, Chonburi 20110
Number of Employees	: 1,700 Persons.
Type of Building	: Hospital Building.
Age of Building	: 12 - 85 Years.
Nature of Business	: Hospital.
Contact Person	
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Project Abstract:

Queen Savang Vadhana Memorial Hospital is located in *Sriracha District, Chonburi, founded by Her Majesty Queen Savang Vadhana (Sri Savarindira, the Queen Grandmother)*, and is one of the oldest hospitals in *Thailand*. The first hospital building was built near the sea with five thatched roof houses. The opening ceremony was on September 10th 1902. Later, *King Rama V* visited the hospital and named "*Somdej Hospital*", which has been adopted since that time. At present, the 423-bed hospital provides comprehensive medical care with high quality management system in response to the needs of people who seek treatment. The hospital aims to provide excellent services that meet professional standard and highest customer's satisfaction for all people. The hospital, being a clinical teaching center, has joined the program with Burapa University to produce medical graduates in response towards the demand of doctors in the country. For the best quality of all services, *Energy Conservation* scheme has been integrated through the *Symbolic Process Analysis: SPA* into every unit to help raise the value of their routine responsibility and will not feel as if it is more workload. *Energy Conservation Campaign* during 2014-2017 helped reduce the carbon emission by total of *2,247.31 TonCo2*. As the result, the hospital was able to reduce the energy consumption by *2,352,294.99 kWh* which can be translated to *9,879,638.97 Thai Baht*. Presently, *Somdej Hospital* has become the *Energy Conservation Center of Thai Red Cross Society*.

OVERVIEW

Queen Savang Vadhana Memorial Hospital (Somdej Hospital) is a full medical service center where is capable of accommodating upto **423 beds**. The hospital is comprised of both old and new buildings, which are located in a row from one another and very close to each other. There are 16 buildings in total.



The hospital is a full circle medical center that provides full medical services such as diagnostic, treatment, food preparation or even laundry which required a special kind of large facility management. The amount of the IPD patients was averaged **11,722.83 person/(bed/day)/month in 2014**.

Table 1 summarized data on energy consumption, heat and energy consumption in the years .2017 - 2014

Year		Amount of Patient (Person)	(1) Electricity (kWh)	(2)Heat (MJ)	(3)Energy Consumption (MJ) [(3) = (1)*3.6 +(2)]	Total Energy Index (MJ/bed-day)
2013	Jan-June	66,739.00	4,368,992.00	3,817,920.00	19,546,291.20	292.88
	July-Dec	69,904.00	4,065,412.00	4,195,209.60	18,830,692.80	269.38
2014	Jan-June	70,772.00	4,271,560.00	3,806,959.20	19,172,636.20	270.91
	July-Dec	72,945.00	4,431,011.00	3,903,400.80	19,843,100.40	272.03
2015	Jan-June	67,566.00	3,959,974.00	3,568,339.20	17,824,245.60	263.80
	July-Dec	72,462.00	3,796,732.00	3,664,780.80	17,333,016.00	239.20
2016	Jan-June	68,981.00	3,700,473.85	3,609,326.88	16,931,032.74	245.44
	July-Dec	71,693.00	3,778,076.77	3,761,222.40	17,362,298.77	242.18
2017	Jan-June	66,466.00	3,723,746.69	3,685,274.64	17,090,762.72	257.14
Total		490,885.00	27,661,574.31	25,999,303.92	163,934,076.43	2,352.96
Average		70,126.43	3,951,653.47	3,714,186.27	18,214,897.38	261.44

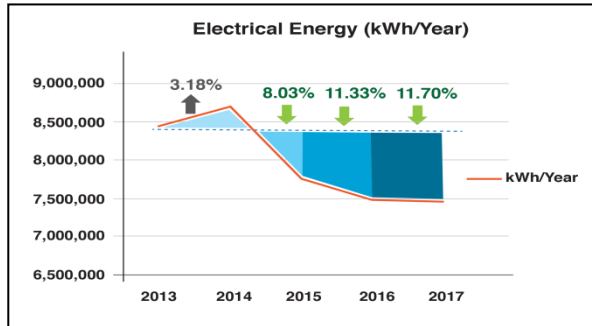
Queen Savang Vadhana Memorial Hospital is currently receiving electricity supply from the Provincial Electricity Authority measured through 2 electricity meters: 1) registered electricity user number 9806-020002575662 rate type 4.2.2, TOU rate. 2) registered electricity user number 9118-020002572785 rate type 3.1.2, General rate. For the best quality of all services, energy conservation scheme has been integrated through the **Symbolic Process Analysis: SPA** into every units and departments of the organization to help raise the value of their routine responsibility and will not feel as if it is more workload. **Symbolic Process Analysis** is a process where each unit will find a simple symbolic to identify its responsibility and use that as the reminder to formulate measures for energy management in its own unit.



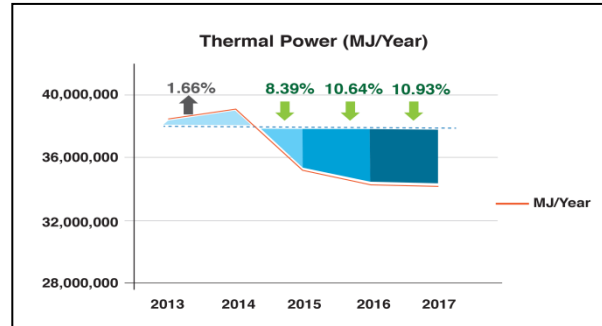
Symbolic Process Analysis Training

1. IMPACT

1.1 Energy Saving



a) Electrical energy usage 2013 – 2017



(b) Thermal power usage 2013 - 2017

In 2014, *Somdej Hospital's energy consumption was very high at 8,702,571 kWh/year for electricity and 39,015 MJ for heat*, which averaged about *271.47 MJ bed/day*. The *Energy Conservation Campaign* was then appointed. As result through the *Energy Conservation Activities*, the hospital was able to reduce the energy consumption by *2,352,294.99 kWh* which can be translated to *9,879,638.97 Thai Baht*, while during 2013-2014, the amount of patient increased by *5.18%*. With this upsurge would naturally raise the electricity and heat consumption by *3.18%* and *1.66%* respectively. Between 2014-2017, the hospital finally could evidently prove the reduction of electricity usage; *8.03%*, *11.33%* and *11.70%* of each year respectively, while the reduction on the heat usage during 2015-2017 were down by *8.39%*, *10.64%* and *10.93%* each year respectively which averaged at *249.55 MJ /bed-day*.

Remark: Based on the electricity and heat consumption per bed day during July to December 2017 where the average energy consumption per bed day during January to June 2016 is used as the base figure.

1.2 Environmental Effect

1.2.1 Reduction of CO₂ Emission through Energy Conservation

Energy Conservation Campaign during 2014-2017 helped reduce the carbon emission by total of *2,247.31 TonCO₂*.

1.2.2 Pollution and Waste Management

Queen Savang Vadhana Memorial Hospital determined to successfully manage garbage and waste by adopting *ISO: 14001* to help reduce the impact on the environment. The hospital has established the waste management into a part of the policy along with *Energy Conservation Campaign*. Before the beginning of the planning, the responsible team went to study trip to learn about the successful process at *Chaophraya Yommaraj Hospital* who is one of the best practitioner in waste management around. The team had gain much of the knowledge and came back to implement the process. At *Queen Savang Vadhana Memorial Hospital*, there are 4 types of waste to be managed properly; *general waste, recycle waste, infectious waste and hazardous waste*. The team decided and planned on managing all these waste properly by the international standard for hospital (Infection Control: IC).



In waste management the **3R: Reuse Reduce Recycle**, are adopted.



Reuse: use both side of the paper Reduce: use personal food container instead of foam Recycle: the innovation of wrapper and brine

Project: Save the World Bank was the initiative of the Managing Director and management which included the environmental team. With the objective to encourage all personal to be part of separate the recycle waste from the beginning of the process. This method helps reduce the cost of waste management and also gain money from selling recycle. The money then divided into two parts; 20% go to Hospital and 80% go back to the units that collect. Where all the recycle collected will be sold to the **Save the World Bank** 3 times a week; Monday, Wednesday and Friday. By adapting **JCI standard** and waste management regulation, the result is very satisfy, presently the hospital have built a large shed to store all the recycle before selling them to independent contractor.

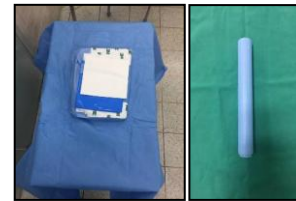








Save the World Bank

1.2.3 Recycle

1) Tourniquet cuff stain protection with **disposable sheet**

Disposable sheet: It was the Orthopedic Department Innovation. The procedure was to use Disposable pack left over from the Eye Department and cut them into the size of .cm 18 × 90 Use this instead of brill We in operation with Tourniquet cuff, it effectively helps absorb any kind of liquid that soak through to Tourniquet cuff,



<p>quet Tourni cuff Webrill</p>		<p>→</p>		<p>→</p>	
<p>Tourniquet cuff Disposable sheet</p>		<p>→</p>		<p>→</p>	

Summary :reduce Webrill usage from 1 roll/ use, to 1 roll/ 2 uses, which help save the cost by 63,756 Thai Baht / year, besides it is one of the most efficient ways to reuse, recycle material for surgery operation.

2) “Train your hand” Innovation

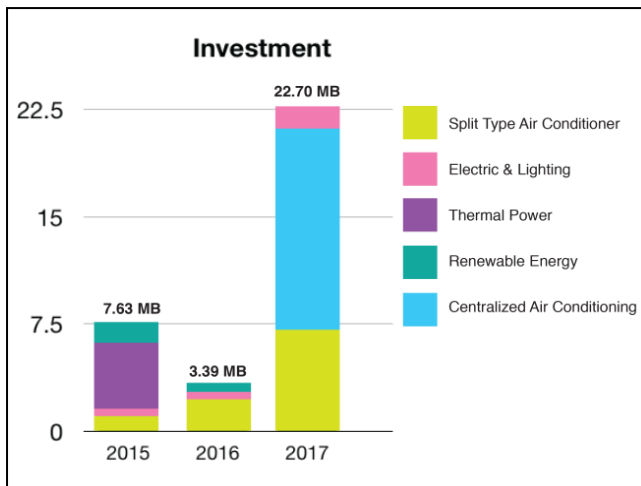


“Train your hand”: is the innovation in Rehabilitation Department, by recycle the old and broken staff/ cane to make a rehabilitation tool for patient who need hand/ arm rehabilitation which included those with movement problem from different body parts such as shoulder muscle, elbow, arm and hand.

Standard hand training equipment	Innovative hand training equipment
	<p>Materials</p> <p>Old staff/ Cane</p> <p>Wood treatment</p> <p>Screws</p> <p>Chopstick</p> <p>Adhesive</p>
<p>Summary :The innovative hand training equipment is operating and assisting in the shoulder muscle, elbow, arm and hand rehabilitation as well as the actual standard hand training equipment. This innovation help the hospital to reduce the cost of purchasing the standard equipment one which cost around 700 Thai Baht per unit, where the hospital can self-produce to accommodate all that required. Moreover, the patent can be given to those patients who would like to DIY at home as well.</p>	

1.3 Economic Impact

1.3.1 Investment



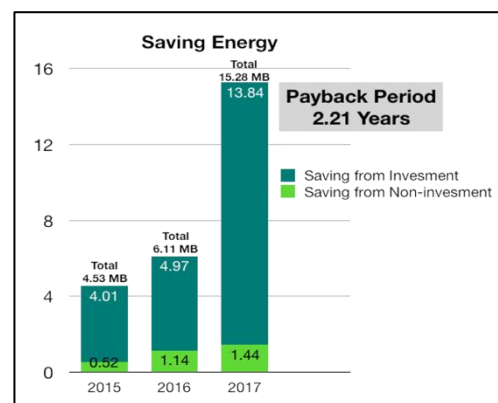
Since 2015, *Somdej hospital* has been investing in more efficiency equipment and technology to improve the energy management, i.e. *Centralized Air conditioner, LPG boiler, LED lights, solar collector, VSD for CHP, Start-Stop sensor for the escalator, VSD/ VRF Split-type air conditioner and Heat ventilation*. The total investment was **33,716,430 MB**.

2015-2017 Energy Conservation Investment

Year	Investment					Total
	Centralized Air Conditioner	Renewable Energy	Thermal Power	Electric & Lighting	Split Type Air Conditioner	
2015	-	1,500,000	5,300,000	291,120	535,000	7,626,120
2016	-	450,000	-	377,180	2,559,440	3,386,620
2017	17,170,000	-	-	648,060	4,885,630	22,703,690
TOTAL	17,170,000	1,950,000	5,300,000	1,316,360	7,980,070	33,716,430

1.3.2 Payback period

For the payback period which included the non-investment was total of 2.21 year. (Investment 33,716,430 ÷ 15,276,080 saving = 2.21 year) This success is considered to be very well executed as plan, especially for the Government owned hospital. The knowledge can be use to improve the energy management procedure further on in the future.



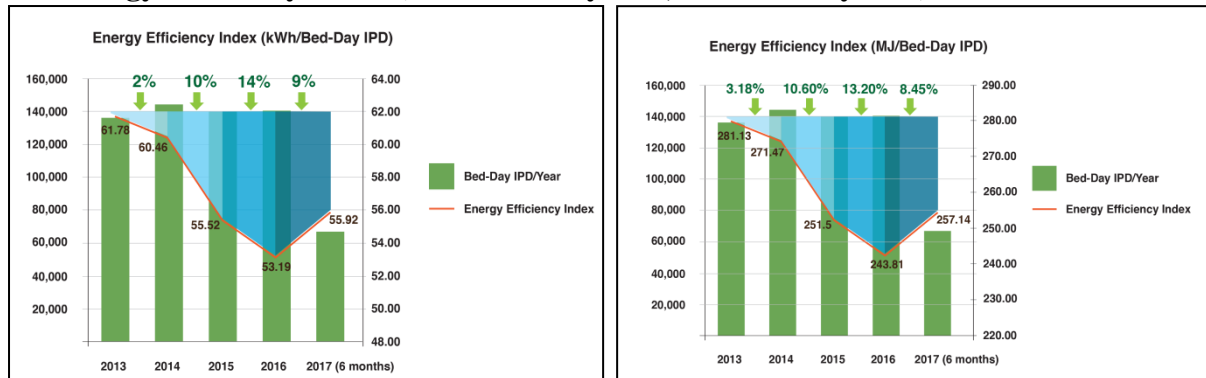
Total saving

Year	SAVING ENERGY						
	Saving from Non-investment	Saving from Investment					TOTAL
		Centralized Air Conditioner	Renewable Energy	Thermal Power	Electric & Lighting	Split Type Air Conditioner	
2015	519,563.32	-	434,921	2,497,330	706,167	371,704	4,010,122
2016	621,205.57	-	171,641		496,731	288,746	957,118
2017	297,562.15	3,260,888	-		1,569,859.45	4,039,761.60	8,870,509
TOTAL	1,438,331	3,260,888	606,562	2,497,330	2,772,757	4,700,212	15,276,080

Table 2: Energy Conservation activities during 2015-2017

Energy Conservation Activity	Saving						Invest. (THB)	Payback Period (year)
	Electricity			Fuel				
	(kWh)	(THB)	CO ₂ Reduced (TON)	(MJ)	(THB)	CO ₂ Reduced (TON)		
Measures from non-investment								
Sterile Device Planning	1,031.04	4,330.37	0.75	-	-	-	-	-
Fabric Dryer Planning	7,726.10	32,449.60	5.61	-	-	-	-	-
Hot Air Oven Planning	48.19	202.40	0.04	-	-	-	-	-
Lean Process Registration /Keep-Search	10,452.00	43,898.40	7.63	-	-	-	-	-
Weaning Ventilator Planning	104,448.23	438,682.55	76.26	-	-	-	-	-
Measures from investment								
Replaced To LED Tube 18W	152,073.60	620,460.29	110.48	-	-	-	217,000	0.35
Replaced To LED Tube 9W	21,006.48	85,706.44	15.26	-	-	-	74,120	0.86
Installed Solar Collector Fl.5,6,7	106,598.25	434,920.86	77.45	-	-	-	1,500,000	3.45
Replaced Boiler LPG	-	-	-	968.64	2,497,330	0.22	5,300,000	2.12
Replaced To Inverter Air-Conditioner	91,104.00	371,704.32	66.19	-	-	-	535,000	1.44
Total for 2015	494,487.88	2,032,355.23	359.67	968.64	2,497,330	0.22	7,626,120	1.68
Measures from non-investment								
Discharge Planning	8,725.44	33,156.67	6.34	-	-	-	-	-
Autoclave Planning	148.57	624.00	0.11	-	-	-	-	-
Lean Process Prepare Room Before Admission	136,386.00	518,266.80	99.09	-	-	-	-	-
Dish Washer Planning	4,051.50	15,395.70	2.94	-	-	-	-	-
Lean Process Discharge Planning	14,148.00	53,762.40	10.28	-	-	-	-	-
Measures from investment								
Replaced To LED Tube 18W	94,187.52	357,912.58	68.43	-	-	-	134,400	0.38
Replaced To LED Tube 9W	18,501.12	70,304.26	13.44	-	-	-	65,280	0.93
Installed Solar Corrector Fl.2,3,4	45,168.75	171,641.25	32.82	-	-	-	450,000	2.62
Installed Start-Stop Sensor Escalator	15,840.00	60,192.00	11.51	-	-	-	150,000	2.49
Replaced To VRF Air-Conditioner	75,985.70	288,745.66	55.20	-	-	-	2,559,440	8.86
Installed Photo Switch For Lighting	2,190.00	8,322.00	1.60	-	-	-	27,500	3.30
Total for 2016	415,332.60	1,578,323.31	301.75	0	0	0	3,386,620	2.15
Measures from non-investment								
Increase The Temperature Of Air-Conditioner	6,259.75	26,290.95	4.55	-	-	-	-	-
Unplug the Appliance If Not In Use	1,624.38	6,822.40	1.18	-	-	-	-	-
Decrease the Admission Of Patient	62,964.00	264,448.80	45.74	-	-	-	-	-
Measures from investment								
Replaced To LED Tube 18W	322,297.92	1,353,651.26	234.15	-	-	-	459,900	0.34
Replaced To LED Tube 9W	50,492.64	212,069.09	36.68	-	-	-	178,160	0.84
Installed Dropped Switch For Lighting	985.50	4,139.10	0.72	-	-	-	10,000	2.42
Replaced To VSD Screw Air Cooled Chiller	571,166.72	2,818,900.22	487.61	-	-	-	16,290,000	5.78
Installed VSD For CHP	105,235.20	441,987.84	76.46	-	-	-	880,000	1.99
Replaced To Inverter Air-Conditioner	583,280.00	2,869,776.00	496.41	-	-	-	4,012,500	1.40
installation of heat ventilation equipment by condensate water	278,568.00	1,169,985.60	202.38	-	-	-	1,108,288	1.88
Total for 2017	2,182,874.11	9,168,071.26	1,585.89	0	0	0	22,703,690	2.48
Total 3 Years	3,092,694.59	12,778,749.80	2,247.31	968.64	2,497,330.00	0.22	33,716,430	2.21

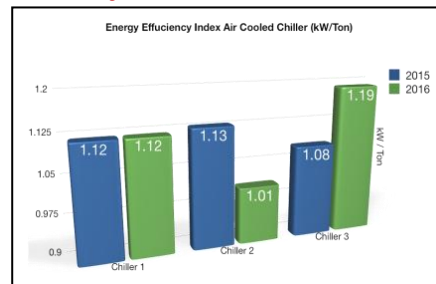
1.4 Energy Efficiency Index (kWh/Bed-Day IPD, MJ/Bed-Day IPD)



a) Energy Efficiency Index (kWh/Bed-Day IPD)

b) Energy Efficiency Index (MJ/Bed-Day IPD)

In the evaluation of *Energy Conservation Campaign*, *Queen Savang Vadhana Memorial Hospital* chose the metric; *kWh/ bed-day* to calculate the *electricity consumption index*, and *MJ/ bed-day* to calculate the *heat consumption index*. Because the amount of IPD patient directly fluctuate with the energy consumption, resulted from the energy conservation campaign showed the decrement in electricity consumption between 2014-2017 by 2%, 10%, 14% and 9% respectively, and the heat consumption reduced by 3.18% 13.20% ,10.60% and 8.45% respectively. However, the reason for the *increased energy consumption in 2017 was from the full renovation on 3 operating rooms* to meet the *JCI standard* requirement. The project started in January 2017 on, resulted in the decrease patient per bed-day by an average of 1,095 bed-/day per month. Besides, the hospital also considered to use *kW/Ton energy metric* to measure the electricity consumption on the air-cooled chiller, where it helped create the learning process to manage the chiller operation time and planned on to replace with a more efficiency water-cooled chiller.



2. SUSTAINABILITY

2.1 Level of Participation and Involvement

Through the *Energy Conservation Policy* appointed by Managing Director of *Queen Savang Vadhana Memorial Hospital* to continuously improve the energy conservation process and become sustainable for the benefit of the community and society. *The Energy Conservation Committees (ECC)* has been formed, with Dr. *Dr.Somporn Techapalokul* as the president of the committees,



to take charge and achieve the objective. Further on the hospital has been honored with *“The best energy conservation hospital: under the management and staff development program in hospital 2014”* from Department of Alternative Energy Development and Efficiency. In 2017, when *Dr.Somporn Techapalokul* was retired, he had passed the authority onto *Dr.Tanate Jadwattanakul*, who

has been taking charge since. There have been many energy conservation activities organized since the beginning of the campaign, especially *the energy conservation awareness training* which resulted in encouraging the participation from all levels of personal; management, doctors, nurses, interns, pharmacists, engineers, security and housekeeper. The ECC then decided to recruit the energy conservation volunteers and assigned them to be the energy conservation volunteers (ECV) to be the mainstay and oversee the activities in their own work units. Since the beginning, 80 persons were recruited, and the number keeps on climbing up higher every year, through *“Follow the footsteps to energy conservation campaign.”* Presently, there



are more than 400 ECV from every units and departments which resulted in over 100 measurements which were created by the volunteers. They also are

active in being part of the *Energy Management Matrix (EMM)* evaluation. In addition to the energy saving within the organization, the hospital must also comply in accordance with the *Energy Conservation Promotion Act (BE 2535 amended 2007)* to continuously developing and reach sustainability; whether be raising the awareness and consciousness in all personal, or promoting it to community and society. In doing so, the *Energy Conservation* is implemented into every holiday’s celebration activities. The focus here is to help reduce the *energy consumption* and become *environmental friendly organization*.

2.2 Top Level Management Commitment

Professor emeritus. Kittikul Chaivej Nuchprayoon, M.D. at Somdej Hospital has committed to create a sustainable energy conservation environment to benefit the community and society as to become environmental friendly organization. *“Energy conservation campaign can only be achieved through participation of all level personal, everyone must be conscious of energy conservation, acknowledge the important of energy conservation, establish a transparent governance system based on good governance, and acquire the appropriate monitoring and evaluation system. Therefore it is capable of reflecting the strength and weakness for future development planning. Energy conservation does not refer to only the saving; it must not affect the quality of services as to become environmental friendly organization.”* By appointing the energy conservation policy to reduce the energy consumption by **10%** based on energy consumption of the year before, and it is a mission where all personal shall participate. The *Energy Conservation Campaign* must be well monitored by each unit and report the progress to the management monthly. *“The goal is to become the best energy conservation organization by the year 2017.”*



Appointing
Energy Conservation Policy



Energy conservation policy

In addition, the hospital had organized the **8 Steps Energy Management** training, so the management can acquire the knowledge and proper procedure in energy conservation. **Somdej Hospital** has made the policy publicly; providing energy conservation campaign signs at various points to emphasize the staff as reminder and to follow strictly. The energy conservation management team keeps track of the progress through the energy conservation team monthly meeting. The MD recognized the importance of encouraging the morale, so he always appear as honored management for the opening ceremony on every **Energy Conservation** events and personally hand out the prizes for the winners.



(a) Announcement board
With energy conservation technique



(b) Energy monthly meeting



(c) The director gives an award
to the staff

2.3 Short and Long-term Plans

With a very clear target in the energy conservation policy as to become the best energy conservation hospital by the year 2017, and also an **Energy Conservation Learning Center** for the **Thai Red Cross Society**. To reach the actual target, it is crucial to raise the awareness and keep everyone conscious of the energy conservation, until accustomed. The hospital encourages the staff to training internally and externally, while planning on upgrading the equipment and technology for improved efficiency.

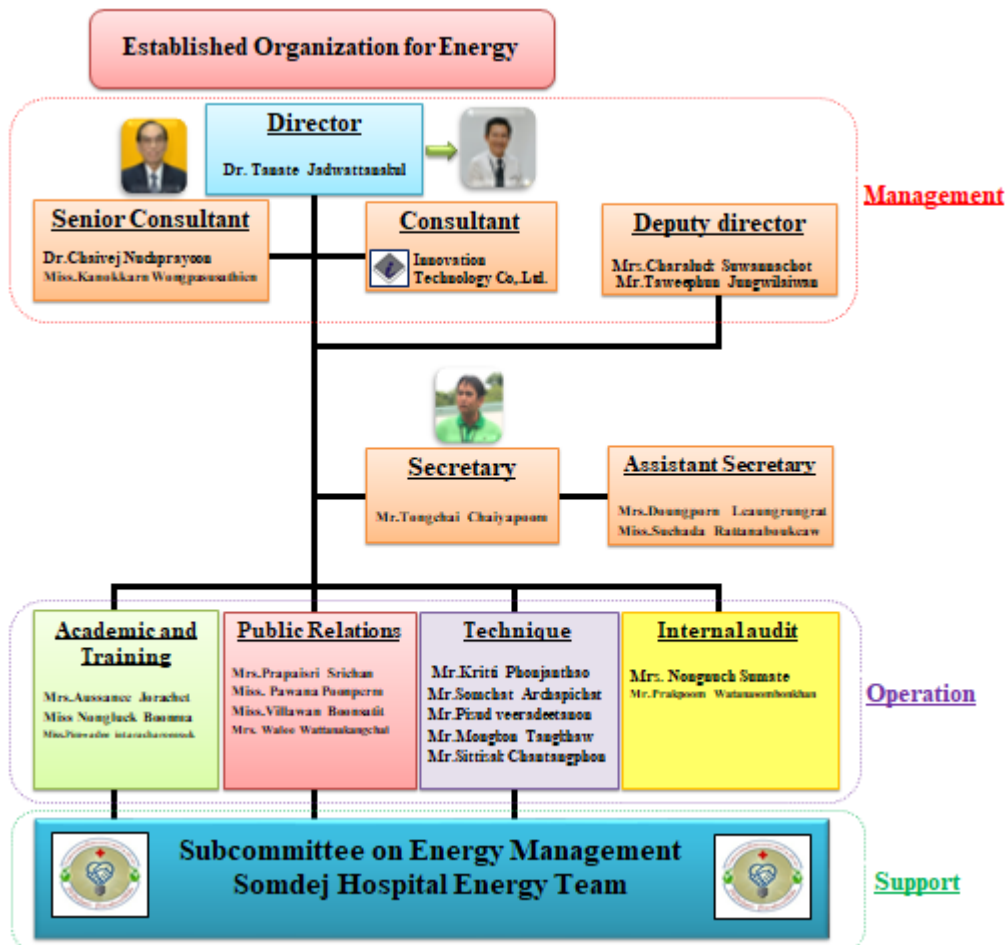
Table of the action plans for energy conservation in the future (2018 onwards)

Order	Action plans for energy conservation	Period (Month/Year)		Energy conservation goal per year					Investment (Bath)	Payback Period (Year)
		Start	End	Electricity			Fuel			
				Electricity (kW)	Electricity (kWh)	Saving (Bath)	Volume (Unit)	Saving (Bath)		
First year plan (2018)										
1	100% Energy conservation training	Feb	Feb	-	-	-	-	-	50,000	-
2	Development of Conservation training	Jun	Jul	-	-	-	-	-	20,000	-
3	Ability development of PRE	Aug	Aug	-	-	-	-	-	10,000	-
4	Awareness of energy conservation for new worker	Jul	Jul	-	-	-	-	-	10,000	-
5	Process of symbolic analysis training (SPA 5)	Oct	Oct	-	-	-	-	-	200,000	-
6	Change high efficiency motor	Jun	Jul	5.60	24,528	93,206.40	-	-	100,000	1.07
7	Change LED instead of Fluorescent T8 (1,000 units)	Jun	Jul	28	245,280	932,064	-	-	500,000	0.53
Second year plan (2019)										
1	100% Energy conservation training	Feb	Feb	-	-	-	-	-	50,000	-
2	Development of Conservation training	Jun	Jul	-	-	-	-	-	20,000	-
3	Ability development of PRE	Aug	Aug	-	-	-	-	-	10,000	-
4	Awareness of energy conservation for new worker	Jul	Jul	-	-	-	-	-	10,000	-
5	Process of symbolic analysis training (SPA6)	Oct	Oct	-	-	-	-	-	200,000	-

6	Change high efficiency of Air conditioning (50 units)	Feb	May	65	284,700	1,081,860	-	-	2,500,000	2.31
7	Install VSD of pump motor (2 sets)	Feb	May	5	43,800	166,440	-	-	100,000	0.6
Third year plan(2020)										
1	100% Energy conservation training	Feb	Feb	-	-	-	-	-	50,000	-
2	Development of Conservation training	Jun	Jul	-	-	-	-	-	20,000	-
3	Ability development of PRE	Aug	Aug	-	-	-	-	-	10,000	-
4	Awareness of energy conservation for new worker	Jul	Jul	-	-	-	-	-	10,000	-
5	Process of symbolic analysis training (SPA 7)	Oct	Oct	-	-	-	-	-	200,000	-
6	Change high efficiency motor	Feb	May	8.4	36,792	139,809	-	-	150,000	1.07
7	Change LED instead of Fluorescent T8	Jun	Jul	42	367,920	1,398,096	-	-	1,000,000	0.71
Total					1,003,020.00	3,811,475.40	-	-	5,130,000	1.35

2.4 Organization

2.4.1 Established Organization for Energy Management



Somdej Hospital Energy Conservation Committees are assigned into 3 teams: **Management** is comprised of the president, vice presidents; they are responsible for policy formation, set energy conservation direction and endorse all proven energy conservation measurements.

Operation Team is assigned to be responsible for 3 different areas; Training and Special Activity, Public Relation and Technical Training.

Academic and Training: Plan and conduct academic work in accordance with the *Energy Conservation Policy*, organize sustainable energy conservation activities.

Public Relations : Planning functions and promotes Energy Conservation Campaign; energy news, policy, information and knowledge to all personnel at all levels, as to stimulate awareness of energy conservation.

Technique: Planning for energy saving measures to maximize efficiency, oversee equipment management, and implement energy saving technology. Promote and develop innovation, renewable energy. Seek for new measures to save energy and improve efficiency.

Internal audit Team is responsible for following up with all the progress in every units. Evaluate the results from both non-investment and investment measurements every month, then the team will analysis the strength and weakness of measures to improve the energy management procedure.

Support Team is comprised of energy conservation volunteers, they are responsible to encourage and oversee all the activities in their own units to achieve the target continuously and sustainably.

2.5 Capacity building

2.5.1 Activities: internal and external of organization

Energy Conservation Activities and Projects both internally and externally are mainly focused on all level participation. The activities are interpolated into holiday's activities to encourage the participation. This helped encourage pride in being part of the campaign. Over time, *Somdej Hospital* has been facilitating *Energy Conservation Campaign* both internally and externally.

Internal Activities

- "Energy Conservation Promotion " Somdej Hospital choose 4 step measures""
- Encourage to use the stairs
- Energy Conservation Logo Competition
- "Symbolic Process Analysis: SPA " First Presentation Event
- "Symbolic Process Analysis: SPA " Second Presentation Event
- Public Relation on Energy Conservation
- 2016 Energy day
- "Symbolic Process Analysis: SPA " Third Presentation Event
- Reduce the energy usage on the Web page
- "Symbolic Process Analysis: SPA " Fourth Presentation Event
- 2014 Energy day
- "Answer the energy question program Every Wednesday"
- Public Relation on Energy Conservation
- Energy Conservation Evaluation Round
- Energy Conservation "Line Group" (SD)
- Measurement Presentation of each unit

External Activities







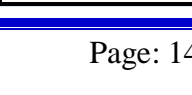
- Energy Conservation Promotion at Sukhumwit Community
- Encourage to stop using foam product at Sriracha market and food vending in front of hospital
- Energy Conservation Promotion at Beachfront Community
- Energy Conservation Promotion at Government office
- Energy Conservation Promotion at Duangmanee Community
- Bring back the mangrove forest
- Energy Conservation Promotion at Thai Red Cross Society group: Comprehensive Care center (Bangphra)
- Participate in "Ride for Mom" event
- Participate in "Ride for Dad" event



2.5.2 Educational Training

The Energy Conservation Committees recognized the importance of training to provide the proper energy conservation knowledge to improve energy usage behavior in all levels. All personal must attend the training, whether they are the management, doctor, dentist, pharmacist, technician, security or house keeper. The trainings are provided both internally and externally

Energy conservation training plan

Name of course	Day/Month/Year	Place	Quantity (People)	Activity Pictures
Internal				
"DIY Energy Conservation" Training	15-17,28-30 July 2014	Leelawadee Conference Room 1 Centennial Memmorial Building	1,650	
8 Steps to Energy Conservation	31 July 2014	Leelawadee Conference Room 2 Centennial Memmorial Building	40	
"Energy Management Model Hospital Development" Training	29-Aug-14	Sutad Anna Thangtewaprasit Centennial Memmorial Building	197	
"Process Analysis" Training	09-Mar-15	Sutad Anna Thangtewaprasit Centennial Memmorial Building	150	
"Energy Management Team and Energy Conservation Personal Development in Hospital" Training	25-27 Mar 2015	Leelawadee Conference Room 1 Centennial Memmorial Building	40	
Symbolic Process Analysis: SPA First Training	21-22 Sept 2015	Leelawadee Conference Room 1 Centennial Memmorial Building	158	
"Carbon Footprint" Training	23-Sep-15	Leelawadee Conference Room 1 Centennial Memmorial Building	158	
Raise the conciousness in Energy Conservation (New Staff)	5-6 Feb 2016	Leelawadee Conference Room 1 Centennial Memmorial Building	1360	
Energy Conservation Technology Training	12-Feb-16	Leelawadee Conference Room 4 Centennial Memmorial Building	156	
Symbolic Process Analysis: SPA Second Training	23-24 Feb 2016	Leelawadee Conference Room 1 Centennial Memmorial Building	175	
Internal Inspection Team Training	16-Mar-16	Leelawadee Conference Room 2 Centennial Memmorial Building	59	
Symbolic Process Analysis: SPA to save energy Training	16-May-16	Leelawadee Conference Room 2 Centennial Memmorial Building	155	
Symbolic Process Analysis: SPA Third Training	09-Aug-16	Leelawadee Conference Room 1 Centennial Memmorial Building	270	
Symbolic Process Analysis: SPA Fourth Training	31-Jan-17	Sutad Anna Thangtewaprasit Centennial Memmorial Building	299	
Energy Conservation Alliance Training	23-Jun-17	Leelawadee Conference Room 2 Centennial Memmorial Building	86	

External				
Project result publishing seminar	23-Jan-14	The City Sriracha Hotel Chonburi	2	
Seventh Annual Energy Conservation for the King seminar	6-7 Mar 2014	Queen Sirikit National Institute of Child Health Bangkok	10	
Site visit: Human resource development for choosing and operating Energy Conservation Technology	17-Jun-14	Energy Conservation Building in the Honor of the King Prathumthani	9	
Service mangement team development Training Energy Management in hospital Training	18-20 Jun 2014	Phyathai 2 Hospital Bangkok	10	
"Protecion plan: energy user's rights and reponsibility" Press Conference	22-Aug-14	Buraphar University Chonburi	2	
"Hospital Energy Management Team Development" Training	11-13 Mar 2015	Chaophraya Yommaraj Hospital Supanburi	1	
Site Visit: Energy Management and Infection Control Waste	19-Jun-15	Chaophraya Yommaraj Hospital Supanburi	59	
Law Compliance for Government Controlled Building Seminar	17-Jul-15	Town in Town Hotel Pattaya Chonburi	2	
Smart Energy 2015 Seminar	18-Jul-15	Energy Conservation Building in the Honor of the King Prathumthani	3	
Proficiency Development for Energy Management Personal to increase the efficiency of the equipment in factory and controlled building. (Refresh PRE)	28-Aug-15	Embassdor Hotel at Chomtian Chonburi	5	
"Hospital Energy Management Team Development" Training	25-27 May 2016	Phramongkutkloa Hospital Bangkok	3	
Site visit: Energy Conservation Building in the Honor of the King	17-Aug-16	Energy Conservation Building in the Honor of the King Prathumthani	40	
Competency Development for Energy Conservation Team Training: First Edition	17 – 19 May 2017	Aikchol Hospital Chonburi	11	
Competency Development for Energy Conservation Team Training: Second Edition	31 May 2017 – 2 Jun 2017	Bangkok Pattaya Hospital Chonburi	14	
How to establish energy matrix; SEC for hotel and hospital	09-Jun-17	The Twin Town Hotel Bangkok	2	
"High Efficiency Motor (IE4)" Energy Conservation Seminar	15,22,29 June 2017	Energy Conservation Building in the Honor of the King Prathumthani	13	
Solar cell System Training	29-Jun-17	Celestica TH Chonburi	21	

3. REPLICABILITY

3.1 Management Practices and Measures

The Energy Conservation Campaign aimed to develop the energy conservation process continuously and sustainably for the benefit of the community and society. All the energy conservation and environment friendly activities are promoted through special activities like “*A Quality Expo at Queen Savang Vadhana Memorial Hospital*” and “*The Energy Days*”.

Energy Day which is the yearly event. This event aimed to promote and encourage the energy conservation sustainably. The benefit should be for people, organization and society, as also to motivate the morale in all staff.

From a very successful feedback on the first *Energy Day* event, this impelled the event to later years, there were other organizations joined the events such as hospitals, factories, universities, cooperate and even small businesses.



Energy Days activities

A Quality Expo at Queen Savang Vadhana Memorial Hospital is a yearly event, its objective is to promote all the hospital activities and services to visitors. The event also promotes *Energy Conservation Knowhow* which can be adopted to use, such as “*how to save on using the air-conditioner, 4 steps measure: turn off, adjust, release, replace*”, and *recycle material innovation*.



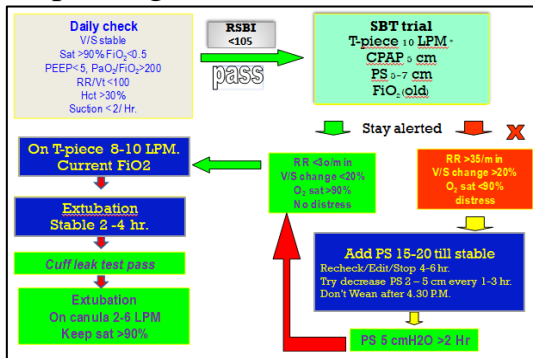
Quality Exhibition of Queen Savang Vadhana Memorial Hospital

For the successful energy conservation campaign is promoted and shared to the Thai Red Cross Society group such as *Industrial Medicine Center (Lamchabang); Power Meters, and Comprehensive Care Center (Bangpra); LED lights and helped set the TOR (Term of reference)*. These are the easy and proven technologies that the investment return can be achieved within 3 years. *The Queen Savang Vadhana Memorial Hospital* is acting as a coach to follow up with all the progress until the project was successfully executed.

3.2 Technology

Non-investment

• **Weaning Ventilator:** This process is a simple procedure to help the patient to wean off ventilator dependency, especially those patients who are improving from their illness. This process has great benefit on the patient because the sooner they are able to stop using the ventilator and breathe on its own, the quicker they recuperate, as resulting in reducing the energy consumption. The **Weaning Ventilator** measure has been applied since 2015, within one year; it helped save the cost on the electricity and maintenance by **438,682.55 Thai Baht or 104,448.23 kWh in electricity and reduced CO₂ by 76.26 Ton CO₂.**

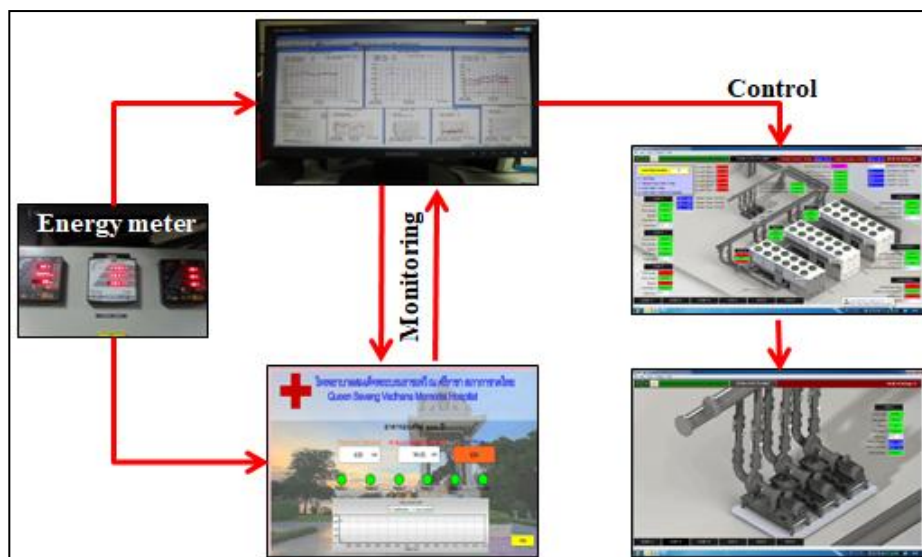


Weaning Potocol

Investment

• **Energy management and CPMS-Chiller Plant Management System**

Since the start of **Energy Conservation Campaign**, **Somdej Hospital** found one of the main problems was to collect and access the energy usage data of each building, and could not manage to turn each chiller on/off as schedule. 28 units of **Power Meter** were installed, **VSDs** were installed with **CPMS-Chiller Plant Management System**, then the real time data from **Power Meter** were analyzed to set parameter for the **CPMS program** to operate the chillers while the real time data can be tracked on the smart phone by everyone to decide on the measure to reduce the energy usage. The idea helped to form “**Set an energy building prototype to become an energy conservation learning center.**” Overall investment on these technologies was **3,000,000 Thai Baht**, the result in comparing with the energy consumption in 2015, for 2016 the hospital was able to reduce the energy consumption by **318,002 kWh or 1,272,010 Thai Baht**, where in 2017 (January-July), reduced by **318,843 kWh/ 1,339,141 Thai Baht**.



Energy management and CPMS-Chiller Plant Management System

4. ORIGINALITY

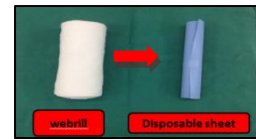
4.1 Creativity/Innovation

- Tourniquet cuff stain protection with *disposable sheet*:



use disposable sheet

The procedure was to use pack Disposable left over from the Eye Department and cut them into the size of 18x90 cms. Use this instead of *Webrill* in operation with Tourniquet cuff, it effectively helps absorb any kind of liquid that soak through to Tourniquet cuff. This measure helped reduce Web rill usage from 1 roll/ use, to 1 roll/ 2 uses, which help save the cost by 63,756 Thai Baht / year, besides it is one of the most efficient ways to reuse, recycle material in surgery operation.



- **“Train your hand”**: is the innovation in Rehabilitation Department, by recycle the old and broken staff/ cane to make a rehabilitation tool for patient who need hand/ arm rehabilitation which included those with movement problem from different body parts such as shoulder muscle, elbow, arm and hand. The innovative hand training equipment is operating and assisting in the shoulder muscle, elbow, arm and hand rehabilitation as well as the actual standard hand training equipment. This innovation help the hospital to reduce the cost of purchasing the standard equipment one which cost around **700 Thai Baht** per unit, where the hospital can self-produce the DIY hand training equipment to accommodate all that required. Moreover, the patent can be given to those patients who would like to DIY at home as well.



- **Energy Conservation Full Medical Services Building**

Through the **Energy Conservation Campaign** with knowledge and experience gained, **Somdej Hospital** decided to implement the knowledge into constructing a new energy efficiency medical center. This building received **“the Building Plan’s Energy Conservation Awards”** at 2016 BEC Awards. The new building will be the first new full service hospital building in Thailand.



25. BENEFITS

Queen Savang Vadhana Memorial Hospital is part of the **Thai Red Cross Society** with the role in saving lives and provides the best healthcare services to all people. The **Energy Conservation Campaign** aimed to develop the energy conservation process continuously and sustainably for the benefit of the community and society. With this kind of dedication, **Queen Savang Vadhana Memorial Hospital** has become the **Energy Conservation Learning Center of Thai Red Cross Society**. **“Know the usage, know the way, recognize the value, lead to sustainable energy conservation.”**

