



# Future Park Shoping Center

## The Natural - Metro Shopping Park



## Let's Turn off Power to Turn on Energy Saving







Category:  $\square$  Buildings  $\square$  Industries

gs ☑ Large

 $\Box$  Small and Medium

#### Title of Activity / Project / Theme:

Future Park Shopping Center : Let's Turn Off Power To Turn On Energy Saving

#### Applicant General Information

Name Of Company	: Rangsit Plaza Co.,Ltd.
Business Address	: 94 Future Park, Paholyothin Road, Prachathipat, Thunyaburi,
	Pathumthani 12130, Thailand
Number of Employees	: 240 person
Type of Building	: Shopping Center and Offices
Age of Building	: 19 years
Nature of Business	: Shopping Center ; The Natural-Metro Shopping Park
Contact Person	
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Position : Senior Pu	blic Relation Manager
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## **Project Abstract:**

Project Abstract:

Future Park Shopping Center strives to be the professional real estate development and management in retailing, who also care for the clients, partners, society, environment, employees, investors and shareholders. Since 1995, Future Park has managed the retail business with strong emphasis on the responsibility toward stable and sustainable growing of society, community, and environment for over 19 years. Our core CSR missions include Corporate Governance, Future Park Goes Greener, Social Contribution, Employee and Customer & Supplier. In the past three years with green business by 3R as reduce, reused and recycle, Future Park Shopping Center can reduce CO2 emission 3,824.93 tons. Secondly, we can save 416,729 m3 by reused and recycling water and occurring reduction of 11 tons CO2 emission. Furthermore, municipal waste management can obtain 1,800 tons per year for waste disposal reduction. Moreover, activities on natural reforestation can increase a large amount of oxygen about 880 tons per year; hence we can solve global warming and climate change. Future Park Shopping Center continues to support a customer relationship management in a green activities participation program as energy conservation day, the recycle market and the natural reforestation program.

For these reasons, the energy conservation and environmental conserves are our key business issue so we can develop a sustainable future with a vision of the organization being "The Retail Professional That You Can Trust For a Sustainable Future"





#### **CERTIFICATION AND ENDORSEMENT**

The Management of Future Park Shopping Center here by agreed to allow the ASEAN Board of Judges and other experts that may be designated by ACE to visit the building and verify the authenticity of the data. However, two weeks advance notice is required to allow for necessary arrangements.

We also here by agreed that ACE can publish the whole submission in ACE publications and website, without any prior consent of the owner of the buildings. If the submission will be published in other publications, the consent of the concerned building would be required.

We, the undersigned certified that the information given is true and accurate and prepared with the consent of the party/ies involved.

Endorsed by Focal Point

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(Mr.Chatchai Doungdane) Engineering Manager Rangsit Plaza Co., Ltd Tel : 662-958-0011-50 ext.1088 Fax : 662-958-0081 E-mail : chatchai.d@futurepark.co.th

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## **Project/Activity Overview**

#### Description

Future Park Shopping Center was officially started to operate in 1995 under the management of Rangsit Plaza Co.,Ltd. The buildings has four stories with one basement and can be categorized into Shopping Center and Offices. Future Park located at 94 Future Park,



Paholyothin Road, Prachathipat, Thunyaburi, Paholyothin Road, Prachathipat, Thunyaburi, Pathumthani, Thailand on area of 106 Rai. The gross areas are 302,829 m<sup>2</sup> which composed of functional area 189,110 m<sup>2</sup>, air conditioning area 135,396 m<sup>2</sup>, non-air conditioning area 53,714 m<sup>2</sup> and car park 113,719 m<sup>2</sup>. The shopping center receives over 160,000 visitors in daily and operates 10.30 am-9.30 pm on Monday to Friday and 10.00 am-10.00 pm on Saturday and Sunday with total operating hour 4,198 h/y.

Future Park Shopping Center

The energy consumption for Future Park Shopping Center can be classified into electrical consumption and thermal energy (LPG and Diesel). LPG uses for cooking and diesel uses for electricity generator. The breakdown of electricity consumption and thermal consumption are 87% and 13%, respectively.

The energy uses in Future Park are classified into 3 sections, namely, Central Area, Office area and rental shop area. Energy consumption for each section are recorded by digital meter as following.

- Central Area: This area covers central air conditioning system, lighting system and public utilities
- Office Area: Electricity is supplied to office area for air conditioning system, lighting system and office equipment.
- **Rental Shop Area:** This section covers all rental shops.



Energy Consumption during 2010-2013





#### 1. Impact

#### **1.1 Energy Saving**

According to the energy crisis, the board and whole staffs of Future Park Shopping Center promptly conjoin to concentrate on energy conservation. The board of Future Park Shopping Center fully supports energy conservation activities to achieve the sustainable energy uses.

Energy conservation measures obtained from energy management without investment and with investment from retrofitting, replacement of existing equipment



to the high efficient equipment and using high technology for efficient management were done during 2011-2013. The energy saving can be achieved with the amount of 5,264,781 kWh and the values of saving 19,450,258 Baht with the investment cost 109,395,140 Baht and payback period 5.62 years as given in Table 1.

		Savi	Invostment	Dovbook			
Energy Conservation Measures	Electrical Consumption (kW)	Energy Consumption (kWh)	Cost Saving (Baht)	CO <sub>2</sub> Reduction (Ton)	Cost (Baht)	Period (Year)	
Year 1:2011							
Energy Management Measures (no							
investment cost)							
1 Reduction of the amount of air		143,186.53	483,970.47	104.03	-		
conditioner units in office							
2 Reduction of operation hours of		8,441.58	28,532.54	6.13	-		
lighting system in office							
3.Increasing of chilled water		132,983.10	449,482.88	96.61	-		
temperature from 41 °F to 42 °F							
Energy Measures with investment							
cost							
1.Reduction of the amount of air	4.30	37,711.80	127,465.88	27.40	45,000	0.35	
conditioner units in store							
2.Replacement of Compact	18.04	79,015.00	267,070.70	57.41	93,000	0.35	
Fluorescent Lamp 23 Watts instead							
of PAR 120 Watts							
3. Replacement of Compact	30.60	111,690.00	377,512.20	81.14	300,900	0.80	
Fluorescent Lamp 15 Watts instead							
of PAR 75 Watts							
Year 2: 2012	T	r	r	1	r		
Energy Management Measures (no							
investment cost)							
1.Energy public relation in Office		31,000	115,320	22.52	-		
Energy Measures with investment					-		
cost							
1. Replacement of split type air		88,586	329,538	64.36	567,100	1.72	
conditioners with chillers							
2. Replacement of lamp T8 36 W	48.49	230,075.56	855,881	167.15	3,746,800	4.38	
with LED lamp							
Year 3: 2013							
Energy Management Measures (no							
investment cost)							
1.Energy public relation in Office		58,302	232,625	42.36	-		
2.Reduction of lighting system		20,032	79,928	14.55	-		

#### Table 1 Energy Conservation Measures during 2011-2013





		Savi	Invoctment	Povhoek		
Energy Conservation Measures	Electrical Consumption (kW)	Energy Consumption (kWh)	Cost Saving (Baht)	CO <sub>2</sub> Reduction (Ton)	Cost (Baht)	Period (Year)
30% for car park at basement after						
12 a.m.						
3.Reduction of operating time of		14,235	56,798	10.34	-	
motor and ventilation fan						
Energy Measures with investment						
cost						
1.Replacement of CFL 80 W		7,768	30,994	5.64	5,180.00	0.17
instead of Low Bay 250 W						
2.Replacement of water pump 30	8.00	46,720	186,413	33.94	1,500,000	8.05
kW with water pump 22 kW and						
installation of VSD						
3.Retrofitting of chiller plant and		4,255,034	15,828,726	3,091.35	103,137,160	6.52
applying energy management						
Grand Total	109.43	5,264,781	19,450,258	3,824.93	109,395,140	5.62

#### **1.2 Environmental Effect**

## **1.2.1** Evaluation of the reduction of carbon dioxide $(CO_2)$ emission from energy conservation

Energy management and replacement of more efficient equipment can reduce  $CO_2$  emission during 2011-2013 as followings.

- Year 2011, energy saving 513,028.01 kWh/y or the reduction of  $CO_2$  emission 372.72 Ton  $CO_2$
- Year 2012, energy saving 349,661.56 kWh/y or the reduction of  $CO_2$  emission 254.03 Ton  $CO_2$
- Year 2013, energy saving 4,402,091 kWh/y or the reduction of CO<sub>2</sub> emission 3,198.19 Ton CO<sub>2</sub>

The total energy savings are 5,264,781 kWh or the reduction of  $CO_2$  emission are 3,824.93 Ton  $CO_2$  for the period of three years.

Moreover, Future Park pursues environmental issues i.e. waste segregation, waste recycle, water recycle, planting trees along road and car park and planting tree in various areas to increase the amount of oxygen content.





#### **1.2.2 Disposal Waste and Pollution**

Future Park applied ISO 14001standard to its organization to deal with waste management, water pollution and air pollution i.e. deteriorated materials, food scrap, wash water and garbage are systematic managed. Waste water was pump to the storage tank and then process to water recycle treatment under water standard conditions. Dry garbage are identified the proper separation place and distribute to recycle market directly between rental shops and waste buyers. The rest is left to municipal waste disposal determination.











Waste	Management Method
Paper Paper Sheet/Scrap of Paper/Newspaper/Handbill Milk Carton/Paper Box/Folding carton	Waste segregation and distribution in recycle market fair to scrap buyer
Plastic         -       Plastic/Plastic Bag         -       Drinking Bottle/ Beverage         -       Edible Oil Bottle/Condiments Bottle/ Milk Bottle/Dishwashing Liquid Bottle         -       Water glass/Straw/Can/Pen/Toner Cartridge         -       Basket/Rack/Basin/PVC Pipe/Crate	Selection and Distribution in market fair to scrap buyer
Glass - Alcohol Bottle/Bottle of Drinking Water/Bottle of Energy Drink/Medicine Bottle - Glass/Plate	Selection and Distribution in market fair to scrap buyer
Metal - Steel /Copper/Aluminium/Stainless Steel - Can	Selection and Distribution in market fair to scrap buyer
Materials and Hazardous Wastes         - Lamp         - Spray Canning/Insecticide Canning/Chemical Container         - Expired Battery	Packing and hiring agencies for disposal waste.
Others (can sell)           - Office Equipment/Table/Cabinet           - Ceramic/Tiles/The material through the use of already	Distribution in recycle market fair to scrap buyer
Food Scraps - Debris from Shops/The Central Cone	Distribution to buyer
Domestic Waste           -         Daily Consumer i.e. Foam Box/Plastic Bag           -         Various Dust/Other Junk Waste	Employment of municipal agencies to get rid of waste in the correct way.
Infectious Waste           Infectious from hospital clinic i.e.           Syringe/Gauze/Blade/water rack/Mask/Cleaning Cloth	Packing and hiring agencies for disposal waste.
Waste Water           - Waste water from Future Park/Central/Robin Son/BigC	Treatment with waste water treatment plant and water reused according to water supply standard.

#### **1.2.3** The Management of Wastes and Pollutants towards Recycle Projects

According to Future Park Shopping Center's policy and commitment, material and waste scrap are recycle by various processes for waste reduction and can generate incomes for the community and conserve the environments which are divided into 2 parts.





#### • Self-Waste Management

- Secondary Waste Water Treatment is operated with color and odor removal and reused for water planting and water flushing. Moreover, the remaining waste water treatment will be recycled with Ultra Filtration Membrane Technology and used in cooling tower system. Sludge is distributed to buyer.
- Ppapers (used 1 page) are used to produce the book and donate to interested schools and organizations.
- Preparation of the cloth bag to whole staffs, customers and rental shops instead of plastic bag.



#### Waste without Self-Management

Ink cartridge, glass bottle, plastic bottle and paper box are separated to distribute in recycle

market.

#### **1.3 Economic Effect**

Future Park shopping Center continuously actions on the energy conservation measures and holds activities for promoting energy conservation. The goals of these activities focus on consciousness of whole staffs and rental shops on sustainable and efficient energy usages without investment or less investment. In addition, the energy awareness can be obtained and applied to have popularity, sustainable energy which can be transfer to communities and societies in a wider range. The saving outcomes are extended to global aspect of Thailand.

Action plans and budgets for energy conservation measures are set up in annually to retrofit or replace high efficient equipment in consideration of payback period and saving earns. Low investment cost will be the first priority to promptly action. The feasibility studies of energy conservation measures with high investment cost are investigated carefully to analyze the outcomes for consideration. *The total investment costs for energy conservation measures are 109,395,140 Baht occurring electrical saving 5,264,781 kWh or 19,450,258 Baht with payback period 5.62 years and imported crude oil reduction can be obtained 18.953 ktoe for the duration of 3 year (2011-2013).* 





#### **1.4 Energy Efficiency Index**

The specific energy consumption (SEC) during 2010-2013 is given in following Table. The energy management and energy conservation measures were processed continuously and the saving can be achieved with average 4.41% (during 2011-2013) comparing the baseline year 2010.

Year	Energy Consumption (kWh/y)	Thermal Energy (MJ/y)	SEC (kWh/m².y)
2010	63,300,298	-	334.73
2011	57,108,962	-	301.99
2012	62,892,720	-	332.57
2013	55,893,600	-	295.56
Average	59,798,895		316.21

The values of SEC in 2011-2013 decrease comparing to baseline SEC in 2010 as followings.

- SEC in 2011 reduces 32.74 kWh/m<sup>2</sup>.y or 9.78 %
- SEC in 2012 reduces 2.16 kWh/m<sup>2</sup>.y or 0.64 %
- SEC in 2013 reduces 39.17 kWh/m<sup>2</sup>.y or 11.69 %

In the end of year 2011, there has float crisis and Future Park Shopping Center was closed for 1 month. In the beginning of 2012, the maintenance and machine improvement were done occurring the higher energy consumption.

#### 2. SUSTAINABILITY

#### 2.1 Level of Participation and Involvement

The energy conservation committees have appointed the working group or called small group activities to ensure the sustainability in the participation and involvement of all staffs in energy management. Each small group is responsible for each energy conservation measures. Energy conservation measures of each small group are conducted in accordance with the energy conservation plan in coordination with energy conservation committees. The small group will be the driven mechanism in each department to closely share the energy conservation committees. Future Park Shopping Center focuses on energy conservation campaign. All staffs involve in the energy conservation promotion i.e. the contest on energy conservation board, energy and environment slogan contest, reduction of electricity bill.



Participation of Staffs





#### 2.2 Top Level Management Commitment

The energy policy has set up by the boards of Future Park Shopping Center to be a part of business works. The target goals are clearly set and become part of responsibility from the top management down to all levels in the organization. The energy policy covers the supporting in investment of high efficient technology for energy conservation, energy awareness training for all staffs and rental shops, energy and environmental campaign to obtain sustainable outcomes and social responsibility under the concept of Green Awareness of Future Park Shopping Center which composed of five key factors under the social responsibility of ISO 26000 as followings:

- Corporate Governance: To encourage staffs for relationship in organized popularity in morality and honest aspects.
- Environment: To operate green business, consume and take care natural resources in efficient and CO<sub>2</sub> reduction under 3R (Reduce, Reused, Recycle)
- Social: To encourage activities in the organization and any societies.
- People: To Improve personnel potential and support public relation activities for the organization, societies and environment.
- Customers & Suppliers: To offer valuable attentions, invitation staffs, rental shops, customers and other people to participate energy conservation activities or



energy saving and environmental projects with various advertising media.

ประกาท บริษัท วังสิทหลาข่า จำกัด ที่ อง42551
เรื่อง นโยบายอนุรักษ์พลังงาน FUTUREPARK
เพื่อแขตงความผู้เป็นของบริษัทฯ ในการดำเนินชุรกิจ บริษัทธ์สมกับว่า การอยุรักษ์ที่ส่งรวมเป็น อังสำคัญ ร่วยประเท็ดหลังสามอดดับทุน และลดการะไดกร้อน ร่วดดอแฮนองการดำเนินการของบริษัท ๆ และประเทศทร และกรรรเป็นหน้าที่ของหนักรามทุดอนที่ต้องร่วมเชือกันด์หนัดการจัดการหลังงานอย่าง ด่อนนี้ออและไห้ค.อรู่ด่อไป
ดังนั้นบริษัทฯ จึงถ้าหนดนไขนายขนูรักษ์หลังงานเพื่อใช้เป็นแนวทางการดังเป็นงานด้านหลังงานและ เพื่อสังสรับการใช้หลังงานได้เกิดประสิทธิภาพและเกิดประโยชน์สูงสุด ทั้งนั้นริษัทฯ จึงกำหนดนไขมาย ดังส่อไปนี้
1. บริษัตร จะสำเนินการและพัฒนระบบการจัดการพลังรามอร่าแหมาะสน โดยกำหนดได้ การอยุรักม์ พลังรามเป็นส่วนหนึ่งของการด้านนิเงานของบริษัตร สอดคล้องกับกฎหมายและจัดกำหนดที่นา ที่ เพื่อรังจะ
2. บริษัทฯ ขะดำเนินการปรับปรุงประสิทธิภาพการใช้ทรัพยากรพถังงานขององก์กรอย่างต่อเมือง และ เหมาะสมกับธุรกิจ เทคโนโลชีที่ใช้ และแนวทางการปฏิบัติงานที่ดี
3. บริษัทฯ จะกำหนดแดนและเป็าหม่ายการอนุรักษ์พลังงานในแต่ละปี และสื่อสารไท้หนักงานทุกกน เจ้าใจและปฏิบัติได้อย่างถูกค้อง
4. บริษัทร ชื่อว่าการหนูร์กาษ์หลังระหามินหน้าที่การบริบัติตขอนของรังของ ผู้บริหาร และพบักงานของ บริษัทฯ การสอบที่จะได้ความร่วมมือในการปฏิบัติศามาตรการที่กำหนด คิดตามครวจสอบ และ รวจธาต่อตอนร่างรงที่เการจัดการหลังราม
3. บริษัทฯ ขะให้การสนับสนุน พรัพธากรด้านบุคตล ด้านงบประมาณ เวลาในการทำงาน การฝึกธบรม การประชาตัมพันธ์ กิจกรรมการอยุรักษ์พลังงาน และการมีส่วนร่วมในการนำเสนอข้อลิดเห็นเพื่อ พัฒนาระบดภัณฑนั้นหนังาน
6. ผู้บริหารและคณะทำงานด้านการจัดการหลังงานจะทบทรวมและปรับปรุงนไชบาช เป้าหมาย และ เมหมการดำเนินงานด้านพลังงานทุกปีอย่างต่อเมือง
จึงประกาศมนพื่อทราบและอื่อปฏิบัติโดยทั่วกัน
ประกาศ ณ วันที่ 13 ธันวาคม 2553
1120 T CU for .
1733/0713 ថ្មីមីកា31 បេដែក Schoolanti 2410 អនុរដ្ឋអាហារិយលោក អីហា កាលការិយល់ (សាល់ទៅហើយ ទោះ សាល់ (សាល់ទៅហើយ) ទោះ សាល់ (សាល់ទៅហើយ) ទោះ សាល់ (សាល់ទៅហើយ)

The boards and all level staffs cooperate in planning and implementation to obtain effective achievements, evaluation and revision to improve and develop continuously and efficiently, personal supporting and budget for energy conservation measures. In addition, these include feasibility study supporting before

implementation and invitation expert energy consultants in energy analysis for investment. Training for all level staffs and energy conservation encouragement are also supported. Moreover, the energy conservation committees will be the driven mechanism to achieve the target goals.

#### 2.3 Short and Long-term Plan

Energy conservation and environmental conserves are the key goals of Future Park Shopping Center and there have three main key factors to fulfil this goal as policy aspect, operation and training.







3 Kev Factors for Energy Conservation

- **Policy Aspect:** The boards of Future Park Shopping Center concise on public relation campaign, supporting investment to achieve sustainable energy and environment which fulfill energy conservation goals set as KPI in annually for the organization.
- **Operation**: This factor focuses on energy reduction in equipment losses, efficient operation in the organization, knowledge on energy awareness covering whole staffs and rental shops, and corporation with

external organization in energy conservation activities.

• <u>*Training*</u>: Energy and environment trainings and relevant trainings inside and outside the organization are set up for all staffs and rental shops to obtain valuable knowledge and skills in energy management.

		Duration		Target Energy Conservation			Investment	Dovbook
Item	Energy Conservation Measures	Start	Finish	Electrical Consumption (kW)	Energy Consumption (kWh/y)	Saving (Baht/y)	(Baht)	Period (y)
Action	<u>n Plan: Year 1</u>							
1	Energy conservation in Office	Jan 2014	Jan 2014	-	44,731	155,952	-	-
2	Using only 1 lift instead of 2 lifts from Monday to Friday	Feb 2014	Feb 2014	-	46,464	172,381	-	-
3	Adjustment of chilled water temperature in the period of cold climate	Nov 2014	Dec 2014	-	44,565	165,336	-	-
4	Replacement of LED 18 W instead of FL 36 W	May 2014	Dec 2014	25.3	42,628	158,150	1,055,000	6.67
5	Replacement of water pump No.2 from 30 kW to 22 kW and installation of VSD	Jul 2014	Jul 2014	10.2	44,676	165,748	1,500,000	9.05
Action Plan: Year 2								
1	Installation of roof solar cell for electricity generation	Jan 2015	Dec 2015	Feasibility and detailed studies are examined and analyzed in 2014.				zed in
	Total Saving	5		35.5	223,064	817,567	2,555,000	3.13

#### Table 3 Future Plans for Energy Conservation Measures (Year 2014-2017)

#### **Table 4 Training Plans in 2014**

Training Course	Duration	Internal Activities	External Activities
- Energy conservation training in cooperation with external organizations	Jan – Dec 2014		$\checkmark$
- Persons Responsible for Energy (PRE)	Mar – Apr 2014		$\checkmark$
- Power leading for power saving	May 2014	$\checkmark$	
- Energy conservation awareness and value engineering	Jun 2014	$\checkmark$	
- Lean management	Nov 2014	$\checkmark$	





#### Table 5 Energy Awareness Activities for Staffs and Rental Shops in 2014

Activities	Duration	Internal Activities	External Activities
- Energy conservation campaign for rental shops	May 2014	$\checkmark$	
- Visiting best practice energy conservation buildings	Jul 2014		$\checkmark$
- Public boot for energy and environment campaigns	Jan – Dec 2014	$\checkmark$	
- Public relation i.e. stickers for energy conservation campaigns covering whole areas	Jan – Dec 2014	$\checkmark$	
<ul> <li>Cooperation with government and private sectors to organize energy conservation campaigns</li> </ul>	Jan – Dec 2014		$\checkmark$
<ul> <li>Forestation for increasing oxygen content and CO<sub>2</sub> reduction</li> </ul>	Jul 2014		$\checkmark$

#### 2.4 Organization

#### 2.4.1 Established or Improved Organization for Energy Management

The boards of Future Park Shopping Center has appointed the Energy Management Committees which were organized from representative of each department and internal audit committees. The energy management committees deal with energy management respected to the energy policy, controlling energy uses, knowledge distribution, training organization, public relation on relevant energy conservation aspects for all staffs and rental shops. Furthermore, the energy management committees also incorporate between operating staffs and the boards of Future Park Shopping Center for valuable suggestions in order to achieve sustainable energy conservation. Internal audit committees were set up to follow up the energy conservation measures and activities to fulfill the effective energy management in the organization. Moreover, the internal audit committees summarize the resultant of energy evaluation to the boards of the organization to satisfy energy conservation targets and objectives. The assigned persons and responsibility are illustrated in the following flow chart.





Committee on Energy Management	Technical working	<ul> <li>-Mr. Chatchai Doungdanet, Engineering Managers/ Secretary</li> <li>-Mr.Kantaphat Phongted, Chief Mechanical</li> <li>-Mr. Shudsa Jumnonk, Head of Electrical and Communications</li> <li>-Mr.Tongchai Bunpisitsakul, Chief Electrical</li> <li>-Mr.Suwit Thingtong, Chief Maintenance</li> </ul>	re, n all ne
	Published and Public Relations	-Miss Pathra Mora, Senior Public Relation Manager -Mr.Montri Thitiwiwatkul, Assistant Director of Sales -Mrs.Chawana Phuwanakitchakorn, Secretary	Ϋ́f, ie
	Develop and enhance their knowledge of energy	<ul> <li>-Mrs.Napaporn Phokhaidhanes, Office Manager</li> <li>-Miss Kanya Kajonklin, Manager Cleanliness and Landscaping.</li> <li>-Miss Natthayapat Pavanaviwat, Head of Human Resources</li> </ul>	d tkshops to on to
Committee of Assessors Power Management	Internal	-Mr.Suchi Vaichapaikul, Senior Vice Precident -Mr.Santi Dachaprompun, Building Manager -Mrs.Chinapat Narakhote, Finance manager -Mrs.Jeerapa Vijitkagee, Assistant Account Manager -Miss.Nattaya Sotiyothin, Head of AreaManagement -Mr.Suradech Soonthontaweewat, Head of Systems Development -Miss Chanapa Danrahan, Head of Legal	t f the t results to nt and ons to y set.

Energy Management Committees and Internal Audit Committees

#### 2.5 Capacity building

#### 2.5.1 Activities: Projects / activities applied for internal and external of organization

Future Park Shopping Center corporates with the government and private sectors to conserve energy and environment inside and outside the organization. In addition, these corporations also expand to sustainable energy conservation and social responsibility. *External Energy Conservation Activities* 

- Join with Department of Environmental Quality Promotion, Thailand in energy conservation network.
- Join with Nokia for recycle activities "We can do"





- Disseminate the energy conservation activities of Future Park through the Energy Saving Magazine.
- Promote the energy conservation knowledge via public boot for exhibition event.
- Corporate with Department of Alternative Development and Efficiency (DEDE), Ministry of Energy to hold Inhouse Practical Training in Future Park "Power Saving next GEN 1-1"





Join with Nokia for recycle activities "We can do"

Join with Department of Environmental Quality Promotion, Thailand in energy conservation network.



**Energy Saving** 

**Environmental Day Joined with Department of Environmental Quality Promotion, Thailand in energy conservation network.** 

#### Internal Energy Conservation Activities

- Training on Energy Conservation Awareness for rent shop.
- "Green Passport" Activities.
- Project on "Zero Waste"
- Board, sticker, poster to promote energy conservation campaign more than 160 points.
- Promotion of energy conservation campaign through the intranet, food court, information board.
- Dissemination on "Future Focus" magazine











Green Passport Activities

Winner Award for Rent shops under Green Passport Activities



Project on "Zero Waste"

#### **2.5.2 Educational Training**

Future Park Shopping Center focuses on the development of all level staffs in the energy conservation aspect. The energy workshop trainings are organized and invite experts from DEDE, universities, experience private companies to educate energy conservation knowledge and best practice workshop. Furthermore, the staffs whom pass the energy training could be the instructor to transfer the obtained knowledge to other staffs and rental shops. The energy conservation training courses are summarized in Table 6.

#### Table 6 Energy Conservation Training Courses

Course	Date/Location	Attendants (People)	Remarks
Inhouse Practical Training			
- Internal Audit of Energy Management	1 Feb 2011 (Meeting Room Fl.3)	19	
Value Engineering and Energy Sustainability	4 Mar 2011 (Meeting Room Fl.3)	10	Manager
Power Saving	25 Aug 2011 (Meeting Room Fl.3)	42	Generation 1
Power Saving	28 Sep 2011 (Meeting Room Fl.3)	56	Generation 2
Sustainable Energy Awareness	24 Sep 2012 (Meeting Room Fl.3)	49	Generation 1
- Sustainable Energy Awareness	25 Sep 2012 (Meeting Room Fl.3)	52	Generation 2
Sustainable Energy Awareness	2 Oct 2012 (Meeting Room Fl.3)	43	Generation 3
Sustainable Energy Awareness	3 Oct 2012 (Meeting Room Fl.3)	37	Generation 4
Sustainable Energy Awareness	16 Sep 2013 (Meeting Room Fl.3)	42	Generation 1
Sustainable Energy Awareness	17 Sep 2013 (Meeting Room Fl.3)	46	Generation 2
Sustainable Energy Awareness	18 Sep 2013 (Meeting Room Fl.3)	49	Generation 3
Sustainable Energy Awareness	19 Sep 2013 (Meeting Room Fl.3)	52	Generation 4





Course	Date/Location	Attendants (People)	Remarks
External Training			
Persons Responsible for Energy (PRE), Senior	10-14 Mar 2011	2	
Environmental and Energy Management	25 Mar 2011	1	
Project on Energy Management Promotion	25 Mar 2012	6	
- Energy Conservation and Innovation	25 Mar 2012	8	
- Energy Conservation for Thai Entrepreneurs	25 Mar 2012	3	
- Seminar on Energy Conservation Dissemination	5 Apr 2012	3	
- Environmental and Energy Management	Sep 2013	1	
Persons Responsible for Energy (PRE)	Oct 2013	1	





Power Saving Sustainable Energy Awareness

## **3. REPLICABILITY**

#### Management Practices and Measures/Technology

For the promptly responsive services of growth customer, Future Park Shopping Center decided to retrofit the existing chiller plant with high efficient chillers and equipment integrated with chiller plant management. The breakdown of energy consumption for central air-conditioning system is 34-35% of the total energy consumption and the system is composed of the followings.

- Chillers: cooling capacity 1,700 RT with the amount of 6 units and cooling capacity 900 RT with the amount of 1 unit.

Chilled water pump: Primary and Secondary chilled water system. Pri

- mary chilled water system with flow capacity 2,720 GPM (6 units) and flow capacity 2,160 GPM (1 unit). Secondary chilled water system with flow capacity 2,250 GPM (4 units: high zone) and flow capacity 2,250 GPM (4 unit: low zone).
- Condenser water pump: Flow capacity 2,720 GPM with the amount of 13 units (2 units per chiller).
- Cooling tower: Cooling capacity 1,700 RT (2×850 RT per cell), 6 units.







The Existing Central Air-Conditioning System

Chillers 1,700 RT with the amount of three units and 900 RT with the amount of 1 unit have operated between 8.30 am to10.30 pm. The maximum cooling load is 5,100 ton as given in the following figure.



Cooling load profile of Future Park Shopping Center (March 6, 2011)

#### **Rationale:**

The average performance of chiller is 0.93 kW/RT. For example, the performance of chiller 1,700 RT is 0.96 kW/RT which is higher than specification 0.29 kW/RT or 43.3% of cooling capacity. Moreover, the standard criterion value obtained from DEDE is 0.80 kW/RT, whereas the performance of chiller 900 RT is 0.68 kW/RT. For that reason, the electricity consumption increases due to chillers 1,700 RT and the the cooling load cannot be obtained with the existing system (during 8.30 am to afternoon).

	Specification			Measurement Data			
No.	% Load	Electrical Consumption	Cooling Capacity	Performance	Electrical Consumption	Cooling Capacity	Performance
		kW	RT	kW/RT	kW	RT	kW/RT
CH-1	80.0	1,140	1,700	0.67	1,010.75	1,061.13	0.95
CH-2	81.0	1,140	1,700	0.67	879.60	960.18	0.92
СН-3	93.0	1,140	1,700	0.67	957.52	1,067.64	0.90
CH-4	80.0	1,140	1,700	0.67	951.81	945.52	1.01
CH-5	87.0	1,140	1,700	0.67	1,009.17	1,122.89	0.90
CH-6	92.0	1,140	1,700	0.67	1,069.89	945.39	1.13
CH-7	97.0	612	900	0.68	566.16	830.04	0.68
Total/Avg	87.1	7,452	11,100	0.671	6,444.89	6,932.79	0.93

Table 7: The Measured Performance	of Chillers
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Performance of chilled water pumps, condenser water pumps and cooling towers is 0.09 kW/RT, thus the total performance of chiller plant can be obtained 1.02 kW/RT. **Solution method:** 

Replacement of high efficient chiller integrated with chiller plant management system in order to efficient energy management and also support the requirement of customers and comfort condition can be obtained. For that problem, the 1,700 RT chillers increase the electric energy consumption, so the high efficiency chiller is used and apply the chiller plant management system in the operation. Moreover, in the future, a target value of the electric energy consumption must not excess 0.78 kW/RT. Consequently, the electric energy saving is 0.24 kW/RT (23.53%).

- (1) Replacement of five high efficient chillers (2,000 RT and 0.581 kW/RT) instead of the existing chillers six units (1,700 RT).
- (2) Replacement of the primary chilled water pumps 5 units (45 kW and 3200 GPM) instead of the existing primary chilled water pumps with 6 units (37 kW).
- (3) Replacement of the primary chilled water pump 1 unit (30 kW and 2160 GPM) instead of the existing old primary chilled water (30 kW).
- (4) Replacement of 5 units condenser pumps (110 kW and 6,000 GPM) instead of the existing 12 units condenser pumps (45 kW).
- (5) Replacement of 1 unit condenser pump (55 kW and 2,730 GPM) instead of the old condenser pump (55 kW)
- (6) Replacement of 11 units cross flow cooling towers (1,000 RT) instead of existing 6 units cooling towers (1,700 RT).

#### **Benefit:**

The total investment cost is 103,137,160 Baht. The energy saving and cost saving are 4,255,034 kWh/year and 15,828,726 Baht/year or 15,318,122.40 MJ/year in comparison between 2013 to 2012 with the payback period 6.52 years. The  $CO_2$  emission can be conserved 3,091.35 ton per year. Moreover, the cooling capacity for the new system with the effective management can fulfil completely the requirement of customers.



The new central air-conditioning system



Energy consumption of chiller plant





## 4. ORIGINALITY

#### **Creativity/Innovation**

#### Waste Water Recycle Using in Cooling Tower instead of Water Supply

In the beginning, Future Park Shopping Center concerns the waste water recycle to reuse before construction and focuses on resources saving and conserves including reduce, reuse and recycle to achieve "Future Park Goes Greener". Waste water drainage has the amount of large quantities in a day and has been treated by various process i.e. water recycle, activated carbon filtration and disinfection. After mentioned treats, the water can reuse for supplying to building again. The primary process of waste water treatment is activated sludge including with equalization tank, aeration tank, sedimentation tank and sand filter and the secondary process has four sets of sand filters and carbon filter. The water quality after two mentioned process can reuse to water the plants and water flashing.



In 2009, Future Park Shopping Center consumed average water supply 1,390 m<sup>3</sup>/day which can be classified to supply activities in Future Park 960 m<sup>3</sup>/day or 69.06% of total water supply and supply to cooling tower 430 m<sup>3</sup>/day or 37.94% of total water supply. The price of water supply is 24 Baht/m<sup>3</sup> that means the cost of cooling system is 10,320 Baht/day or 3,766,800 Baht/year.

year	Water Supply (Baht/m <sup>3</sup> )	Water Used for Activities (m <sup>3</sup> /y)	Water Used in Shopping Center (m <sup>3</sup> /day)	Water Used in Cooling System (m <sup>3</sup> /y)	Reused Water Produced (m <sup>3</sup> /y)	Reused water for Activities (m <sup>3</sup> /d)	water supply to recycle process (m <sup>3</sup> /d)
2009	23.54	507,350	350,400	156,950	277,400	105,850	171,550
2010	23.54	397,034	260,351	136,683	272,019	130,692	141,327
2011	23.70	335,594	218,602	116,992	193,479	99,787	93,692
2012	28.24	401,843	234,109	133,504	205,810	101,531	104,279
2013	32.41	470,669	304,436	166,233	268,380	124,506	143,874

#### Table 8Water Supply and Reused Water

As seen in Table 8, Future Park Shopping Center has technical concepts to reduce make up water in cooling tower system using reused water recycle with Ultra filtration membrane technology which the initial cost for producing water supply from reused water is 16 Baht/m<sup>3</sup> and lower than existing make up water 8 Baht/m<sup>3</sup> with capacity 36 m<sup>3</sup>/h and turbidity less than 1 NTU. The water recycle is produced with high quality according to standard of WHO (Particle more than 0.01 micron size cannot pass for example, colloid, bacterial, virus and dust).





The project corporates between Aqua Infinitity Co., Ltd and Future Park Shopping Center and the contract has signed in term of BOT (Build Operate and Transfer) with during period 10 years.





The saving of water supply to cooing tower is 416,729  $\text{m}^3$  per three years or 4,181,356 Baht per three years. Furthermore, the reduction of CO2 emission can be obtained 11 Ton per three years (make up water 1  $\text{m}^3$  is equivalent to CO<sub>2</sub> emission 0.0264 kg or energy consumption 11,000 kWh per three years.

- Year 2011, saving of make up water 116,992  $m^3/y$  or CO<sub>2</sub> 3.09 Ton/y, cost saving 900,838 Baht/y (referred to different price at 7.7 Baht/m<sup>3</sup>).
- Year 2012, saving of make up water 133,504 m<sup>3</sup>/y or CO<sub>2</sub> 3.52 Ton/y, cost saving 1,563,332 Baht/y (referred to different price at 11.71 Baht/m<sup>3</sup>).
- Year 2013, saving of make up water 166,233  $\text{m}^3/\text{y}$  or CO<sub>2</sub> 4.39 Ton/y, cost saving 1,717,187 Baht/y (referred to different price at 10.33 Baht/m<sup>3</sup>).

